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Five Theses on Microtonality[1]

Thesis 1: Die "harmonic series" is an artifact

The series of partial tones of a single sound (the so-called "harmonic series" or overtone series) is one of the fundamentals of microtonal harmony. This series is calculated by means of Fourier analysis of actual instrumental sounds or, through the use of a narrow filter, filtered from a recording of these sounds. Through translating the results of this calculation into notation, chords and harmonies have been derived, which have a sensual charm and yield an enrichment of musical possibilities.

But it is strange the extent to which the "harmonic series" is loaded with ideology. Already the wording is dogmatic: "harmonic series," "pure temperament" – as if anything else would be unnatural or impure.

Hence any attempt to precisely grasp this overtone series is doomed to failure. The precondition for a Fourier analysis would be a periodic (always precisely consistent) oscillation – actual instrumental sounds are always slightly changing, therefore its only possible to achieve an approximate measure of these pitches. Moreover, the higher partials are shifting, that is, they occupy a position that deviates from the ideal position: strings have a mass or diameter, which then combines with the acoustic properties of strings and metal rods.[2] With wind instruments not only the air column vibrates, but also the vibration exciter, which affects the diameter of the air column, etc.

The Fourier analysis of the results of this oft-used term "sound spectrum" suggests an analogy to optics.

It seems tempting, in fact, to draw parallels between some of the refraction of white light in the rainbow and the analysis of sound. But a fundamental difference is not considered: light waves vibrate extremely fast, i.e., for a spectral analysis of light is a huge number of oscillations are available. The changes or deviations of individual oscillations are irrelevant.

Sound waves vibrate by orders of magnitude slower. Especially during the transient they change from single to single vibrational oscillation – these constant changes affect the character and individuality of the sound. (To illustrate this difference: if one tone in the pitch A4 = 440 Hz contained as many oscillations as one second of blue light, it would sound for 50,000 years.)

Partials are most clearly perceived in unchanged, static sounds: hence the paradoxical phenomenon that one can hear very clearly the "harmonic series" in machine sounds (old refrigerators, substations, marine engines ...).

If the partials - whether approximately measured or abstractly calculated -are converted into instrumental sounds, these are therefore not a transfer of the "nature" of the sound into music, but a free artistic decision.

If I orchestrate an overtone chord for string orchestra (that is, I realize let the result of a hypothetical Fourier analysis of a single instrumental tone through many different instrumental sounds), then this result relates, with regard to the individual sound, much like the blue and black beads of a blackboard in chemistry class relate to the oxygen atom which they depict. What thereby arises can be throughout of high aesthetic appeal, but it is only a (mental) model of the mapped phenomenon. So I have shown here not a natural phenomenon but something transferred from one world to an entirely different one, and composed a new sound of fascinating quality.

It is also a misconception to equate natural harmonics or overblown brass sounds with partials.

This can be clearly illustrated by touching a piano string, for example the 7th Overtone, and the difference from the tempered tone "palpably" demonstrated: one strikes low C and touches the string at the appropriate place and compares the resulting B^b4 with that Bb4 created through striking the piano’s key. It is obvious that the harmonic tone is deeper than the piano tone. The seventh harmonic would be lower than the tempered minor seventh. But it cannot be concluded that both are equally low. (Karl Valentin: "Somewhere - I was there once before!"("Irgendwo?- Dort war ich auch schon einmal!")[3]

The attempt to tune microtonal scordatura string instruments with the help of higher "natural" harmonics in the overtone leads only to approximations - the deviations are too large.

Without a doubt: natural harmonics and overblown brass sounds are a great way to get out of the twelve-tone tempered system. In order to enter the - virtual – partial tone harmony, still requires additional practice.

I will never forget how difficult it was in my first String Quartet or for the strings in the opera *Night*, to be without finding this too tedious, to align higher "natural harmonics" with the intonation of the "harmonic series" - or how in *in vain* had to correct the "natural tones" of horns and trumpets so that they corresponded to the "harmonic series." "Nature" had proven to be fiction.

To summarize: The sounds of the "harmonic series" which we can take pleasure in/can reclaim [abgewonnen], exert a tremendous fascination. But the ideology that is sometimes associated with it, the drivel of "purity" and "nature," belongs on the scrap heap. The harmonic series is as artificial as any other musical material.

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

Comparing different musical traditions, it is again - in different configurations [Ausführungen]- the desire to "false", i.e. minimally meet the proportions of the different intervals overtone series: augmented or diminished octaves (e.g., the enlarged octaves of Slendro gamelan music) or the savoring of closely spaced "slightly detuned" unisons. Even considered in the intonational "purity" of Indian music, there are ragas in which is at least one of the central tones stands in a beat-rich interval range of a drone fifth. Although the major triad (supposedly derived from the "harmonic series") is a singular event in the western music (but now of substantial broad appeal [Breitenwirkung]), the different kinds of beats appear culturally independent in a significant frequency. Empirically, it can be shown that it is not correlative to the proportions of the overtone series that is sought in the different musical traditions, but the deviation from it: not the fusion, but the friction.

I suspect that the twelve-tone tempered harmonic system is so widespread, not despite, but because of its abstract intervals: because of its wonderful "false", beat-rich major and dominant seventh chords.

And it is well known that a wealth of micro-tonal variations occurs in the performance practice of tonal music: choral string vibrato (= microtonal clusters), excessively sharp singing of soloists in the opera (be that they heard better and sound brighter), conscious false intonation of violinists ("...so that everyone in the hall notices that I really play the octave double stop with two pitches..."), etc. the resulting beats life into the music.

The beats that thereby result bring life to the music.

