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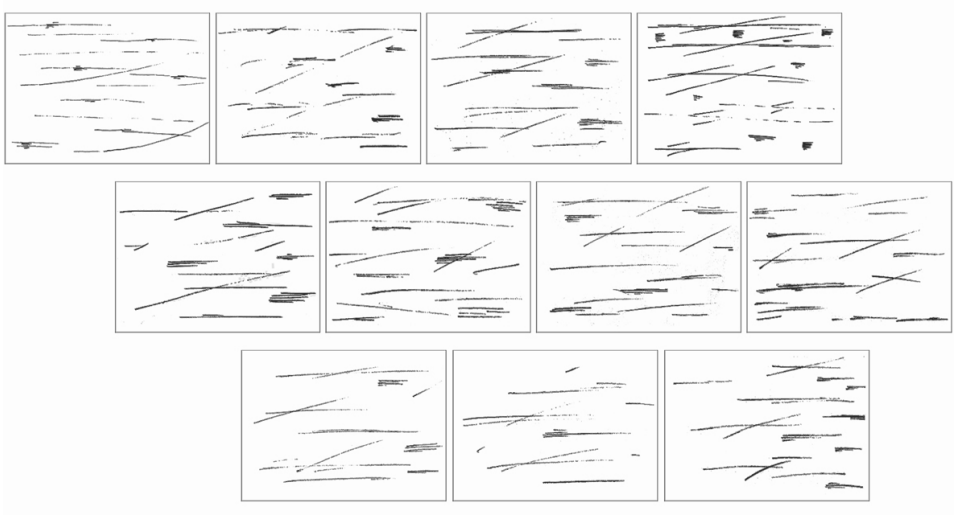
OPENING EARS
The Intimacy of the Detail of Sound

Since 2004, I have been engaged in a new composition method, that, for me is tremendously exciting. It begins with the creation of a drawing – a work of two-dimensional art, designed to represent the fullness of sound. A drawing provides an abstract, yet fertile starting point, which can be transformed into sound through an arduous but exciting composition process. To date, I've composed about ten pieces this way, including works for acoustic instruments (mixed chamber ensembles, a string quartet, and a chamber orchestra), and for acoustic instruments with sine tones. This graphic approach began to superscede the more traditional generative compositional methods I had been developing and using, around the year 2000. This change was partly triggered by my interest in creating music featuring long (unmetred) sustains; extremely slow glissandi; and just-intonation-based pitch material, in order to bring aural phenomena such as beating and difference tones into focus. Most important for this kind of very slow, duration-based music,[1] to keep it from becoming amorphous or drone-like (a kind of music I wasn't interested in), was the development of clear, strong forms, with dynamic inner structures. Using a graphic approach to achieve this,[2] I found a renewed sense of liberation at the most critical point of the composition process: at the very moment of the creation of material. With a blank white artists' sketchbook page in front of me, and a pencil in hand, the tactility of drawing forms became increasingly important to the generation of each new composition – and my imagination felt remarkably free to explore, with confidence and curiosity, a long sought-after soundworld (whose potential seemed endless).

This article will attempt to describe how and why this drawing method became central to my compositional process; why I use just-intonation-based ratios; how I incorporate ratios into my work in relation to the drawings; and how the consequences of working with musical material in the way I do affects the listening experience. I will provide some background information (the origins of some aspects of my approach), and will explain why I, as a young composer at the end of the 20th century, was drawn to this method; to metre-less material; to the rejection of manuscript paper; to acoustical phenomena; and to a microtonality stemming from the just-intonation ratio system (and I will pose some philosophical questions along the way).



example 1: The Spaces Between Them, *for mixed ensemble & sine tones, 11 drawings, 2005.*

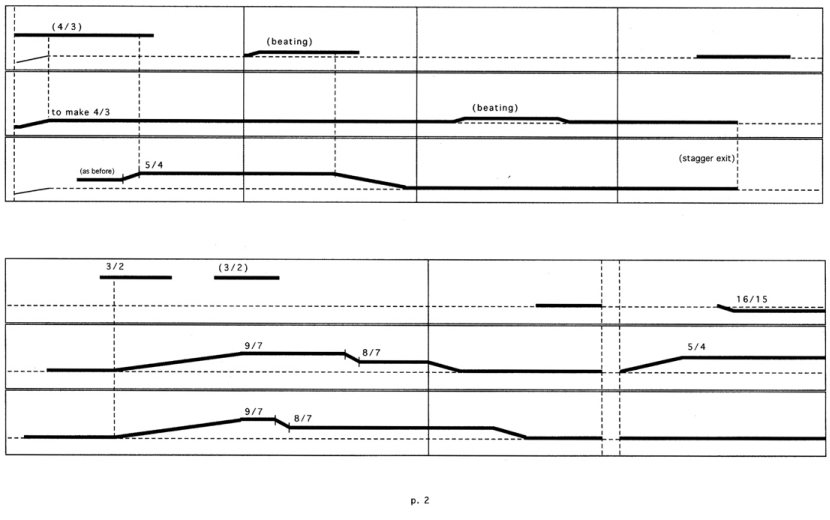
[1] The music is not metre-based, rather, it is durational in minutes and seconds. When I use a time signature, it is only to facilitate the coordination of a large ensemble, through a conductor.
[2] By graphic approach, I do not mean that I produce graphic scores open to interpretation by musicians.

The entire composition process begins with the generation of a drawing, or a series of drawings, towards a specific piece for an existing ensemble or a group of instruments. When a drawing emerges that is strong and convincing, I then begin a long translation process, one which transforms the abstract images into sound.

Why Draw?

I was initially drawn to drawing because a graphic approach seemed an effective way of producing and representing extremely slow musical figures – which, because they were not based on traditional (metred) time and pitch units, required a new method to create and control dynamic structures within strong sections, and within a strong overall form.

