The 'harmonic series' is an artifact": ideology, process and perception in Georg Friedrich Haas's *in vain*

> There is no tradition of microtonal music. Even into the twentieth century all composers who compose microtonically have begun anew. Nowadays it is considered unusual to use microtones. It is necessary to show cause why one is using tones outside of the tempered system.[1]

The music of the Austrian composer Georg Friedrich Haas is most often aligned with the spectralist school of composition, which draws its musical materials from the analysis of natural sounds and their changes over time. His varied and prodigious output includes concerti, operas, homages and several dozen chamber works, yet most of his compositions display the three qualities Joshua Fineberg associated with spectral music: sound color as a central element of musical discourse, the subsumption of individual voices into a rich texture, and a resonant sonic image notable for a kind of "acoustic glow."[2]

The orchestral works *in vain* and *Hyperion* move beyond this "acoustic glow" to incorporate optics as both a metaphoric and literal aspect of the composition in a way that recalls the light associations of works by Gérard Grisey or Tristan Murail. But the concerns of Haas transcend the so-called "spectral attitude" to embrace a diverse compositional practice that reflects life both within and outside the concert hall. In this paper I introduce Haas' aesthetics and musical influences, before turning to *in vain* as a case study of his compositional process. I analyze how the use of heterogeneous harmonic resources, tempered and untempered tunings and extramusical associations force a convergence of nature and artifice, in a mirror of the political and ethical concerns that motivate Haas' music.

Situating Haas

Although the sound and associations of his works identify Haas as a spectralist, all three composers have positioned themselves differently. Manifestos delivered by the founding members of l'Itinéraire were unified less by method than by adherence to a "spectral attitude."[3] Grisey, for instance, extolled the "living nature" of the sound object, while Murail spoke of sound as a sensation, whose transformation demands a global approach to the act of composition.[4] In contrast, Haas self-identifies as a microtonal composer whose compositional concerns are focused on harmonic alternatives to—rather than extensions of—the equal-tempered system. Bernhard Günther notes further genealogical and methodological differences between Haas and the spectralists, yet adds wryly that in

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[1] Georg Friedrich Haas, "Mikrotonalitäten," *Österreichische Musikzeitschrift* 54/6 (1999), pp. 9-15.

[2] Joshua Fineberg, "Spectral Music," *Contemporary Music Review* 19:2 (2000), p. 3.

[3] See especially Gérard Grisey, "Did You Say Spectral?," *Contemporary Music Review* 19:3 (2000), p. 1.

[4] Tristan Murail, "Target Practice," trans. Joshua Cody, *Contemporary Music Review* 24:2–3 (2005), pp. 149–71.

Austria, “isms are avoided more than equidistances.”[5] Hence the writings of Haas focus on microtonal events, and on the ad hoc constructions that feed his creative process.

As with the spectralists, Haas begins with his material: “The love of sound elements, attention to the sounds, like living things unfolding in space and time, is for me one of the basic requirements of my work.”[6] As Lisa Farthofer notes, Haas assigns complex inner life and narrative to sounds.This narrative begins with the conviction that micro intervals represent neither a distortion nor embellishment of equal-temperament, but "a basic human need,” one whose necessity we take for granted as a mundane feature of everyday life, in the squeak of a door or a bird’s song.[7]

A Microtonal Aesthetics

Early in his career Haas was exposed to non-tempered tunings, and the work of microtonal composers. At the University in Graz he performed works by Ivan Wyschnegradsky, Alois Hába, James Tenney, Harry Partch and Julián Carrillo with friends and colleagues. Although attracted to the formal procedures of Hába and the tuning experiments of Tenney and Partch, Haas was directly influenced by three of Wyschnegradsky’s key concepts: the "sound continuum,” ultrachromaticism, and non-octaviant tonal collections and cycles.

In *La loi de la pansonorité* Wyschnegradsky introduced the ‘total sound continuum’ as an “operational limit” for the constitution of ultrachromaticism.[8] This total sound continuum—“an infinite number of musical tones arranged at infinitely small distances”—forms a purely hypothetical backdrop to the relative sound continuum, which divides the audible spectrum into 144 sounds per octave, as 12ths of a whole tone. Non-octaviant frequency spaces were those formed by substituting a contracted or expanded interval for the traditional octave equivalence. [Fig. 1] Although theoretically any interval might suffice, Wyschnedgradsky’s table listed every space small or larger than an equal-tempered octave, as indicated by the volumes below, listed in multiples of the smallest system unit

In a structural analogy with the diatonic system, Wyschnegradsky employed these spaces as interval cycles to generate scale collections. Cycling through different interval cycles will produce collections of different sizes and scope. His favorite semitonal intervals—the major seventh and minor ninth—theoretically unfold over 11 and 13 octaves respectively: beyond the audible range (or at least the span of a piano keyboard). [Fig. 2] This theoretical space is given shape in the *Étude sur les mouvements rotatoires*, Op. 45,[9] in which two

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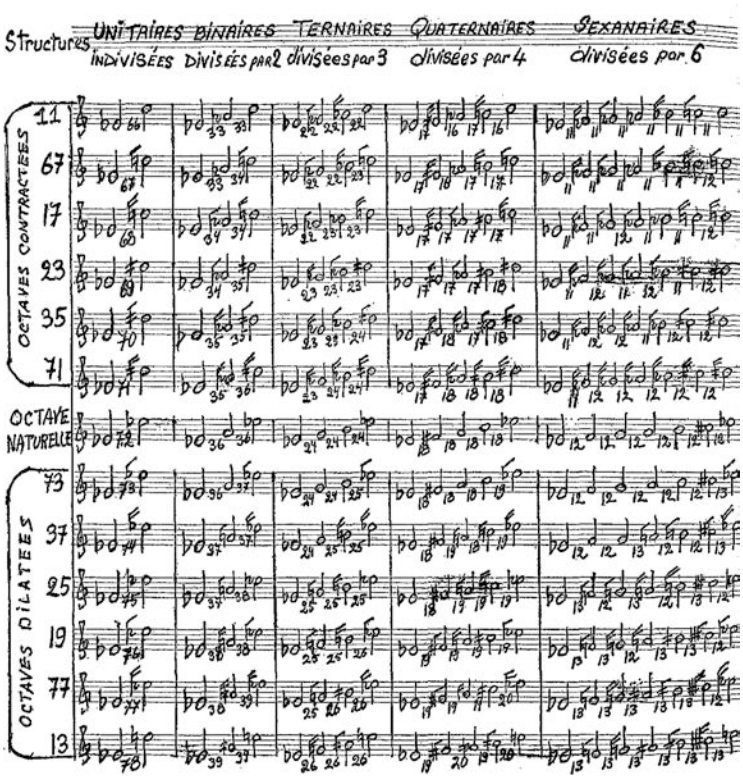
[5] Bernhard Günther, program notes for *in vain* (2000), available at Universal Edition, http://www.universaledition.com/composers-and-works/Georg-Friedrich-Haas/in-vain/composer/278/work/7566

