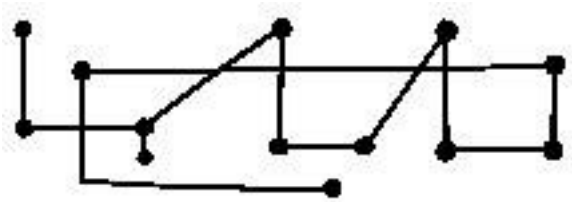
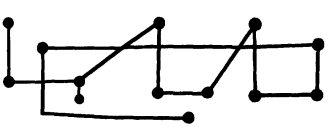


Adding Pitches: Some New Thoughts, Ten Years after *Perspectives of New Music*'s "Forum: Microtonality Today"



Julia Werntz

As we wonder what it is that grips us and fills us with foreboding and delight in Chopin's music, we are apt to find a solution that might appear to many as pure fantasy, namely that Chopin's intention was to release upon us a cloud of quarter-tones, which now appear as phantom doppelgänger in the shadowy realm within the intervals produced by enharmonic change. Once the quarter-tones are emancipated, an entirely new world of tones will open to us. But since we have been accustomed to the long established divisions into semitones, these new sounds will seem weird, suggesting a splash of

> discordant waves. Yet the children of the next generation, or the one after next, will suck in these strange sounds with mother's milk, and may find in them a more stimulating and doubly rich art.
>
> —Johanna Kinkel,
> *Acht Briefe an eine Freundin über Clavier-Unterricht*

IN 1991, *Perspectives of New Music*'s "Forum: Microtonality Today" was groundbreaking in its clear presentation of the varied methods and accomplishments of several of the most important pioneers of microtonalism. Ten years later I am responding with some thoughts of my own, as one of a small minority of microtonalists referred to by Douglas Keislar in his introduction: composers who use microtones for no reason other than to obtain the stimulating sonorities that are available with the added pitches, and who employ distinct, functional, expanded forms of equal temperament to this end.

If such composers did not figure prominently in the Forum, this is understandable considering their extreme scarcity in recent decades.[1] Today microtones are considered most often as a means of attaining acoustically "correct," pure tunings in scalar, frequently triadic idioms. There also are many composers who, although they may be unconcerned with pure tuning, nonetheless use the added pitches in an incidental fashion, either as mere ornaments to the twelve traditional pitches, or in clusters designed actually to *reduce* the function of individual tones, in the manner of Iannis Xenakis or Krzysztof Penderecki.

Earlier in the twentieth century bold efforts *were* made to forge a discrete melodic and harmonic language out of expanded equal temperament, by Alois Hába, Julian Carrillo and Ivan Wyshnegradsky. However this path fell into disuse, with very few composers following in their painstakingly-made footsteps. This is surely due largely to the bewildering challenge of making musical sense out of the added pitches, a challenge that largely was not met by these composers, who left no substantial repertoire of inspirational works to affirm the merits and artistic potential of this approach to future generations.[2] Nonetheless, it is my belief that even in this nearly embryonic state expanded equal temperament is actually the most valuable form of microtonalsim, and that it carries the most potential for musical innovation.

In 1988 I began several years of private study with Joe Maneri, one of the few composers still developing and advancing expanded equal temperament. Despite near-obscurity and isolation even amid the already marginalized international community of microtonalists, Maneri has been writing with seventy-two-note equal temperament, and has been

teaching it with unwavering commitment and passion to students in his microtonal course at the New England Conservatory of Music, since the late 1970s. Although his microtonal oeuvre to date remains small, totaling seven pieces, the beauty and innovation in these works is profound, and provides a rich subject for study.

Through observing Maneri's music, through my years as his student, and through my own subsequent independent composition and study, I have arrived at what I consider to be some simple, essential truths about microtonal composition. With the following essay I have two purposes. In Part 1, I will examine and compare the main currents in modern microtonalism and the vastly contrasting points of view that underlie each, which generally may be grouped into either the pursuit of pure tuning—*just intonation* being the most popular method, or *simply adding pitches*, and to show why the second approach has several advantages (practical, artistic—even theoretical) over the first, and further, to advocate the use of *distinct equal-tempered microtonal chromatic scales.* In Part 2, using excerpts from Maneri's and my own music, I hope to illuminate some practical issues that are fundamental to composition with non-just, microtonal equal temperament, and to suggest how these may affect compositional technique. Although the reader may find the issues, especially in Part 2, to be of a somewhat rudimentary nature, I believe that this in fact is an indication of their pertinence. My hope is that these ideas will serve to complement *Perspectives of New Music*'s Forum of a decade ago, by clearing the air even further about why and how composers use microtones, and providing an alternative perspective.

Part 1: Why Add Pitches?

Just Intonation

Musicians using pure tunings represent the largest and most popular trend in microtonalism today, as any web search on the subject of microtonality will demonstrate, and just intonation is by far the preferred tuning model (though neo-meantone and Pythagorean tunings are also used by some). Despite variations in technique, all theorists and composers in this category have in common a philosophical attraction to the notion of obtaining pure (i.e. truly consonant) intervals, regardless of whether they arrive at this practice through the "scientific" ideal of simulating the intervals of the overtone series, or arithmetically, through small whole number ratios. Some have constructed intricate microtonal chromatic

scales to facilitate modulation, and most have also expanded the basic practice of triadic just chord construction, based on pure thirds (5/4) and fifths (3/2), to include larger number ratios (higher overtones). Many have formed groups or institutes to further the study and practice of pure tuning.

American composer Harry Partch could be described as the father of American modern just intonation. He expanded the range of acceptably small ratios from 5 to include the numbers 7, 9 and 11, and developed a forty-three note, symmetrical chromatic scale whose tones form intervals with the fundamental using ratios within this "11-limit." Partch influenced subsequent generations of American composers, most notably former students Ben Johnston, who has further expanded the range to include prime numbers as high as 31,[3] and Lou Harrison, an especially outspoken advocate of just intonation who is well known for the justly tuned non-European instruments and scales he frequently uses in his music.[4] Partch has recently gained popularity in Europe as well, as evidenced by the numerous performances there by Newband (an ensemble whose unique instrument collection includes instruments made by Partch, as well as some replications), and the creation of the Harry Partch Society in England in 1995.[5]

In the Netherlands in the 1950s, Dutch physicist Adriaan Fokker initiated a revival of the 31-note equal temperament of 17th-century scientist and theorist Christiaan Huygens. This method modifies the infinitely ascending fifths of meantone tuning, by enlarging them slightly from 696.578 cents to 696.774 cents, resulting in a series that closes at the 31st fifth, and from which fifths, minor thirds, major thirds and minor sevenths may be derived that do not deviate from the pure intervals by more than about 6 cents. Although today the government-funded Stichting Huygens-Fokker (founded by Fokker in 1960) provides a forum for a variety of microtonal disciplines, the influence of Fokker's ideas is apparent in the high number of Dutch (and some non-Dutch) musicians who write or perform in 31-note equal temperament.[6]

In Salzburg the Richter-Herf Institut für Musikalische Grunglagenforschung (Institute for Basic Research on Music) was founded by the late theorist and composer Franz Richter-Herf in 1972, under the aegis of the Mozarteum Academy. In the 1970s Richter-Herf and fellow theorist Rolf Maedel conducted studies at the acoustical laboratories of the Mozarteum which were concerned with the perception of musical intervals and chords. Richter-Herf advocated, and used, seventy-two-note equal temperament as a means with which to obtain comfortably close approximations of the pure intervals. The Institut was formed "in order to integrate the musical, theoretical and psychoacoustical research of

bases as a scientific foundament [sic] into the education at the Hochschule 'Mozarteum.'"[7] Directed today by musicologist Prof. Horst-Peter Hesse, the Institut's activities have expanded, not so much to function as an umbrella to varying types of microtonality like the Stichting, but to encompass the broader field of psycho-acoustics, of which pure tuning (termed "ekmelic music" by Richter-Herf) is one aspect.

It is my belief, first, that there are serious, fundamental weaknesses in the theoretical premise of just intonation. It is true that holes in a composer's theory or logic may not *always* result directly in flaws in his/her music, as can be seen in some superb pieces written by "just" composers—a matter I will address later. Nonetheless I feel it is necessary to reexamine this premise because of its considerable influence today in the microtonal "mainstream," and because its assertions are grave and misleading, with regard both to our understanding of existing music and to the creation of our own music. Second, and more importantly, there are certain fundamental *practical* limitations inherent in the application of just intonation principles. And third (and this is admittedly a subject which involves even more overtly biased views), I also believe that the *artistic* premise for just intonation warrants examination.

THE THEORETICAL PREMISE OF JUST INTONATION AND THE GENERAL ISSUE OF DISSONANCE

At the heart of just intonation theory lie certain presumptions about consonance and dissonance which can be summed up more or less as follows: the intervals available to us through the great compromise of standard Western equal temperament are merely phony representations of the "natural," "pure" intervals, and are incorrect, flawed and dissonant, whereas the pure intervals are the correct ones, are truly consonant, and must be—indeed *are*—better to listen to. Arguments are frequently made about "what the ear is equipped to hear," etc.

Such views are unambiguously expressed by most proponents and practitioners of just intonation. For example, Harry Partch's popular book *Genesis of a Music* is full of statements like the following: "the prime faculty of the ear is the perception of small number intervals."[8] Ben Johnston cites as the original source of his interest in just intonation his sudden realization in college that "we had developed a music that was not based on the real scientific nature of sound,"[9] and Lou Harrison simply refers to justly tuned intervals as "real intervals" and equal-tempered ones as "fake intervals."[10] An even more elaborate declaration of such views can be found in the website of the Just Intonation Network, under

"What is Just Intonation?," a description for newcomers which includes the following statements:

> The simple-ratio intervals . . . are what the human auditory system recognizes as consonance, if it ever has the opportunity to hear them in a musical context.

and

> Twelve-tone equal temperament was ultimately adopted . . . because it made all of the intervals of a given type equally out of tune, thus avoiding the contrast between in-tune and out-of-tune intervals that characterized some earlier temperaments.[11]

Horst-Peter Hesse, in his essay for the Forum on Richter-Herf, cites experiments on test subjects (though without many details given as to the variables of said experiments), which reveal simultaneously played major thirds to be perceived as "impure, rough and strained" when tuned to wide Pythagorean tuning (408 cents) and "pure and clear, smooth and resolved" when tuned to exactly 5/4 (386 cents). Hesse concludes that the pure intervals "enjoy a special position in human perception due to their sonance. From this it can be seen that not all musical intervals can be treated in the same way. This fact was temporarily denied in twentieth-century music theory."[12] And Adriaan Fokker, albeit in a slightly more diplomatic tone than many of his colleagues, wrote in 1955:

> No doubt this equal temperament with its perfect cyclic symmetry has rendered great services in the evolution of Western musical civilization. One must recognize this. On the other hand, many musicians are aware of the deficiency of the chords sound [sic] on the pianoforte and the organ that have been tuned according to the duodecimal temperament.[13]

Obviously it is a certain abhorrence of perceived or suspected random dissonance that is the source of the controversy. Not only do most proponents of just intonation, motivated by their beliefs about dissonance to renounce traditional equal temperament, reject other types of non-just microtonal music as well, such as quarter-tone music,[14] but they are also implicitly—though not outwardly—at odds with *all* non-just music, of any kind. Because of this rarely addressed issue, it is worth examining the matter of dissonance with regard to microtonal music, and to demon-

strate the flaws of this professedly scientific approach, which inevitably will entail some revisitation of the issue in general terms as well. (This discussion could benefit, as well, those listeners who interpret a pervasive dissonant sound in microtonal music *at large*—including some justly tuned music.)

Acoustics obviously do play a *partial* role in our perception of intervals. For example, one cannot ignore the fact that two intervals commonly perceived as consonant, stable or simple are the octave and the fifth, and that these coincide with the first three partials, or the simplest frequency ratios.[15] And with regard to dissonance, there seems to be a general consensus wherein "sharp" dissonances, or tension, or complexity, are perceived in near unison intervals (anything smaller than, say, a major second). This is convincingly explained—in part—by the beats produced by proximate tones, a phenomenon which begins to be noticeable when the frequency difference is about 5 cps and begins to lose intensity at a difference of about 30 cps (flaws in Helmholtz's beat theory notwithstanding).

The coexistence of these two phenomena, *beating* produced by the *partials* of two tones, should also explain—again, in part—why equal-tempered major thirds could sometimes seem dissonant, as well as various other traditionally consonant intervals that have been microtonally altered. An equal-tempered C-E could be perceived as dissonant because of the beats the E creates—or that its second, fourth, etc. partials create—with the fifth, tenth, or twentieth partials of the C, which are around 14 cents lower. And a fundamental tone of G raised by, say, a quartertone, may be perceived as dissonant when sounded above an ordinary C (creating an interval of 750 or 752 cents) because of the beats it creates with the G of the third, sixth, or twelfth partials of the C.[16] The beating in the equal-tempered major third is in fact frequently cited as "evidence" of the inadequacy of equal temperament, and the sort of quartertone interval mentioned above, used by such non-just microtonal composers as Alois Hába, is both unacceptable according to just intonation theory, and also could seem dissonant to the new-comer.