In 2000, I was more interested in working with pitch than rhythm because, parallel to composing, I was learning as a musician to recognize specific just-intonation ratios through practice: playing glissandi to reach very specific intervals, using sine tones as a guide.[3] During this practice, I became increasingly interested in listening to audible phenomena such as beating and difference tones – and my interest in these phenomena began to rival the goal of my practice, which was to recognize the sound of pure, beatless intervals.[4] In addition to this new-found interest in acoustical phenomena, I discovered, while using extremely slow glissandi to practice tuning, how large a semitone can be – both vertically and horizontally – it seemed to contain an *infinite* number of pitches. And with a glissando, I was able to extend the vertical span of this "small interval" over a very long duration.[5] This realization changed my view about vertical and horizontal space, and necessitated a notation for a new kind of music – music which is slowed-down (expanded) in order to magnify the audibility of the *detail* of sound, in order to make various auditory phenomena perceptible. But I also gravitated towards creating this kind of music in order to do something *different:* much of the new music that surrounded me seemed to have the same kind of nervous, jagged and jittery material, none of which focused on the detail of sound in quite the way that I was interested in listening to it: calmly, without the violent drama of ego in the material – as pure musical thought.



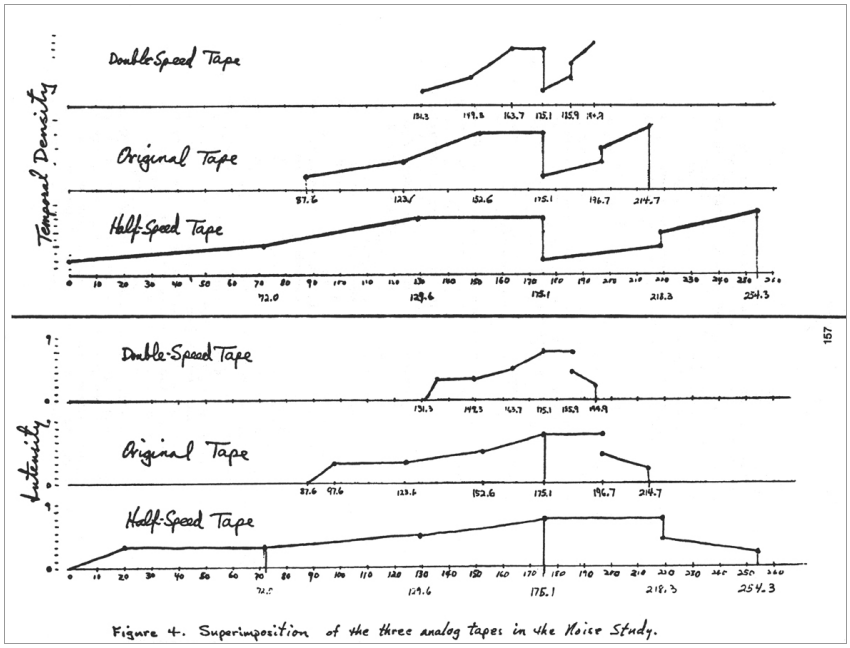
example 2: Partial Response, *for mezzo-soprano & 2 alto saxophones, page 2, 2000. Precursor to later drawings.*

[3] There was much activity and interest in just-intonation-based music in Berlin around 1999-2000. I was working with the saxophonist Ulrich Krieger, who is a proponent of music by La Monte Young, Phill Niblock, and James Tenney; and with the violinist and composer Marc Sabat, who was, together with the composer Wolfgang von Schweinitz, energetically researching and developing just-intonation theory and applications for specific instruments. These two eventually produced a just-intonation notation system called The Extended Helmholtz-Ellis JI Pitch Notation. I was also playing in The Plainsound Orchestra, an ensemble Sabat and Schweinitz founded to perform works using just intonation. I was also struck by a notion of simultaneous slow and fast speeds through beating, as described by composer Walter Zimmermann during a lecture on his string quartet Festina Lente. Theoretical writings and Helmholtz-Ellis JI Pitch Notation fonts can be found at: www.plainsound.org

[4] It is my belief that attention to sound is crucial to contemporary music. Music which does not explore sound, in the way that electronic music, some American minimalism, and spectralism have done, simply sounds old fashioned to me.

[5] Alvin Lucier's pieces, such as In Memoriam Jon Higgins, gave me confidence to pursue developing slow forms featuring beating.

My attraction to just-intonation ratios grew along with my interest in psychoacoustical phenomena, which were highlighted through practical work on a musical instrument and fostered by the musical activity in Berlin at the time (see footnote 3). But I was introduced to the just-intonation system, as well as to auditory phenomena, by James Tenney,[6] my first (and most influential) composition teacher. Shortly after I began composing, I studied privately with Tenney and attended seminars at his house from 1994 to 1997.[7] During that time, Tenney introduced me to acoustical principles and phenomena (with strong references to Helmholtz's writings), and explained how they relate to the human hearing apparatus: the ear and its basilar membrane. But Tenney also planted a different kind of conceptual seed during my first private session with him. He advised me to use parametric graphs to structure the composition I was then working on. While writing this article, I have discovered that my first purely graphic score (*Partial Response*, from 2000, example 2) has striking similarities to Tenney's graphs (example 3). Although I own the publication in which these graphs are contained, I didn't ever study or refer to them, so I was quite shocked to see uncanny similarities between them and *Partial Response*. Tenney's influence on my work may be greater than I have ever realised – and will perhaps become increasingly apparent in the years to come.



example 3: Superimposition of the three analogue tapes in the Noise Study, *by James Tenney* [8]

Unlike Tenney, I do not create drawings in order to produce unique forms for the parametric control of material;[9] rather, I create works of art to produce unique forms which almost literally represent frequency and duration. Not only are these drawings an effective way to shape and control very slow figures over an extended period of time, they are also extremely effective in producing surprisingly unique and dynamic harmonic movements which continually shift between the known and unknown – between situations that are stable, and those that are destabilized by a dissolution of "harmonic identity" through glissandi. The drawings' first identity as visual art (by *definition* only – I am not certain I would exhibit them) seems crucial to the consistent production of a variety of fascinating musical results.

My strong urge to create the drawings as one-to-one representations of frequency and duration may be the result of a very early childhood experience of music. Because my parents were both visual artists, my attention was always directed towards the visual. Until I moved to Germany in 1997, I listened to contemporary music with my eyes closed,

6 James Tenney (1934-2006)† born in New Mexico, USA, outlined theories (and composed pieces) which brought together, among other things, historical psychoacoustical perception and music theory (A History of Consonance and Dissonance); Gestalt principles related to form and harmony (Meta –/ Hodos and META Meta –/ Hodos); computer-generated music; Fourier analysis; stochastic and ergodic forms; and analyses of John Cage's work.

