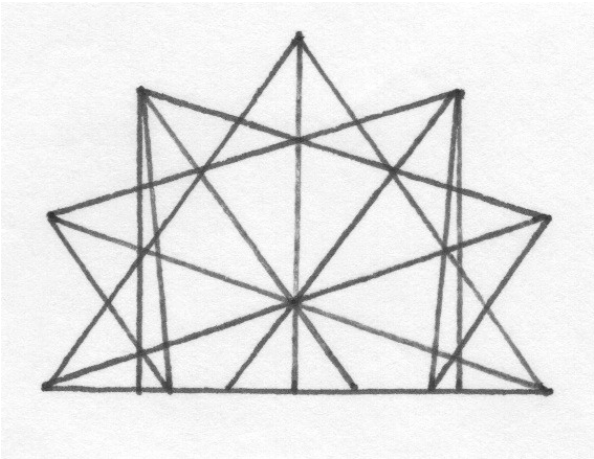
Toward a Theory of Meantone (and 31-E.T.) Harmony



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ABSTRACT

The author develops a syntax for meantone harmony based on the structural characteristics of the temperament. These features include a description of the Regions with their boundary functions, and also the three Genera. An abstract topology of triad progression is introduced, as well as an introduction to the organization of Functional Tables for 31-E.T.

INTRODUCTION

The great One-quarter-comma Meantone tuning system has had over-riding importance in the history of European music culture, where it was put to use for longer than any other temperament. Moreover, it was the tuning system associated with the greatest flowering of that culture, being used from the high Renaissance through the 16th and 17th Centuries and on well into the 18th Century. The only evident reason for its demise was a problem of technology. No adequate keyboard was develped which ennabled the performer to impliment all 31 notes to the octave. Since the keyboard became more and more popular over this period of time, musicians moved to an inferior system which better suited the medieval keyboard. However, the long-term influence of this tuning can still be felt in the continued use of a musical notation which employs both flats and sharps, a legacy of the meantone era.

Modern electronic technology makes possible the fabrication of efficient music keyboards for 31-E.T. Remember that most other instruments, for instance wind instruments and strings, have variable intonation and so can readily adapt to whatever temperament is at hand. The keyboard was the <u>only</u> impediment to the use of extended meantone music in ensemble settings. Enharmonic keyboards would be happily accepted by violin players who have no qualms about the use of the enharmonic, thus liberating the potential of the string ensemble. Hence we have the real possibility of a new flowering of meantone music. At the same time, many composers now feel that the 12-E.T. system has been exhausted of its new harmonic possibilities. As a result there is a new willingness to explore alternative systems of harmony. 31-E.T. offers immense harmonic resources which are as yet largely untapped. With the aim of promoting the exploration of meantone harmony I offer a systematic layout of the structural features of the system. Such a layout will suggest a natural syntax for meantone music, without dictating such matters as musical styles.

My aim in this endeavour is to develop a theory which is descriptive, and not proscriptive (as was the case with 19th Century music theory). Musical styles change as the progressive working out of the implications of the structure develop over time. I have already used this observation with regard to the evolution of 12-E.T. harmony in the 19th Century, an evolution

which developed often in spite of the theoretical structure which was overlaid on the materials. We could say, for example, that the structural characteristics of 12-E.T. included an inherent tendency toward atonality. No matter how badly the theoretical structures of the late Century fit the musical patterns, composers felt compelled, nevertheless, to explore the implications of the actual musical structure with its functional ambiguity and potential for rapid modulation. The theoretical language in use, meanwhile, was largely inherited from the meantone era, with its distinction of sharps and flats. Eventually this theoretical language became overly complex and stilted, since it did not suit the actual structure of 12-E.T. To a large extent, this situation came about because of the lack of an adequate model with which to compare the divergent structure of 12-E.T. and 31-E.T.

In the same way as 12-E.T., 31-E.T. has its own structural character which endows it with inherent tendencies. The history of the evolution of harmony during the 16th and 17th Centuries attests to the working out of various implications of the extended meantone fabric. One prominant example which comes to mind was the increasing use of chord relations which depend on the mediant during the course of the 16th Century, so that by the end of the century we see the 'avant-garde' progressions of Marenzio and Gesualdo. Another example was the Baroque distinction between the usual type of Dominant Seventh Tetrad and another type which is typified by the Function b6-1-b3-#4: called a "German Sixth Chord." This chord displays the Harmonic Series Seventh between b6 and #4, instead of the usual Seventh which would have the Function b6-b5, thus giving it a different structure and sound. (This distinction is meaningless in 12-E.T.). Hence we see a progressive working out of the implications of the true, underlying structure of the system; moreover, we see the conservative maintenance of this theoretical language long after musicians were using 12-E.T. in fact, and not 31-E.T. The 31-E.T. distinction between sharps and flats remains 'in theory' alone, and not in the actual structure of 12-E.T.