On the other hand, following this idea to its logical conclusion—which just intonation theory does not—ordinary A-flats or F-sharps would create beats when sounded above the same C, since they have the relationship of about a semitone to the third, sixth, etc. partials, and the intervals of a minor sixth and a tritone must therefore be perceived as dissonant, *regardless of whether they are equal-tempered or justly-tuned* (e.g. the just minor sixths of 841 cents, derived from the 13th partial, and 814 cents, obtained by inverting the major third). In fact, when sounded and sustained on the piano, such intervals (major thirds, minor sixths, etc.)

do create audible beats, and in isolation from any musical context they could be interpreted as dissonant, even though traditionally thirds and sixths function as consonant in diatonic piano music. (This could explain why the perfect fourth would in some contexts sound dissonant—because of the relationships between the upper pitch and both the third partial of the lower pitch (a major second) and the fifth partial of the lower pitch (a minor second).)

However, to conclude from all this that the only consonant intervals are the octave, fifth, pure major third, and perhaps the pure seventh (since the upper members of all other intervals will fall within around a major second from the lower partials of the lower members) would obviously be false. And thus it is clear that the overall theoretical premise of just intonation is flawed, insofar as beating can provide tangible, unequivocal proof of dissonance/discordance—as indeed it would be untrue to criticize as discordant those modern extensions of just intonation which make use of potentially beating intervals that have been derived from higher up the harmonic series.[17] Our perception of consonance and dissonance is subject to too many other factors. First, with regard to acoustics, our ability to perceive even the lower partials (2–5) is highly variable. For example, register is an important determinant. The beats produced by the major third cited above are *especially* strong when the C is played in a low register, and the E either in the same register as the fifth partial of the C, or below that, and *less so* if the E is moved up a few octaves so that it reacts with the more faint tenth, twentieth, etc. partials.[18] (Hesse does recognize *this* consideration on page 220 of his article, although he uses it to suggest further, register-based restrictions upon the composer.) Also, especially on the piano, the partials are much dimmer when the fundamentals are in the higher registers, the beats are not as audible, and therefore *the interval is less dissonant*—in this sense. These factors will obviously vary the effect of the minor sixth, or the perfect fifth enlarged by 50 cents, in the same way. Additionally, because of the varying intensity of certain partials from one instrument to another, timbre is another influential factor.

Second, and more importantly, the musical context has enormous significance concerning our perception of intervals as consonant or dissonant. How long the interval is sustained and how it has been approached in the two voices are two obvious determinants. For example, even in tonal music with equal temperament on an instrument with fixed tuning, such as the piano, G-sharp to B has a consonant sound when the pitches are members of either a major or minor triad, and a different, tense (even dissonant) sound as the augmented second A-flat to B in a C harmonic

minor scale. Even open perfect fifths or octaves may seem "jarring" in some contexts.[19]

Third, the effect of intervals is also subject to the listener's very specific musical background (e.g. rural Turkey vs. Western conservatory) as well as his/her imagination. Indeed, the influence of musical background explains why most Westerners, at least, *don't mind* the equal-tempered major thirds or minor sevenths of Western music, and why the unfamiliar 750 cents fifth—or the unfamiliar just minor sixth of 841 cents—could seem strange, or out of tune, to them. (Or why the imagination could, alternatively, perceive them as exciting or beautiful.) Another interesting example of the imagination's role in music theory is Janáček's axiom about harmony, which states (in conscious opposition to Helmholtz) that "the impression of a triad [equal-tempered] can be 'solidified' by addition of the seventh, ninth, eleventh, or thirteenth." [20]

Therefore, traditional equal temperament, non-just microtonal tunings *and* modern just intonation, as well as most non-Western music, may indeed be full of potentially dissonant intervals, but it would obviously be futile, even absurd, to try to avoid the feared "incorrectness" of this majority of relationships by restricting oneself to simple pure triads or seventh chords in one's music. Rather, the artist will imagine how such potential dissonances may be *used*, or be alchemically *transformed by the context into perceived consonances.* (Or perhaps he/she will even abandon the narrow dichotomy of consonance/dissonance itself in favor of the more versatile—albeit idiosyncratic—notion of interval "character.") He/she will accept a naturally complex human world of pitches and intervals with its infinite, minute gradations near to and far from the so-called natural consonances, and which varies from one culture to another. Of course, this idea is already implicit in the general population's acceptance of a variety of musical systems not as *flawed*, but as having, at most, their own "special sound."

Although these arguments are not new,[21] many theorists still use psycho-acoustical data to support a variety of views and rationales. But the very fact that theories quantifying consonance and dissonance have always changed, from Pythagoras and Aristoxenus to the present, belies the notion that one can objectively interpret acoustical fact and apply one's findings once and for all to music theory.

PRACTICAL LIMITATIONS

Just intonation also has the potential to present serious fundamental limitations on a practical level because of its narrow, one-dimensional

musical conception, and of course this is of more immediate importance to the actual composer. (Perhaps less to theorists who don't compose.)

The notion of the overtone series as an explanation for major and minor tonality has compelled Western musicians and theorists ever since it was first seriously considered in the seventeenth century, and it is obvious that the principles of contemporary just intonation are essentially an outgrowth of those put forth by earlier theorists like Rameau: of "harmonic generation" as a model for the major triad, "harmonic inversion" for the minor triad, and their combination for the subdominant triad.[22] The most significant aspect of this theory with regard to its effect on composition is the belief, shared by Rameau and modern just intonation composers, that *music is generated by harmony.* Just intonation is specifically a vertical view of music, in which the composer's choice of pitches is governed by strict, outside (even scientific) criteria concerning all pitches' relationship to a fundamental. The effect on the compositional process is that the notes of the music will be determined by these pre-existing harmonic structures, and melodies and voice-leading will not be the primary forces producing harmonic relationships. This approach will not be useful to any composer who wishes to have overall melodic freedom, and to assume full responsibility for pitch choice (even within a tonal idiom). Such composers certainly do not constitute a small minority.

Beyond this fundamental creative restriction, it almost goes without saying that just intonation, if truly adhered to in order to maintain the indisputably simple consonant harmonic language that is the credo (i.e. using the ratios 2/1, 3/2, 5/4 and maybe 7/4), also limits the composer *stylistically* to a sparse, simple triadic idiom. And if modulations are to be possible, a complex chromatic scale is necessary with ever-changing tunings for pitches—e.g. one sort of E for a major triad on C and another for a major triad on A. The complexity of such a system increases, of course, the more the composer breaks through the stylistic limitation of the triadic model by adding higher partials while maintaining the strict scientific relationships to the fundamental. This creates a considerable *logistical* obstacle for most performers of Western music, who today are accustomed to playing diatonic music in equal temperament—and to having the "room" to make minute, coloristic inflections, and historically is one reason why just intonation never took hold.[23]

ARTISTIC PREMISE

Finally, I also find just intonation problematical on a more personal, artistic level simply because its origin lies in extra-musical ideologies rather than in musical experience.

Just intonation, as an idea, seems to have a strong and immediate appeal to many theorists and composers for either or both of two reasons. First, it accommodates those who seek in general to apply scientific models to music—perhaps a vestigial product of the Age of Reason. I believe that aside from flaws in the theory itself, the mere *intention* to apply science in such a literal and simplistic manner to music is also misguided. Music is an abstract art, even if certain scientific principles may sometimes have an influential role, and to insist that something that is not abstract (the special sonorities of the overtone series) be always directly represented, for *correctness' sake*, in addition to producing the theoretical and practical quagmires I described above, also disregards the ability of the human mind alone—equipped with its ears, and operating within the context of its given tradition—to imagine and create music that is not only "valid," but beautiful. It ignores and devalues the music of all the great composers and improvisers, from every musical culture, and it denies the beauty of human complexity—the humanity—that is art.

Second, by rejecting the predominant equal-tempered system—and the music written in it—it challenges the musical establishment and thereby satisfies an apparent need for a sort of cultural rebellion. This sort of sentiment is evident in Partch's *Genesis of a Music*:

> I speak from my own mental experiences in breaking with the accepted ways. Mine is a procedure more of antithesis than of simple modification . . . Sometime between 1923 and 1928 I finally became so dissatisfied with the body of knowledge and usages as ordinarily imparted in the teaching of music that I refused to accept, or develop my own music on the basis of, any part of it. With respect to current usage this refusal was a rebellion . . . it was the beginning of a new philosophy of music, intuitively arrived at.[24]

in Harrison's *Lou Harrison's Music Primer*:

> "Westerners" do not regard it as really possible (or if possible, then fair) for other than Europeans to invent or to have invented good clear theory and/or terminology about anything except maybe religion. (Europeans have never invented a major religion.)[25]

in the introduction to David Doty's *Just Intonation Primer*, obtainable from the Just Intonation Network's website:

> By substituting 12 equally-spaced tones for a universe of subtle intervallic relationships [just intonation], the composers and theorists of the 18th and 19th centuries effectively painted western music into a corner from which it has not yet succeeded in extricating itself. Twentieth-century composers have tried in vain to invent or discover new organizing principles as powerful as the common-practice tonal system. Instead, they have created a variety of essentially arbitrary systems, which, although they may seem reasonable in the minds of their creators, fail to take into account the capabilities and limitations of the human auditory system. These systems have resulted in music that the great majority of the population find incomprehensible and unlistenable.[26]

and in the excerpt from Hesse's essay for *Perspectives*, cited earlier. As can be seen, sometimes their remarks carry whiffs of anti-atonality and other times reveal a more general anti-European tenor. But while it has been truly valuable, essential even, to react against a certain cultural imperialism from the West, the more usual route of showcasing and teaching non-Western musical styles would seem to be more effective than attacking the tuning system that grew out of Europe, and everything that has been written with it. And while nothing but perhaps a change of heart can win some people over to Western concert music of the twentieth century, attempts to reduce the music of several generations to a failure due to incorrect triad tunings . . . almost defies commentary. Certainly the need to engage in the intensely negative act of denouncing is a dubious foundation for a new music.

SOME ATTRACTIVE BY-PRODUCTS OF THE FLAWED THEORY

Having said all this with regard to the theory, the rhetoric and the negative influence of just intonation, I must point out that a few enticing pieces have been written by "just" composers. However, those pieces that stand out as strikingly, enjoyably microtonal to me (and to certain "test subject" acquaintances for whom I have played recordings) are the ones where the composers have taken fundamental liberties with the just intonation model, admittedly or not. In some cases, such as Lou Harrison's *Cinna* and *Symfony in Free Style* and many works by Ezra Sims (who doesn't even consider his method to be strict just intonation), such as his *Quintet* for clarinet and strings, *Elegie nach Rilke* and *Flight*, they have emphasized those higher partials (or superparticular ratios, in Harrison's case) which sound the most unusual to our twelve-note, equal-tempered

ears, such as the seventh, eleventh and thirteenth partials (or Harrison's 7/6 minor third, 16/15 minor second and 10/9 major second), and often have de-emphasized the first through the sixth partials, which sound very unremarkable. The beauty of such sonorities is *not* that they make more consonant music (they don't, as I have pointed out) or more correct music (an absurd notion to begin with). Rather, it is that the intervals are simply new and exciting (and in fact this practice flies in the face of the standards of simplicity and consonance which are the very origin and basis of just tuning). In other cases, such as Ben Johnston's *Sonata for Microtonal Piano* and German composer Manfred Stahnke's *Partch Harp*,[27] they have actually superimposed two or more conflicting just tunings, thereby deliberately disobeying the laws of just intonation in order to create interesting "dissonances."

It is my belief that in all of these examples the composers, talented and responding to the stimulus of the new pitches, simply were inspired and had the ingenuity with which to write stimulating music—even if in some cases they wrongly associate the beauty of the new sounds with acoustic purity. One is compelled to wonder why a composer could not just sidestep the theory and access these new pitches more directly, through some sort of simple system that provides, ready-made, the sixth-tones, quartertones, etc. that help make these pieces interesting—as microtonal equal temperaments do.