[6] Georg-Friedrich Haas, „Anmerkungen zum Komponieren,“ in *Musik und Metaphysik*, ed. Eckhard Tramsen, (Hofheim: Wolke Verlag, 2004), p. 117.

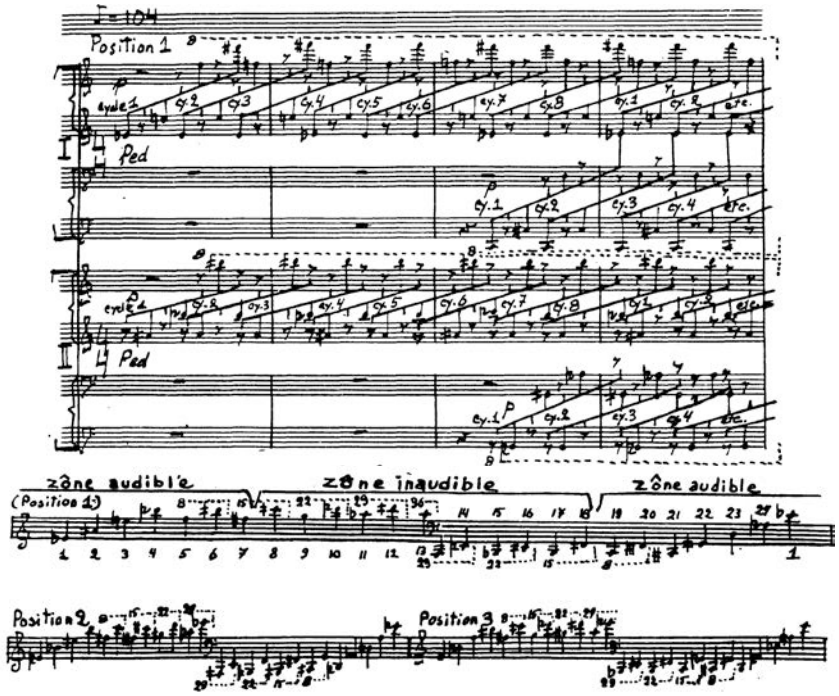
[7] Lisa Farthofer, *Georg Friedrich Haas: „Im Klang denken“* (Saarbrücken, Pfau-Verlag, 2007), 122–27.

[8] Ivan Wyschnegradsky, *Une Philosophie Dialectique de l’Art Musical: La loi de la pansonorité, ed.* Franck Jedrzejewski (Paris: L'Harmattan, 2005; rep. 1936 edition).

[9] Republished M. P. Belaieff, BEL 571, 2003.



1)Wyschnegradsky's Structures de base de volume et de densité diverse, in "Ultrachromatisme et les espaces non octaviants," *La Revue Musicale* 290–91 (1972), pp. 73–138.



2)Ivan Wyschnegradsky, *Étude sur les mouvements rotatoires* for two pianos and four hands, Op. 45, showing cycles of 11 semitones (score) and the subdivision of those cycles by 11 quartertones (below)

circles of minor ninths interlock at the interval of thirteen quartertones, expressing a constant, eight-note pulse that helps us imagine the unheard portion of the cycle as it climbs upward only to reappear at the bottom of the pitch space.

Semitonal cycles generated by the major seventh and minor ninth of course generate the twelve-note scale of the total chromatic. If by analogy we use 11 and 13 to refer to quarter tones, as in the Étude, we traverse all 24 tones of the system. [Fig. 3] But this cycle can also be thought of as two independent cycles of 11 semitones, interlocked at the distance of a major fourth. The internal structure of this periodic unit may be further subdivided by perfect (equidistant) or imperfect (non-equidistant) intervals. [Fig. 4]. Thus the span 11 in semitonal space may be divided imperfectly into a tritone and perfect fourth, or perfectly with a bisection by 11 quartertones, to produce the interval pair Wyschnegradsky labeled major fourth/minor fifth. The major fourth was important because its equal-tempered interval—550 cents—approximates the ratio of 11:8 (551.28 cents) found in the harmonic series. [Fig. 5].

Although the cycle of major fourths theoretically spans 11 octaves, Wyschnegradsky relied on only its first 13 pitches to form his widely used *chromatique diatonisée* scale: similar to the diatonic collection, this scale can be generated cyclically from a fourth/fifth cycle, yet it can also be partitioned into two heptachords related by the same interval.[10] The diatonicized chromatic was fodder for a theory of harmony that replaced stacked thirds with superimposed fourths derived from the division of 11 and 13, inspired by the harmonic practice of Scriabin. By superimposing both perfect and imperfect fourths and fifths, Wyschnegradsky could realize oblique voice-leading and avoid the static progressions inherent in symmetrical structures of limited transposition.