7 I studied privately with Tenney until I left Toronto in 1997 for a Fellowship Grant at the Akademie Schloss Solitude in Germany. The seminars were attended by experimental musicians and composers in Toronto, including microtonal instrument inventors John Gzowski and Garnet Willis, and composers such as Nic Gotham and Linda Smith. In addition to discussing his works and ours, Tenney also played and/or referred to works by composers such as Schönberg, Varèse, Ives, Ruggles, Nancarrow, and Bach.

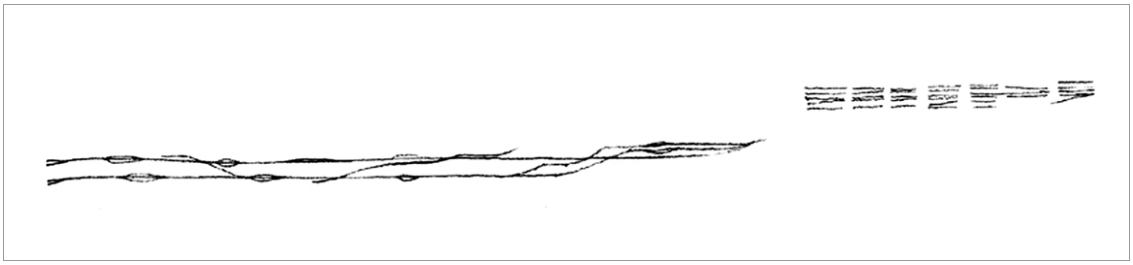
8 Tenney, James, Computer Music Experiences: 1961-64, p. 32. Electronic Music Reports #1. Institute of Sonology, Utrecht. 1969. Taken, with permission, from p. 157 of Larry Polansky's article The Early Works of James Tenney, published in Soundings #13, edited by Peter Garland. Soundings Press, Santa Fe, New Mexico. 1984.

9 The graphs I produced with Tenney were to indicate control over pitch range, duration, temporal density, and dynamics. Over the decades, Tenney himself created graphs for a wide variety of structural means of control, often to set limits for stochastic or ergodic processes, but also, as in example 3, to structure the simultaneous playback of multiple tapes.

to give my full attention to the music without the visual distractions of musicians' or conductor's movements, the light reflecting off instruments, etc. With closed eyes, I focused all my attention on the sounds I was hearing, and always envisioned corresponding images in my mind. These images were most often in the form of lines. Because my first encounters with "experimental music" happened when I was a child,[10] it is possible that I developed this particular form of listening in order to understand the music – because I didn't yet have the mature faculties for musical comprehension. I often think that producing these drawings might be a reversal of that early experience – or be connected to it. Perhaps at that young age, those images inspired by and related to sound were stored in my memory. Perhaps I am now *drawing them out* – or *drawing on them* – as a source of inspiration.

This direct experience of how sound affected my neurological processes opens up an area which still begs for research*:* to what degree do which forms of music and sound affect the body's processes and chemistry, and how do they affect the imagination and thought processes? This could lead the way to a revisitation of questions such as the following. With what aim was a music produced (i.e., for whom, for what particular emotion for what end)? What is the relationship between what the music symbolically represented *at the time* to the composer, and how the composer viewed and handled the material (abstractly or symbolically (or expressively); with an attitude of renunciation or referentially)? How does this music affect our emotions – even today – through our physiology and chemistry? How does a music's material (as analyzed on a scale from the mathematically abstract to the symbolically representative) correlate to its harnessing of, or its negation by, controlling powers? How, then, is a music's material and structure related to ideals or ideologies? I think it is important for living composers to consider the relevance of these questions.

The drawing method has been emancipatory for me*:* it revealed a way of exploring traditional instrumental groupings without the burden of compositional canon (as might be felt by a relatively young composer at the turn of the century); without having to resort to traditional musical building blocks; without the pressure of proving myself with brilliant, logical applications. The method enabled me to trust my own intuitive, quite organic approach, calmly and confidently, completely outside a new-music context that seemed to be filled with competition. And most important, the drawing method has been producing musical results which are varied; which pose significant questions and create dialogue; and which change both the listener's perception of – and therefore her or his comprehension of – both sound and music.



example 4: Gradients of Detail, *1 of 3 drawings*, *2005.*

Imagine a pencilled line, which wavers, darkens, and lightens with the uneven surface of the thick paper. Imagine this line as a solitary violin sustain, gently broken by the texture of hairs on the string, or a change in direction of the bow: *naked and vulnerable. This is the tactility of material.*

Just-intonation Ratios

Just-intonation (JI) ratios are rooted in acoustical principles – they are expressions of the mathematical proportions between frequencies. They are based on the overtone series, and are mirrored in the way the ear's basilar membrane physically responds to sound waves. They are consonances – "beatless" intervals. Ratios have been used since ancient times: the Greek's tetrachords; Arnold Schönberg's theoretical explanation of the major scale; and Harry Partch's proposals/explorations of microtonal scales were all derived from this mathematical; acoustical; and musical system.

These ratios, combined with glissandi, are my material. The resulting acoustical phenomena, together with the instruments' timbres, create the textural basis of my work. Justly tuned frequencies produce a smooth aural surface,

[10] My mother Aiko Suzuki took me along to several seasons' worth of concerts presented by New Music Concerts in Toronto. She designed numerous sets for the Toronto Dance Theatre, which featured original music by Canadian composers including Ann Southam, Milton Barnes, and Philip Werren, among others. Some of her closest friends were composers.

which highlights acoustical phenomena, and which is vulnerable and easily disturbed by glissandi – much as the smooth surface of water highlights ripples and waves, and is itself infinitely supple. The absolute purity of these consonances *focuses* the sensations of beating and difference tones, and what I call "incidental harmonic nodes"[11] in the ear. Such consonances also have their own special sound (which can most clearly be heard in Indian classical music): when intervals are justly in tune, the alignment of their combined overtones produces a distinct shimmering sound.