Added Pitches

Composers in this category are ***adding*** new pitches to their preexisting twelve-note, equal-tempered lexicon. The new pitches are usually obtained in one of the following three ways:

1. Through the construction of microtonal clusters and masses of sound

2. Through mere inflection or bending of the basic, functional tones in a scalar or twelve-note idiom

3. Through full expansion of the twelve-note chromatic by the creation of a new, more minute equal-tempered chromatic (24-note, 30-note, 36-note, 72-note, etc.), in which all intervals are treated as equally distinct, and potentially functional

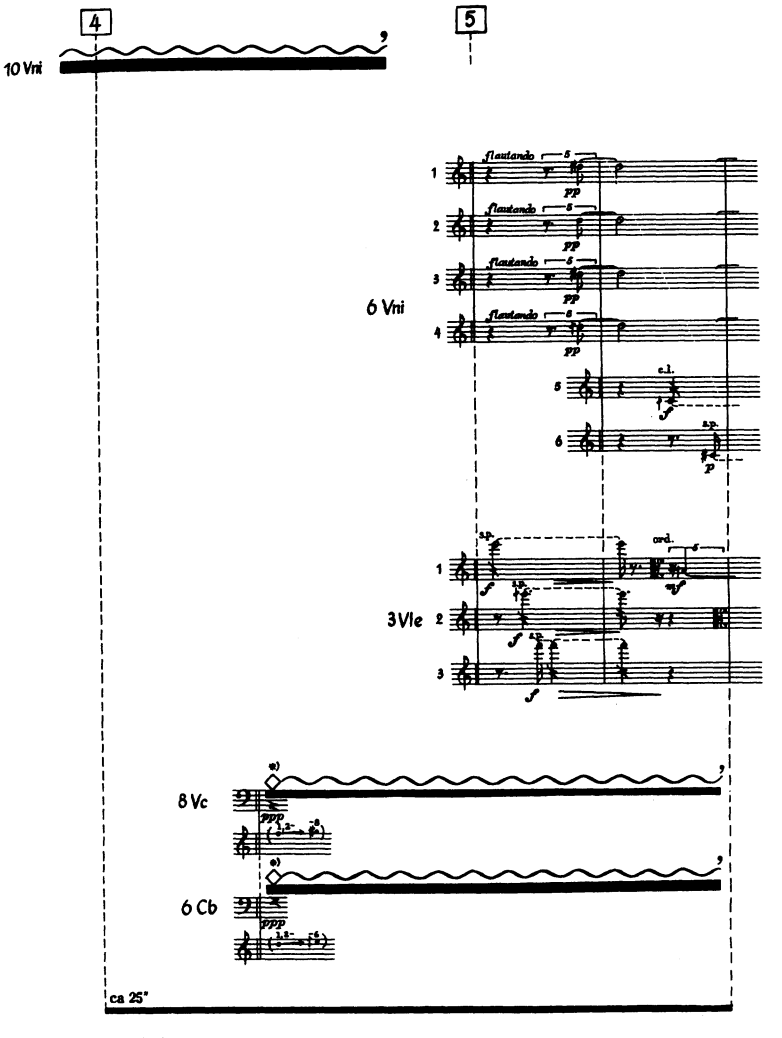
Regardless of the methods used, the choice to add pitches appears in general to be motivated by the stimulating sound of new intervallic relationships. This point of view is, of course, the chief one that distinguishes this group of composers from those using just intonation, who, at least in theory, seek stability, *not* the stimulating effect of new and strange relationships. And it is my belief this attitude is 1) more theoretically sound, simply because of the very *lack* of the sort of equivocal theories and their pitfalls that plague just intonation,[28] 2) more practical, because it does not limit the composer to a vertical (nor to a linear) approach to composition, and because the process of ear-training is simpler and more intuitive,[29] and 3) more artistic, because the microtones are justified by subjective, idiosyncratic aural experiences rather than by a priori scientific formulae or ideological dogmas.

Nonetheless, one can see further splits in point of view between these three types of usage. The first and second types are, in a sense, opposite extremes—the second not intending to deviate functionally from the traditional anchor pitches, and the first intending to deviate so completely that isolated pitches themselves may hardly be perceptible. Examples of either of these two types may be found in many twentieth-century works. They are far more common than the third type, probably because they require much less commitment in terms of developing a new pitch language. The third type is the only one that involves the creation of a discrete new vocabulary. Thus it possesses the most potential for a meaningful expanded melodic and harmonic language—genuine microtonality.

TYPE 1: CLUSTERS AND SOUND MASSES

Many works by Iannis Xenakis, György Ligeti and Krzysztof Penderecki exemplify the first type of usage. This generation were pioneers, for their thought-provoking explorations of timbre and space, and for subordinating or replacing distinct pitches, rhythms and musical lines using such devices as clusters, sound masses, rapid polyrhythmic oscillations and giant glissandi, techniques which are frequently used today. Sometimes microtones, especially quarter-tones, are used in order to heighten the sense of blurring beyond what could be accomplished with semitones.

In works like Penderecki's *Anaklasis* (Example 1), Xenakis's *Mikka*, and Ligeti's String Quartet No. 2, not only are the new tones treated equally to the old ones, but the clarity and individuality of *all* tones and intervals are often lost or obscured, resulting in an intentional chaotic



Microtonal symbols:

1/4-tone sharp 3/4-tone sharp

EXAMPLE 1: PENDERECKI: *ANAKLASIS*, REHEARSAL NUMBER 5

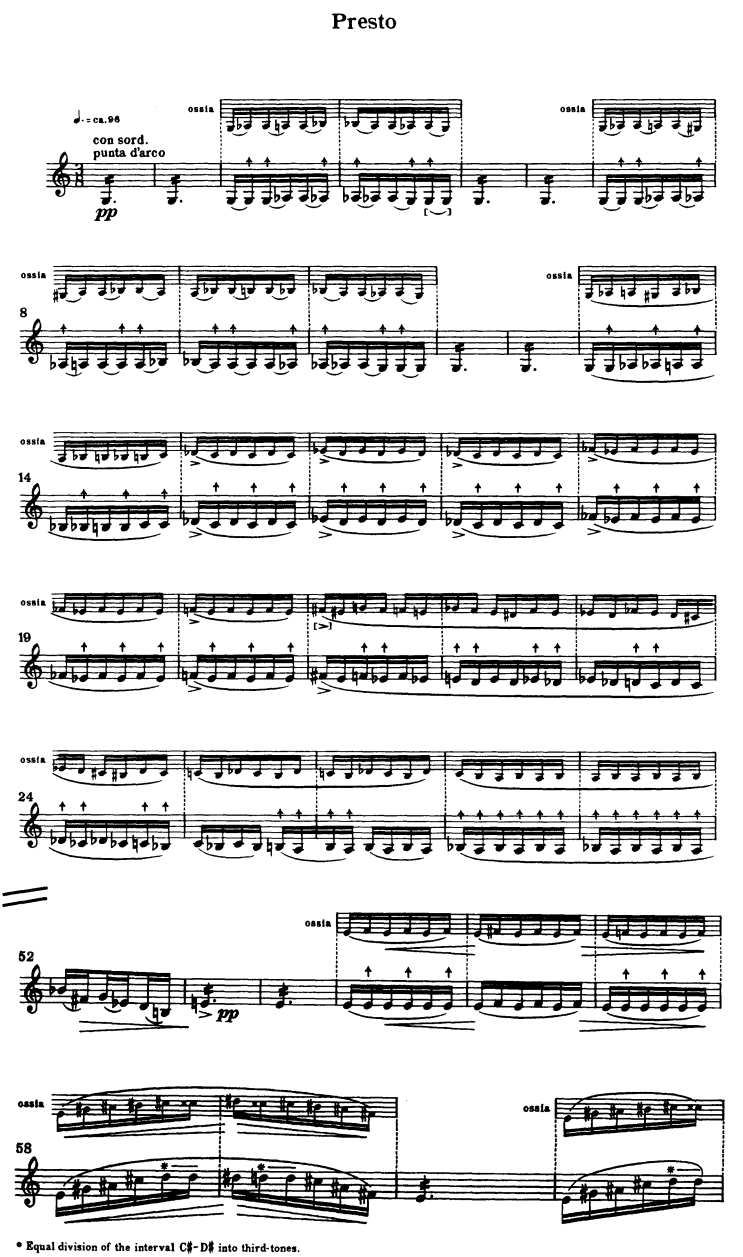
effect. The role of the pitch itself has been transformed so that it is a mere feature of the more important structural components of timbre and texture. In this context pitches may be perceived almost vertically, rather than horizontally, as forward- and backward-looking points of reference.[30] One can see why such works, in a sense, might not even be considered microtonal, since the notion of tones and intervals has itself been made obsolete, or at least of secondary importance.

TYPE 2: INFLECTION OF THE TRADITIONAL TONES

The second type of usage is also common today. Early examples of it may be found in such disparate pieces as Charles Ives' Symphony No. 4 (movement 2, measures 7–16), Béla Bartók's Sixth String Quartet (movement 3, "Burletta," measures 26–32) and Sonata for Solo Violin, and fleetingly even in Alban Berg's *Kammerkonzert* (measures 274–6 and 441–3). In these cases microtones are used with twelve-note equal temperament only for added "color"—often only for brief moments within a piece—even when they are an essential part of a theme, as in the Bartók Sixth String Quartet.

Bartók's Sonata for Solo Violin, composed in 1944 for Yehudi Menuhin, provides a good example of microtonal inflection.[31] In Example 2 it is clear that the quarter-tones and third-tones are either a means of getting from one functional pitch to the next, a semitone away (see measures 3–4, 6–10 and 58–9), or a way of ornamenting single functional pitches in the manner of a trill (see measures 15–23 and 55–7). (Arrows above the staff indicate pitches raised by a quarter-tone.)[32] Here the composer appears to be experimenting with a minute sort of chromatic movement (an interpretation supported by Bartók's alternate version, notated above the staff, in which the quarter- or third-tone movement is replaced by semitone movement). As will be demonstrated later, this use of microtones points toward the kind that was promoted and practiced, albeit in a more complete manner,[33] by Alois Hába, Julian Carrillo, Ivan Wyshnegradsky, and in a looser sense, Joseph Maneri: chromatic movement of smaller than a semitone, or what Wyshnegradsky termed "ultrachromaticism."

The impulse to bend or inflect the members of a fixed scale or set of pitches is a well-known feature of many non-European and folk musical cultures,[34] and very subtle pitch inflections intended to color certain scale degrees are characteristic of the performance of European classical music as well. The use of inflections of a quarter-tone, third-tone, etc. by Western composers like Bartók can be seen as coming from the same



EXAMPLE 2: BARTÓK: SONATA FOR SOLO VIOLIN: IV, MEASURES. 1–28, 52–61

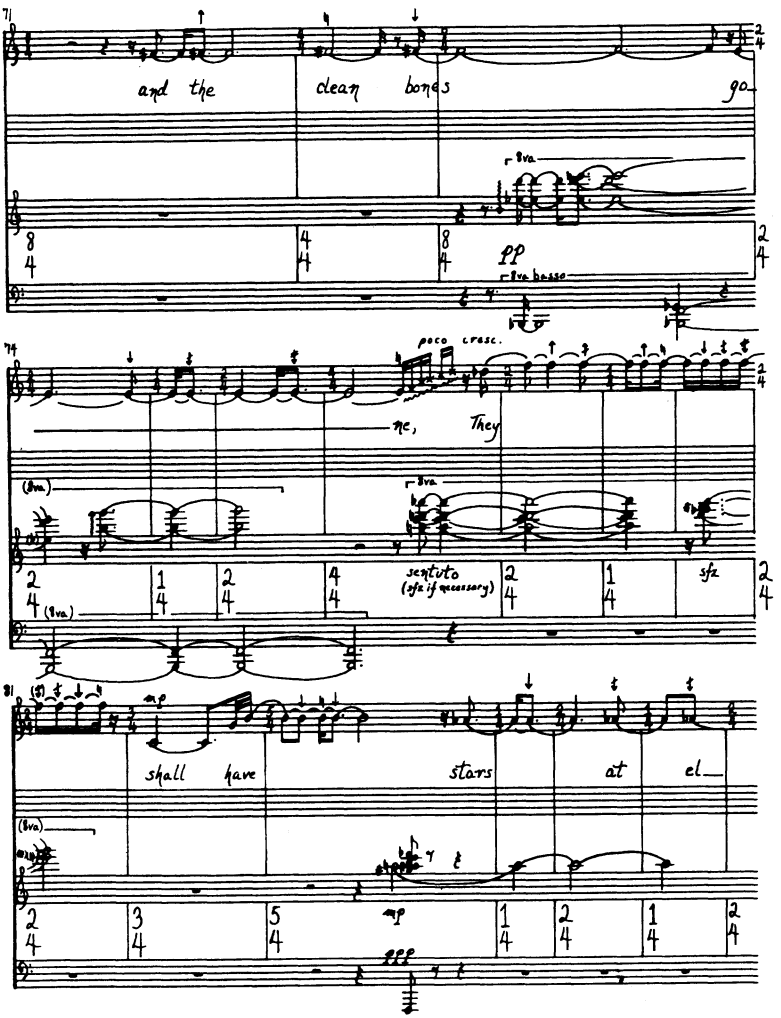
impulse.[35] However, as long as the "new" tones hold a clearly secondary role—as ornaments for the "old" tones—a fully microtonal language, again, is obviously not indicated.

