Clashing Harmonic Systems in Haas's Blumenstück *and* in vain

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Georg Friedrich Haas (b. 1953) has been recognized as a major second-generation "spectralist" composer, but that designation ignores the substantial influence on his music of earlier microtonal composers, especially Ivan Wyschnegradsky, a pioneer of microtonal equal temperaments, and Harry Partch, who developed a system of extended just intonation based on the intervals of the overtone series. Haas's recent works *Blumenstück* (2000) and *in vain* (2000) create large-scale form by dramatizing the opposition between equal temperament and just intonation.

Keywords: Georg Friedrich Haas, *in vain*, *Blumenstück*, *de terrae fine*, *"In iij. Noct"*, microtonality, just intonation, spectral music, *Klangspaltung*, Shepard-Risset glissando, Ivan Wyschnegradsky, Harry Partch, Ben Johnston, David Lewin, Steven Rings, generalized interval system.

In the past fifteen years, Austrian composer Georg Friedrich Haas (b. 1953) has begun to receive increasing international recognition for his richly sonorous microtonal music. In the United States, his music has found a number of passionate advocates, including the JACK Quartet, Argento Chamber Ensemble, and Sound Icon. Haas took up residence in New York in fall 2013 as a professor of composition at Columbia University, replacing the retiring Tristan Murail. Although, like Murail, Haas is often characterized as a "spectralist" composer due to his frequent use of chords based on the overtone series, this is a problematic and rather misleading label. Even composers closely associated with spectral music have raised doubts about the label: as Gérard Grisey put it, the term—first used in an essay by fellow composer Hugues Dufourt—was "just a sticker that we got at a certain period."[1] For Grisey, this sticker placed undue emphasis on the concept of acoustical spectra, ignoring other important aspects of his musical thought such as innovations in temporal structuring. A distinction must also be made between the term "spectral music" narrowly defined to include only the French *école spectrale*—the composers linked with the ensemble and composers' group L'Itinéraire including Grisey, Tristan Murail, and their students and associates—and a broader definition that includes composers of a wider geographical and aesthetic range. Robert Wannamaker, for example, has suggested a definition of spectral music that requires only "that it invoke Fourier spectral analysis as a conceptual point-of-reference": e.g., "North American spectralism" in the case of James Tenney.[2]

In Haas's case, the "spectralist" label is particularly problematic, since, in addition to conflating his music with the quite different concerns of the French *école spectrale*, it overlooks the significant role played by other, non-spectral concepts in his compositional thought:

> Yes, I use overtone spectra. But I would protest against being called a "spectralist." . . . I set against the overtone chords other harmonies, which are based on the major seventh, and thus stand in the tradition of the Second Viennese School, and especially of Anton Webern. In these non-microtonal chords I use concepts from Ivan Wyschnegradsky—this is perhaps another similarity to established microtonal traditions.[3]

These major-seventh-based chords inspired by Webern and Wyschnegradsky stem from a very different theoretical tradition: the equal-temperament language of atonal music. Rather than simplistically identifying Haas's music with the spectralists, we can better understand it as a unique combination of several different ways of thinking about pitch, emerging from a close engagement with the established traditions of microtonality. Two particularly important influences are the composers Ivan Wyschnegradsky, a pioneer of microtonal equal temperaments, and Harry Partch, who developed a system of extended just intonation based on the simple frequency ratios of the overtone series. In Haas's recent works *Blumenstück* (2000) and *in vain* (2000), one of his most powerful devices for creating large-scale form is the musical dramatization of this theoretical opposition between equal temperament and just intonation, between Wyschnegradsky and Partch.

Haas describes how he arrived at this dichotomy in a 2011 interview with Bálint András Varga:

> In the early 1980s, the Graz composer Hermann Markus Pressl wrote an impressive, straightforwardly structured vocal work which he called *Asralda*. The piece is based on the contrast between temperament (tritone A–E♭) and the overtone series (fifth D–A). That contrast has been stylized in the title, an artificial word, composed of "Asraphael" (=spiritual principle, =tempering, =A–E♭) and "Esmeralda" (=sensory principle, =overtone series, =D–A). The ideological, slightly esoteric background did not interest me in the least. However, the contrast between temperament (in my case mostly tritone-fifth and tritone-fourth chords) and the overtone series was to exercise my mind in many of my compositions over the next thirty years.[4]

For Haas as well as Pressl, the tritone, as a mathematically precise division of the octave into two equal halves, exemplifies

1 Dufourt (1991), Grisey (1996).
2 Wannamaker (2008, 91).
3 Haas (2007a, 128).
4 Varga (2011, 104).

equal temperament. The fifth, of course, also divides the octave in two, but unequally into the intervals of fifth and fourth. Considered as frequency ratios, the intervals are starkly different: the frequencies of the notes of a perfect fifth stand in the simple ratio $\frac{3}{2}$, meaning that the interval can be found between the second and third overtones. The ratio of the equal-tempered tritone, on the other hand, is the irrational number $\sqrt[12]{2}$, which cannot be found among the ratio intervals of the overtone series. Intervals close to the tritone do exist in the overtone series—for example, $\frac{7}{5}$ (5.83 semitones) or $\frac{17}{12}$ (6.03 semitones)—but none divide the octave into precisely equal halves.

Haas's ability to combine these different schools of microtonal composition to dramatic effect is possible only because, as a latecomer, he approaches contrasting theories as a relatively neutral outsider. Haas stands apart from more partisan composers like Ben Johnston, who in defense of just intonation once described temperament as an "acoustical lie."[5]

> I am not really comfortable with being pigeonholed as a "microtonal composer." Primarily I am a composer, free to use the means needed for my music. There is no ideology regarding "pure" intonation, either as Pythagorean number mysticism or as a notion of "Nature" determined by trivial physics. I am a composer, not a microtonalist.[6]

The composer's claim to be free from ideological commitments deserves to be approached with some skepticism: after all, the image of the creative artist as an outsider is a well-worn trope of modernist aesthetics, which Charles Wilson has described as a "rhetoric of autonomy."[7] Even so, Haas's simultaneous embrace of the usually antagonistic schools of equal temperament and just intonation does represent an aesthetic approach demonstrably different from the *esprit de système* common among his microtonal precursors. Haas defines himself as a pragmatist rather than an ideologue—the system-building preoccupations of other microtonalists are set aside in favor of the flexibility to draw on a range of theoretical concepts for the organization of pitch. One might view this as an instance of postmodern "incredulity towards metanarratives"[8]—certainly Haas's free mixture of equal-tempered and overtone-based theoretical constructs stands in sharp contrast to Partch's stated intention to invent a consistent harmonic system on a bedrock of "Archean granite" (the physical certainties of acoustics) rather than the received practices of Western music, including the equal-tempered scale.[9] Rather than writing within the boundaries of a single theoretical model, Haas achieves striking results through the confrontation of incommensurable systems. Comparable examples in the twentieth-century canon include Berg's juxtapositions of tonality and atonality and Britten's tonal glosses on twelve-tone material.

Haas's pluralist approach to microtonality is apparent in his taxonomy of different microtonal approaches (see Example 1), which appears in slightly different forms in two essays, "Mikrotonalitäten" (note the pluralized title, "Microtonalities") and "Mikrotonalität und spektrale Musik seit 1980."[10]

In their broad outlines, the two classifications tend to agree: in particular, categories 3 and 4, *Klangspaltung* and aleatoric microtonality, are identical in both schemes. *Klangspaltung* refers to the "sound-splitting" effect of closely spaced microtones around a single pitch, while aleatoric microtonality arises from techniques like multiphonics, the prepared piano, or indeterminate notation that does not precisely specify pitch. The primary difference between the two schemes in Example 1 lies in their classification of just intonation, the overtone series, and spectral music. In the earlier "Microtonalities," Haas draws the primary distinction in categories 1 and 2 between equal temperament on one hand and just intonation and the overtone series on the other. Surprisingly, spectral music is absent here, though some limited aspects of spectralism might be incorporated under the heading of "overtone series proportions." In the later article, "Microtonality and Spectral Music since 1980," Haas has reorganized the scheme. Here the guiding principle is a division between the horizontal and the vertical, between scales (whether equal-tempered, in just intonation, or stemming from various non-European traditions) and harmony (encompassing both the overtone series and other devices from spectral music). The primary conceptual split of the earlier taxonomy between two ways of theoretically dividing pitch space (equal temperament and just intonation) is abandoned in the later version to acknowledge that, despite their theoretical differences, both are essentially scalar modes of thought and thus quite different than either overtone-based or spectral music (which focus on sounding vertical harmony instead of abstract scale structures). This reorganization suggests that to Haas the extended just intonation of Partch and his followers is primarily scalar in conception, not harmonic.

With the exception of "non-European scales," aspects of all these approaches are found in Haas's own music. Haas is interested not only in microtonal equal temperaments but also in the standard twelve-tone variety. In his harmonic writing, Haas often contrasts chords in twelve-tone equal temperament with overtone-series harmonies that extend to the twenty-second harmonic partial and beyond. Compared to French spectral composers like Grisey and Murail, Haas shows little inclination to explore real-world spectra that differ from the harmonic series, like the inharmonic spectra of bells or gongs. Rather, Haas's view of the overtone series seems more similar to that of James Tenney, who described the series as a kind of perceptual archetype.

> I'm not using the harmonic series to imitate something else. . . . I'm using it because of its special properties or the special properties of the auditory system in relation to it. It's a unifying structure. It's a structure that our auditory systems have built into

5 Johnston (2006, 62).
6 Varga (2011, 102).
7 Wilson (2004, 6).
8 Lyotard (1984, xxiv).
9 Partch (1974, xvii).
10 Haas (2003), Haas (2007a).

"Mikrotonalitäten" (2003)	"Mikrotonalität und spektrale Musik seit 1980" (2007)
1. Equal divisions of the octave	1. Scales
	a. non-European scales
	b. equal divisions of the octave
	c. irregularly structured scales (including Partch's just intonation)
2. Overtone series proportions/just intonation	2. Overtone chords and spectral music
3. *Klangspaltung*	3. *Klangspaltung*
4. Aleatoric microtonality	4. Aleatoric microtonality

EXAMPLE 1. *Georg Friedrich Haas's taxonomy of approaches to microtonality. Topics have been reordered to show the similarity between the two classifications.*

them: the capacity to reduce to a unity, to a singularity. . . . And that's a very useful formal idea.[11]

Tenney's idea of the overtone series as a "unifying structure" echoes Albert Bregman's observations about the "harmonicity principle": the tendency of partials belonging to a single overtone series to be fused into a single percept.[12] Haas confirms the importance of the overtone series as "one of the foundations of microtonal harmony," but objects to the ideological baggage of phrases such as "natural tone row" (*Naturtonreihe*), or pure tuning (*reine Stimmung*). The composer's artistic decision to invoke the overtone series in his music makes it an "artifact . . . exactly as artificial as any other musical material."[13]