This smooth aural surface to which I refer can comprise simple, identifiable chords, or complex, less familiar intervals. The ratio system is, in this way, a very malleable, controllable form of microtonality. And the introduction of extremely slow glissandi in this context not only creates many of the acoustical phenomena mentioned above, it also takes the microtonality to a much more complex level. As I mentioned earlier, an interval as small as a semitone seems to contain an infinite number of pitches. Every one of those pitches also creates a ratio with simultaneously sounding frequencies. This means that even when a familiar consonant interval is present, its identity is immediately altered by the presence of an additional pitch. And if that pitch is constantly *changing*, the overall harmonic identity is also continually dissolving and changing. The resulting ratio combinations are so irrational, that they could never be composed — but it is this "incidental" combination of the familiar (relatively simple) and the unfamiliar (complex) that creates one of the most interesting dynamics in my work. I like to think of it as showing how the indomitability of harmonic identity can be completely dissolved and redefined by glissandi. I call it the dissolution of harmonic identity by glissandi.

Harmonic identity is implicit in the JI system. Ratios' numbers represent proportional relationships, which, when they are simple, produce the intervals which were central to musical evolution until the last century, and which still resonate with our biology today. But the ratio system can also be infinitely complex, as it represents a vast (unlimited) potential as a "network of interrelated pitches". This system provides me with material rich in possibility. Each drawing carves a unique path through a limitless potential of material. This gives me a tremendous sense of artistic freedom, a free hand, and curiosity during the creative process.

Transformation Through Translation: *Art (visual) ⇒ Representation ⇒ Art (aural), in 4 Phases*

There are four distinct phases of transforming a drawing into a score, once I am convinced that a drawing is strong enough to serve as the basis for a piece, and after I have scanned it into my computer. 1. I superimpose horizontal and vertical grids on the image (define global scales), 2. I adjust the drawing and grid (set regions), 3. I name all the pitches (specify just-intonation ratios; make local decisions) and orchestrate the work (colour and/or fuse sound), and 4. I produce a score more or less in traditional musical notation.

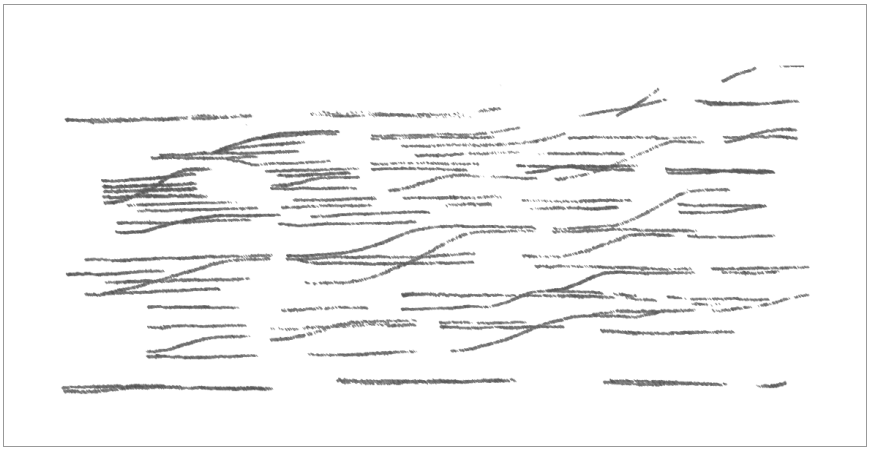
The first two phases are quite straightforward. The third phase is complex, and I will summarize it here, then try to illustrate the process with examples from a recent composition, *Gradients of Detail*. I will also briefly explain some aspects of working with ratios, which will let the reader see how I build material. The fourth phase – creating a score – will be left out entirely, as it is a completely straightforward process (although scoring considerations, especially when composing for an orchestra, do affect orchestrational choices). For pitch indications, I use accidentals based on *The Extended Helmholtz-Ellis JI Pitch Notation* (see footnote 3) to denote the "limit" of a given pitch, and most often indicate cent deviations from equal temperament.

Transformation – First Phase: *Setting Global Scale*

I first make global decisions with respect to overall pitch range and timescale by adjusting the proportions of the drawing (or series of drawings) and the grid (representing the treble and bass clefs, ledger lines, and duration in minutes and seconds).

[11] A glissando and a sustain can create audible "harmonic nodes" (a psychoacoustical phenomenon), when they are in simple ratio relationships with each other. The ear (the mind) clearly recognizes these "nodes" as consonances ("resting points") within a continually changing field of microtonality, even when a glissando continues past these points with a constant velocity. This phenomenon is not intentionally built into the compositions—it simply results from the material's design.

I usually have an idea of an overall pitch range and duration before I begin drawing. This affects where I position my drawing on the page. It also forces me to decide what a single page's duration will be, and, therefore, how many pages I will have to generate for a piece.



example 5: Wind in the Ceiling*, single-page drawing, 2004.*

example 6 (see next pages): Wind in the Ceiling, *for chamber orchestra, pages 1-2 of final score, 2005.*

Since these decisions are made before I begin creating the material, I am very cognizant of formal structuring while drawing. So, adjusting the proportions between the drawing and grid, as described above, is relatively easy. (I do, however, continually produce new drawings, without specific projects in mind. Their abstractness allows for a range of interpretation later on. If I am using an older drawing, I might decide on a specific overall pitch range which is different from the notion I had while creating the drawing.)

Transformation – Second Phase: *Setting Regions*

Next, I set regions, or individual pages (if the work comprises a series of drawings). This involves sliding the drawing of each page up and down and readjusting proportions, until its significant lines are right (I will already have made a rough placement in the previous phase). In this case, "right" means that the significant lines and shapes are within the pitch range (voice area) I had in mind while drawing. But it also involves looking at each page in relation to the preceding page, the following page, and in the context of the entire piece: I now place the drawing(s) so that significant lines (or shapes) line up with specific pitches.

