

Abstract of paper to be submitted to Computer Music Journal for consideration for inclusion in issue on tunings, temperaments, and microtonality

Ralph David Hill

Bold
italic
~~Title~~: RELATIVE JUST INTONATION: (A more powerful conceptual framework for pitch organization leading to the composition, performance, and appreciation of an expanded music for our time)

Abstract: A major potential benefit of computer assisted music synthesis is that it permits notes of virtually any pitch to be sounded polyphonically without the usual restriction to a limited set of twelve fixed pitches per octave found on conventional keyboards and many other traditional musical instruments. Musicians have generally been slow to take advantage of this capability for two reasons. Firstly the infinity of different pitches in the audible pitch continuum is too vast for the human mind to deal with conceptually without some organizing principle for reducing it to a manageable number of meaningfully different pitches. Secondly, twelve tone equal temperament (12 eqt), which is really a conceptual framework for pitch organization and thus much more than simply an instrument tuning system, has had for musicians (myself included) such a compelling aura of completeness and universality that most have taken this simplified model of the universe of all possible pitch relationships and harmonies to be for every practical purpose as good as that universe itself. Thus most have found it almost impossible to believe that anything of real musical significance could be achieved by going outside the largely hidden but very real bounds set by 12 eqt.

I have
~~The author~~ has used a computer-controlled digital music synthesizer to prepare recordings of contrasting just intonation and 12 eqt versions of chords, chord progressions, and passages of traditional music. In addition, ~~he~~ *I have* explored some harmonic progressions containing just chords based upon frequency ratios of the integers 11 and 13. These investigations have provided him with breathtaking glimpses of a vast, largely unexplored universe of harmonic and melodic possibilities which can be exploited only by going beyond the limits of 12 eqt. ~~His~~ *my* work has given ~~him~~ *me* the vision of an expanded, more richly nuanced, "three dimensional" music waiting to be created by composers of today and tomorrow.

As the conceptual framework for note pitches to be used for the composition and performance of this new music ~~the author~~ *I have* proposed a system of relative just intonation (rji). In both the rji and 12 eqt frameworks, the essential structural elements used in the construction of chords and melodic lines are harmonic and melodic intervals. The sets of building block intervals used in the two systems differ radically from each other, however. While in 12 eqt the intervals are restricted to being an integral number of 12 eqt semitones, in rji the building block intervals are taken to be those for which the sound frequencies of the notes bounding the interval lie in a small integer ratio of the form m/n . No upper limits for m and n are proposed but

it is suggested that fertile territory can be found without going beyond 16 or at most 32 for harmonic intervals and 128 for melodic intervals. The proposed framework does not presuppose any set of fixed pitches but rather assumes that any pitch in the audible continuum (or region of the continuum) may be sounded with adequate accuracy (to within .5 cent or 1.0 cent for most purposes). It is at this point envisioned that at any moment during the performance of a piece of music composed using the rji framework most of the notes sounding will lie in integer frequency ratios to one another and that most of the foreground melodic steps taken by prominent instrumental parts will similarly be just. However there is no requirement that the tonal center(s) of a composition hold to a fixed pitch or to any kind of fixed pitch lattice. Furthermore it is envisioned that composers will be perfectly free to deliberately employ chosen deviations from just wherever desired, although the "default" intervals will be just.

For the first time in history means are now available for performing complex polyphonic works composed in the proposed rji framework thanks to present day computer technology. Nevertheless, use of this relatively complex, little explored model is a lot more demanding than is the use of the familiar 12 eqt conceptual framework. If rji is to be thoroughly exploited by the gifted composers of our time, it must be shown to yield such a powerful and different music that the efforts this new framework demands will be seen by them as being very worth their while. In order for this to be done, convincing demonstrations must be prepared. A just intonation theoretical edifice building upon but going well beyond the work of Helmholtz and his predecessors going back to the time of the renaissance will need to be laid down. This edifice will have to be rich in content, but also intellectually and logically well enough conceived to stand up to and jibe with data obtained from extensive critical research in music perception. A notational system which is clear, unambiguous, and yet at the same time "friendly" to human users will need to be devised. There is a great deal to be done towards the development of computer languages and other software tools which will make use of the rji framework as straightforward as possible for composers. Finally and most importantly, effective training programs must be developed for composers seeking them. The most essential element of such programs is the opportunity for listening to the just interval, chord, and melodic step building blocks of the new music in the widest possible variety of musical contexts.

It is the ^{my} author's conviction that for all the mathematical complexity just intonation presents on paper, its musical melodies and harmonies themselves have an intuitive plausibility and naturalness about them. He predicts that many composers, upon hearing these just intervals and chords properly demonstrated, will find themselves drawn instinctively to them and will experience that, contrary to what they had been led to believe, they find using them in their creative work to be a joyous act consonant with their inner artistic nature.