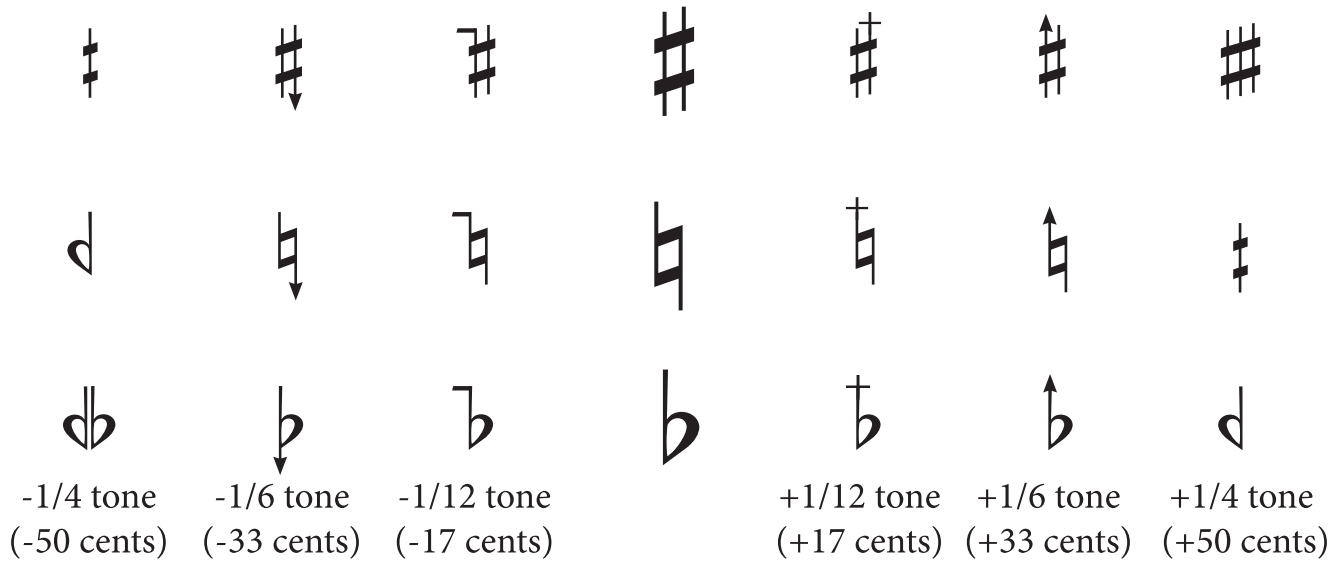
Even when using harmonies based on the overtone series, Haas takes an equal-tempered approach to microtonal notation, dividing each tempered semitone into six equal parts or twelfth-tones (see Example 2). This is reminiscent of the equal-tempered microtonality of Wyschnegradsky and Alois Hába, marked by the use of quartertones as well as smaller equal divisions like sixth-tones, eighth-tones, twelfth-tones, etc. Haas notes, however, that in his music these "are not exact twelfth-, sixth-, and quartertones, but rather indicate the corresponding intervals of the overtone series."[14] The twelfth-tone divisions closely approximate deviations from equal temperament found in the overtone series, like the flat fifth and seventh partials, to within a few hundredths of a semitone. For example, the interval between the fourth and fifth harmonics is 14 cents (hundredths of a semitone) flatter than a tempered major third, so the tempered interval flattened by a twelfth-tone ($16\frac{2}{3}$ cents) is a close approximation. Flattening by two twelfth-tones ($33\frac{1}{3}$ cents) brings a tempered minor seventh close to the natural seventh between the fourth and seventh harmonics (31 cents flat), and the interval between the eighth and eleventh harmonics (a tritone reduced by 49 cents) can be represented quite accurately with an adjustment of three twelfth-tones (50 cents, or a quartertone).

This notation offers an effective compromise of microtonal pitch concepts (both equal-tempered and just) with traditional pitch notation, though it is not without problems, such as awkward enharmonic spellings, as Haas admits.[15] A similar twelfth-tone equal temperament has been used extensively by Ezra Sims, James Tenney, and Joe Maneri in the United States, and by Hans Zender and Franz Richter Herf in Germany and Austria.[16] Unlike a strictly just-intonation system of notation like those developed by Partch, Johnston, or more recently Marc Sabat and Wolfgang von Schweinitz,[17] this fine-grained equal temperament does not ascribe a particular just-intonation derivation to every pitch and interval. This neutrality of derivation opens the door to hybrids between equal temperament and just intonation: depending on its context, for example, the interval of $3\frac{1}{2}$ semitones might be seen either as an equal-tempered construct (a "neutral third," or half of an equal-tempered fifth) or as the close approximation of a just interval such as $\frac{11}{9}$ (3.47 semitones) or $\frac{16}{13}$ (3.59 semitones). For Haas, the number of subdivisions of the semitone is largely a practical matter: "all this is a question of scaling (*Skalierung*), just as one can choose different resolutions for a computer screen."[18] He describes a preference for "thinking in sounds" and only notating relatively late in the compositional process.[19]

BLUMENSTÜCK

We can start to explore some of the tensions between harmonies based on the overtone series and those based on equal temperament in Haas's 2000 composition *Blumenstück,* an eighteen-minute setting for thirty-two-voice choir, tuba, string quartet,

11 Tenney and Dennehy (2008, 87).
12 Bregman (1990, 232).
13 Haas (2007b, 122–24).
14 Haas (2000).
15 Haas (2007b, 126–27).
16 Sims (1988), Tenney (1987), Maneri (1985), Zender (2003), Hasegawa (2011), Hesse (1991).
17 Sabat (2008, 70).
18 Haas (2007a, 126).
19 Haas (2007b, 126–27).



EXAMPLE 2. *Haas's twelfth-tone accidentals.*

and double bass of excerpts from "The Dead Christ Proclaims that There Is No God," a poetic "flower-piece" set into the narrative of Jean Paul's novel *Siebenkäs,* published serially in 1796 and 1797 (see Example 3). The text is a refutation of atheism, though commentators have also read it as written "out of a feeling of anguish and doubt."[20] The text is "a dream of annihilation,"[21] the fantasy of a dreamer who imagines the chaos and despair of a universe without God. The narrator recounts a dream: while lying on a sunny hillside, he falls asleep and dreams he is in a dark churchyard. In the midst of a swirl of chaotic imagery, Christ himself speaks and declares the nonexistence of God. The dream closes with an image of the "serpent of eternity" crushing the universe, at which point the dreamer finally awakes, weeping with joy that his dream was unreal, and that he and the world live on "in the eternal father's sight." The text presents the peace and orderliness of the world as an argument against atheism—without a God, Jean Paul concludes, the world would indeed be plunged into a chaos such as he describes. Though it closes with a reaffirmation of God and life, the uncanny text seems to arise from a deep fear of mortality and destruction and has been described as "the first poetic expression of nihilism in European literature"[22]

Haas's setting of the text often draws out words and phrases, as at the beginning of the piece where the words "zersprengt und zerschlagen" ("shattered and shivered" in Ewing's translation) are drawn out over twenty-seven measures of slow $\frac{4}{4}$ time. The first minutes of the piece already point to Haas's primary compositional concerns: the smooth just-intonation thirds of mm. 2–6 are contrasted with the equal-tempered tritone A–E♭ at m. 7. In these opening measures, we also hear a characteristic clash between purely tuned overtones built above two fundamentals separated by an equal-tempered semitone, A♭ and A (as in Example 18 from the composer's *in vain*, to be discussed later in this article), and also a relatively rare example in mm. 12–13 of what Haas categorizes as "aleatoric microtonality": each voice starts on an indeterminate pitch, "as high and quiet as possible," before swooping down to a notated arrival point as part of a just A♭-major triad.

Given Haas's fascination for the combination of clashing systems of pitch organization, one section of Jean Paul's text that is *not* set by Haas stands out. Near the beginning of the dream, the narrator describes how "the church was heaved and shaken to and fro by two terrific discords striving in it, beating in stormy effort to attain harmonious resolution."[23] Though this text is never set by Haas, it is an evocative image for the passage from *Blumenstück,* summarized in Example 4, that first establishes a just-intonation chord on the fundamental G, then combines it with an equal-temperament chord that "beats" against it. Through glissandi, the initial overtone chord on G drifts smoothly into a chord of alternating tritones and fourths. The text, "into innumerable glittering quicksilver globules of individual personalities," suggests that the move from the acoustically fused pitches of the overtone series to the dissonant equal-temperament chord can be understood as a musical illustration of this fragmentation. In the music, the just-intonation and equal-temperament chords sound simultaneously, suggesting Jean Paul's discords "beating in stormy effort to attain harmonious resolution."

We hear in this passage how Haas contrasts the warm sound of the just-intonation overtone series with the harsher, less aurally fused effect of stacked tritones and fourths in equal temperament. In foregrounding the contrast between just

20 Vijn (1982, 26).
21 Vijn (1982, 25).
22 Uwe Schweikert, cited in Vijn (1982, 50).
23 Richter (1796/1897, 262).

…das ganze geistige Universum wird durch die Hand des Atheismus **zersprengt und zerschlagen in zahlenlose quecksilberne Punkte von Ichs, die blinken, rinnen, irren, zusammen und auseinander fliehen**, ohne Bestand und Einheit. (2)

The whole spiritual universe is **shattered and shivered,** by the hand of Atheism, **into innumerable glittering quicksilver globules of individual personalities, running hither and thither at random, coalescing, and parting asunder** without unity, coherence, or consistency. (260)

Ich ging durch unbekannte Schatten, denen alte Jahrhunderte aufgedruckt waren. (5–6)

I passed among shadows, strange and unknown to me; but they all bore the impress of the centuries. (262)

Ich suchte im ausgeleerten Nachthimmel die Sonne, weil ich glaubte, eine Sonnenfinsterniß verhülle sie mit dem Mond. (4–5)

I looked for the sun in the dark and void night sky, for I supposed that some eclipse was hiding it with the moon. (261)

Christus fuhr fort: "Ich ging durch die Welten, ich stieg in die Sonnen und flog mit den Milchstrassen durch die Wüsten des Himmels; aber es ist kein Gott. Ich stieg herab, so weit das Senn seinen Schatten wirft und schauete in den Abgrund und rief: Vater, wo bist du; aber ich hörte nur den ewigen Sturm, den niemand regiert, **und der schimmernde Regenbogen aus Wesen stand ohne eine Sonne, die ihn schuf, über dem Abgrunde und tropfte hinunter**." (7)

And Christ spake on, saying, "I have traversed the worlds, I have risen to the suns, with the milky ways I have passed athwart the great waste spaces of the sky; there is no God. And I descended to where the very shadow cast by Being dies out and ends, and I gazed out into the gulf beyond, and cried 'Father, where art Thou?' but answer came there none, save the eternal storm which rages on, controlled by none; and towards the west, above the chasm, **a gleaming rainbow hung, but there was no sun to give it birth, and so it sank and fell by drops in the gulf**." (263)

EXAMPLE 3. *Excerpts in Haas's* Blumenstück *from Jean Paul's* Blumen-, Frucht- und Dornenstücke oder Ehestand, Tod und Hochzeit des Armenadvokaten F. St. Siebenkäs im Reichsmarktflecken Kuhschnappel *(1796). Text in bold is set by Haas. All English translations by Alexander Ewing (Richter 1897).*

"Ach, wenn der Jammervolle sich mit wundem Rücken in die Erde legt, um einen schönern Morgen voll Wahrheit, voll Tugend und Freude entgegen zu schlummern: **so erwacht er im stürmenden Chaos, in der ewigen Mitternacht—und es kommt kein morgen und keine** sanfte, **heilende Hand** und kein unendlicher Vater!" (10)

"But when the sad and weary lays down his worn and wounded frame upon the earth to sleep towards a fairer brighter morn all truth, goodness, and joy,—**behold! he awakes amid a howling chaos, in a night endless and everlasting; and no morning dawns, there is no healing hand,** no everlasting Father." (264–65)

"Starres, stummes **Nichts**! Kalte, ewige Notwendingkeit! **Wahnsinniger Zufall**! Kennt ihr das unter euch? Wann zerschlagt ihr das Gebaüde und mich? **Zufall, weisst du selber** …" (8–9)