Nonetheless, it is easy to see how this type of approach can lead to the third method of adding pitches, the seizure of the inflections and their transformation into the elements of a new vocabulary. Maneri's piece for soprano and piano *And Death Shall Have No Dominion* (1977) exemplifies what could be called a transitional stage of microtonalism, somewhere between the second and third types. On the one hand, the pitches of the piano (tuned traditionally) ensure that the piece will have a strong twelve-note skeleton, and the pitches of the soprano part seem to be anchored in the twelve notes as well. For instance in Example 3a, measures 71–3, the F-sharp, by being articulated twice—the second time on a downbeat—is perceived as the note *around which* the neighboring quarter-tone pitches revolve. The E that follows, in measures 73–4, and then begins to shift upward a microinterval at a time, is also sounded in the piano part. This sort of treatment would seem to put the non-traditional pitches in an ornamental, inflecting role. On the other hand, the microintervals used in the soprano part are varied and distinct, totaling eight divisions of the semitone (even though, as the instructions explain, each horizontal line adds only "a little more" to the quarter-tone represented with the arrow symbol, rather than a more precise interval size), and at moments they venture very far from the twelve notes, to the point where they become almost independent, i.e. the listener's ability to hear them in relation to the traditional intervals is briefly lost. (See Example 3b, measures 114–7.)

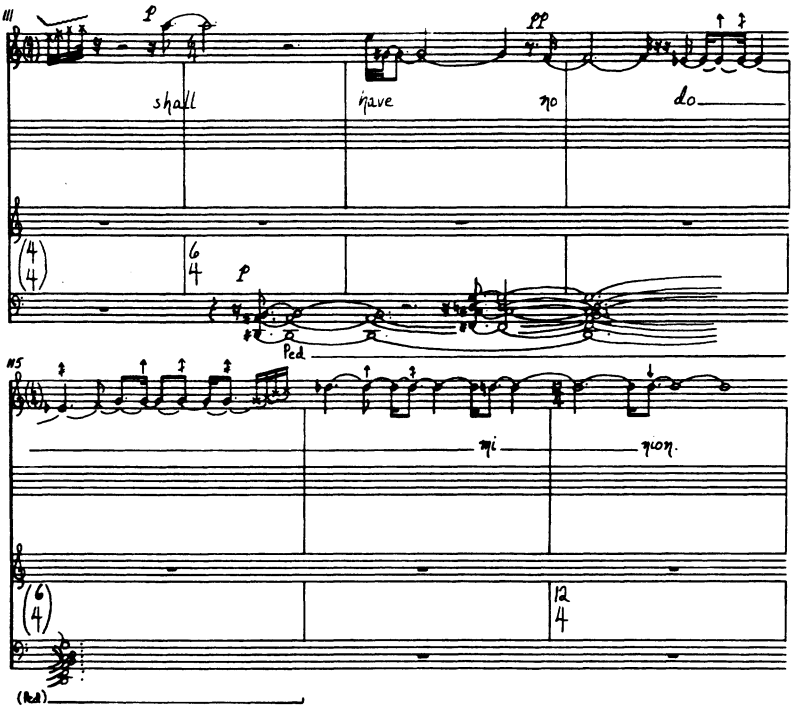
TYPE 3: FUNCTIONAL MICROTONAL EQUAL TEMPERAMENTS

With the third type of usage one finds, finally, the most genuine effort to develop a truly microtonal language. Minute equal-tempered divisions of the octave are made, often totaling numbers divisible by six or twelve in order to create a chromatic scale that includes whole-tones or semitones along with the microtones. Alois Hába composed with quarter-tones, fifth-tones, and third- and sixth-tones, Ivan Wyshnegradsky composed with quarter- and eighth-tones, and third-, sixth- and twelfth-tones, and Julian Carrillo composed with quarter-, eighth- and sixteenth-tones.[36] Maneri today uses quarter-, sixth- and twelfth-tones all together in his compositions.

These composers have in common not only their use of equal-tempered scales, but also a chromatic writing style. The microintervals in



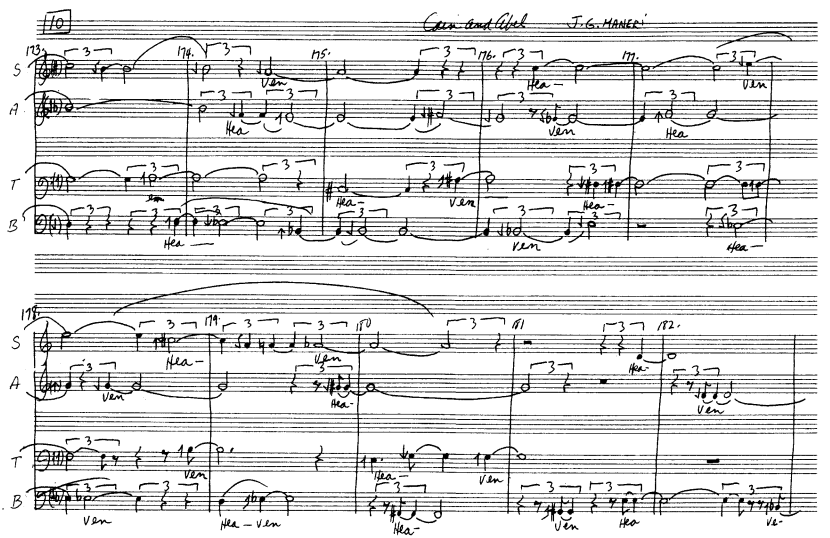
EXAMPLE 3A: MANERI: *AND DEATH SHALL HAVE NO DOMINION*, MEASURES 71–86



EXAMPLE 3B: MANERI: *AND DEATH SHALL HAVE NO DOMINION*, MEASURES 111–7

much of their music appear similarly to the way they do in the Bartók Sonata for Solo Violin cited above—that is, featuring conjunct, linear melodic progressions—although they are assimilated even more thoroughly as pitch material, particularly in Maneri's work.[37]

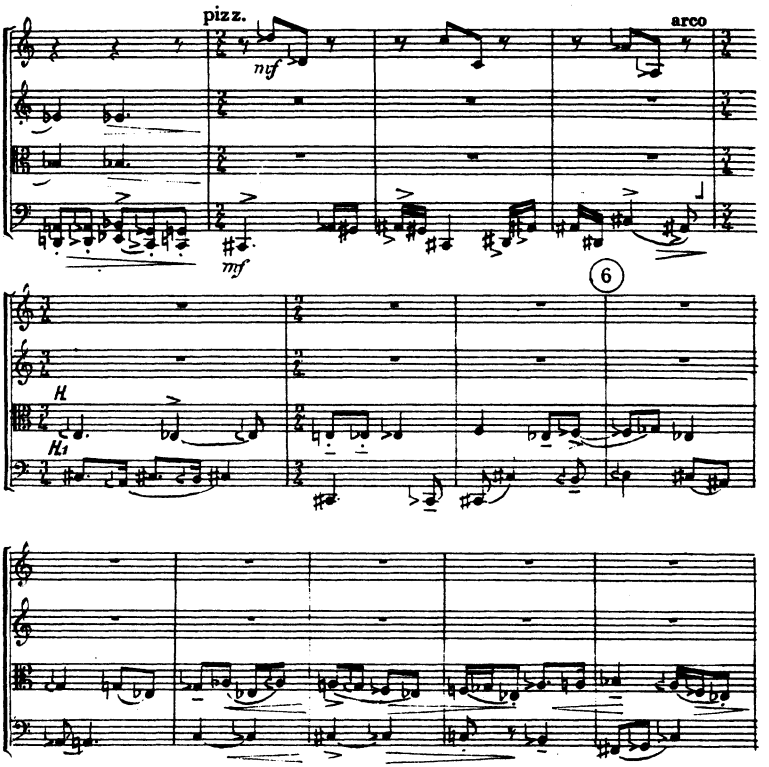
Quarter-tones are used in all of the excerpts in Example 4 except for the Maneri, which uses twelfth-tones. In the Hába example, the viola melody which starts three measures before rehearsal no. 6 comprises a quarter-tone ascent with a pedal of E-flat, beginning on quarter-low E, reaching A-natural in the third-to-last measure, and after a brief interruption continuing on through quarter-high A to B-flat in the last measure.[38] Simple stepwise quarter-tone progressions may also be seen in any part of the both Wyshnegradsky and the Carrillo examples. (The Carrillo example also contains eighth-tone movement in the alto and cello parts, and there are sixteenth-tones elsewhere in the piece.) Conjunct melodic movement is also clearly seen in the Maneri example,



Microtonal symbols:

↑	𝄲	𝄳
1/12-tone higher	1/6-tone higher	1/4-tone higher
↓	𝄱	𝄴
1/12-tone lower	1/6-tone lower	1/4-tone lower

EXAMPLE 4A: MANERI: *CAIN AND ABEL*, MEASURES 173–82



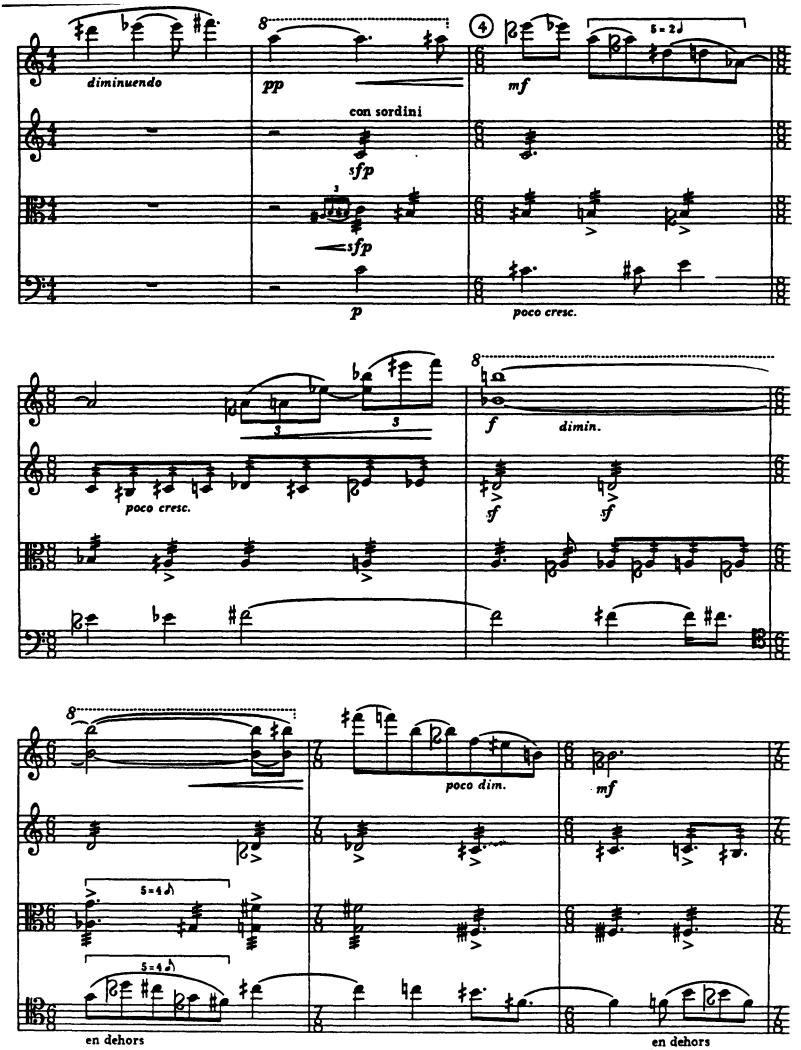
Microtonal symbols:


1/4-tone sharp


3/4-tone sharp


1/4-tone flat

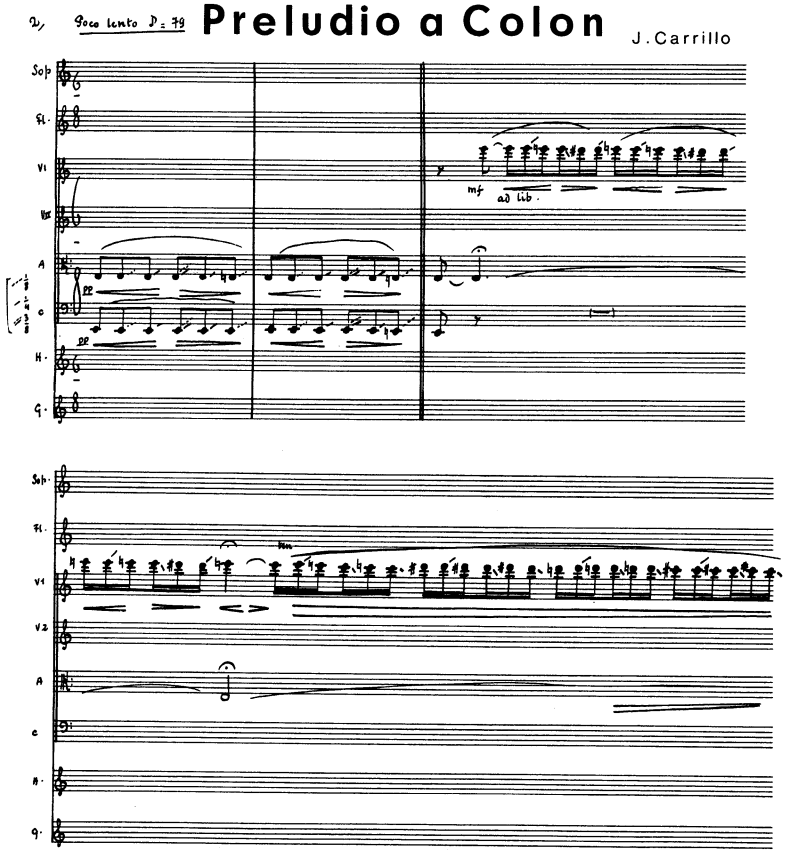
EXAMPLE 4B: HÁBA: STRING QUARTET NO. 12, FIRST MOVEMENT



Microtonal symbols:

1/4-tone sharp 3/4-tone sharp 1/4-tone flat

EXAMPLE 4C: WYSHNEGRADSKY: *COMPOSITION POUR QUATUOR À CORDES*, OP. 43



Microtonal symbols:

1/4-tone higher 1/4-tone lower 1/8-tone higher 3/8-tone higher

EXAMPLE 4D: CARILLO: *PRELUDIO A COLON*, MEASURES. 1–3

although Maneri goes even further in that he uses finer micro-intervals of continually varying sizes, and gives his new intervals even more independence, not seeming always to be comparing the "new" pitches with the "old," nor constructing such obvious kinds of chromatic ascents and descents.