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

We have become used to giving pitches names, and then they are assigned to only one octave (an Ab is always an Ab-regardless of whether it is set in the major, the minor or the three-line octave). Then an academic music education oriented to historical harmony on top of that does still more in order to possibly reduce the sensitivity to octave permutations: a thinking in "inversions," "narrow" and "wide" positions leads to the assumption that the octave position of each note were an additional attribute, a specification of abstractly defined chord through the only one of the tonal space (independent of the octave positions). The "pitch class system" then extended this thinking to atonal music.

The extent to which this principle of abstraction is in fact appropriate to historical, composed music, can not be discussed here. The smaller the intervals, however, the more complex are composed sonorities, the more meaningful is the choice of octave position.[4]

When one works with partial tones, the need to consider the special octave position is especially evident: although the 10th harmonic, for example, sounds as an octave higher than the fifth, it is also defined through its neighbors, namely the 9th and the 11th, that is through the minor intervals that arise around it (specifically in this case different intervals of a second). An octave displacement of odd-numbered partial tones higher to a lower position alters the entire harmonic spectrum, also displaces the fundamental, referring to the target of the partial tone chord, an within an octave [um eine Oktave]. An example of this: if the 11th partial of C2, which a quartertone flat F#5 with the eighth partial C5 and the 10th partial E5 are combined into a triad and then transposed down an octave, the entire partial chord changes: From the partials 8, 10, 11 of C3 come the partials 11, 16, 20 of C3.

Beats react very sensitively to octave position changes. The beats of one and the same dyad become completely different one octave higher (and if only one of the two tones is offset by an octave, can then occur even something substantially new.)[5]

Thesis 4: Conventional musical notation is obstructive to microtonal thinking

The notation, which we have grown accustomed to and that is largely still essential as the means of communication between composer and interpreter, is a relic of times long ago, an adaptation of 16th century organ tablature. In order to note rhythmic subtleties, dynamic shadings, tonal distinctions, cumbersome additional characters are necessary in many cases to like the decision, either a lot or only to indicate the score to be overloaded.

But this writing is woefully inadequate if you should want to notate microtonally: even the twelve-tone method of composition inadequately represents(two characters per pitch are necessary-note head plus sign). Because there exists in the diatonic seven-tone system's notation unequal major steps, it continually happens that equal major intervals of unequal size must be written, for example, for the augmented fourth to the diminished fifth, minor thirds will be augmented seconds and so on).

In fine-grained intervals, it is not a problem, noting subtle differences with special signs, but when it comes to the interval relationships, confusing the score, "enharmonic reinterpretations" are inevitable.

Two simple examples to illustrate:

a) If we compare in the quarter-tone system the trichord - c - high d - f with the trichord high f-ab - low b. You have to be already experienced to some degree, to quickly determine that the second chord is a transposition of the first.

b) An overtone chord of c (4 to 7 partials) is listed in the twelve-tone system as follows: c - twelfth-tone flat e - g - sixth-tone flat bb. If now again an overtone chord is built on this lowered bb, we arrive at the following pitches: sixth-tone flat bb - quartertone flat d - sixth-tone flat f - sixth-tone flat g. An added-sixth chord (shifted in the microtonal) comes from the dominant seventh chord (shifted in the microtonal).

Composing means to me: "thinking in sound." The font used to thereby render, so that the sound thought can be made communicable (performable). But depicting the sound in writing can also irritate. I prefer, therefore, to notate microtonally only late in the compositional work in process, when I'm already happy with the decisions, and instead search as long as possible for other possibilities (only readable for myself) of specification [Fixierung].[6]

Thesis 5: Microtonal music requires its own composition of time

The smaller the composed interval differences, the more time it takes in order for the human perception to distinguish them. While can be kept apart, for example, within a split second the dyad of a minor second can bedistinguished from a major, it takes sustantially longer to slow beats to be recognizeable. One of the proportions of the partial series constructed chord requires much time to be able to "click" (both for the performers as well as the listeners). Rapid movements within the quarter-tone system (or even more closely meshed systems) activation result in clouding, a neutralization of the pitch differences.

The temporal composition in the rhythmic domain also cause changes in this respect.[7] In general let’s say that microtonal music needs more space, more time, more opportunities for development - for unless it is [erwas] intended completely differently: the joy of discoloration, as has been demonstrated by [erwa] Charles Ives in his Three Quartertone Pieces.

1 First published in: *Positionen*, 48 (2001), S. 42ff.

2 Piano tuners know this problem: Since the lower strings of the Partial tones early as the second Partial (octave) are shifted noticeably, the string is tuned to this - and not the fundamental.

3 Analogously, quoted from memory.

4 Even the pioneers of microtonal music have questioned the principle of interchangeability of octaves: Alois Haba, in his harmony text points to the importance of the intervals between the single notes of a polyphonic, unfolding chord over several octaves (which in any octave displacement these tones naturally completely change!) - but without having to invoke a system for this harmony. And in Ivan Wyschnegradsky’s method, the microtonal music of tones [Tonvorrat] of his pieces is arranged in a network of "cycles" in a "non-octaviant space," an octave jump will be classified the same, for example, as the melodic step of a minor second.

5 For example, from the rough-sounding, expanded major second low bb-c, to the mildly diminished minor seventh of the partial series c - low bb.

6 I am thinking here especially of Giacinto Scelsi, who could reject notation in general.

7 works such as James Tenney's *Critical Band* his string quartet *Koan* show in their gradual, sense- sharpening changes [die Sinne schärfenden Veränderungen], how can this be another composition of time in music [wie diese andere Gestaltung der Zeit zu Musik werden kann].