Haas readily admits his long-standing preference for Wyschnegradsky chords, especially those of the "imperfect" variety.[11] He employs these harmonies as a unit, and claims that, to

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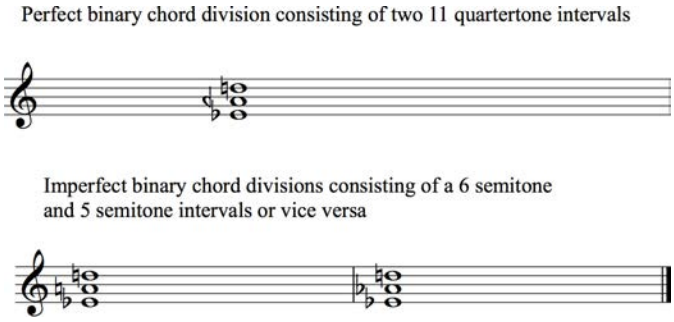
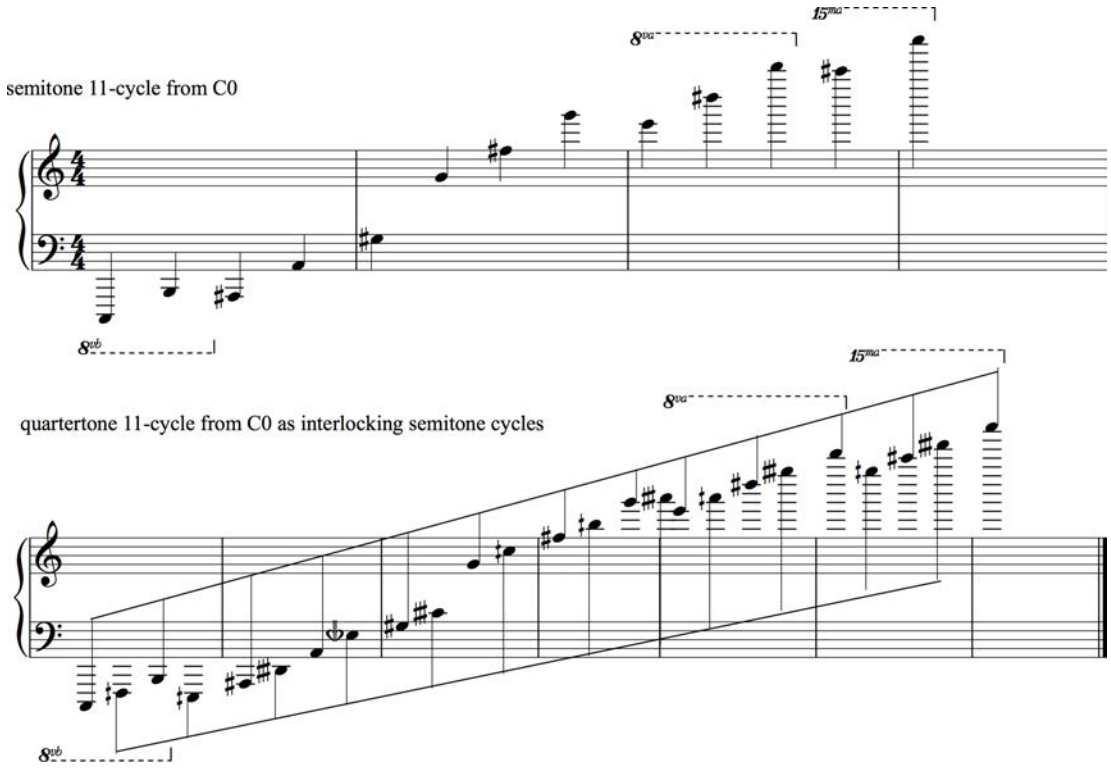
[10] Explained in Ivan Wyschnegradsky, "Ultrachromatisme et éspaces non-octaviants," *Revue Musicale* 290–291 (1972), pp. 73-141. See also Marc Beaulieu, "Cyclical Structures and Linear Voice-Leading in the Music of Ivan Wyschnegradsky," *ex tempore* V/2 (Fall 1991), archived at http://www.ex-tempore.org/beaulieu/BEAULIEU.htm; J.-P. Caron "Into the Full: Strawson, Wyschnegradsky and Acoustic Space in Noise Musics," in *Resonances: Noise and Contemporary Music*, edited by Michael Goddard, Benjamin Halligan, Nicola Spelman (London: Bloomsbury Academic, 2013), 286–93; and chapter 5 of Myles Skinner, "Toward a Quarter-Tone Syntax: Selected Analyses of Works by Blackwood, Hába, Ives, and Wyschnegradsky," Ph.D. diss., State University of New York at Buffalo (2007), archived at http://www.tierceron.com/diss/index.php.

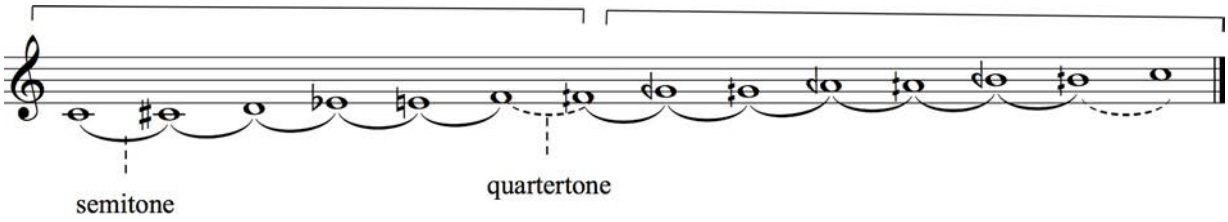
[11] Georg Friedrich Haas, " Jenseits der Zwölf Halbtöne – Versuch einer Synopse mikrotonaler Kompositionstechniken," *Programmheft Next Generation Salzburger Festspiele 1999*, ed. Frieden Schafleiter (Salzburg: Residenz-Verl., 1999),pp. 17–23; his articles on Wyschnegradsky's music include "Arc-en-ciel op. 3. Ivan Wyschnegradskys behutsame Annäherung an das Zwölftonintervall," in *Mikrotöne IV* (bericht des 4. Symposions über Mikrotonforschung, Salzburg 1991) (Munich: Nymphenburg 200), pp. 79–82; and "Die Verwirklichung einer Utopie: Ultrachromatik und nicht-oktavierende Tonräume in Ivan Wyschnegradskys mikrotonal Komposition," in *Harmonik im 20. Jahrhundert*, ed. Claus Ganter (Vienna: Hochschule für Musik und Darstellende Kunst, 1993), pp. 87–100.



3) Semi- and quarter-tone interval 11 cycles and their relation.



4) Perfect and imperfect binary chord divisions in semi- and quarter-tone space.



5)Wyschnegradsky's diatonicized chromatic scale

Wyschnedgradsky, it was irrelevant whether the ear could separate out its constituent pitches. Yet Haas has thought long and hard about what it means to not only compose outside of twelve-tone equal temperament, but to listen and perform in a microtonal universe. His *Five Theses on Microtonal Music*[12] begin with the declaration "the "harmonic series" is an artifact," the first of three philosophical statements about our general conception of music in the West.