The inclination toward chromaticism apparent in the microtonal music of these composers is certainly a result of the influential role certain composers and theorists had in their training and in the formation of their musical point of view. Hába was influenced toward a chromatic writing style while studying under the Austrian composer Franz Schreker, through whom he was also introduced to the music of Arnold Schoenberg. He attended concerts of the Society for Private Musical Performance, and became fascinated by Schoenberg's twelve-tone technique, especially by the apparent penchant for minor seconds, major sevenths and minor ninths.[39] Maneri was also trained by a close associate of the Second Viennese School, Alban Berg's pupil Joseph Schmidt, and his earlier pre-microtonal works from that time are also richly chromatic. Wyshnegradsky was strongly influenced by the chromatic music of Alexander Scriabin. He even perceived an inclination towards microtonal chromaticism, or "ultrachromaticism," as he termed it, in Scriabin's later works, and viewed his own work as a realization of this potential.

From the moment microintervals are introduced into a composer's vocabulary with the assumption that each may be treated as an independent and potentially functional element, the composer will have available a vast, seemingly infinite resource of new possibilities with regard to melody and harmony. In fact, these same "possibilities" will very likely present themselves as "demands" or unavoidable "implications," and the microintervals will be found to affect *other* aspects of the music, such as rhythm, even structure, all of this potentially resulting in the emergence of what could properly be called a new style. If we remain ignorant of these implications we will very likely produce music with a peculiar or awkward quality, or write in such a way that the new tones can hardly be perceived and are therefore irrelevant. If, conversely, we study the implications and develop our technique accordingly, we are more likely to realize the potential of true microtonal writing and to give our music meaning. It is compositional matters of this kind that will the subject of Part 2.

Part 2: What May Happen

In Part 1 of this essay I advocated first an approach in which microtones are used simply to add pitches to the composer's vocabulary, and then, more specifically, the use of equal-tempered chromatic scales and the treatment of all the microintervals as equally distinct and potentially functional. In Part 2 I will describe some of the important, elementary *practical implications* inherent in this approach, and then discuss how these may lead to *the basis for a compositional technique.*

Before proceeding to the main points, I must first make clear two further presumptions—beyond the use of equal temperaments—which underlie the discussion in Part 2. First, I have chosen *seventy-two-note* equal temperament in particular as the example, partly because it is the system of temperament used by Maneri (whose music so uniquely demonstrates the potential of this branch of microtonalism), but also because its intervals are sufficiently small to illustrate the general issues that I believe are important. As a composer, I find that this system provides a substantial variety of new relationships, and as will be demonstrated, its smallest interval is able, according to the musical context, either to create very subtle, delicate color changes and modulations, or to be quite pronounced, its two pitches even functionally distinct. However, there is nothing sacred about the number seventy-two. Other minute equal temperaments, such as forty-eight note (eighth-tones) or thirty note (fifth-tones) certainly provide material for innovation, and the basic issues discussed in this essay are applicable to them as well.

Second, there is a decided "atonal" bias to the discussion. I advocate an atonal, or non-scalar, approach for composers using microtonal chromatics, not simply out of aesthetic preference, but, more importantly, because of the simple but defining characteristic wherein *notes are related only to one another.*[40] Microtonal composers who restrict their music from the outset to preexisting diatonic schemes, and subject the pitches automatically to the overwhelming structural gravity of a fundamental tone, will risk being unable to hear each of the new intervals independently and may therefore not have the richest palette available to them for writing, thereby limiting the scope of their musical innovations. In fact, as will be demonstrated below, the use of a traditional diatonic idiom can make intervals as small as a twelfth-tone *inaudible* (see Example 6), and except in the case of justly-tuned tonality, there would seem to be no reason to use microtones in a manner in which they can't be perceived.[41]

Conversely, the absence of the traditional prescribed intervallic hierarchies enables one to search freely and examine the new relationships. Although *any* technique has its underlying bias, removing the prescrip-

tions of tonality in this manner seems, more than any other approach, to allow the composer to "start from scratch," and to use his/her ears and intellect to invent a compositional method. With the creation of a new intervallic vocabulary such as the seventy-two note chromatic, such freedom from presumptions is crucial.

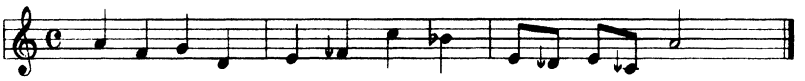
Practical Implications

In the absence of a triadic or scalar scheme, the single interval stands alone as the primary functional element. With twelve-note equal temperament most composers are using a vocabulary that is already familiar—the same twelve intervals they already know from diatonic music. Composers (and performers) using microtonal equal temperaments such as seventy-two note, by contrast, must engage in a study of the intervals in order to attain the necessary intimacy both to be able to recall them spontaneously and to use them effectively. Beyond the obvious need at the outset for rigorous ear-training, two practical compositional matters stand out as rudimentary: (1) whether the microintervals can be perceived, and (2) how the microintervals are grouped.

Whether the Microintervals Are Perceived

It is implicit in the choice to use the full seventy-two note chromatic that its smallest interval, the twelfth-tone, is presumed to be perceptible *in general.* However, this does not mean that one can *always* perceive two pitches a twelfth-tone apart as different, and that one has therefore a chromatic scale with seventy-two automatically independent intervals. In fact, it is apparent that in certain instances one *cannot* perceive intervals as small as a twelfth-tone. The most important consideration here, with regard to its effect on compositional technique, is the *relativity of interval size*, although other compositional elements also play a large role, and are effective in determining *how* clearly the microintervals are perceived.

Relativity of interval size, conjunct motion.
In Example 5, the F and the twelfth-low F sound essentially the same, as do the D and the twelfth-low D, and the C and the twelfth-low C. A combination of several factors prevents these twelfth-tones from being noticed, but the one with the most radical ramifications is that they are minuscule and too subtle in relation to the other intervals in the melody, and are therefore lost. The implication is that in order merely to be



EXAMPLE 5[42]

perceived, *the smaller microintervals must constitute most of the linear material.* Therefore an appropriate axiom for this type of microtonalism would be that it requires, on its own minute scale, *conjunct motion* between adjacent pitches.[43] This does not mean, of course, that larger leaps may not be used, but it does mean that they must be used with great care so as not to overwhelm the smaller microintervals and render them ineffectual. One method of controlling this would be to regard leaps of around a major third or more as relatively significant registral shifts, and to give both listener and performer time to make the aural adjustment to these events by isolating them in time; "preparing" for them and "recovering" from them using smaller microintervals before and after. This type of treatment of leaps can in fact be seen in measures 19–22, and 25 of Example 6.

The notion of melodic writing full of mostly tiny intervals may seem unacceptable at first, perhaps even to be an essential, irreconcilable weakness in the whole idea, if one believes that every system must accommodate any type of writing—i.e. that we should be able to write microtonal music that is full of large leaps. In that case it may useful to view this as a *characteristic of a new vernacular*, analogous to the partiality to conjunct motion (and similar control of leaps) in much diatonic music. In both cases we have a stylistic trait born of a practical demand—namely the demand that the melodies may be perceived with ease by the listener, and also delivered smoothly by the performer (vocal or instrumental). Such an analogy reminds us that *any* system carries with it its own inherent implications.

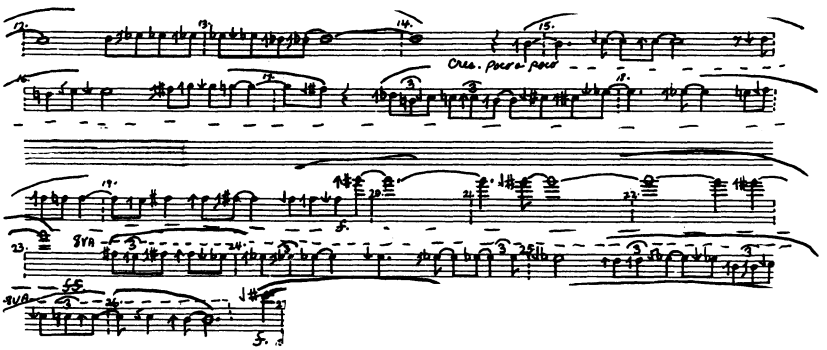
Other factors.

Other factors affecting our ability to perceive the smallest microintervals include the pitches' *ordering* (including the aforementioned existence or absence of tonal hierarchies), *relative temporal proximity, repetition, rhythm* and *accent.* For example, in Example 5 the twelfth-tones are obscured even further for the following reasons: a quasi-diatonic context is established—aided in part by the repetition of the A's, the E's, the "F's" and the "C's"—and the listener is inclined to ignore any tiny differences in order to recognize these patterns (*ordering*); there is enough

time and activity in-between both members of each pair that the listener's memory of the first of the two pitches is not precise (*relative temporal proximity*); the pitches involved in the twelfth-tone relationships are not repeated (*repetition*); the even, quarter-note-based rhythm contributes to the sense of order and sameness created by the quasi-diatonic language mentioned above, perhaps even emphasizing an implicit harmonic rhythm (*rhythm*); the twelfth-low D and the twelfth-low C are shorter—half the value of the predominant quarter notes—and twelfth-tone differences are thus easily missed (*rhythm*); the twelfth-low F, the twelfth-low D and the twelfth-low C do not occur on accented beats and are thereby further de-emphasized (*accent*).

In Example 6 the twelfth-tones are generally easier to perceive because there are many other intervals of relatively similar sizes in the melody. In addition, the following excerpts demonstrate other factors which contribute to our ability to perveive the twelfth-tones: the twelfth-tone differences between the quarter-high and the sixth-high E-flats in measure 12, and between the twelfth-high G-sharp in measures 19–21 and the sixth-high G-sharp in measures 22–3, are audible because in both cases they are separated by only one pitch (and that pitch is so close in frequency) (*relative temporal proximity*); in measure 13 the twelfth-tone between the E-flat and the twelfth-low E-flat is emphasized by the first pitch's placement on the downbeat, and the fact that the E-flat has already been heard two pitches earlier (*accent and repetition*); the D in measure 16 is distinguished from the preceding twelfth-low D partly because it falls on the downbeat (*accent*); the prolongation of the quarter-high D-flat in measure 13 and of the G in measures 16–7 helps distinguish them from their preceding notes, which in both cases are a twelfth-tone lower (*rhythm*); all of the twelfth-tone progressions mentioned above, are registrally isolated somewhat—and therefore exposed—even if approached or departed from only by a "leap" of 133 cents as in the case of the G in measures 16–7.

When emphasis through these secondary means is reduced, the smallest microintervals will be more subtle, as in the movement from the sixth-high B through the twelfth-high C in measures 25–6. However, these still will be audible due largely to the fact that the lines generally are replete with the smallest microintervals. Of course, the articulation used by the performer—bowing, in this case—will further determine how distinct any of the smallest microintervals are.



EXAMPLE 6: MANERI: *VIOLIN PIECE*, MEASURES 12–26

HOW THE MICROINTERVALS ARE GROUPED

Two matters which are vital to our understanding and interpretation of the new chromatic are: (1) our *initial* perceptions of the new intervals in relation to the twelve traditional ones, (2) the subsequent importance of de-emphasizing the traditional intervals.