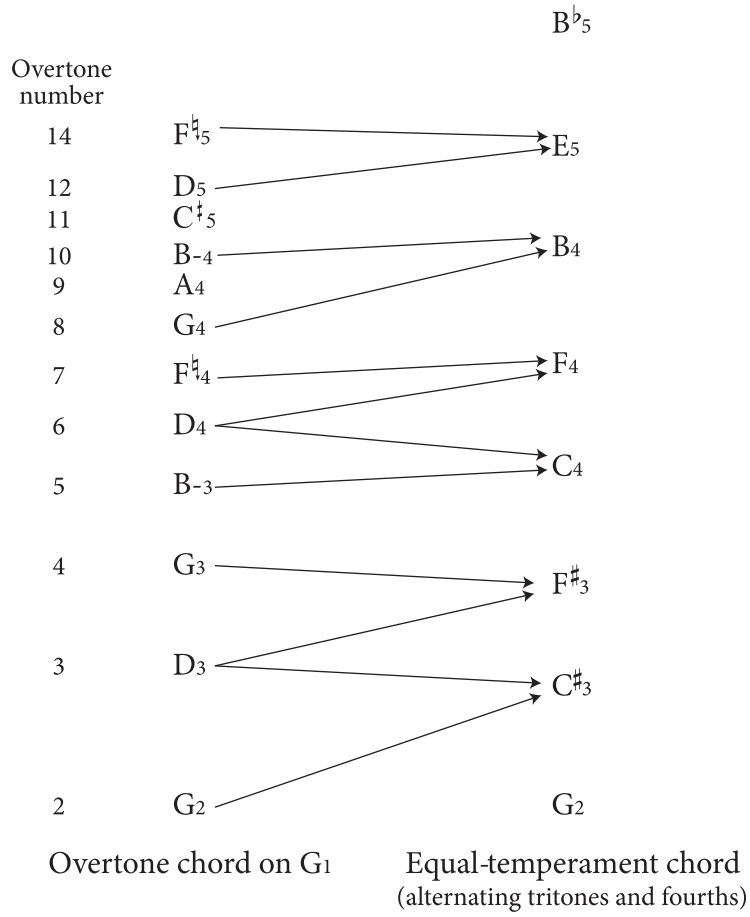
"O dead, dumb **nothingness**! Necessity endless and chill! Oh, **mad unreasoning chance**—when will ye dash this fabric into atoms, and me too? **Chance, knowest thou** …" (263)

Und als ich niederfiel und ins leuchtende Weltgebaüde blickte: **sah ich die emporgehobenen Ringe der Riesenschlange, der Ewigkeitschlange, die sich um das Welten-All gelagert hatte—und die Ringe fielen nieder und sie umfasste das All doppelt—dann wand sie sich tausendfach um die Natur uns quetschte die Welten aneinander—und drückte zermalmend den unendlichen Tempel zu einer Gottesacker-kirche zusammen—und alles wurde eng, düster, bang—und ein unermesslich ausgedehnter Glockenhammer sollte die letzte Stunde der Zeit schlagen und das Weltgebaüde zersplittern…** als ich erwachte. (11)

And I fell down and peered into the shining mass of worlds, and **beheld the coils of the great serpent of eternity all twined about those worlds; these mighty coils began to writhe and rise, and then again they tightened and contracted, folding around the universe twice as closely as before; they wound about all nature in thousandfolds, and crashed the worlds together, and crushed down the boundless temple to a little churchyard chapel. And all grew narrow, and dark, and terrible. And then a great immeasurable bell began to swing in act to toll the last hour of Time, and shatter the fabric of the universe** to countless atoms—when my sleep broke up, and I awoke. (265)

EXAMPLE 3. *(Continued).*

intonation and equal temperament, Haas is not necessarily favoring one aesthetically over the other. Haas's second "thesis on microtonality" states that "there is a basic human need for beats in music." He proposes that "the twelve-tone tempered system is so widespread not *in spite of,* but *because* of its abstract intervals: because of its wonderfully 'false,' beat-rich major and



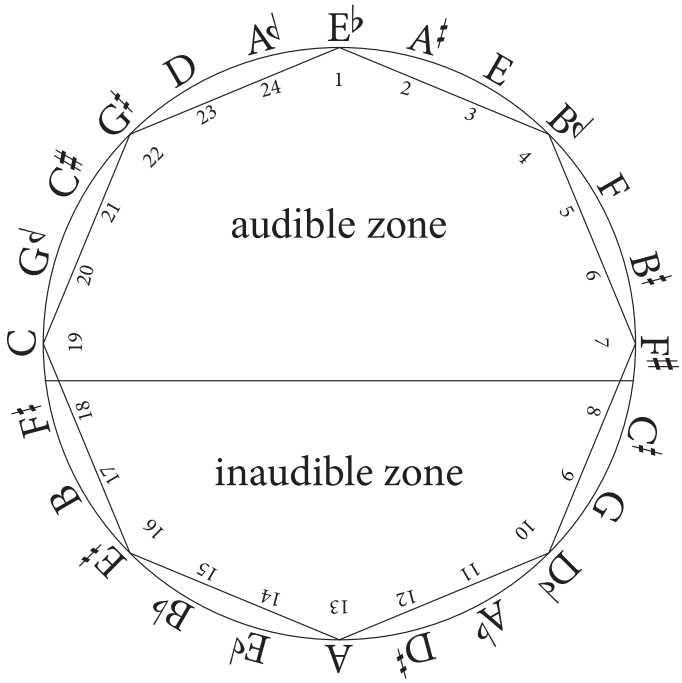
EXAMPLE 4. *Diagram of* Blumenstück, *mm. 120–29. Arrows represent glissandi within a single voice.*

dominant seventh chords." As Haas notes, the practice of music is full of intentionally beating intervals, as in string sections playing with vibrato or the wide octaves of Balinese *slendro* tunings: "The resulting beats bring life into the music."[24]

Though the chordal alternation of tritones with fourths (or fifths) is a favored device of a wide range of twentieth-century composers from Bartók to Boulez, Haas identifies it with a lesser-known figure, the Russian-French microtonal composer Ivan Wyschnegradsky. By Wyschnegradsky's own account, such cycles first appear in the music of Scriabin, Honegger, Bartók, and Obukhov.[25] Wyschnegradsky looms large in Haas's range of influences as an exemplar of the equal-tempered approach to microtonal composition. One of Wyschnegradsky's theoretical constructs was a "cyclic space" of intervals of $6\frac{1}{2}$ semitones each, analogous to the familiar circle of fifths in the way that it exhausts all twenty-four quartertone pitch classes (see Example 5). Two $6\frac{1}{2}$-semitone intervals, taken successively, split a minor ninth into equal halves: for example, the minor ninth E♭–E is subdivided by an A sharpened by a quartertone. Fancifully, Wyschnegradsky conceptualizes thirteen of the pitches in the "audible zone" of seven octaves corresponding roughly to the range of the piano, while the circle wraps around to complete itself in the "inaudible zone" of pitches above and below the limitations of the piano's range.[26] As the center of this "audible zone," the pitch $E♭_4$, equidistant from the boundary pitches C_1 and F♯, is assigned the numerical position label 1, and the remaining twenty-three pitches are labeled in clockwise order.

Example 6 shows the activation of this cyclic space at the beginning of Wyschnegradsky's 1961 *Étude sur les mouvements rotatoires*, for two pianos, eight hands, Op. 45a. The second piano is retuned a quartertone flat in comparison to the first. The pitch structure of the first five measures of the excerpt is presented in an analytical reduction in Example 7. At the beginning of the work (labeled "Position 1" in the score), the performers play a canonic texture of ascending lines in even rhythm, beginning at C_1 and rising by equal $6\frac{1}{2}$-semitone intervals to $F♯_7$. New voices enter the canon at the temporal distance of three eighth notes, forming simultaneities based on the

24 Haas (2007b, 124).
25 Wyschnegradsky (1972, 112).
26 Beaulieu (1991).



EXAMPLE 5. *Diagram of Ivan Wyschnegradsky's* espace cyclique, *adapted from the preface to* Étude sur les mouvements rotatoires, *op. 45a (1961). Copyright © 1961 by M. P. Belaieff Musikverlag. Copyright © renewed. All rights reserved. Used by permission of European American Music Distributors Company, U.S. and Canadian agent for M.P. Belaieff Musikverlag.*

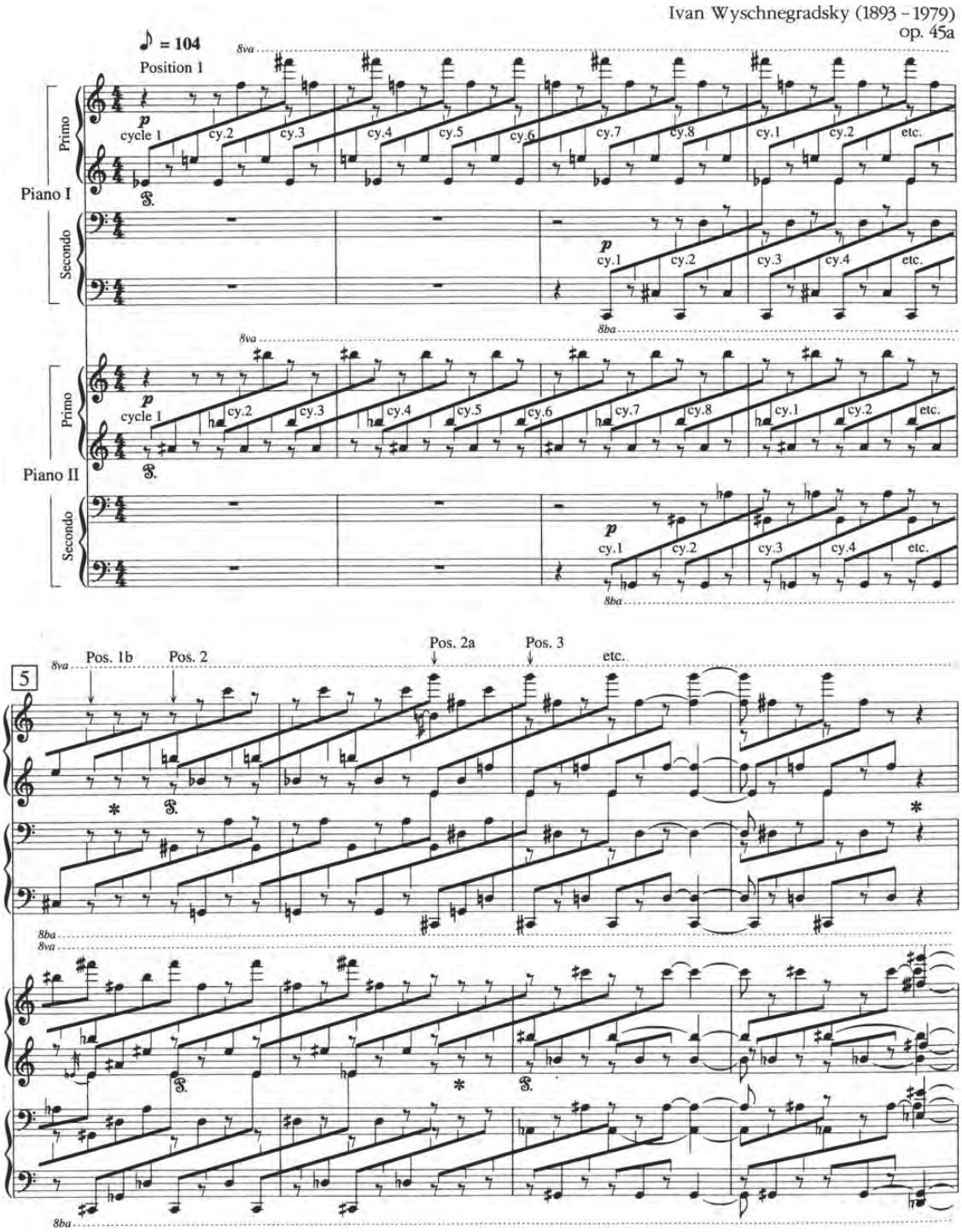
vertical interval of $19\frac{1}{2}$ semitones (3 times 6 $\frac{1}{2}$), a perfect twelfth plus a quartertone. The canon yields the sonority C_1–G¼♯$_2$–E♭$_4$–B¼♭$_5$–F♯$_7$ every three eighth notes. These pitches are marked in Example 5 as five of the vertices of a regular octagon (positions 19–22–1–4–7). With the ascent of $6\frac{1}{2}$ semitones every eighth note, this octagon rotates one position clockwise, mapping onto its original orientation after three steps. The constant addition of new rising voices starting from the low C results in a never-ending ascent reminiscent of a Shepard-Risset glissando, an aural illusion that later became one of Haas's favorite musical devices (see the discussion of Example 11 below). Among the French spectralists, it seems likely that the second movement of Grisey's *Vortex temporum,* described by the composer as "a sort of double rotation," was inspired by Wyschnegradsky's *Étude;* it shares a similar continuity of motion, and Grisey's students Jean-Luc Hervé and François Paris report that he assigned the *Étude* as an orchestration exercise.[27]