Thesis 1: The "harmonic series" is an artifact

Thesis 2: There is a basic human need for beats in music

Thesis 3: in microtonal music there is no longer the principle of identically-named pitches in different octaves

Thesis 4: Conventional musical notation is obstructive to microtonal thinking

Thesis 5: Microtonal music requires its own composition of time

Table 1, *Five Theses on Microtonal Music*

The partial series stands as one of the fundamentals of microtonal harmony; whether calculated by means of Fourier analysis or filtered from an instrumental recording, it enriches our musical language with a "sensual charm." But the terms "harmonic series" and "pure temperament" are loaded with ideology, when in fact they represent a model as abstract as any serial procedure. Actual instrumental sounds are always slightly changing, their higher partials shifting as the physical mass of their sound source and surroundings shift. Hence the paradoxical phenomenon that sounds which most clearly manifest the harmonic series are completely static: old refrigerators, electrical substations, and other machines. Haas declares that "any attempt to precisely grasp this overtone series is doomed to failure."[13] Yet it is this very striving after an impossible ideal that seems to characterize Haas' compositional process, and his aesthetics as a whole, down to the motivation behind *in vain*.

Thesis 2—the basic human need for beats in music—serves as a further illustration of the difference between abstract models and the messiness of actual sounds. Augmented or diminished octaves, "slightly detuned" unisons and other examples of "friction, not fusion" proliferate across musical cultures. Indeed, Haas suspects that the near universal success of the twelve-tone tempered harmonic system may be a direct result of its "false" but beat-rich major and dominant seventh chords. Thesis 3 notes that, just as we have abstracted the notion of a harmonic series, so we have abstracted the notion of pitch in space. But each partial tone is bound to an octave position, as well as to a neighborhood of intervals around it.

The final two theses directly concern the composition, performance and perception of explicitly microtonal music. Our cumbersome inherited notation often clouds the interval relationships and harmonic relationships of the score, distracting both composer and performer. But a greater challenge lies with the perceptual difficulties of working with small intervals. The smaller the interval difference, the more time it takes the human

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12 "Fünf Thesen zur Mikrotonalität," *Positionen*, 48 (2001), 42ff; reprinted in Farthofer, pp. 122–27.

13 "Fünf Thesen," in Forthofer, p. 122.

perceptual apparatus to distinguish it. Rapid movements within microtonal systems will simply neutralize pitch differences, as both performers and listeners need time to hear out slow beats and the upper proportions of the partial series. Thus microtonal music needs more space, more time, and more opportunities for development.

Compositional Procedures

Haas began his career working in a more serial, abstract manner, including a residency in IRCAM. Much like György Ligeti and the French spectralists, his work with computers made him more aware of the inner structure of sounds, and of the possibilities of extending that structure compositionally. Thus he developed the concept of projection: the realization of any abstract model within a given compositional system. In a 1995 article he lists three forms of projection: spectrographic sound models as an aid to composition, the projection of complex frequencies on a given microtonal grid (e.g., a sixth-tone system), and projection as a harmonic-theoretical concept (e.g. a dominant seventh chord as a projection of the 4th, 5th, 6th and 7th partials to tempered twelve-tone space).[14] [Table 2] Those models used in *in vain* comprise at least 5 categories: 1. "super slow motion" intimated in the fifth thesis, 2. composed-out acoustic beats, 3. sound splitting, or microtonal frequency compaction around a pitch, as in the music of Scelsi, 4. a musical-thematic approach to the Shepard scale effect, and 5. combination tones. All of these techniques appear in the 75-minute single movement *in vain,* written for 24 instruments and a "spotlight," a visual feature that puts unique demands on performer, listener and conductor.

1. spectrographic sound models as an aid to composition

2. the projection of complex frequencies on a given microtonal grid (e.g. a 6th-tone system)

3. projection as a harmonic-theoretical concept (e.g. a major-minor seventh chord as a projection of the 4th, 5th, 6th and 7th partials to tempered 12-tone space)

Table 2, Three forms of projection

Let there be Light

Haas began using light as a metaphorical feature of his theatrical compositions with the brief opera *Adolf Wölfli* in 1981. In the 1996 chamber opera *Night* the character of Hölderlin appears bathed in different colors to indicate his mental state and the fluctuation between reality and fiction. *Melancholia*, an opera about the poor Norwegian painter Lars Hertervig, uses light similarly to distinguish the artist's inner life from his cold reality. But working with light as a "musical instrument" has become a part of Haas' instrumental music as well, culminating with *Hyperion* in 2006, subtitled "Concerto for light and Orchestra." The artist rosalie designed a light sculpture for *Hyperion's* premiere, but the published score allows some flexibility, as long as four orchestral groups—placed around the four walls of the performance space—are each faced by a different light source.

[14] "Die Abbildung akustischer Phänomene als Material der kompositorischen Gestaltung," *Ton* 4/1996–1/1997, pp. 24–7.

According to Haas, a change in light color changes one's perception of sounds, and the structure of light in time "acts like a silent drum."[15]

But it is the absence of light that changes both audience and performer's perception of sounds and space in *in vain*. In the best known of its two versions, concert lights on the rostrum and desk fade to full darkness at m. 70. The shift from light to darkness accompanies and intensifies metaphorical gradations of light in the harmonic language of the work: combinations of – and transitions between – vastly different harmonic collections, and strategic juxtapositions of tempered and non-tempered harmonies that generate auditory illusions. Wyschnegradsky's notion of cycles feeds into certain pitch paradoxes that Haas favors, such as the Shepard scale effect that serves as the work's thematic backbone. Haas's chord voicings seem to reflect William Sethares's demonstrations on the relation between "sensory consonance and dissonance" and timbre and tuning. Sethares demonstrated that tritone-based chords will sound consonant and function differently in an inharmonic musical universe.[16]