OUR INITIAL PERCEPTIONS OF THE NEW INTERVALS.
All microtonalists—composers and performers alike—necessarily begin their ear-training by hearing the new intervals ***in relation to the traditional twelve.*** In this initial phase musicians usually make the same observations about seventy-two note equal temperament, namely that in either a harmonic or melodic context: the twelfth-tone alteration of a traditional interval sounds like an inflection (perhaps "brighter" if larger and "darker" if smaller); sixth-tone alterations are perceivable as truly different, and even sound peculiar; and quarter-tones are in a category of their own, sounding like neither of the traditional intervals on either side. While these characterizations may seem self-evident because they correspond in such an obvious manner to the increasing size of the deviations, they are nonetheless important to recognize since they are the point of departure from which the composer may begin to organize and then reorganize the seventy-two notes.

"ATWELVE-TONALITY."

As was suggested in Part 1, only when the composer begins to hear and use the new intervals independently from the traditional twelve can we say that a deeper level of microtonality has been attained and that a genuinely new language may have emerged. A concerted effort to *avoid* emphasis of the traditional intervals is based, of course, not on some presumed criteria regarding the quality of certain relationships, but rather upon the need simply to experience the new relationships, to become familiar with them and give them musical relevance. This is an extension of the atonal bias described earlier, and is not unlike Schoenberg's advice in 1923 to avoid major, minor and diminished triads, advice that may seem, especially to today's twelve-note composers, dogmatic and arbitrary. At the time it certainly seemed to some composers and listeners a necessary phase in order to bring one's ears out of the old formulas and old logic.[44] *How* this shift in emphasis may occur in practical terms will be discussed in the next section.

VOICE-LEADING AS THE BASIS FOR A COMPOSITIONAL TECHNIQUE

In atonal, seventy-two note music featuring conjunct motion, voice-leading will be a primary concern, locally and structurally. Over the span of one or two phrases (i.e. in a context roughly analogous to Schenker's "middleground"), variations in dynamic, durational or registral emphasis—an inevitability in most music—are likely to result in the formation of functional hierarchies among groups of pitches that are relatively close in frequency (twelfth-tones, sixth-tones, quarter-tones, etc.), with the less emphasized pitches functioning in relation to the more emphasized in a subordinate manner reminiscent of auxiliary or passing tones between triad members in tonal music.

On a larger scale the emphasized pitches may form cohesive background[45] structures, either as mere resultant schemes, or even possibly as systematic and clearly defined pitch frameworks in the manner of ostinati, grounds, cantus firmi, aria subjects, etc. More locally, the less emphasized pitches in the foreground may of course have an important and influential motivic role (just as non-triad members may in tonal music).

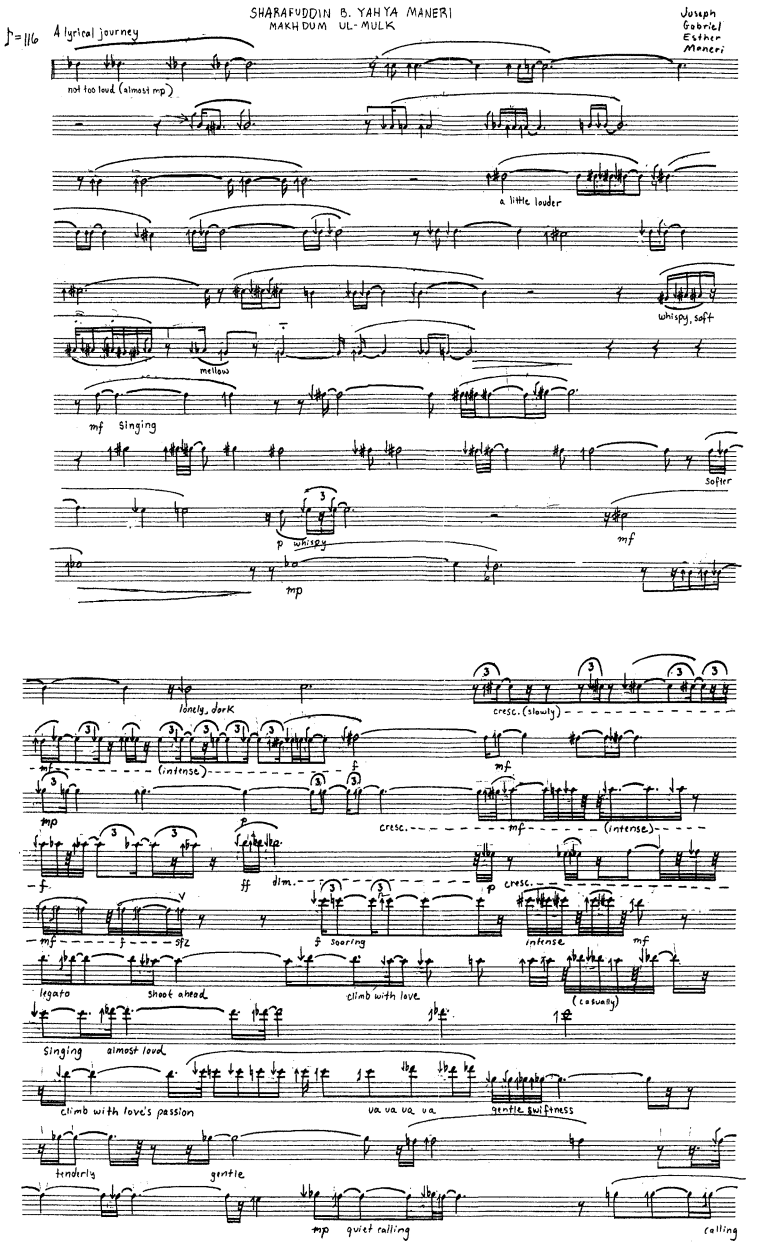
MANERI'S MICROTONALISM

The potential consequences of seventy-two note writing featuring an "atwelve-tonal" bias and careful, yet innovative voice-leading are beautifully exemplified in Joseph Maneri's music, since Maneri fully exploits the possibilities offered by the new pitches on both the background and motivic levels.

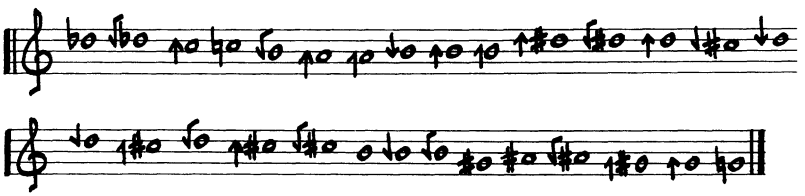
Background.
In Maneri's *Sharafuddin B. Yahya Maneri, Makhdum Ul Mulk* (1995)[46] for solo flute, a resultant scheme formed by the emphasized pitches holds the piece together and propels it forward according to more-or-less conventional voice-leading principles (e.g. "stepwise" progressions and a balanced and artful contour). Here, in the absence of such explicit indicators of emphasis as specified meter and accent markings, the observer or performer relies on recognition of such things as duration, registral isolation or dynamic accent due to rhythmic placement of a pitch (e.g. as the "downbeat" of a phrase, as the third in a grouping of four equal note-values, as the last note in a phrase, especially when followed by a rest, etc.), in order to determine where the emphases are and trace this scheme. The latter looks something like the line in Example 7b.

It is especially through these sorts of more prominent background progressions that the "atwelve-tone" bias suggested above may be manifest, as it is in Example 7. (Note that the scheme outlined in Example 7b is in no way biased toward the semitonal intervals.) Achieving this is really a simple matter in theory, since it is entirely at the composer's discretion to determine the size of the intervals between successive emphasized pitches, and there is no reason to maintain the groupings described on page 42, which are centered around the twelve traditional intervals and leave the quarter-tone isolated in-between. In practice, however, it takes much trial and error, and a certain "opening" of one's hearing, to make the shift away from the influence of the traditional semitonal intervals.

With regard to the shape of the background scheme itself, Maneri not only de-emphasizes the semitonal intervals, but also takes advantage of the sheer variety of possible "step" sizes available—for example, in the background progression of a twelfth-tone, a twelfth-diminished major third, a third-tone, a sixth-tone, a quarter-augmented minor second and a twelfth-augmented minor second beginning on the twelfth-high B on line three (notes 9–15 of Example 7b). The net result upon listening is the sense of a genuinely new musical dialect of great detail, depth and mutability.



EXAMPLE 7A: MANERI: *SHARAFUDDIN B. YAHYA MANERI, MAKHDUM UL MULK*, PAGES 1 AND 2



EXAMPLE 7B: RESULTANT BACKGROUND SCHEME FROM LINES 1–6

FOREGROUND.

In the first two lines of Example 7a four motives are found which provide material for the rest of the piece. The first motive is a descent of three successive twelfth-tones at the very beginning. The second one, which follows immediately, is a variation of this with one repeated pitch in the middle and a different rhythm (short-long-short-long). Immediately after, a third motive appears, consisting of a twelfth-tone "neighbor tone" figure (quarter-low B to sixth-high A-sharp, and back up). At the end of the second line there is a fourth motive, beginning on the quarter-low B-flat: a sixth-tone down, a twelfth-tone up, a two-thirds tone up and a twelfth-tone down.

The style of motivic development in this piece is liberal; sometimes the exact intervallic content of a motive is preserved, and other times just the contour and basic rhythm. The motives are also subject to standard variations such as augmentation, diminution, inversion, etc. For example, the first motive reappears (sometimes extended or shortened by a twelfth-tone) on lines two, three, four and five of page one, and lines three, four, five, six, seven, eight and ten of page two. The second motive, or some combination of its rhythmic feature with its repeated note feature, is recalled frequently, as in lines three, six and nine on page one, and lines three and nine on page two. The third, "neighbor tone" motive reappears on lines four, seven and eight on page one, and lines two, three, four, five, eight and nine on page two. And so on.

Here, too, Maneri avails himself of the simple abundance of pitches, frequently suffusing the gap *between* adjacent members of the background voice-leading scheme with more varied melodic activity—and more *time*, in a sense—than would be possible with only twelve pitches. For example, imagine the "distance" a localized melody could travel within a background progression of a major second using twelve-note equal temperament, and compare it to the activity between the first twelfth-low E and the quarter-low F-sharp, on line two of page two in

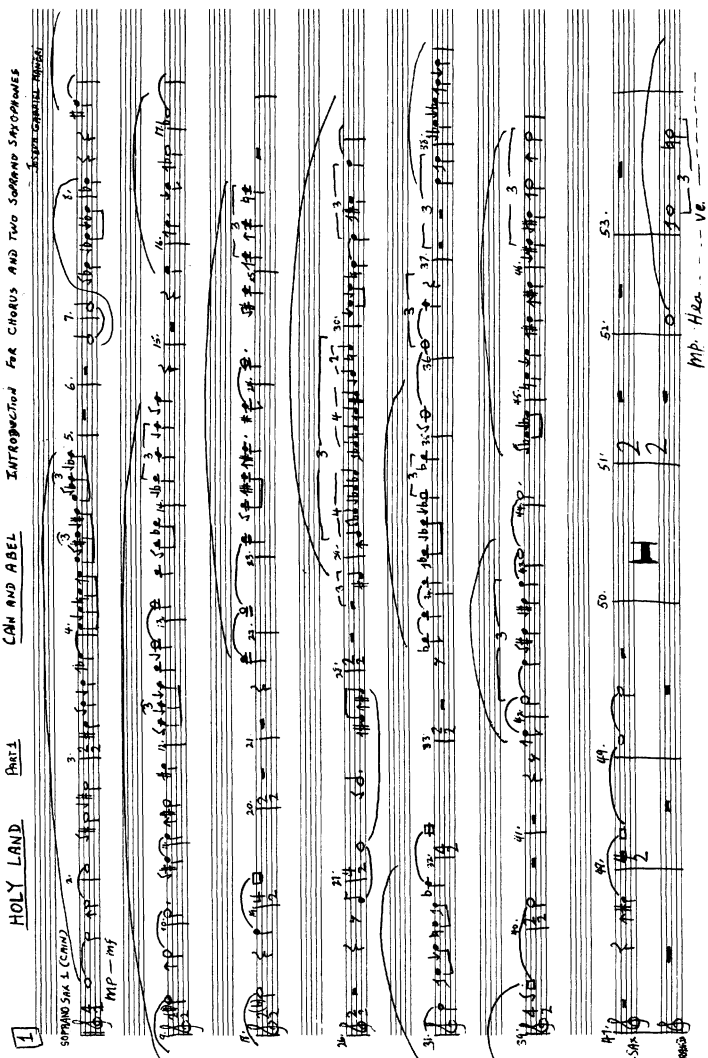
Example 7a. With the regions established by the emphasized pitches thus frequently prolonged by the surrounding less-emphasized pitches, the pace of the background voice-leading here is generally slower than with most twelve-note atonal music. This slowed progression coupled with such rapid change in the foreground amount to a widening of the separate dimensions of foreground and background, perhaps even the sense of a deepened division between the two realms, and create in the music a vast and multifarious character.

SERIAL PROCEDURES

More strict, serial procedures could also be applied to either the background structure or the motivic structure. In fact, seventy-two note equal temperament can offer compelling new possibilities to the serial composer. However, if one wished specifically to extend the dodecaphonic techniques of *nonrepetition* and *use of the aggregate*, and apply them somehow to the formation of one's series, one would need to reconsider why they are usually used and how they pertain to the seventy-two note chromatic, in light of the pitches' tendency to fall into differentiated dominant and subordinate roles, as described earlier.