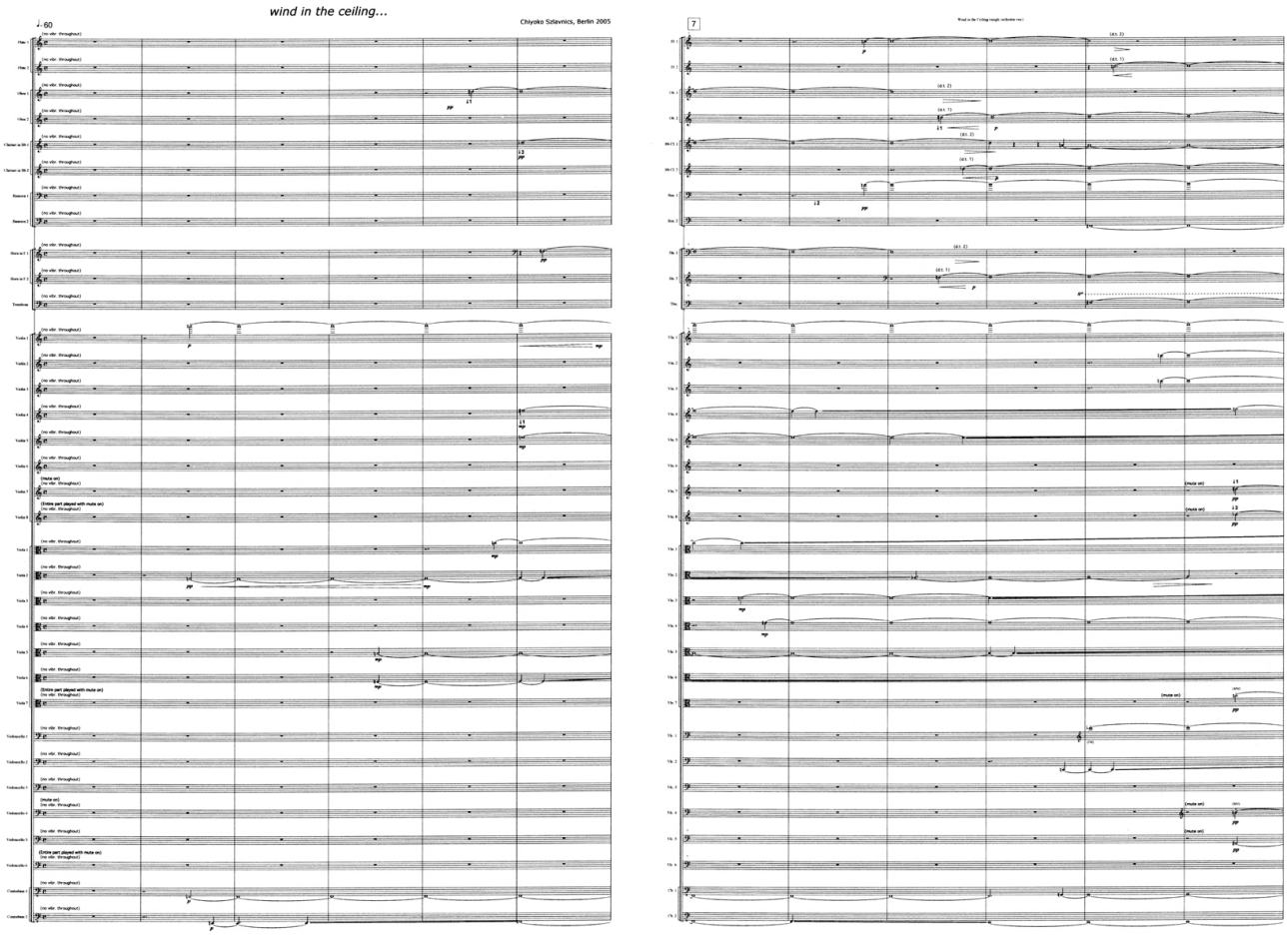
Specific pitches are chosen, throughout my process, in a variety of ways. A pitch might be chosen for its significance on the instrument that will play it; because I had it in mind while drawing; or because in the context of the entire piece, a particular pitch makes harmonic sense to me – what I mean by this, is that I often use an intuitive melodic feel when I am working through an entire piece during this phase.

Translation/Transformation – Third Phase: *Making Local Decisions (Naming Pitches & Orchestrating)*

Once a piece has been set, as described above, a long and complicated process of a) orchestrating, and b) specifying pitches follows. These two activities are completely intertwined – they inform each other in a continually alternating dance, which varies tremendously from piece to piece.

The decisions made during this part of the process depend on which, and how many instruments I am writing for; how experienced the musicians are with just-intonation ratios; whether they will perform with tuners; whether electronics are involved; how complex the drawing is; how large the ensemble is; and how many decisions I had already made before I began drawing.

In general, because I have already set the drawing(s), at this point I let all remaining lines' locations in relation to the grid inform my decisions about pitch. I allow the process to become aleatoric – in fact, I *enjoy* allowing the drawing and the grid to define the pitch material. In a sense, it is this dialogue between an abstract drawing representing sound, and a grid representing musical history and evolution, that becomes most exciting during the transformation process.



My task becomes one of precisely defining the frequencies, using ratio identities. I do this by looking at the drawn lines' locations on the grid (the staff lines) – to see how closely they line up with it. At this point, I often work through an entire piece and identify all the pitches. When a piece is strictly for acoustic instruments, my pitch choices usually include ratios to the 17-limit. When electronics are involved, my choices are more liberal and experimental: I often use more complex ratios, such as extremely high limits (especially for clusters) or experiment with undertones (I am particularly interested in combining pitches within the critical band,[12] for this is where the ear becomes confused by the combined sound waves – where fusion most distinctly occurs).

Many of my pitch decisions result from orchestrational considerations, and vice versa. This is why I described this phase as a dance between the two (I will try to elucidate this complicated process later, with a step-by-step description of orchestration and pitch decisions for the opening figure of a recent string quartet).