This rising, cycling texture is subjected to a further, large-scale "rotation." The $6\frac{1}{2}$-semitone cycle can be considered as two interlocking cycles of minor ninths; these are alternately shifted upwards by quartertone steps, resulting in intermediate stages where all the pitches fall into a single twelve-note scale. The first such stage is labeled "Position 1b": the minor ninths of Piano I (C_1–C♯$_2$–D_3–E♭$_4$–E_5–F_6–F♯$_7$, stems down in Example 7) are taken over by Piano II a quartertone higher. In combination with the interlocking cycle of ninths already played by Piano II, this transposition produces an alternating pattern of tritones and fifths (six and seven semitones). Unlike the equal $6\frac{1}{2}$-semitone steps of Position 1, these alternating tritones and fifths divide the minor ninth into *nearly* equal segments. Of course, a similar cycle can be built out from the complement of $6\frac{1}{2}$ semitones, $5\frac{1}{2}$ semitones. This is the cycle that gives rise, when approximated to twelve-tone equal temperament, to Haas's stacked fourths and tritones, as in the passage analyzed in Example 4. Wyschnegradsky referred to these twelve-tone approximations as "imperfect cycles."[28] In the *Étude* the imperfect cycle of Position 1b is transformed into the perfect cycle of Position 2 through another transposition by ascending quartertone, this time applied to the other cycle of minor ninths (stems up). In comparison to Position 1, which includes the pitches numbered 19 through 7 in Example 5, Position 2, a quartertone higher, is a clockwise rotation of thirteen steps (pitches 8 through 20).

The end of *Blumenstück* resolves the conflict of tempered and just intervals in favor of just intonation, with a chaconne based on transpositions of the just-intonation dominant-seventh chord (overtones 4 through 7): see Example 8 for a reduction of the chaconne chords in the chorus during the first pass through the repeated progression (mm. 212–31), with the fundamental of each chord indicated both on the bottom staff and with a letter name. The repeating chord progression sets the text's

27 Grisey (2008, 159), Criton (2013, 468).

28 Wyschnegradsky (1972, 110).

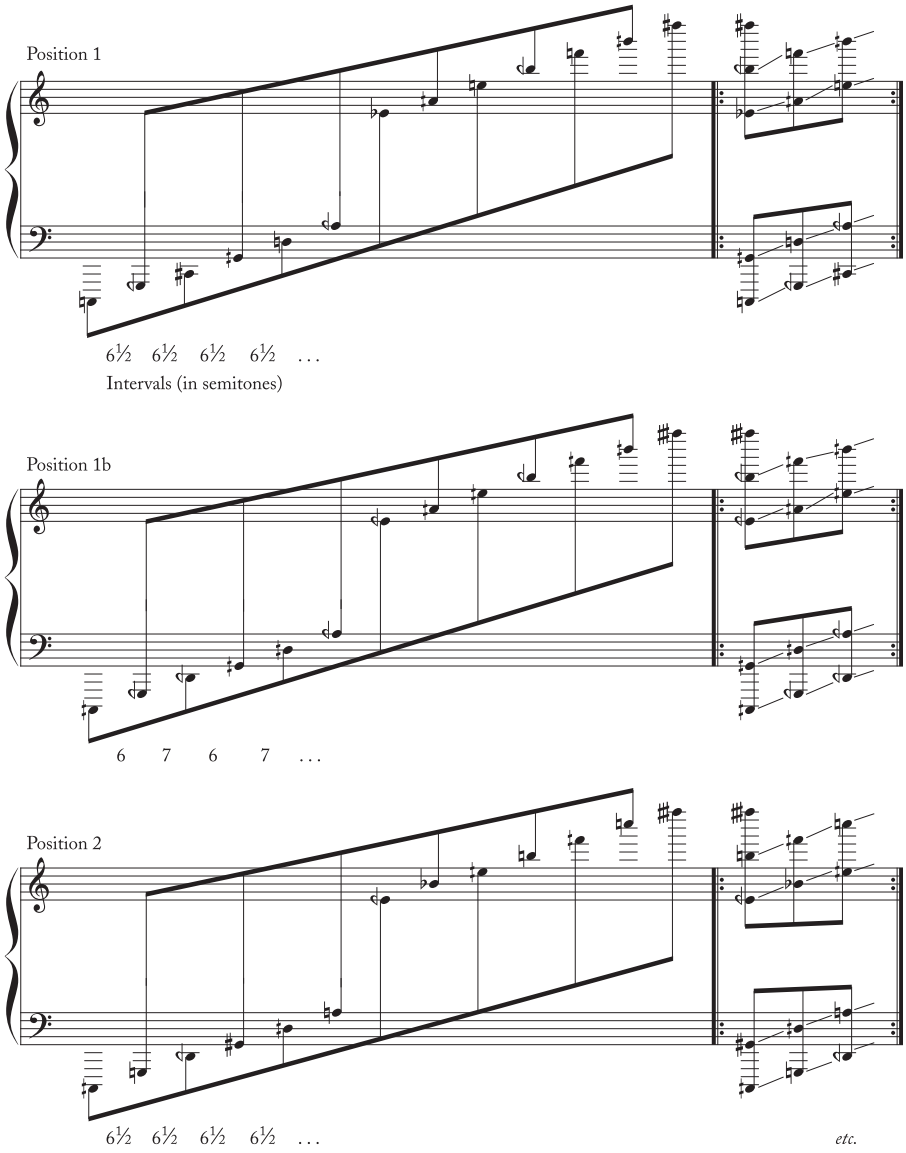


EXAMPLE 6. *Opening of* Étude sur les mouvements rotatoires, *mm. 1–8. Copyright © 1961 by M.P. Belaieff Musikverlag. Copyright © renewed. All rights reserved. Used by permission of European American Music Distributors Company, U.S. and Canadian agent for M. P. Belaieff Musikverlag.*

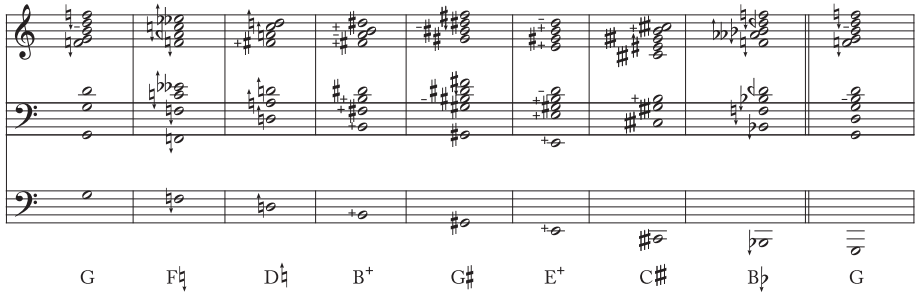
final apocalyptic image "[I] beheld the coils of the great serpent of eternity, all twined about those worlds," and can be heard as a musical depiction of the serpent's infinite spirals.

Example 9 develops an analysis of the chaconne, using a direct-product GIS (generalized interval system) that identifies each pitch both by its position in the overtone series and by its pitch class.[29] This GIS is inspired by recent research on tonality by Steven Rings and is useful here for tracking the parallel

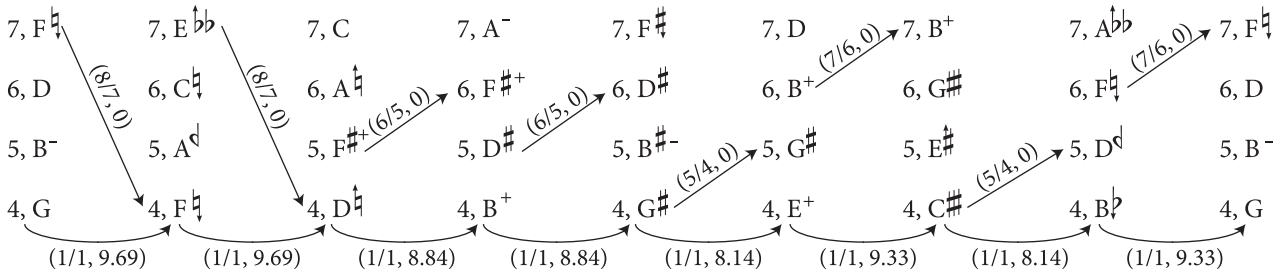
29 Lewin (1987, 26).



EXAMPLE 7. *Summary of interval cycles in Wyschnegradsky's* Étude sur les mouvements rotatoires, *mm. 1–5.*



EXAMPLE 8. *Harmonic progression of* Blumenstück*'s closing chaconne, mm. 212–71.*



EXAMPLE 9. *Analysis of the* Blumenstück *chaconne. Curved arrows show real transpositions between roots; straight arrows indicate pivot intervals (reinterpreted common tones).*

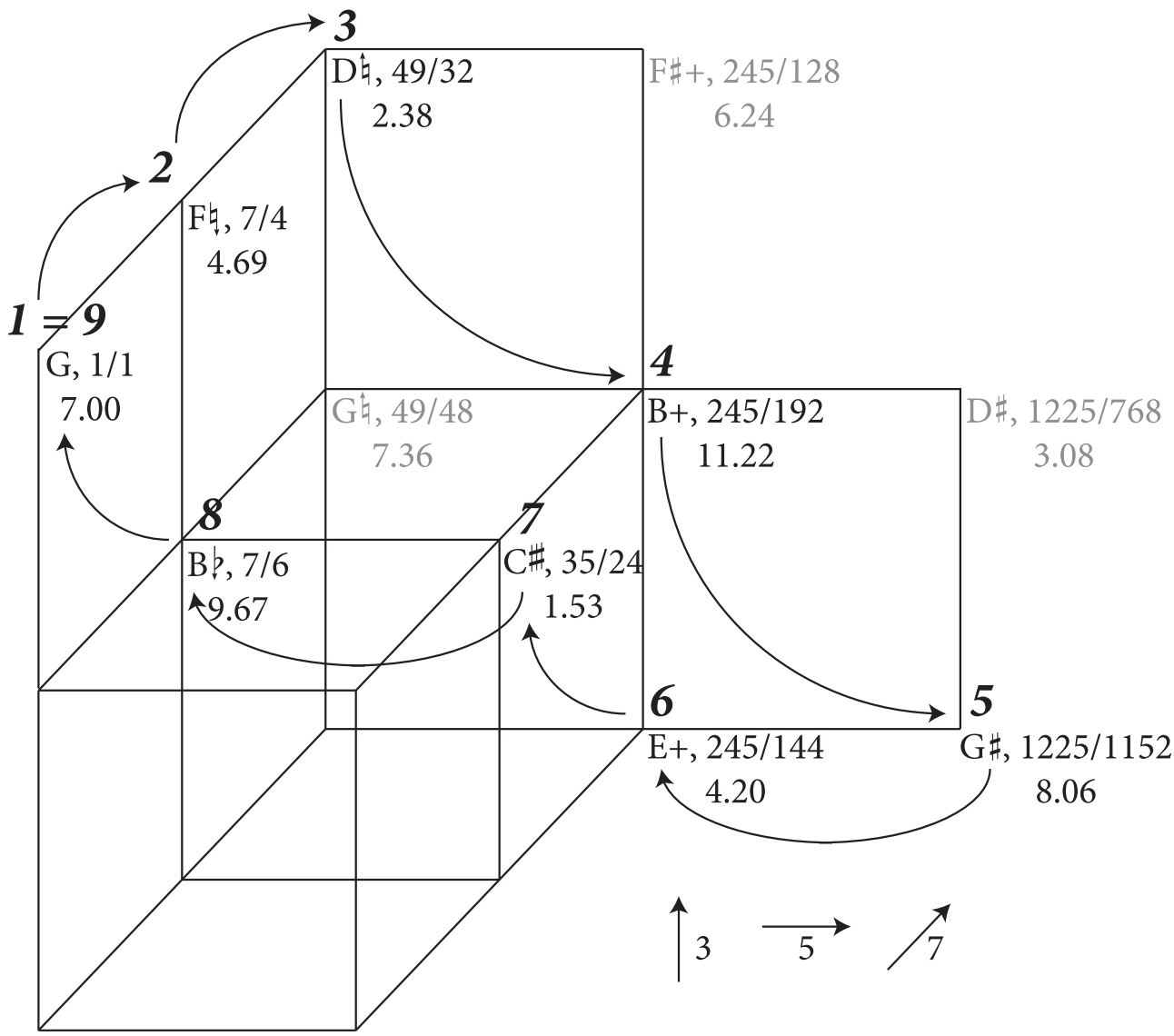
unfolding of two different interval types. Anthony Cheung and Kris Shaffer have used a similar GIS to describe aspects of György Ligeti's *Hamburgisches Konzert,* a late work (1998–99/2002) for solo horn, obbligato natural horns, and small orchestra.[30] The GIS embodies very neatly the mechanics of the horn soloist in that piece, who plays a standard double valve horn. Ligeti's writing for the valve horn is specific (more so than in standard notation) about both the valves used (to change the pitch class of the fundamental) and the overtone of that fundamental that must be played: precisely the two spaces mapped by this GIS.