"Seventy-two-tone" music?

Nonrepetition is traditionally employed to avoid uncontrolled domination by certain pitches, which results in either unwanted tonal centers or stagnation, and thereby to attain functional independence and potential for all the pitches, as well as complete control over pitch connections. It is clear that with seventy-two notes one can maintain these ideals without applying nonrepetition uniformly to the entire chromatic. Because of the sheer length and density of the chromatic, it is possible for any of the less emphasized pitches to reoccur well before completion of the aggregate without establishing a conspicuous "gravitational pull." For example, in the saxophone solo in the opening of Maneri's *Cain and Abel* (Example 8)—not a serial piece, but an atonal one—there are many repeated pitches (e.g. the quarter-low F-sharps in measures 4 and 10, the B's in measures 12 and 13, the B-flats in measures 8 and 13, the sixth-low B-flats in measures 7 and 14, etc.), and none of these creates anything even approaching a tonal center in function, nor a sense of stagnation. Therefore avoidance of repetitions is only perhaps necessary if one wants, for some aesthetic reason, to establish functional independence for each of the notes, not only from some tonic, but *from each other*, and thereby to obliterate pitch memory (i.e. voice-leading), and this would only be



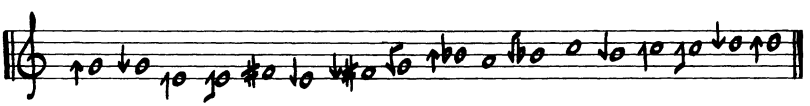
EXAMPLE 8: MANERI: *CAIN AND ABEL*, MEASURES 1–53

possible if one also strictly, even obsessively, avoided any clear differences in emphasis.

The aggregate of pitches is used usually in order to saturate the octave range, presumably because the composer has an aesthetic preference for the richest possible palette. Again, because of the length and density of the chromatic, and because it is the emphasized pitches that make the lasting impressions, it is also possible for the composer not to present the entire aggregate in any given section of the piece and still to have a "saturated sound," perhaps even the illusion of an aggregate, or at least an exceptionally rich harmonic texture. Example 4 demonstrates this well, especially since Maneri doesn't appear even to be thinking in terms of presentation of the aggregate.

SERIES FORGED OUT OF CHROMATIC.

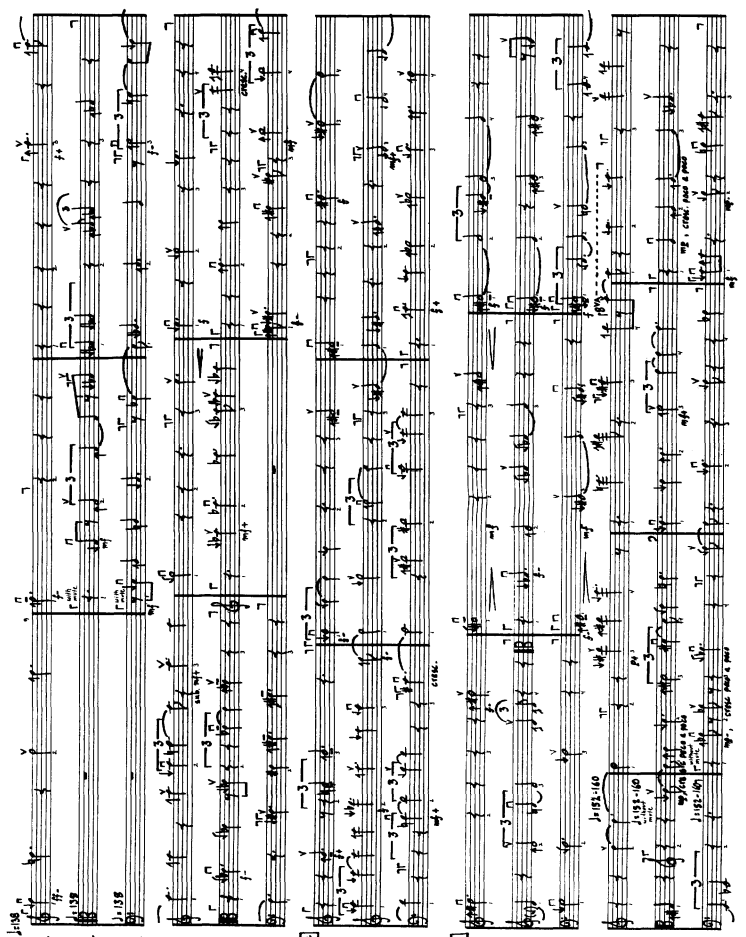
It would seem, then, that it is only in the background voice-leading schemes that one would need to apply these two techniques. One could select, out of the seventy-two, an ordered series of pitches to be emphasized, as in Example 9. Nonrepetition could be used with this series, and any fixed number of pitches could be chosen.



EXAMPLE 9

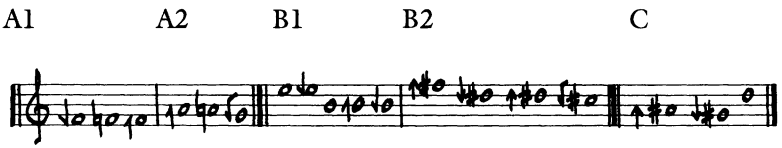
Of course, this would create a unique situation in which pitches that don't belong in the series could be included in the motives and melodies, the function of the series being completely restricted to the background and isolated from the motivic realm. In this case, perhaps separate motivic series, or sets, could be introduced.

The first movement of my own *String Trio With Homage to Chopin* (1999) provides an example of fixed motivic sets—as well as a general aesthetic of nonrepetition—even though the piece is not strictly speaking a serial one, and the background voice-leading is freely conceived. The movement opens with a theme in the violin, accompanied by the viola and cello. (See Example 10a, measures 1–14) From the resultant background scheme of the violin theme I derived a series, which I subsequently broke down into five motivic sets. (Example 10b) These provided much of the melodic foreground material, freely applied and in various permutations, for the rest of the movement. Further "accompanying" motivic sets were derived from the opening figures in



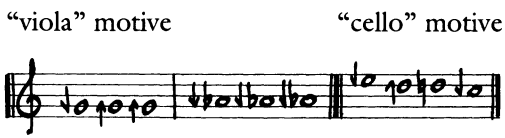
EXAMPLE 10A: WERNTZ: *STRING TRIO WITH HOMAGE TO CHOPIN*, MEASURES 1–16

accompanying viola and cello parts in measures 2 and 3, and also were used throughout the movement. (Example 10c).



The first and second sets are grouped together as A1 and A2, and the third and fourth as B1 and B2, because they are very frequently paired together in the piece. (Set C doesn't reappear until the very end of the movement, having been reserved as the big cadential set.)

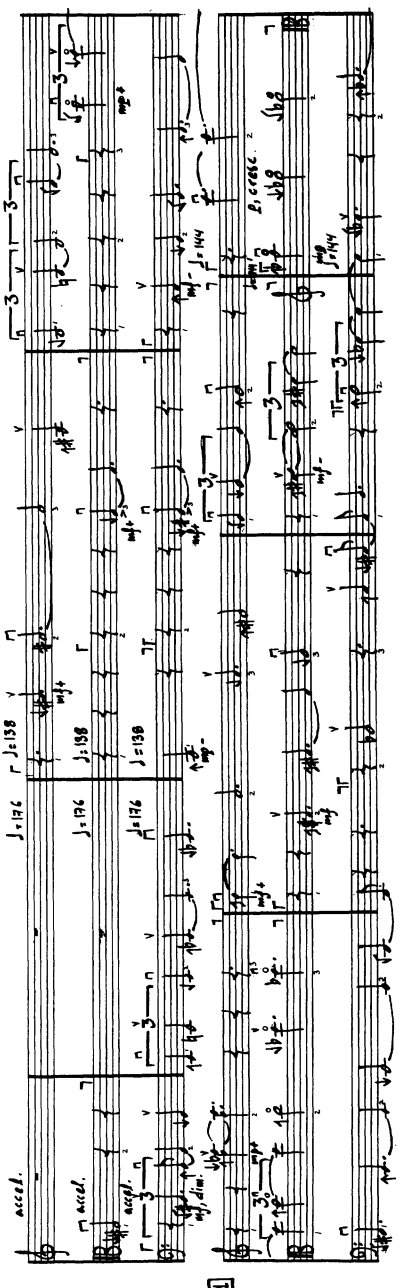
EXAMPLE 10B: THEMATIC SERIES



The motive derived from the viola part in measures 2 and 3 appears sometimes as a quarter-tone with a repeated pitch (as in measure 2) and sometimes as a twelfth-tone (as in measures 2–3).

EXAMPLE 10C: ACCOMPANYING MOTIVIC SETS

Example 10d shows a moment of the activity of some of these motivic sets. Beginning in measure 69 the violin again has a prominent melody, constructed with sets A1, A2 (an inversion, beginning on the sixth-low B in measure 70), A2 twice again in measure 72 (a retrograde-inversion beginning on the quarter-high B, joined to a prime by the overlapping sixth-tone from A to sixth-low A), and A1 in measure 73. The viola has two prominent "responding" phrases in this excerpt, which use sets A1 (twice, in measures 70–1) and A2 (in measure 74). In measures 72 and 73 the viola has its accompanying motives (see example 6c). The cello line in this excerpt is made up of the "cello" accompanying motivic set (retrograde-inversion in measure 70, prime in measure 71, retrograde in measures 72–3, and retrograde-inversion in measures 73–4).[47]



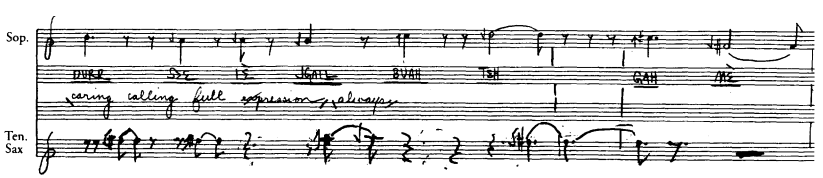
EXAMPLE 10D: WERNTZ: MEASURES 67–74

BEYOND ATONALITY

On the other hand, it could be that in seventy-two note music written with an "atwelve-tone" sensibility and featuring conjunct motion, even the recurrence of individual pitches *with emphasis*, and relatively close by, would not jeopardize the atonal status of a piece. For instance, when the quarter-low E returns in the tenor saxophone part of Maneri's *Kohtlyn* (Example 11), due to the unusual new ground covered in the in-between pitches, it is a profoundly different kind of return than one is used to with twelve-note equal temperament, and does not evoke any of the traditional diatonic patterns. Here, the repeated pitch creates a subtle and transitory focus, but one can even imagine a technique involving still more thoroughly established regions, through more repetition and/or greater emphasis—something that might even recall, structurally, the harmonic regions of diatonic music, but which would possess an entirely different behavioral potential from any tonal center conceivable with the twelve-note chromatic.

In any case, the possibility of repeating pitches in such a manner indicates that this music may by its nature be such a thorough departure from traditional diatonicism that the essential quality of atonality—freedom from tonal logic—can practically be taken for granted, and that procedures such as pitch-class serialism, insofar they are used to ward off tonal tendencies, may therefore be obsolete in this context, although the motivic/harmonic principles of serialism could still be perfectly applicable.

If "atwelve-tone" microtonalism is thus able to alter these central techniques of atonal writing, which aspects of atonality, if any, remain relevant for the microtonal composer? This can be answered by looking at the simple *creative impetus* that has been atonality's basis. For many musicians in the twentieth century, this impetus could be characterized as an attempt, out of artistic necessity, to move from tonality to a state of innocence where there are simply *pitches*, and where one has the freedom to



EXAMPLE 11: MANERI: *KOHTLYN*, MEASURES 23–5[48]

develop one's own methods.[49] In this light, microtonalism, with its additional, historically unfamiliar intervallic relationships—its ready-made "innocence"—can provide today's composer with a renewed, heightened sense of that freedom with which to compose.