In vain begins with descending (0167) tritone/fifth chords over C2 in the bass, in marimba, crotales, piano, accordion, and strings—soon joined by winds —in a hetereophonic, descending cascade. cascade. In m. 2 the upper voices are further subdivided to form an octatonic (1,2) collection, while those beneath G2 reflect a symmetrical (0134) tetrachord— octatonic (0,1) with gaps of a third, as shown in a pitch reduction of the opening bars. [Fig. 6] In mm. 2-9 the Shepard's tone effect gathers momentum: although the scales descend in pitch, they circle back to rise ever higher, with instrumental groups ebbing like waves. In m. 18 a sustained (0235) in woodwinds and strings, joined by a septachord in strings, heralds a new harmonic phase. Here one whole-tone of the octatonic is subdivided in order to form non-octavian scales: a different pitch collection in each registral band. By m. 29 a 3-octave descent appears in winds, mallet percussion, piano, accordian and strings from C#6 to G#3, as shown in Figure 7.[Fig. 7]

The light dramatically dims in mm. 70-78, and the scale fragments wane in winds, glockenspiel, piano, and accordion, while, beginning in the bass, staggered lines rise in sustained ascents of semi- and sixth-tones, as shown in a harmonic reduction [Fig. 8]. Here the pace slows dramatically, and Haas shifts to letter names for the glacially slow m. 76. By this time the auditorium is completely dark, and the harmonic cast shifts from tritone/fifth chords to those built on non-tempered partials. [Fig. 9] The harp enters at rehearsal E with partials of Bb, followed by the strings with partial chords related to Bb2 and A2. [Fig. 10] Bar numbers resume in m. 77 along with a hesitant march back into light, accompanied by what is essentially an extremely-slowed down version of the initial ascending descent,

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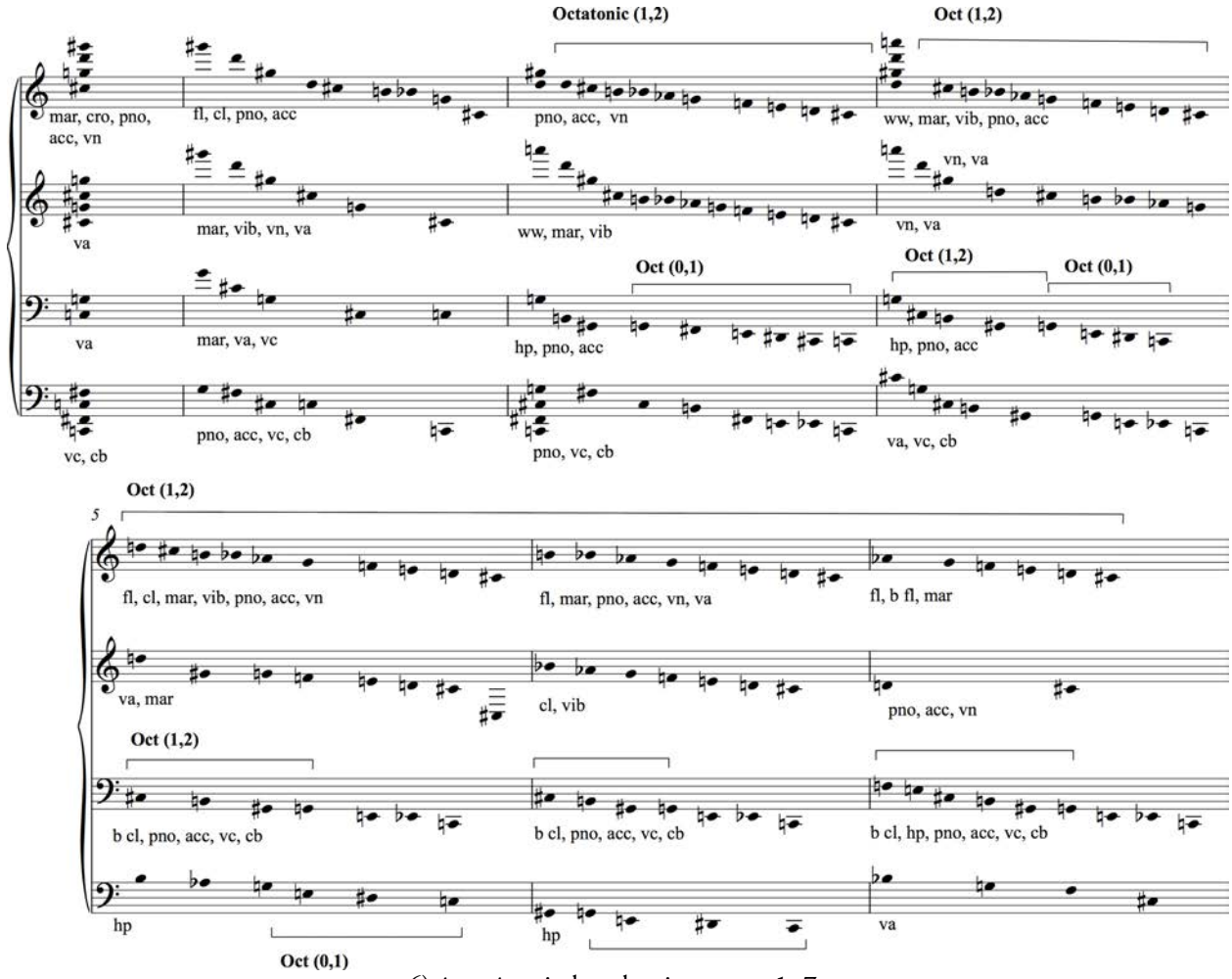
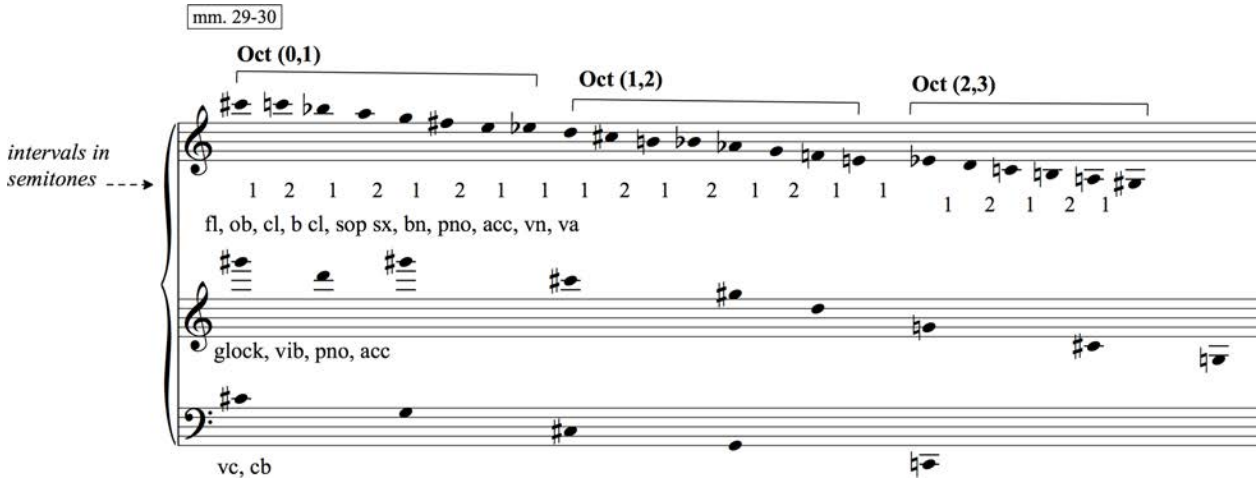
[15] Introduction to *Hyperion*, trans. Peter Burt, Universal Edition, http://www.universaledition.com/composers-and-works/Georg-Friedrich-Haas/Hyperion/composer/278/work/12730.