In Rings's conception, the intervals of the GIS are defined between both scale degrees and pitch classes—the contrast in intervallic definitions between the two systems allows Rings to model important features of tonal syntax. Here I've replaced scale degrees with a number indicating the position of each pitch in the overtone series of its assumed fundamental: 4, 5, 6, or 7. In analogy to the concept of pitch class as opposed to pitches-in-register, we can think of each overtone as belonging to an "overtone class": the set of pitches including a particular overtone of a given fundamental as well as all pitches related to it by octave transpositions (multiplications by any power of two). For example, in relation to the first fundamental G (overtone class 1), overtone class 5 is made up of overtone 5 (B) and all its octave transpositions (10, 20, 40, etc.). Despite Haas's assertion that "in microtonal music, the principle of octave-equivalence no longer holds,"[31] this generalization from overtones to overtone classes has considerable analytical utility in this case, especially since overtone classes coordinate effectively with pitch classes, and we can define intervals between overtone classes just as we do pitch-class intervals. An overtone-class interval can be measured by a ratio from $\frac{1}{1}$ up to but excluding $\frac{2}{1}$ (i.e., within a single octave), which when multiplied with the first overtone class transforms it into the second: for example, the overtone-class interval between overtone classes 3 and 5 is $\frac{5}{3}$. This same interval is found between any two members of these two overtone classes: not only between 3 and 5, but also between 6 and 20, 3 and 10, 12 and 40, etc.—just as the pitch-class interval between any G and any E is 9 semitones. In Example 9, the intervals (labeled arrows) indicate first the overtone-class interval between two pitches (a ratio between $\frac{1}{1}$ and $\frac{2}{1}$), then the pitch-class interval (approximated to two decimal places). Pitch classes are shown as letter names, with Haas's accidentals as described in Example 2. To account for microtones, the pitch-class intervals in Example 9 are given with a two-decimal-place suffix indicating deviations from equal temperament.

Two transformation types will be of particular interest: these correspond to Rings's real transpositions (intervals from an overtone to its corresponding overtone in the next chord) and pivot intervals (reinterpretations of the same pitch as an overtone of a different fundamental). Real transposition is simple to conceive, and we see multiple examples along the bottom row of Example 9. Here the overtone class does not change from one node to the next, so that each arrow leads from the fundamental of one chord to the fundamental of the following one. (Similar horizontal arrows could be drawn connecting all the fifth overtones, all the sixth overtones, and so on.) Note that all the pitch-class intervals between adjacent roots are 8.14 semitones or larger: taken as descending intervals, the sizes range from the wide major second $\frac{8}{7}$ of 2.31 semitones (as heard in the first two root intervals) to the narrow minor third $\frac{7}{6}$ (2.67 semitones) and the familiar just-intonation minor and major thirds of $\frac{6}{5}$ and $\frac{5}{4}$ (3.16 and 3.86 semitones). There are four different intervals of real transposition in the excerpt.

In contrast to real transpositions, pivot intervals (represented by diagonal arrows in Example 9) keep the pitch class constant, but change its overtone class, i.e., its function within the chord. From the first chord to the second, for example, the lowered F is held over, changing its role from the natural seventh of G to the root of the second chord. Clearly, the pivot intervals are closely correlated with the real transpositions: in musical terms, this means that the common tones between chords are the key to the accurate intonation of the root progression. Note that not all the possible pairings of overtone classes are used in the pivot intervals: there is never a pivot interval involving the perfect fourth/fifth (between overtone classes 1 and 3) or the tritone-related pair 5 and 7. I speculate that this is to keep the impression of a constant descent of the fundamental by just seconds and thirds—the fifth and tritone are both too wide to fit into this pattern, and the fifth carries additional tonal implications that would be distracting in this context.

30 Rings (2011), Cheung (2010), Shaffer (2006).
31 Haas (2007b, 125).



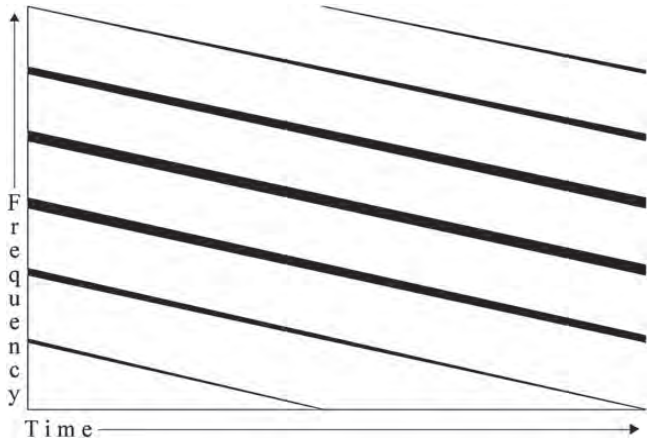
EXAMPLE 10. *Root progressions from the chaconne mapped onto a three-dimensional "3–5–7" matrix, after Ben Johnston.*

While earlier in the piece Haas uses pure overtone chords for their sonic quality (loosely speaking, a spectralist approach) and their contrast with equal-tempered "Wyschnegradsky chords," in the chaconne Haas turns to the extended just intonation of Harry Partch and his successors, most notably Ben Johnston. The harmonic progression defines a complex pitch-class space based entirely on simple frequency ratios.

Example 10 maps the chaconne root progression onto a three-dimensional matrix, modeled after Johnston's "3–5–7" lattice as described in "Rational Structure in Music."[32] The front face of this lattice is a version of the familiar *Tonnetz*, with major thirds (factors of 5) on the horizontal x-axis and perfect fifths (factors of 3) on the vertical y-axis. The diagram is extended into three dimensions by the addition of a z-axis, representing the flat natural seventh (factors of 7). Each pitch is labeled with its letter name, its intervallic relationship to the initial G (expressed as a just-intonation ratio), and its pitch-class modulo 12 (rounded to the nearest hundredth of a semitone, with G as 7.00).

Conceiving the progression in this way helps to give a sense of the distances covered in harmonic space. The first two moves, each lowering the root by an interval of $\frac{8}{7}$ (equivalent to tonicizing the flat seventh partial of the preceding sonority), lead to a raised D, represented by the ratio $\frac{49}{32}$ in Partch and Johnston's notation. The next two intervals, both descending minor thirds ($\frac{6}{5}$), bring the harmony to its most distant point from the initial "tonic" G, a G♯ representing the unwieldy interval 1225/1152. From here, the harmony must work back to the starting point to close the loop for another pass through the chaconne: this return takes place through a different succession

32 Johnston (2006).



EXAMPLE 11. *Descending Shepard-Risset glissando.*

of intervals, this time just major thirds (3.86 semitones) and narrow septimal minor thirds (2.67 semitones).

In pitch terms, the descent from G back to G occurs through eight intervals adding up to two octaves, with an average size of 300 cents (an equal-tempered minor third). Yet at the end of this pass through the chaconne harmonies, the music is not two octaves lower, but at essentially the same G chord where it began. A clear inspiration here is the well-known auditory illusion of the Shepard-Risset glissando, illustrated schematically in Example 11, where the thickness of the lines corresponds to the amplitude of each partial. This illusion creates the effect of an endless descent by using a tone with octave-related partials: as the lower partials descend, they fade away, only to be replaced by upper partials imperceptibly fading in. Haas's approach is slightly different: he maintains register by shifting voices up an octave at staggered intervals; these shifts are carefully distributed between voices to keep a general impression of smooth descent.

Perhaps surprisingly, given the text's apocalyptic imagery, Haas's setting ends "not with a bang but a whimper": after a gradual decrescendo to *pianissimo*, the chorus cuts off abruptly on the penultimate lowered B♭ chord of the chaconne, with the words "und das Weltgebäude zersplittern" ("and shatter the fabric of the universe").

OTHER WORKS: *DE TERRAE FINE* AND *"IN IIJ. NOCT."*

Similar just-intonation constructs are found in other works by Haas from this period. In the excerpt from the solo violin piece *de terrae fine* (2001) shown in Example 12, the violinist negotiates a modulation in just intonation from a B–D♯ major third to a tritone consisting of the seventh and tenth harmonics (A♭ and D) of a "somewhat too high" B♭. This passage is particularly significant as the first departure from the speech melodies (*Sprachmelodien*) of the first forty-nine measures (notated in tempered quarter- and sixth-tones) and the introduction of the contrasting just-intonation material that plays an increasing role in the second half of the piece, eventually replacing the speech melodies with violent multiple stops.

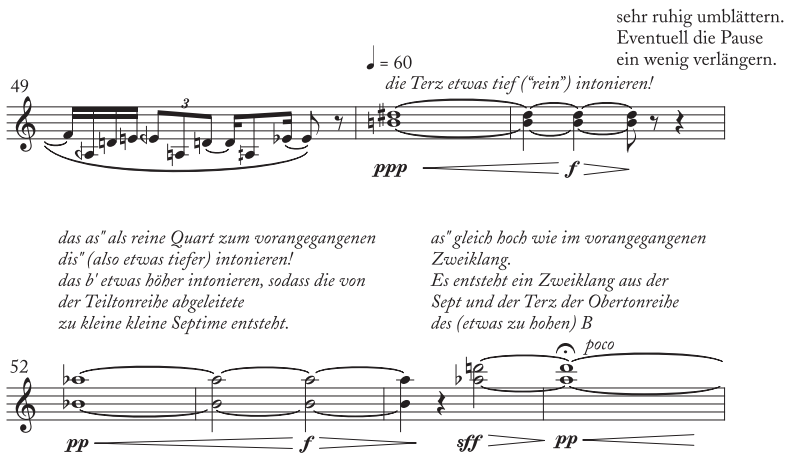
Since the notation of this excerpt uses only standard accidentals, the text in the score is particularly important. First, the major third B–D♯ is tuned slightly narrower than in equal temperament, as a $\frac{5}{4}$ just third of approximately 3.86 semitones. The A♭ is tuned as a just fourth (4.98 semitones) to the D♯, and is thus also slightly flatter than in equal temperament. The B♭ is a narrow natural seventh ($\frac{7}{4}$) below the A♭, sounding as a fourth overtone in relation to the A♭ as seventh overtone—the actual fundamental of this overtone series would be the B♭ two octaves lower. In the final dyad, the A♭ is sustained from the previous chord, and D is added as a fifth overtone above the same B♭ fundamental. The precise tunings of this passage are summarized in Example 13, which uses the same 3–5–7 lattice as Example 10.