Notes

1. Of the ten composers featured, only John Eaton had composed extensively from this approach, although Easley Blackwood also was a strong advocate of equal temperaments.
2. Of course, the political and cultural wall separating Czech Alois Hába and his many published works from Western Europe and the United States until the 1990s is also an important factor. Of the three composers mentioned, Hába probably had the most to offer.
3. See John Fonville, "Ben Johnston's Extended Just Intonation: A Guide for Interpreters," *Perspectives of New Music* 29, no. 2, or Heidi Von Gunden, *The Music of Ben Johnston* (Metuchen, N.J.: Scarecrow Press, 1986).
4. See Douglas Keislar, "Six American Composers on Nonstandard Tunings," *Perspectives of New Music* 29, no. 1, or Heidi Von Gunden, *The Music of Lou Harrison* (Metuchen, N.J.: Scarecrow Press, 1995).
5. See online newsletter at <http://partch.edition.net/>.
6. See website at <http://www.xs4all.nl/~huygens/english/foundation.html>.
7. See website at <http://www.moz.ac.at/user/herf/index_gb.html>.
8. Harry Partch, *Genesis of a Music*, 2d ed. (New York: Da Capo Press, 1974), 87.
9. Steven Lantner, "An Interview with Ben Johnston," The *Microtome* 2, no. 2. (Nov. 1997): 2.
10. Keislar, 184.
11. See "What Is Just Intonation?", at <http://www.dnai.com/~jinetwk/>.
12. Horst-Peter Hesse, "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, no. 1 (Winter 1991): 218.
13. See Adriaan Fokker, "Equal Temperament and the Thirty-One-Keyed Organ," at the website of the Stichting Huygens-Fokker at <http://www.xs4all.nl/~huygensf/doc/fokkerorg.html>.

14. The quartertone microtonality of Hába, Wyshnegradsky and Carrillo has been frequently denounced on this basis. See Partch 425, Hesse 212–7, 223, Fokker 2.

15. Certainly the lower partials, as they may be produced on most instruments using flageolet tones and multiphonics, have often had an effect on musicians with regard to scale construction and melody, with a variety of results world-wide. For example, octaves and fifths are commonly emphasized in many musical systems. (Basic string-tuning procedures, through which one can easily encounter the 2/1 and 3/2 relationships, may also explain this.) But even here there is ambiguity: is the next most consonant interval determined by the next new *pitch class* to appear, measured against the *fundamental*—i.e. the major third (followed in rank by the minor seventh), or by the *interval* created by the *adjacency* between the third and the very next (fourth) partial—i.e. the perfect fourth?

16. This idea bridges the apparent gap between the two explanations, wherein one theory positively attributes consonance to the presence of the lower overtones, and the other negatively attributes it to the absence of beats (and positively attributes dissonance to the presence of beats). It also is a simpler and more palpable variation on Helmholtz's *Klangverwandtschaft* theory which measures consonance by the *number of coinciding overtones* between two fundamentals.

17. As for those frequent claims which cite *no* evidence other than merely to assert simple numbers, superparticular ratios, or derivation from the harmonic series (no matter how high up), as guarantors *in and of themselves* of sonoric superiority, these really just fall into the realm of numerology, and should simply identify themselves as such, rather than as science.

18. This would imply that traditional dissonances are less so when they are compound intervals (e.g. C to D-flat three octaves higher). Perhaps this is true.

19. A simple example of such fifths is found in some of Bartok's *Mikrokosmos* etudes in the Lydian mode, such as No. 55 in book 2.

20. Suzette Mary Battan, "Alois Hába's 'Neue Harmonielehre des diatonischen, chromatischen, Viertel-, Drittel-, Sechstel- und Zwöftel-Tonsystems,'" Diss., University of Rochester, Eastman School of Music, 1980 (Ann Arbor: UMI, 1980), 47. The same sensibility can be found in jazz harmony, which is characterized by the

use of these higher chord members, and where cadences are routinely made on major seventh chords.

21. See Robert W. Lundin, "Toward a Cultural Theory of Consonance," *The Journal of Psychology* 23 (1947): 45–9.

22. In fact, in their theoretical writings both Arnold Schoenberg and Paul Hindemith speculated that the compelling force of the overtone series would be responsible eventually for the expansion of the twelve note chromatic and the creation of finer divisions—Hindemith with some skepticism about the feasibility of such efforts. Arnold Schoenberg: *Theory of Harmony*, Trans. Roy E. Carter, 3d ed. (Los Angeles: University of California Press, 1978): 423–4, and Paul Hindemith, *The Craft of Musical Composition*, Trans. Arthur Mendel, 4th ed., Book 1, *Theory*, (London: Schott, 1942): 50–2. Alois Hába also used the overtone series as one of his two basic rationales for the use of microtones—although as will be seen later he actually made no use of the principle of pure harmonies at all in his work. See Battan, "Alois Hába," 75. However, time has shown—as I intend to show—that these speculations were myopic; that the urge to "fill the gaps" between the twelve equal-tempered intervals in order to *expand* the vocabulary and the desire to simulate the overtone series are in fact very different, even mutually exclusive, and therefore incompatible.

23. These are obviously not problems for those who have already espoused the dogma. Note the following quote from the Just Intonation Network website:

> Equal temperament allowed eighteenth- and nineteenth-century composers to explore increasingly complex harmonies and abstruse modulations, but this benefit was short-lived. By the beginning of this century, all of the meaningful harmonic combinations in the equally-tempered scale had been thoroughly explored and exploited, and many composers believed that consonance, tonality, and even pitch had been exhausted as organizing principles. What was really exhausted was merely the limited resources of the tempered scale. . . .
> . . . Unfortunately, until recently composing and performing sophisticated music in Just Intonation presented such difficulties that only the most dedicated enthusiasts were likely to invest the required time and effort. However, due to the recent appearance of affordable electronic instruments with programmable

tuning capabilities, it is now possible for almost any musician to explore Just Intonation without first making a major commitment. "What Is Just Intonation?" <http://www.dnai.com/~jinetwk/>.

24. Partch, 4.

25. Lou Harrison, *Lou Harrison's Music Primer: Various Items about Music to 1970*, (New York: C.F. Peters, 1971), 26–7.

26. David Doty, "The Just Intonation Primer," at <http://www.dnai.com/~jinetwk/>.

27. Listen to excerpt at: <http://members.aol.com/stahnkem/pharp.mov>.

28. Even the sort of mathematical models used in the music of Xenakis are applied to the structure of pieces rather than specifically to the microintervals, and are not an attempt to project scientific "facts" onto the listener.

29. On this point, most "just intonation" microtonalists would likely argue that equal temperament is *counter-intuitive* because it denies the natural intervals sounding within every tone. I maintain that *that which has become second nature through habit* is what musicians can truly call intuitive. Therefore the process of simply adding pitches, in which one measures the new microintervals against the twelve traditional (habitual) intervals is more intuitive, more "natural," than that of just intonation because it demands, not that musicians embark on a fundamental re-training of their ears and re-invention of their vocabulary, but rather that they *expand from a familiar point of departure.*

30. The obscuring of individual elements (such as pitches), so that a more massive musical activity may be perceived is, of course, an essential feature of Xenakis' concept of "stochastic" music. Xenakis wrote: "We can control continuous transformations of granular and/or continuous sounds. In fact densities, durations, registers, speeds, etc. . . . can all be subjected to the law of large numbers with the necessary approximations. We can therefore with the aid of means and deviations shape these sets and make them evolve in different directions." Nouritza Matossian, *Xenakis* (London: Kahn & Averill, 1986), 94.

31. The urtext edition is cited here, which contains the original quarter and third tones, not Yehudi Menuhin's edition, in which they have been removed.

32. In a letter to Menuhin, Bartók himself made it clear that these tones were intended as mere inflections, and even seemed nearly ambivalent about whether they were necessary. "The 1/4 tones in the 4th movement have only colour-giving character, i.e. they are not "structural" features, and—therefore—may be eliminated. . . . if you don't feel inclined to worry about 1/4 tone playing. However, the best would be, if I could hear played both versions, and then decide if it is worth while to use these 1/4 tones." Béla Bartók, "Letters to Yehudi Menuhin." (Peter Bartók, 1994); quoted in Béla Bartók, *Sonata for Solo Violin*, Urtext Edition (London: Hawkes & Son, 1994), viii.

33. Only about one third of the movement of the Bartók uses microtones, and the other movements use none at all.

34. For example, the "ko" technique of traditional Japanese koto playing involves depressing strings behind the bridge after they have been plucked in order to bend the pitch upward. Such inflecting of fixed scale degrees, of course, is a separate matter from the mere existence of other tuning systems, scales themselves which have different pitches from those of Western 12-note equal temperament, such as the 22 sruti of Indian classical music.

35. Maneri often cites the years he spent in the 1940s and fifties performing Greek and Eastern European Jewish folk music around New York on the clarinet, as well as his ongoing parallel career in jazz (playing alto and tenor saxophones and clarinet)—all of which are highly inflected musical styles—as fundamental influences in his disposition for microtones. (The other major influence, chromaticism, is discussed below.) Although there are no deliberate allusions to these styles in Maneri's music, their influence can be heard at certain moments, such as the saxophone solo which opens his choral piece *Cain and Abel*, which almost evokes the performance style of the clarinet soloists of northern Greece.

36. Although Carrillo apparently had some interest in musical acoustics and the overtone series, his equal-tempered scales and their application in his works do not demonstrate any concern with simulating pure harmonies.

37. Unfortunately, in the work of Wyshnegradsky and Carrillo, and to a lesser extent that of Hába, the chromaticism often seems almost too obvious or elementary, like chromaticism for its own sake or for demonstrative, experimental purposes.

38. At other moments in the piece the "new" intervals are used somewhat more independently, and in a slightly more innovative manner—for example, in the pizzicato figures of the violin part which immediately precede the viola melody.

39. Battan, 7–8. Hába was influenced also by Czech composers and theorists like Frantisek Skuhersky and Leos Janáček and their claims that "every triad is possible on every degree of every key." (Battan 45–7) Based on this sort of idea, Hába devised his own theories. Citing the music of Romantic composers such as Wagner, Chopin and Liszt (toward which he was favorably disposed), he claimed that harmony may be governed by "single basic tones," rather than by a "tonal center, with its predetermined set of hierarchies and harmonic functions." (Battan 52) From this standpoint Hába created, in his *Neue Harmonielehre des diatonischen, chromatischen, Viertel-, Drittel-, Sechstel- und Zwolftel-Tonsystems*, elaborate catalogues of "vertical structures"; lists of ways semi-, quarter-, sixth-, and twelfth-tone intervals may be stacked, transposed, inverted, combined, etc.. The usefulness of such exhaustive lists is, of course, debatable.

40. Or, as George Perle writes: "The 'rightness' of a note depends not upon its possible containment within a preestablished harmonic unit, as it does in tonality, but upon larger compositional factors whose meaning must be discovered within the work itself." George Perle, *Serial Composition and Atonality: An Introduction to the Music of Schoenberg, Berg, and Webern*, 5th ed. (Berkeley: University of California Press, 1981), 9.

41. Furthermore, many microtonal works that employ a tonal or scalar system of some kind often have a peculiar quality, as if an arbitrary superimposition of unrelated techniques has been attempted, or, even worse, as if otherwise ordinary tonal music is simply out of tune.

42. In Examples 5–11 Ezra Sims's microtonal symbols for seventy-two-note equal temperament are used, the same ones seen in Example 4a.

43. Although one usually associates this term with the diatonic language, in which one is aware of distinct scale degrees, it is also possible in atonal music to differentiate between "steps" and "leaps." It is the

musical context that will determine our perception of the relative size of intervals, and whether we hear two pitches as adjacent or disjunct. (For example, it's possible to imagine how even an isolated series of ascending fifths could be perceived as adjacencies.)

44. As Schoenberg wrote: "At the root of all this is the unconscious urge to try out the new resources independently, to wrest from them possibilities of constructing forms, to produce with them alone all the effects of a clear style . . . To use here the old resources in the old sense saves trouble—the trouble of cultivating the new—but also means passing up the chance of enjoying whatever can *only* be attained by new resources when the old ones are excluded!" Arnold Schoenberg, *Style and Idea* (Berkeley: University of California Press, 1975), 207.

45. When discussing structure, I will henceforth use only the terms "foreground" and "background," the latter referring to any voice-leading on a larger scale than note-to-note. It would of course be senseless in this hypothetical context to presume the existence of two separate levels on the larger scale—middleground *and* background—as is the case with Schenkerian analysis of tonal music.

46. As for the title, Maneri's son brought home a book he discovered by chance in a bookstore, by the 14th-century Indian philosopher *Sharafuddin B. Yahya Maneri.* Amused by the coincidence of their last names, and genuinely moved by the writings, Maneri decided to name his piece after the book.

47. These accompanying motives are not always given to the instruments they originated in, though they are in this excerpt.

48. Maneri has used a clef of his own invention in place of the traditional treble clef.

49. Of course, part of the beauty of much twelve-note, melodic atonal music lies in the very *inability* of the pitches sometimes to be heard as "simply pitches," because of the dim echoes of tonality that often resonate in the traditional intervals, especially when the composer juxtaposes these with his/her own, unexpected (non-diatonic) structures. (Take practically any moment of Schoenberg's Opus 33a and 33b piano pieces, for example.) Similarly, a microtonal chromatic such as seventy-two-note equal temperament, used more or less according to the principles outlined in this paper, may on occasion produce subtle echoes of twelve-note music, in the familiar, yet altered, sound of the traditional intervals augmented or diminished

by a twelfth or sixth-tone (e.g. the violin phrase in measures 11–3 of example 11a, with its very pronounced sixth-enlarged major second, from the twelfth-high A-sharp to the twelfth-low G-sharp).

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