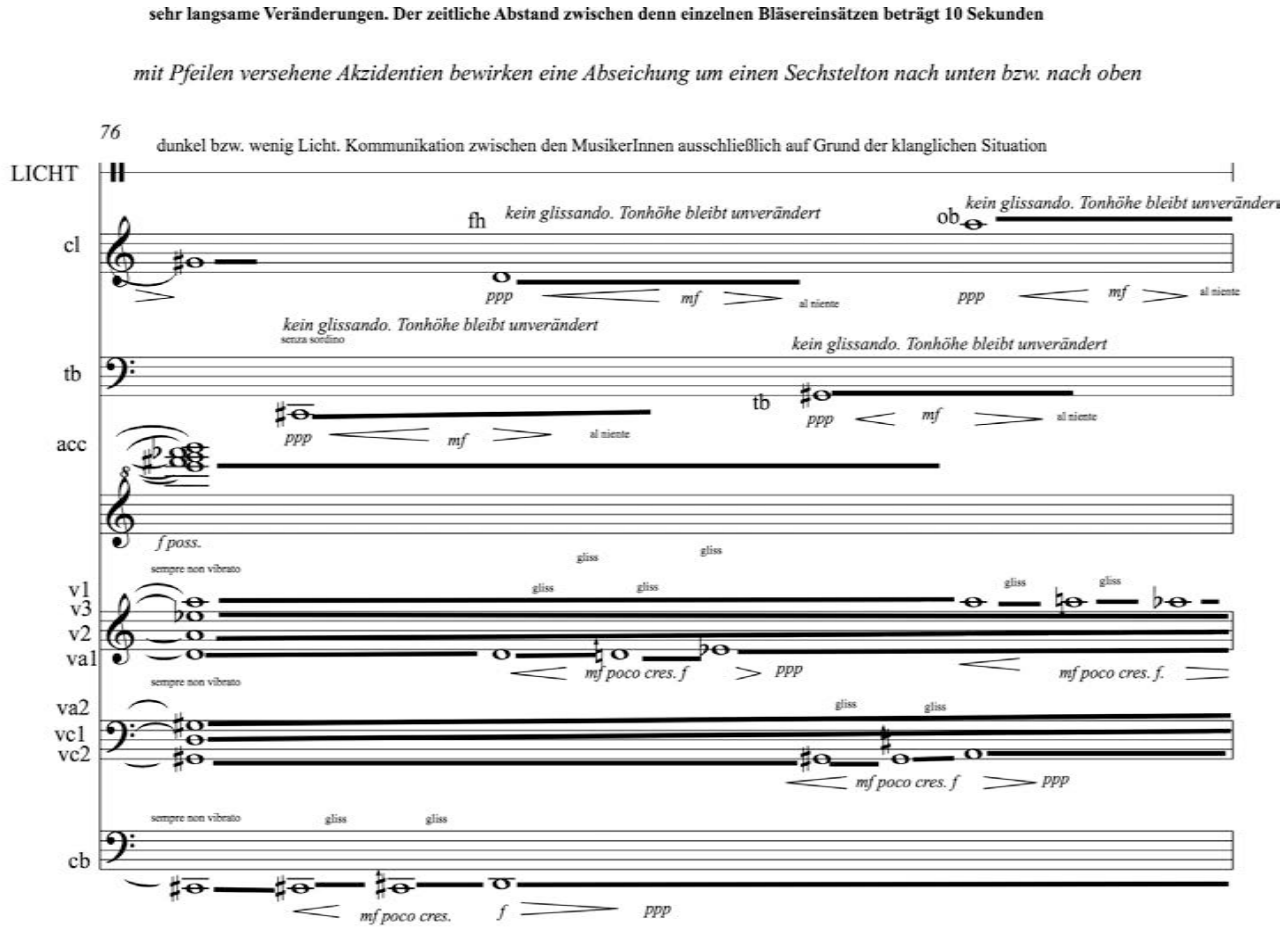
[16] "… consonance and dissonance are not inherent qualities of intervals, but ... are dependent on the spectrum, timbre, or tonal quality of the sound."
"Both the fifth ... and the fourth ... lie near peaks of the tritone dissonance curve. Thus, the dissonance curve predicts that a chord containing both a fourth and a fifth should be more dissonant than a chord containing two tritones, at least when played with [certain timbres]. William A. Sethares, *Tuning, Timbre, Spectrum* (London: Springer, 2005), pp. 1, 102.