It is important to note that by the end of the excerpt, the final pitch-class D (2.02) is only 2 cents wider than an equal-tempered minor third from the starting point of B (11.00), despite the complex just-intonation ratio of $\frac{25}{21}$ between the two pitches. Both the B and D can be notated as standard, equal-tempered pitches without microtonal inflection. We might think of the move from B to D through this complex, just-intonation path as the revelation of an unexpected and exotic inner structure hidden within the prosaic tempered third. In the measures that follow, the arrival pitch D is paired with the eleventh overtone (3.67) of the same "too high" B♭ fundamental, notated as a tempered quartertone E¼♭ to pave the way for the return of the quartertone speech melody in m. 58. The dramatic contrast between just intonation and the rougher, less pure sounds of tempered intervals also informs mm. 174–88: ethereal parallel major thirds in just intonation ("*wie aus einer anderen Welt kommend*") gradually narrow through intermediate steps ($3\frac{1}{2}$ semitones, 3 semitones, etc.) to minor seconds and finally a tense eighth-tone dyad. The gradual accelerando that accompanies this transition from purity to roughness plays on the correlation between a sonority's duration and its intonational purity that is also explored in Haas's *in vain*.

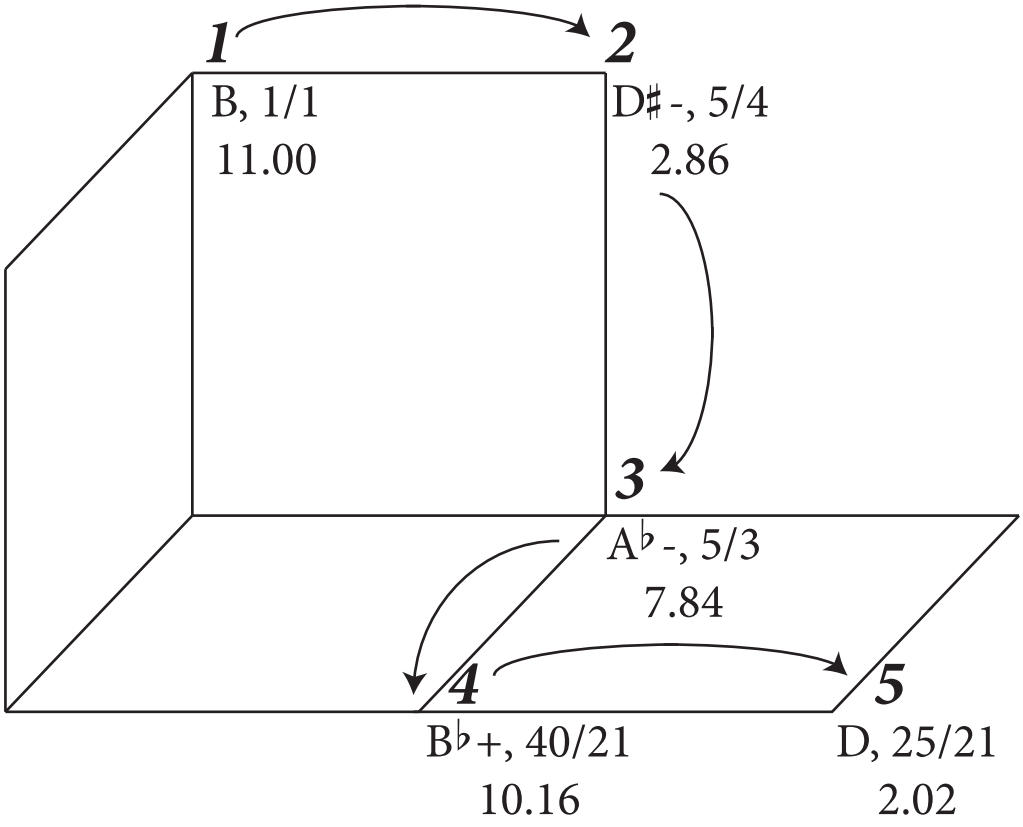
In his third string quartet, *"In iij. Noct."* ("in tertia nocte," 2001), Haas calls for similar chains ("Ketten") of overtone chords in a "do-it-yourself" version. The quartet is played in complete darkness, and the performers (arranged at different corners of the hall) communicate through a series of invitations (*Einladungen*) that can be accepted or ignored. In the material marked "C," one player offers an "invitation" with a simultaneous pizzicato and bowed unison. If the invitation is accepted, the other players join in to create a just-intonation seventh chord, as in the *Blumenstück* chaconne:

> This tone will be taken as part of an overtone chord in just intonation, understood either as fundamental, third overtone (octave plus fifth), fifth overtone (two octaves plus major third), or seventh overtone (two octaves plus minor seventh). A second instrument adds one of these tones, and the third and fourth instruments complete the sonority as a four-voiced overtone chord.[33]

33 Haas (2001, 4).



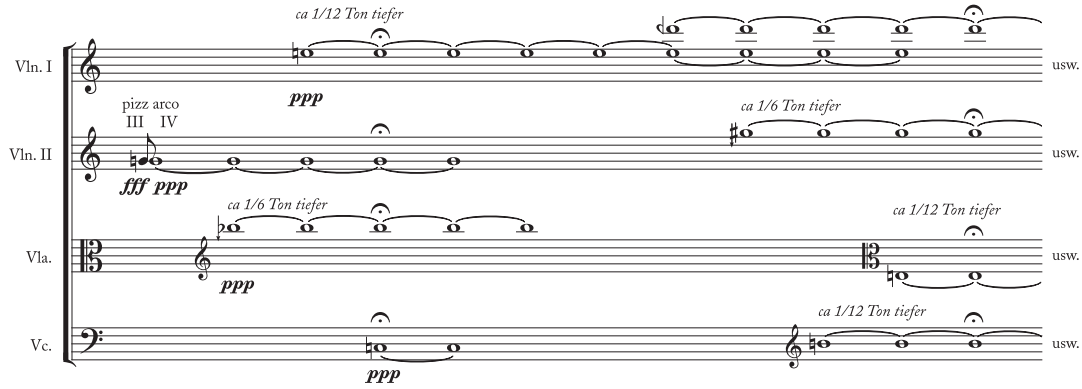
EXAMPLE 12. *Just intonation excerpt from* de terrae fine *for solo violin (2001).*



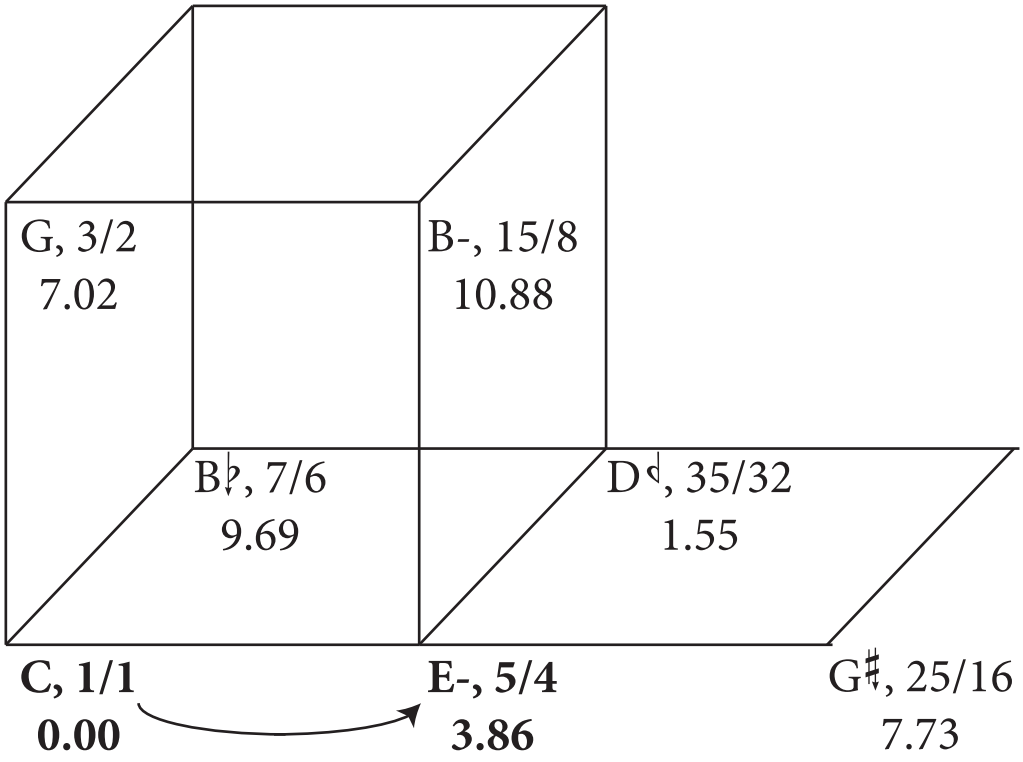
EXAMPLE 13. *Analysis of the excerpt from* de terrae fine *in Example 12.*

The voices of the chord then drop out until only the fifth or seventh overtone is sustained—this pitch class is then reinterpreted as the fundamental of a new seventh chord. The sample excerpt offered by Haas in Example 14 illustrates how this process effects a move from an overtone chord on C to a chord on E a just major third higher.

Example 15 shows how the pitches of the sample excerpt would appear on Johnston's 3–5–7 lattice, with the fundamentals in bold type. The first chord consists of the corner marked "C, $\frac{1}{1}$" and the three points attached to this fundamental by line segments, while the second chord consists of the analogous pitches in relation to the new fundamental of E-. Note that,



EXAMPLE 14. *Score excerpt from* "In iij. Noct." *(2001): sample realization of "do-it-yourself" overtone chords.*

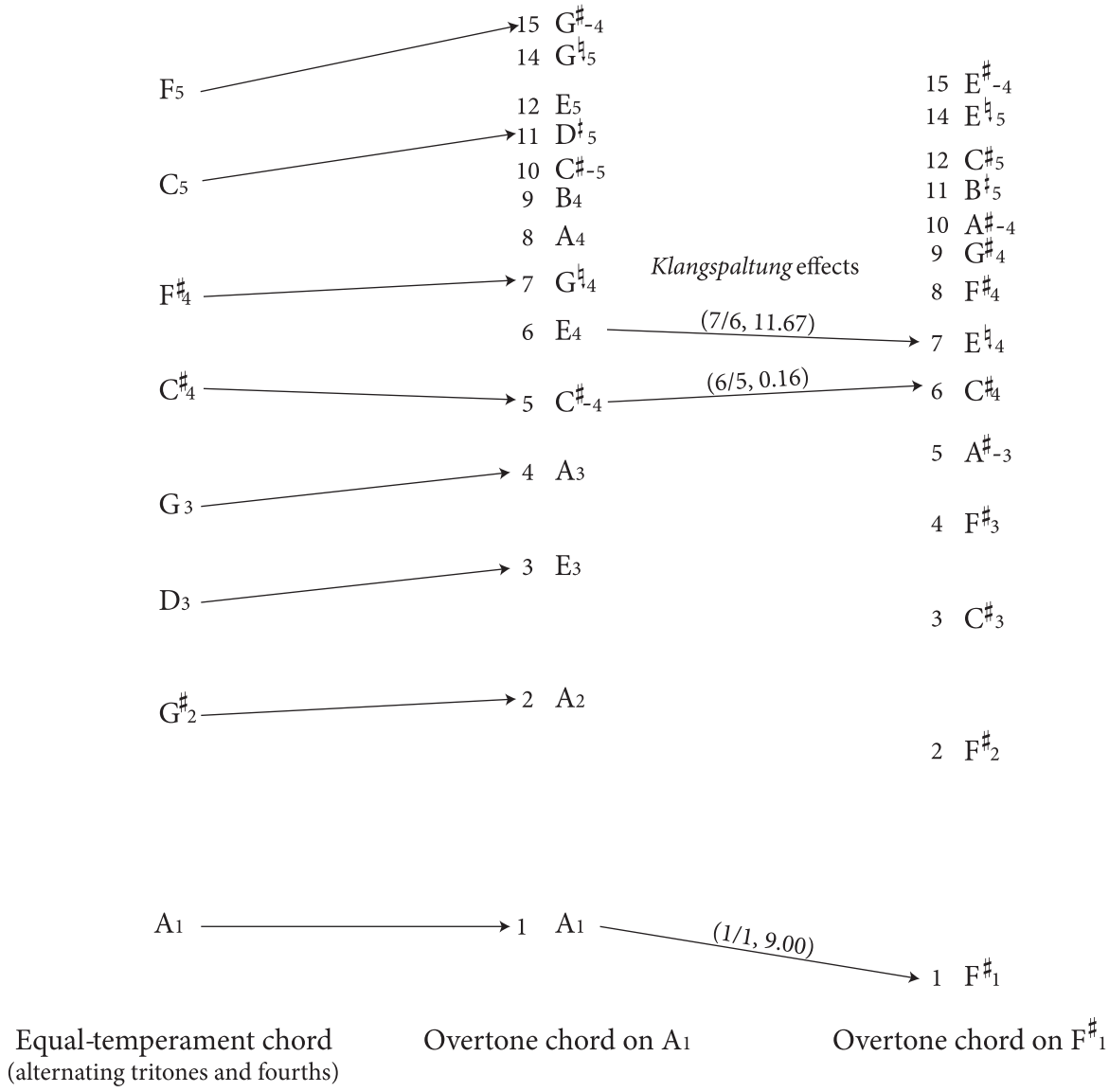


EXAMPLE 15. *Analysis of the sample realization from* "In iij. Noct." *in Example 14. Fundamentals of each seventh chord are shown in bold type.*