Understanding and Working with Ratios

A *very* simple illustration of one kind of relationship between ratios gives an idea of how I make local pitch decisions. As a premise, I understand ratios as being a network of interrelated pitches connected to each other through

12 "For a given frequency, the Critical Band is the smallest band of frequencies around it which activate the same part of the basilar membrane. Whereas the Differential Threshold is the just noticeable difference (jnd) of a single frequency, the Critical Bandwidth represents the ear's resolving power for simultaneous tones or partials." B. Truax, ed. Handbook for Acoustic Ecology, CD-ROM, Cambridge Street Publishing, 1999. (www.sfu.ca/sonic-studio/handbook/Critical_Band.html)

direct (simple) or indirect (complex) mathematical relationships. The following table shows how a few overtones of fundamentals are simply related to each other – how the simplicity of their *mathematical relationships* is reflected in very familiar intervals. All the ratios in the table are spelled in relation to C*:*

1.	Dominant 7th of C:	**7/1**	
	Dominant 7th of G:	7/1 x 3/2 =	**21/2**
	Relationship between these two dominant 7ths:	21/2 ÷ 7/1 =	**3/2** (a pure fifth)
2.	Pure third of C:	**5/1**	
	Pure third of G:	5/1 x 3/2 =	**15/2**
	Pure third of D:	5/1 x 3/2 x 3/2 =	**45/4**
	Relationship between the pure third of D and the pure third of C:	45/4 ÷ 5/1 =	**9/4**
		The pure third of D is a major ninth above the pure third of C.	
		(9/4 can also be represented as 3/2 x 3/2 – showing that a major ninth actually comprises two pure fifths)	
2b.	Pure third of C:	**5/1**	
	Pure third of G:	5/1 x 3/2 =	**15/2**
	Relationship between the pure third of G and the pure third of C:	The pure third of G is not only a pure fifth above the pure third of C, it is the same frequency as the 15th overtone of C (the so-called "leading tone" or "major seventh").	

Another example (again a very simple one) to illustrate the interconnections of ratios, but also the potential for complexity: the dominant sevenths (7-limit) or major thirds (5-limit) described in the table can, themselves, *also* function as fundamentals – they can have their *own* respective overtone series. These new overtone series would then, within their *own* limit, be *directly* connected to one another through simple ratios (i.e., easily recognizable intervals), but would also still be related to the *original fundamentals* – but indirectly, by more complex ratios (i.e., less familiar intervals).

A Lattice of Harmony; "Harmonic Space"

The "network of interrelated pitches" I referred to in the section on just-intonation ratios is illustrated in Tenney's proposals of a "Lattice of Harmony" and "Harmonic Space" (example 7 shows harmonic space "collapsed" into a two-dimensional plane).[13] The example shows how fundamentals (denominators) and limits (nominators; prime number overtones)[14] are related along direct axes.

[13] To quote Tenney: "The one-dimensional continuum of pitch-height (i.e. "pitch" as ordinarily defined) can be conceived as a central *axis of projection* within this harmonic space. [...] Although the pitch height axis is effectively continuous, harmonic space itself is not. Instead, it consists of a discontinuous network or *lattice* of points. A distance measure which I call *harmonic distance* between any two points in this space as proportional to the sum of the distances traversed on a shortest path connecting them (i.e. along the line segments shown in the figures)." Tenney, James. "John Cage and the Theory of Harmony", pp. 16-17. York University, Toronto. 1983. With his theories of a "Lattice of Harmony" and "Harmonic Space" Tenney proposed harmonic relationships which, although they may be beyond the ear's comprehensive capability, are interrelated by simple ratios, and offer a limitless realm: the potential for a microtonality which works with incredibly fine degrees of simplicity and complexity.

[14] As undertones, the nominators' and denominators' functions are reversed.

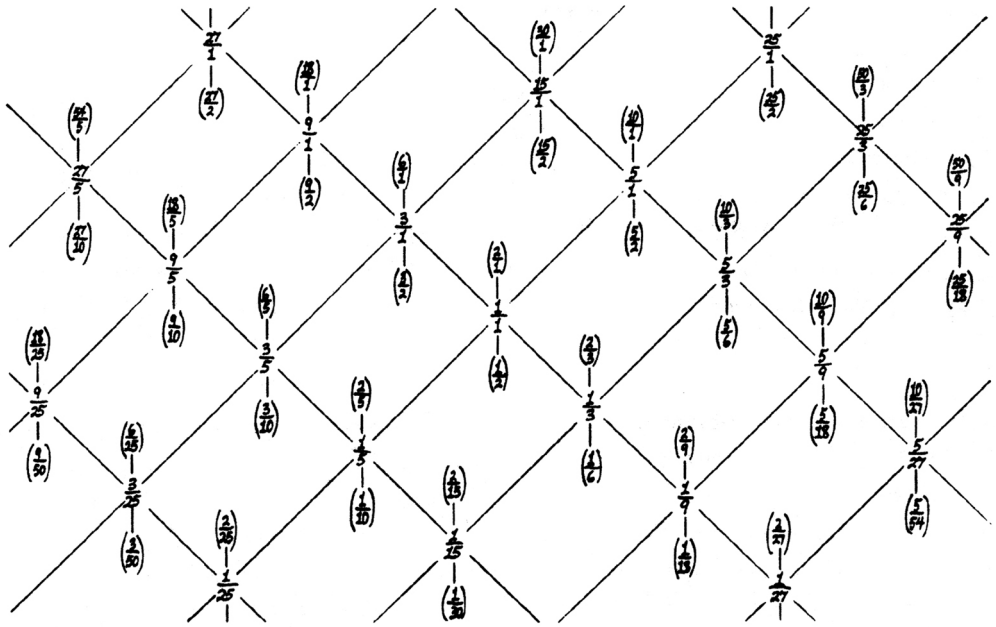


Figure 3. The 3,5 plane of harmonic space as a pitch-class projection plane within 2,3,5 space.

example 7: The 3,5 plane of harmonic space as a pitch-class projection plane within 2,3,5 space, by James Tenney[15]

It is because of this innate interconnection between ratios that I take a great degree of liberty when naming the frequencies for electronics. Because of the purity of sine tone waves and the accuracy of pitch production by computer programs such as Max/MSP, I find that despite complex or distant relationships between ratios, the ear accepts all electronically generated sine tone ratios (and clusters) as consonances[16] (i.e., it might not recognize what an interval's ratio is, precisely, but it does not find them at all offensive: pitch clusters within a major second, when played by acoustic instruments, often create an intense fluttering sensation in the ear; but when electronically-produced, are heard as a very pure, smooth compound periodicity – rhythm – of the frequencies).