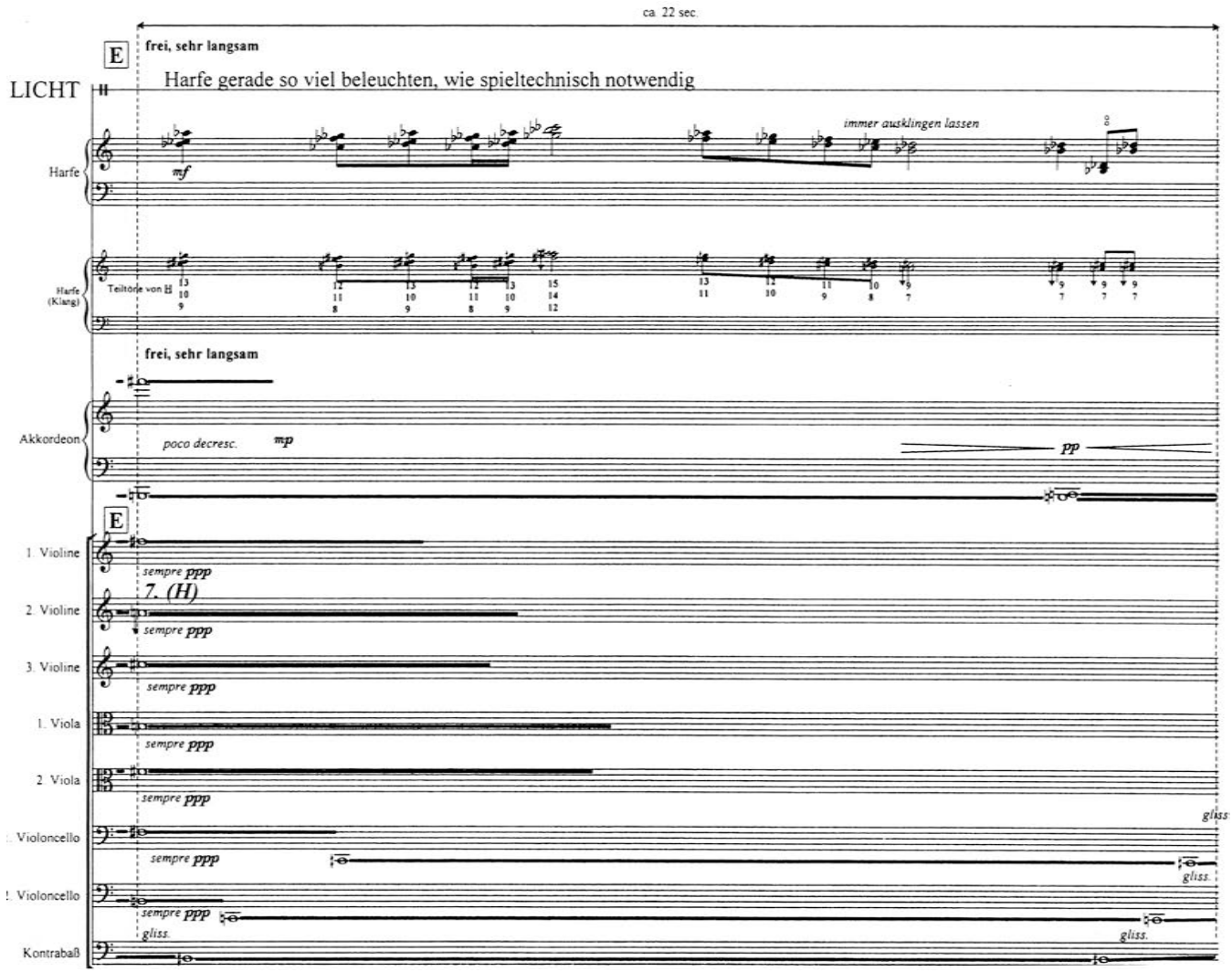
6) *in vain*, pitch reduction, mm. 1–7



7) *in vain*, pitch reduction, mm. 29-30



8) *in vain*, pitch reduction, m. 76



9) *in vain*, harp enters with partial chords, m. 76 E

conducted as a progression of spectra based on virtual fundamentals, as shown in Figure 11. [Fig. 11] During transition to a final dark phase, combinations of different overtone spectra emerge like sparks: for instance, in m. 483, trombones play partials 6 and 7 of F#1, while horns play partials 5 and 6 of A1, to produce two C-sharp4s a 12th tone apart and two E4s a 6th tone apart.[Fig. 12]

In vain disorients the listener by manipulating several fundamental paradoxes of audition, paramount among those our dependence on auditory images to orient our musical perception, and our unconscious use of timbre to map an acoustic environment. Shifts from light to darkness, mutations of harmonic collection and temperament, and extreme orchestrations all contribute to shifts in what Cornelia Fales calls our perceptualization of sound. Perceptualization is a cognitive operation or feature outside of the actual acoustic elements of a signal that nonetheless contributes to its perceptual outcome. Timbre is the parameter most frequently and intensely implicated in perceptualization, which contributes to the so-called paradox of timbre: timbre is the parameter of sound most implicated in source identification but also most implicated in the discrepancy between an acoustic signal and the percept it provokes.

Those musical attributes central to our determination of timbre include spectral centroid (a representation of the relative weights of high and low frequencies, corresponding to timbral brightness), average attack time, spectral flux, and spectral irregularity. These are the very attributes targeted by Haas' manipulation of micro intervallic fluctuations, "super slow motion," combination tones and sound splitting. If, as Fales contends, "perceptualization is the guardian of sensory equilibrium," then the auditory anomalies favored by Haas seem designed to confound more than just our musical bearings; as Fales notes "the cumulative effect of a musical experience of dramatic, subtle, sustained, or sporadic timbre manipulation … may move listeners with a range of specificity and emotion: from a more or less vague sense of perceiving something normally imperceivable, to an unaccountable feeling of transcendence or separation from the earthly world."[17]

The end of in vain returns to the beginning in a direct representation of its title, with a nod to the tradition of still life painting known as "vanitas." The bright, untempered, assymetrical harmonies of the work's middle section are eventually absorbed into an equal-tempered, symmetrical, dark torrent of eternal descent. As the sound continuum contracts, the transcendent sense of separation from the mundane experienced during m. 76 and its subsequent elaboration fades. The cyclic design of *in vain*—a work that juxtaposes microtonal harmonies with equal-temperament, light with dark, and dizzying acoustic illusions with a clear formal design—seems to contradict its brilliant central vision, in the way that the vanitas paintings juxtaposed dazzling beauty and opulence with signifiers of death and decay.