given Haas's rules, the progression of chord roots will always be either to the right (up a major third) or to the back (up a natural seventh) of the lattice as the third and seventh partials are reinterpreted as roots. Despite its open form, *"In iij. Noct."* contains the same contrasts between just intonation and equal temperament found in *Blumenstück*: elsewhere in the piece, do-it-yourself material types appear that are based on "Wyschnegradsky chords," gradually built up by the performers from a single dyad invitation into eight-part chords that alternate tritones with fourths or fifths.

IN VAIN

Haas's hour-long chamber orchestra piece *in vain* (2000) projects the harmonic concerns of *Blumenstück*—in particular the central contrast between just intonation and equal temperament—onto a much larger canvas. The pacing of *in vain* is extreme: as Haas notes, "microtonal music requires its own unique structuring of time"—a chord built on the high overtones takes a certain amount of time to "lock in" (*einrasten*), and Haas allows single harmonies to stretch over long temporal spans, measured

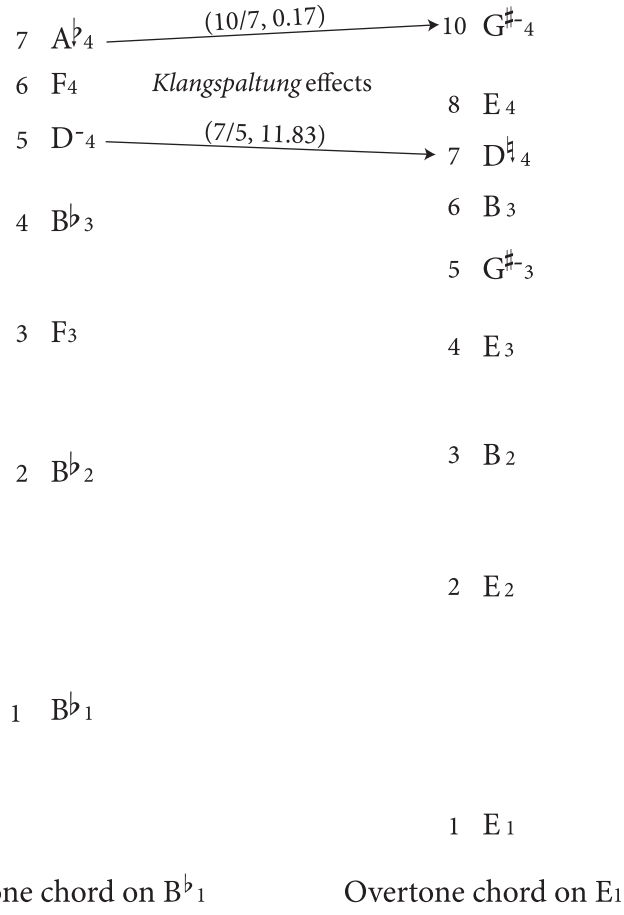


EXAMPLE 16. *Transition from equal temperament to superimposed overtone chords in* in vain, *mm. 475–81. Note the effect of microtonal* Klangspaltung *(tone-splitting) between sustained overtones of A and F♯, separated by intervals of 0.33 and 0.17 semitones. The arrows indicate intervals based on the same GIS used in Example 9.*

in minutes, not seconds.[34] In its scale and slowness, *in vain* seems less indebted to European models than to the music of James Tenney and La Monte Young. Like Young, Haas describes his childhood entrancement with the humming of electrical transformers: "The fascination exercised on me by the overtone chord is undoubtedly rooted in its technological origin: I grew up in the vicinity of a power plant. The transformer station—an eerie place with innumerable cables and insulators—emits a constant overtone chord."[35]

In contrast to the closing chaconne of *Blumenstück*, *in vain* uses only fundamentals from the tempered twelve-tone scale: "I made it very easy for myself and used only twelve-tone tempered fundamentals."[36] In this necessarily selective look at a few passages from *in vain*, I will focus on how the construction of overtone-series chords over fundamentals related by tempered intervals results in carefully controlled instances of *Klangspaltung* or sound-splitting—Haas's third category of microtonality listed in Example 1. With the exception of "non-European scales," this is the last remaining category in Haas's categorizations of

34 Haas (2007b, 127).
35 Varga (2011, 105).
36 Haas (2007a, 128).



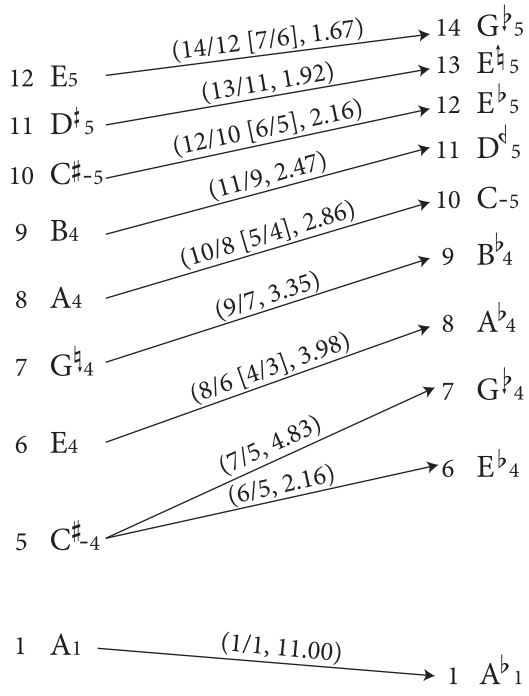
EXAMPLE 17. Klangspaltung *in* in vain, *mm. 515–29.*

microtonality summarized in Example 1—recall that we have already seen examples of every other category in the chart: equal divisions of the octave, just intonation, overtone chords, and aleatoric microtonality. The effect of *Klangspaltung* occurs through the use of microtonal near-unisons: the best-known example might be the quartertone blurrings of Giacinto Scelsi's 1959 *Quattro pezzi per orchestra (ciascuna su una nota sola)*.

Throughout *in vain,* lighting effects are used to complement the musical discourse. Example 16 illustrates the harmonic events of mm. 475–81, the beginning of a passage in which the lights fade to complete darkness, finally achieved at m. 527. The passage begins with an equal-tempered "Wyschnegradsky chord" in alternating fourths and tritones, rearticulated by unison, pulsating attacks in the piano and strings. As the tempo of these attacks gradually decreases, each pitch slides to the nearest member of an overtone chord on A_1, reinforced by the entry of the winds and brass in just intonation. Moments later, the chord is joined by another overtone chord a tempered minor third lower ($F\sharp_1$). The tempered third between these fundamentals creates tiny, beating microtonal intervals between overtones 5–6 of A and 6–7 of F♯: these varied shadings of C♯ and E are assigned to natural harmonics of the horns and trombones and persist even as the other chord tones fade away.[37] Scelsi's quartertone clusters seem rather blunt next to the very precisely calibrated *Klangspaltung* heard here: this precision is, of course, a direct result of the mixture of the just-intonation intervals of the overtone series with equal temperament. The fascination with the auditory effect of such small intervals brings to mind what Michael Harrison (one of La Monte Young's musical disciples) calls the "emancipation of the comma."[38]

Just a few minutes later in the piece, in mm. 515–29, Haas sets up a particularly dramatic instance of *Klangspaltung* with the seesaw alternation of two perfect fifths related by a tempered tritone: B♭–F (winds) and E–B (strings). As discussed earlier, the tritone epitomizes equal-tempered pitch organization in Haas's harmonic language. Taken together, these four pitch classes can be arranged as two differently voiced "Wyschnegradsky chords" of alternating tritones and a fifth or fourth: B♭–E–B–F or B–F–B♭–E. Each of the bare fifths is then joined by higher natural overtones in the brass: the horns play harmonics

37 Günther (2003).
38 Harrison (2007).



EXAMPLE 18. *Overtone chords linked by tempered semitone in* in vain, *pages 173–74. The notional fundamentals on A_1 and $A♭_1$ are included for reference, even though they are not part of the score.*

5 and 7 of E (the just major third and natural seventh), while the trombones play harmonics 5 and 7 of B♭; see the analysis in Example 17. In equal temperament, of course, these are identical pitch classes: G♯ and D over E are equivalent to D and A♭ over B♭. But in just intonation, there are distinct differences of 17 cents between each nearly identical pair of notes. (As Anthony Cheung has pointed out, this chord progression is similar to "tritone substitution" in jazz and chromatic harmony, and similar intonational clashes can be heard in the fifth movement of Ligeti's *Hamburgisches Konzert*.[39]) When the grounding fifths fade away, we hear only the upper overtones of the trombones and horns, playing out-of-phase crescendos and diminuendos that emphasize the difference in tuning. As the fifths vanish, the lights fade out entirely and the musicians are left in complete darkness, playing their parts from memory.

The long passage in total darkness that follows settles into an expansive overtone series chord on C (page 166 of the published score—the notation of this section makes page numbers a more useful marker than measure numbers), enlivened by glissandi between its partials. This fundamental gradually begins to drift downwards, one long-held overtone chord at a time, changing at ever-shorter intervals. At the same time, the house lights begin to come back up. Like *Blumenstück* with its closing chaconne, *in vain* also ends with an infinite descent reminiscent of a Shepard-Risset glissando. The constant descent of the harmonic fundamental is counterpointed by Haas's use of rising glissandi between chords: as he writes, "The glissando climbs, for example, from the 8th partial of the first chord to the 10th partial of the next (the 8th and 10th partials are approximately a major third apart), while the fundamental tone sinks by a semitone."[40] Among other passages, Haas's description could be referring to the passage on pages 173–74 of the score illustrated in Example 18. Here an overtone chord on A (overtones 5 through 12, with a missing fundamental) slides by glissandi in each voice into an overtone chord on A♭, a tempered semitone lower (overtones 6 through 14, also with a missing fundamental). The contrary motion between the descent of the fundamental and the rise of the sounding pitches is reminiscent of the second movement of Grisey's *Vortex Temporum*, where (as described by the composer) the "ascending motion of the spectra, the interlocking of the fundamentals in a chromatic descent, and the continuous filterings of the piano generate a sort of double rotation, a helicoidal and continuous movement which coils up on itself."[41]

The hybridization in this passage of *in vain* between the vertical chords based on the overtone-series and the root progression by tempered semitone is illustrated by the GIS intervals shown as arrows between the pitches of the two chords. Each of these arrows represents a glissando in the score. We can take the glissando in Haas's description as an example: in the chart, the arrow between overtone 8 of A and overtone 10 of A♭ is labeled ($\frac{10}{8}$ [$\frac{5}{4}$], 2.86). As in previous examples, the first part of the interval indicates a transformation from one overtone number to another: here the ratio $\frac{10}{8}$ (or, simplified to its lowest terms, $\frac{5}{4}$) shows that the A (overtone 8 of A) is transformed to a slightly flat C (overtone 10 of A♭). The second part of the interval, 2.86, is a pitch-class interval measured in semitones. Here the interval of 2.86 semitones is derived by subtracting 1 (due to the lowering of the fundamental from A to A♭) from the size of the just major third found between overtones 8 and 10 over a constant fundamental (3.86). In comparison to the just-intonation chaconne analyzed in Example 9, there are no pivot intervals: the tempered semitone between the fundamentals A and A♭ makes any exact common tones between pitches of the two overtone chords an impossibility.