Ratios in the Opening Figure of Gradients of Detail

In the opening of *Gradients of Detail* (examples 4 and 8), I combined simple-term ratios (intervals) from various fundamentals to create unusual clusters within a critical band. The first figure features a main interval of 7/6 of D (a small minor third: C -29¢ / A 0¢) which over three minutes, gradually becomes an 8/7 of C (a large major second*:* C -6¢ / Bb -37¢). At various points within the first minute, additional pitches from closely-related fundamentals are added, such as (not octave-specific) 13 of D (B -61¢); 15 of A (G# -12¢); 16, 15, 14, 13 of C (C -6¢; B -20¢ – this is also 5 of G; Bb -37¢; A -65¢). This is just the first minute – clusters feature throughout the entire piece, with greater or less degrees of complexity. But even the most complex clusters can be broken down into familiar components – familiar intervals – which facilitates rehearsal and practice by the musicians.

I initially found the mathematical principles and the musical application of ratios to be quite daunting. But by rigorously applying these principles to actual sound – by connecting the simplicity of the logic to concrete reality, and doing this with an instrument in hand, as a musician would – I was able to re-learn the numbers' signification (it makes much more sense to me that the numbers 5/4 represent an interval which, on a string in any case, represent a physical reality – and therefore a sound – rather than a step or degree, such as a third in a mode or a scale). One can work mathematically with these numbers and maintain control over the degree of pitch comprehension. And as direct representations of acoustical reality (proportional relationships between frequencies), ratios are not burdened with a symbolic language that needs explaining and/or historical contextualizing: they are plain expressions of the physical (not psychological) reality of what they are.

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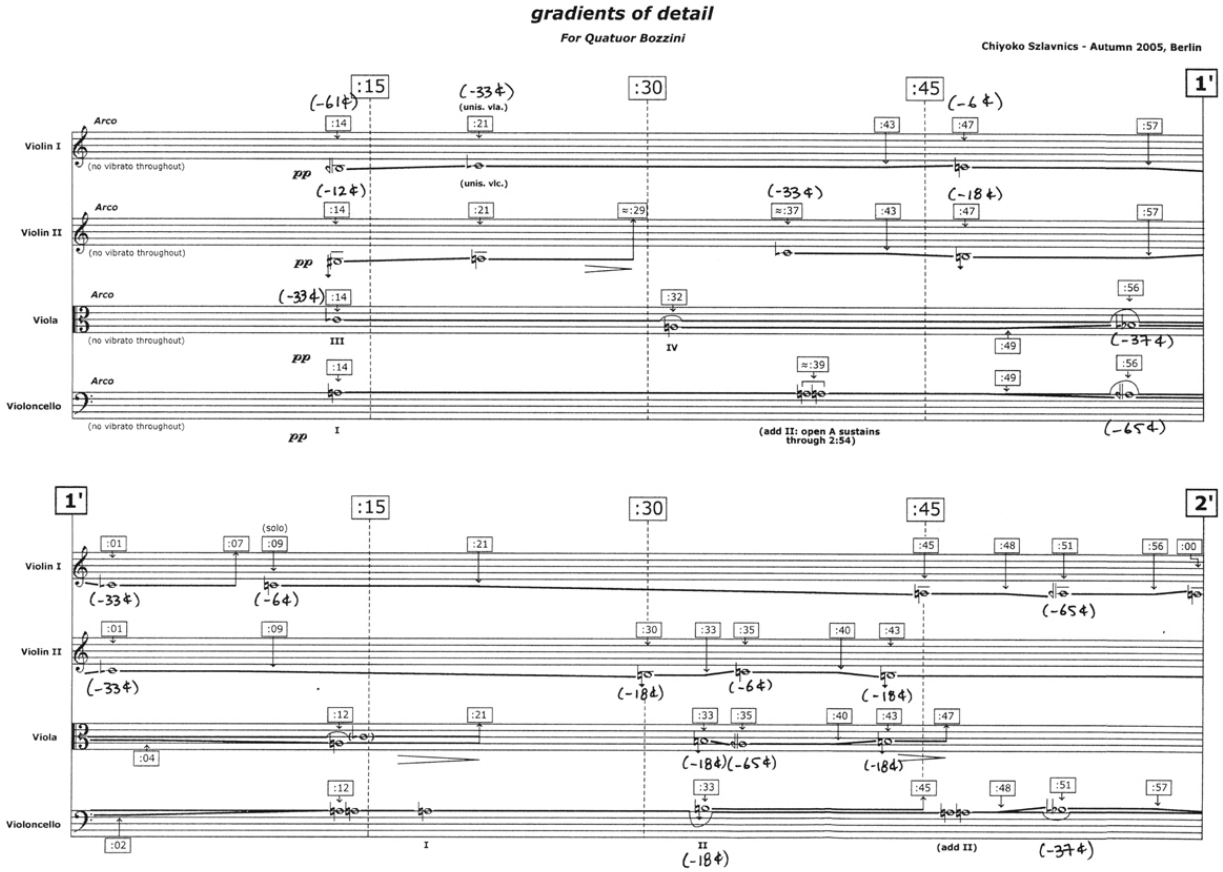
[15] Tenney, James, "John Cage and the Theory of Harmony", p. 18. York University, Toronto. 1983.

[16] Although an infinite number of ratios exists, our ear has a particular tolerance level for recognizing "pitch identity" (Tenney said that the tolerance level is around 4 cents). The higher pitches of an overtone series, since they move ever closer (in octave equivalence) to the lower pitches of the series, would most likely be perceived as simpler ratios (intervals we generally recognise).



example 8: Gradients of Detail*, for Quatuor Bozzini, page 1 of final score, 2005-2006.*

From Preconception to Scoring: *an Illustration from the string quartet* Gradients of Detail

Although I have attempted to outline the transformation (composition) process as various distinct phases, the actual process is not at all so neatly compartmentalized. I have mentioned that, while drawing, it is important to be free of the necessity of specifying an instrument or pitch for each pencil mark I make. But before I begin drawing, I *do* think about the instruments that will be used to perform the work, and I make some decisions – even if they are vague or unconscious – about things like overall pitch range and duration, and the types of shapes and forms I want to work with. These kinds of decisions – whether conscious or unconscious – influence the drawing that then emerges.