Haas wrote the work in a response to the formation of the black-blue government coalition between the Austrian People's Party and the right-wing Freedom Party in 1999. While audiences are often thrilled by the traditional recapitulation that closes in vain, Haas

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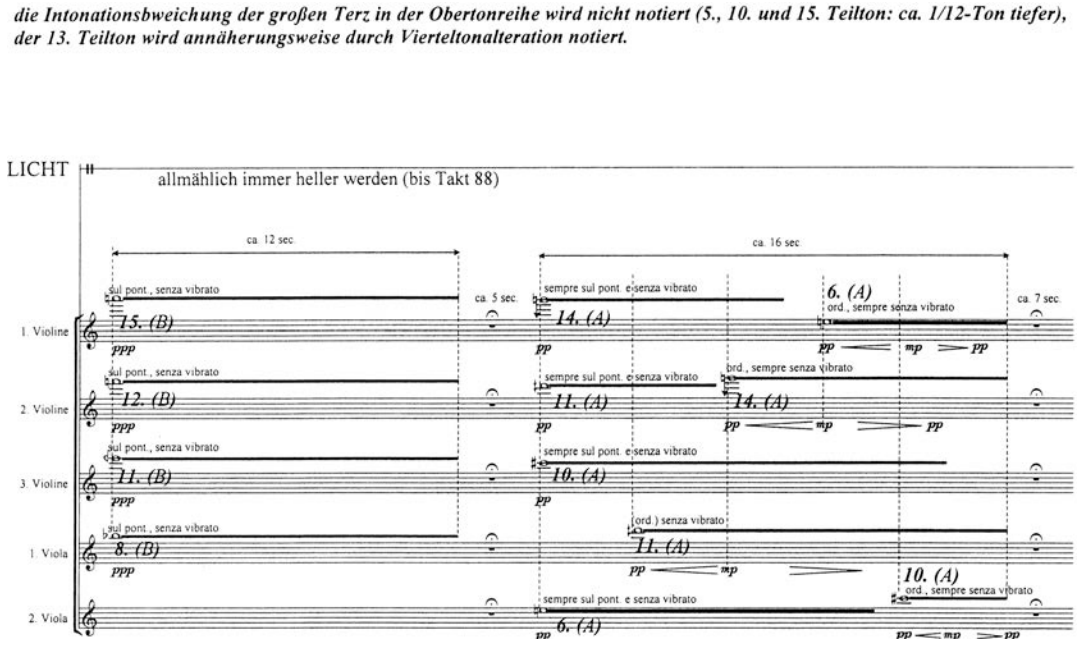
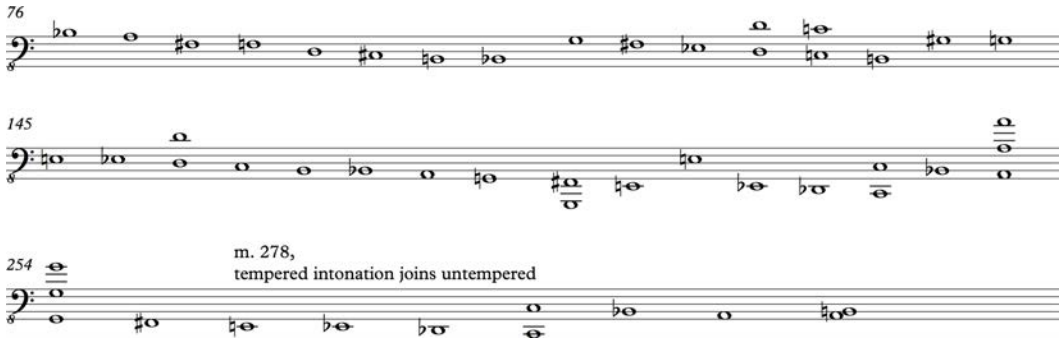
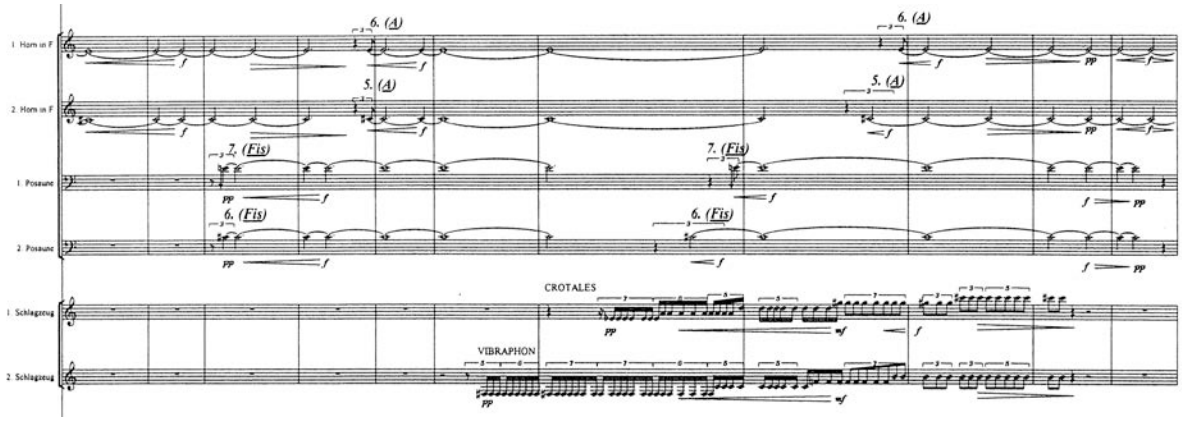
[17] Cornelia Fales, "The Paradox of Timbre," *Ethnomusicology* 46:1 (Winter 2002) pp. 64, 78.



10) *in vain*, beginning of partial-chord descent, m. 76 E



11) *in vain*, progression of "virtual" fundamentals in mm. 76–326.



12) *in vain*, conflicting F#-A thirds in horn and trombone, m. 458

remarks “I can not imagine that anyone will take this recurrence of the beginning as anything but oppressive. That's enough. Nothing more is needed.” Yet like its precursor artworks, *in vain* has outlived its political moment. Its exposure of paradoxes in musical notions of the natural and artificial created something altogether new, in the words of one reviewer “a kaleidoscope of perpetually shifting textures and colours, seemingly hinting at nocturnal worlds and dark natural forces and things mysterious, irrational, and unearthly.” As Haas wrote of Wyschnegradsky’s attempt to carve our individual works from the total sound continuum, constructive considerations are just the starting point for a composition. The work reflects the theory, but the “realization of utopia” is within the music itself.