As the relentless descent of fundamentals becomes quicker and quicker, the musicians find it more and more difficult to preserve the careful overtone-series tuning of each chord, and the harmonies drift into dissonant equal-tempered configurations. Eventually, the cascading chromatic scales heard at the beginning of the work return. Haas describes this process in "Microtonality and Spectral Music since 1980":

> I think that the perception of microtonal structures is closely connected with the compositional use of time. The same event may be perceived quite differently in different tempi, depending on whether the time is available for the special intonation quality of the music to "lock in" or not. Towards the end of *in vain*, I compose a large-scale process, which begins with slow glissandi, always rising from one overtone chord to the next. At the same

39 Cheung (2010, 58).

40 Haas (2007a, 127).

41 Grisey (2008, 159).

> time the fundamental descends in contrary motion. . . . Then the glissandi disappear and only the falling overtone chords remain, becoming faster and faster. The fundamentals always remain within the tempered system. The overtones are therefore outside of this system. When the distance between two chords shortens to a duration of about one second, these intonation differences of the overtones become more and more disturbing, while at the same time it becomes more difficult for the performers to realize them. A tone that was just played as the third (fifth partial) of a tempered fundamental (and thus a twelfth-tone lower than in equal temperament) will a little later, when the fundamental has sunk by a tritone, be a minor seventh (seventh partial) and must thus be played a sixth-tone lower, and so on. The overtone chord character is gradually lost, and finally everything ends in a very fast moving tempered twelve-tone vortex.[42]

The closing section of the piece suggests the endless, overlapping transformations of the Shepard-Risset glissando in the domain of time as well as that of pitch. In a process repeated throughout this section (m. 530 and following), as one layer of descending scales gradually speeds up to its climax of note density, a new slow-moving layer is introduced. The faster-moving layer—now in equal temperament—gradually fades out, leaving behind the single slow layer of just-intonation overtone chords: this too is fated to drift into equal temperament as its speed increases and another new slow layer (again in just intonation) appears to take its place.

The warm overtone-series chords on C of the darkened section are undermined by the implacable and sinister return of equal temperament as the lighting comes back up. Critic Alex Ross hears the final return of equal temperament and the "scurrying" scale figures of the opening as the pessimistic fulfillment of the work's title, *in vain*:

> At the climax, all these shimmering fragments are derived from a fundamental C, meaning that the music accumulates a glorious sheen, like a new dawn of tonality. . . . But it all goes awry: notes bend from their "natural" paths, the lights come back up, the frantically scurrying figures return, and, after several herky-jerky accelerations and decelerations, the music abruptly switches off. And you finally understand the title: a new kind of beauty seems ready to come into the world, but in the light of day it falters, and we end up back where we started.[43]

In Ross's interpretation, the return of equal temperament represents the loss of hope and beauty as represented by the consonance of the overtone series. Both Ross and Paul Griffiths (2009) draw on Haas's own description of the program of *in vain* as a reaction to contemporary political events, his despairing response to the rise of the far-right Freedom Party of Austria (FPÖ) in the 1999 elections.

> In the case of *in vain*, it was my consternation at the formation of a coalition government with the far right in 2000: I composed a piece in which the formal progression revives content at the end of the work that had previously been believed overcome. . . . I still cannot imagine that anybody can perceive the moment when the music from the beginning returns at the end as anything but oppressive.[44]

As in *Blumenstück,* Haas's contrast of just intonation and equal temperament in *in vain* is not merely a question of tuning, but a stark and expressive representation of incompatible worlds.

42 Haas (2007a, 127–28).

43 Ross (2010, 87).

44 Haas (2013, 13).

WORKS CITED

Beaulieu, Marc. 1991. "Cyclical Structures and Linear Voice-Leading in the Music of Ivan Wyschnegradsky." *Ex-Tempore* 5 (2). http://www.ex-tempore.org/beaulieu/BEAULIEU.htm (accessed 14 August 2013).

Bregman, Albert S. 1990. *Auditory Scene Analysis: The Perceptual Organization of Sound.* Cambridge, MA: MIT Press.

Cheung, Anthony. 2010. "Ligeti's Magic Horn: Parallel Universes of Tuning and Tradition in the 'Hamburg Concerto.'" DMA diss., Columbia University.

Criton, Pascale. 2013. "Perspectives." In Ivan Wyschnegradsky, *Libération du son, Écrits 1916–1979.* Ed. Pascale Criton. 467–80. Lyon: Symétrie.

Dufourt, Hugues. 1991. "Musique spectrale." Paris: Société Nationale de Radiodiffusion, Radio-France, 1979. Reprinted in Hugues Dufourt, *Musique, pouvoir, écriture*. 289–94. Paris: Christian Bourgois.

Farthofer, Lisa. 2007. *Georg Friedrich Haas: Im Klang denken*. Saarbrücken: PFAU-Verlag.

Griffiths, Paul. 2009. *Composer Portraits: Georg Friedrich Haas*. Miller Theatre, Columbia University, New York, NY. 6 February 2009. Program note.

Grisey, Gérard. 1996. Interview with "David Bündler." http://www.angelfire.com/music2/davidbundler/grisey.html (accessed 14 August 2013). Translated by Bastien Gallet in Grisey (2008).

———. 2008. *Écrits ou l'invention de la musique spectrale.* Paris: Éditions MF.

Günther, Bernhard. 2003. *in vain*. Klangforum Wien, conducted by Sylvain Cambreling. Kairos 0012332KAI, compact disc. Liner note.

Haas, Georg Friedrich. 2000. *Blumenstück.* Vienna: Universal Edition. Performance note.

———. 2001. "In *iij. noct*." Vienna: Universal Edition.

———. 2003. "Mikrotonalitäten." In *Musik-Konzepte Sonderband: Musik der anderen Tradition: Mikrotonale Tonwelten*. Ed. Hans Rudolf Zeller, Heinz-Klaus Metzger, and Rainer Riehn. 59–65. Munich: Edition Text + Kritik.

———. 2007a. "Mikrotonalität und spektrale Musik seit 1980." In *Orientierungen: Wege im Pluralismus der Gegenwartsmusik*. Ed. Jörn Peter Hiekel. 123–29. Mainz: Schott.

———. 2007b. "Fünf Thesen zur Mikrotonalität." In Lisa Farthofer, *Georg Friedrich Haas: Im Klang denken*. 122–27. Saarbrücken: PFAU-Verlag. First published in *Positionen* 48 (2001).

———. 2013. "On the magic of 'pure' intervals—An interview with Heinz Rögl." *Universal Edition Musikblätter* 5: 12–14. http://www.universaledition.com/tl_files/News_Dateien/Musikblaetter/musikblaetter-05-en.pdf (accessed 14 August 2013).

Harrison, Michael. 2007. "Music in Pure Intonation." http://www.michaelharrison.com/Pure_intonation.aspx (accessed 14 August 2013).

Hasegawa, Robert. 2011. "*Gegenstrebige Harmonik* in the Music of Hans Zender." *Perspectives of New Music* 49 (1): 207–34.

Hesse, Horst-Peter, and Louise Carleton. 1991. "Breaking into a New World of Sound: Reflections on the Ekmelic Music of the Austrian Composer Franz Richter Herf (1920–1989)." *Perspectives of New Music* 29 (1): 212–35.

Johnston, Ben. 2006. "Rational Structure in Music." In *Maximum Clarity and Other Writings on Music*. Ed. Bob Gilmore. 62–76. Urbana: University of Illinois Press. Originally published in *American Society of University Composers Proceedings* 11 (12) (1976–77): 102–18.

Lewin, David. 1987. *Generalized Musical Intervals and Transformations*. New Haven: Yale University Press.

Lyotard, Jean-François. 1984. *The Postmodern Condition: A Report on Knowledge*. Trans. Geoff Bennington and Brian Massumi. Minneapolis: University of Minnesota Press.

Maneri, Joe, Scott Van Duyne, and Julia Werntz. 2008. *Preliminary Studies in the Virtual Pitch Continuum*. Cambridge, MA: Boston Microtonal Society.

Partch, Harry. 1974. *Genesis of a Music: An Account of a Creative Work, Its Roots, and Its Fulfillments*, 2nd ed. New York: Da Capo Press.

Richter, Jean Paul Friedrich. 1796. *Blumen-, Frucht- und Dornenstücke oder Ehestand, Tod und Hochzeit des Armenadvokaten F. St. Siebenkäs im Reichsmarktflecken Kuhschnappel*. Berlin: C. Matzdorff. Translated by Alexander Ewing as *Flower, Fruit, and Thorn Pieces; or, the Wedded Life, Death, and Marriage of Firmian Stanislaus Siebenkaes, Parish Advocate in the Burgh of Kuhschnappel*. London: George Bell and Sons, 1897.

Rings, Steven. 2011. *Tonality and Transformation*. Oxford: Oxford University Press.

Ross, Alex. 2010. "Darkness Audible." *New Yorker*, November 29.

Sabat, Marc. 2008. "Three Crystal Growth Algorithms in 23-limit Constrained Harmonic Space." *Contemporary Music Review* 27 (1): 57–78.

Shaffer, Kris. 2006. "Overtones, Intervals, and Generative Transformations in Ligeti's Hamburg Concerto." Unpublished manuscript. http://kris.shaffermusic.com/media/ShafferHamburgConcertoPaper.pdf (accessed 14 August 2013).

Sims, Ezra. 1988. "Yet Another 72-Noter." *Computer Music Journal* 12 (4): 28–45.

Tenney, James. 1987. "About Changes: Sixty-Four Studies for Six Harps." *Perspectives of New Music* 25 (1–2): 64–87.

Tenney, James, and Donnacha Dennehy. 2008. "Interview with James Tenney." *Contemporary Music Review* 27 (1): 79–89.

Varga, Bálint András. 2011. Interview with Georg Friedrich Haas. In *Three Questions for Sixty-Five Composers*. 101–06. Rochester: University of Rochester Press.

Vijn, J. P. 1982. *Carlyle and Jean Paul: Their Spiritual Optics*. Utrecht: John Benjamins.

Wannamaker, Robert. 2008. "The Spectral Music of James Tenney." *Contemporary Music Review* 27 (1): 91–130.

Wilson, Charles. 2004. "György Ligeti and the Rhetoric of Autonomy." *Twentieth-Century Music* 1 (1): 5–28.

Wyschnegradsky, Ivan. 1972. "Ultrachromatisme et espaces non octaviants." *La Revue musicale* 290–91: 71–141.

Zender, Hans. 2003. "Gegenstrebige Harmonik." In *Musik-Konzepte Sonderband: Musik der anderen Tradition: mikrotonale Tonwelten*. Ed. Hans Rudolf Zeller, Heinz-Klaus Metzger, and Rainer Riehn. 95–135. Munich: Edition Text + Kritik. Reprinted in Hans Zender, *Die Sinne denken: Texte zur Musik 1975–2003*. Ed. Jörn Peter Hiekel. Wiesbaden: Breitkopf & Härtel, 2004.

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