For instance, before creating my recent string quartet, *Gradients of Detail*, I knew that I wanted the drawing to be a kind of organic plant-like figure (I had drawn such forms earlier that year, but hadn't yet incorporated them into a composition). I also had some musical wishes – I wanted most of the piece to occur within various critical bands and to combine simple-term ratios in an unusual way (i.e., to create unfamiliar chords). Also, I wanted the instruments to play unified figures in a non-hierarchical way for much of the piece.

So I began by drawing a plant-like figure, which had two main horizontal lines (an interval), out of which grew small bumps (or bulges), and which was traversed by two delicate lines, like the tendrils of an ivy.[17]

When the time came to transform this opening figure, after I had created, placed, and adjusted the grid, I began the next phase by specifying the pitches for the main horizontal lines, and the instruments that would play them. This decision was informed by my consideration of which instruments would play the bumps and the tendril-like weaving lines. The interplay of pitch and orchestrational decisions begins here: while drawing, I knew that one of the main horizontal lines would be an open string, to provide a constant tuning reference for the others – I may even have already considered it would be the open A string of the violoncello.

[17] I completed three pages of drawings over one or two days, but will not elaborate on the rest of the drawing—I will say, in general, that the drawing proceeded with the original idea of generating plant-like figures, but was completed with cognizance of compositional considerations, such as contrast, register, silence between figures, continuity, non-repetition, and overall form.

I set the main interval as 7/6 of D (as described in the previous section), and the violoncello's open A string as the lower pitch. I thought that this interval, in this range, would be practical on the instruments for this passage of glissandi and clusters – and that this voice area would facilitate fusion (I also wanted to hear this particular interval throughout the first section). Having chosen the violoncello to perform the lower pitch, it was then necessary to define the other instruments' roles for the entire first section – to find, for each instrument, a logical relationship to the drawn figure, as well as to each other. I decided that the two violins would play the lines that weave in and out of the main interval – these lines looked very similar (equal) in the drawing, so I decided to interpret them with like instruments. One violin would play the descending line, the other the one that ascends – I try to share out material as much as possible. Once I had made this crucial decision, a logical orchestrational framework had been established for the first figure. With this framework in mind, I then turned to the opening of the piece, which begins with four pitches. Since the violins had been established as weaving instruments, and, therefore, the viola and violoncello as the main interval instruments, it seemed clear to me that the two violins would also perform the opening figure's glissandi, which led to the main interval.

The orchestration for this page became clear at this point, but not necessarily easy. I encountered a variety of practical difficulties, such as orchestrating the bumps, which, together with the main interval and the weaving lines, sometimes required five or six simultaneous pitches. Each subsequent page also required a new orchestrational framework because the figures – although they were drawn so as to have continuity and to span three pages – were unique, and sometimes contrasted with the previous figure's voice area and structure. Because my intention was to have most of the piece occur within various critical bands, this allowed me to make pragmatic decisions, since the relative homogeneity of four stringed instruments' timbre ensured fusion. I only needed to find a logical approach to orchestrating each page. I often considered score order and thought about the string quartet as an ensemble, in relation to the drawings' figures. The choosing of individual pitches was sometimes informed by playability – by considering which instruments could play them, especially when they existed as natural harmonics on the instruments.

The two score examples (6 & 8) illustrate different versions of my final score notation. I use just-intonation accidentals (see footnote 3) and often indicate cent deviations from equal temperament. The music is performed with stopwatches, unless coordination by a conductor is necessary as would be the case for larger ensembles.

Less Can be More; The Intimacy of Detail

In closing, I would like to address how this music affects the listener. The music demands full concentration, but at the same time, requires an openness and an ability to be in the moment, to let the music happen, to drop expectations. Because the structures and forms in my music are extremely slow, or expanded, and are not built on a conceptual or narrative basis, it is impossible for a listener to predict how a piece will progress. The listening experience is fulfilled by a constant attention to the detail(s) of the sound – the slowness of the music creates a heightened awareness of the present moment, and the listener is carried along by the contours and forms of the work as it unfolds. Part of the satisfaction of the experience, is listening to the variety of material – the listener's attention is constantly shifting between different things: a single sustain; a familiar interval; an unfamiliar interval; the coming into focus or dissolution of those two things (or a unison or a chord); changes in orchestration; fusion; beating; difference tones; the detail of an instrument's sound...or silence. A German music journalist, Matthias R. Entreß, described the listening experience as, *"...an enigma for the ear, one which never allowed our attention to slacken."*[18]

This is why the variety and the sometimes complexity of the drawings, the process, and the musical results of this new body of work is so fascinating to me. Although my music offers *less* than conventional compositions, what happens is interesting enough that the listener must open her or his ears even further. My music requires that the listener step forward, come very close in order to see (hear) the details – just as one would, in order to look at the details of the pigment on a painting. This reflects the actual moment of creation of a work, when I am sitting with my face very close to a page, drawing with a pencil.

The absence of a mediatory symbolic language – at least during the first stage, while drawing – produces musical results, which, I believe, would not have appeared had I begun with a sheet of manuscript paper (i.e., with traditional approaches in mind). By forsaking manuscript paper (as a template) at the entry point of the process, I am emancipated from the historical signification inherent in it – I feel a complete freedom in the activity of creating art on

[18] Entreß, Matthias R. "MaerzMusik – eine Festivalbetrachtung", p. 62, Positionen: Beiträge für Neuen Musik, No. 67. Berlin, May 2006.

a clean page.[19] And the resulting works – both visual and musical – have a kind of autonomy and independence – even from me. This strengthens my feeling of my activity as one of creating art, rather than fulfilling – or reacting to – external expectations.

I trust art. I trust the pure act of creating art, much more than I do a creative act which is driven by external mechanisms. And I enjoy the integration, the rubbing together of that which is organic (the drawing) with aspects of the musical evolution such as ratios, and even the grid of staff lines, later on in the process. But the absence of a mediatory symbolic language (traditional building blocks) right at the beginning of the process allows me to create music which itself is, I hope, unburdened by historical signification, tradition, ideology – or expectation. This music – stemming from curving shapes, contours, and drawn lines, which, themselves, create a unique dynamic on the page where they exist – is an abstract expression of the limitless potential of ratios, and the detail of sound – and our ability (willingness) to hear to it.

Berlin, April-May 2006

[19] Just as a white page reflects the full spectrum of color, it also represents, to me, the potential for the full spectrum of sound: a potential for anything.