The appropriate theoretical language for a system of harmony should arise from its true underlying structure, and not from some other system. Such a practice results in confusion if there is little understanding of the divergencies between the systems. The music cultures of the 19th and 20th Centuries have displayed a deplorable ignorance in their comprehension of meantone harmony. Although the modern situation has improved, there is still the need of an integrated overwiew of the system anatomy. The composer who may wish to work in the milieu of extended meantone tuning needs a theoretical structure which reflects the inherent tendencies of the tuning. With such tools he/she can better utilize the materials at hand. The proper aim of a theoretical structure is to clarify the nature of the materials so that the composer or improviser can command his medium to produce the most satisfying results.

I have already written at length concerning the extended meantone fabric. In the article THE MEANTONE SERIES OF CYCLICAL

The 'vertical' nature of the functional field leads to a natural stratification of the lattice into eight Regions with the Enharmonic Region occupying both the 'south' and the 'north' of the triad web. The Meantone Corridor forms the appropriate boundary between the regions. Triads may be classified according to where they 'sit' in the lattice. For instance, the b6 Major Triad (b6-1-b3) lies squarely in the middle of the Minor region; whereas, the 6 Minor Triad (6-1-3) lies within the Major Region. Note that the Enharmonic Region lies at the furthest removed position from the Major Region. The top and the bottom of the chart meet in a 'strange loop' since it is a closed cycle. Consequently, the regions may also be indicated on the Circle of Fifths, as shown on Figure 6.

Certain functional triads seemingly lie in two regions at once. For example, the 2 Major Triad (2-#4-6) appears in the Major Region as well as the Supra-Major Region, as does its Relative Minor - the 7 Minor Triad (7-2-#4). Such triad functions which have two componants within the Meantone Corridor are called BOUNDARY FUNCTIONS. These functions have peculiar significance to meantone tuning. They do not have the same character in Just Intonation or in 12-E.T. where this whole regional structure collapses to essentially three: Major, Minor, and 'Enharmonic.' Thus in 31-E.T. the 5 Minor Triad (5-b7-2) lies on the boundary between the Major and the Minor Regions, as does its relative major triad, b7 Major Triad (b7-2-4). Suspended Triads and Tetrads, for example the function usually called the 'Tonic Suspended Fourth Triad' (1-4-5) straddle the Major and Minor Regions. They are 'ambivalent' about their major or minor character and do not 'disclose' their region. Certain other harmonic structures, on the other hand, may cover two regions (or even more) at once. For example, the Diminished Triad called 6 Dim. Triad (6-1-b3) covers the Major and Minor Regions at once. The Tonic Wolf Major Triad (1-♯3-♯5) spans three regions: the Minor, Flat-Minor, and Semi-Major Regions. The two pitch functions which stand at the furthest removed position from the Tonic, in the very heart of the Enharmonic Region are the neutral Third and Sixth, ↓3 and ↓6. Note their position on the field lattice of Figure 5.

Figure 6 is self-explanatory. Major and Minor triads naturally pair along these lines so that the circle of Fifths becomes the circle of Major and Minor triads in functional array around the Tonic. Note the symmetrical nature of the Regions. The Enharmonic Region lies 'opposite' the Major region in which the Tonic resides. Modulations to related major and minor key centres can be mapped on the circle of Fifths according to movement in a clockwise or a counter-clockwise direction. An awareness of the regional structure of 31-E.T. leads to increased understanding of the specifics of meantone progression.

THE THREE GENERA

The ancient Greek classification of musical 'types' according to the notion of Genus is perfectly suited to the meantone system.

Intervals, chords, and scales can all be classified according to whether they are Diatonic, Chromatic, or Enharmonic. Such a classification is meaningless to 12-E.T. where the enharmonic is eliminated. This feature of 31-E.T. can already be seen in the functional field of Figure 5. The Ptolemaic structures which we associate with the Diatonic Major and Minor Scales of meantone and of Just Intonation form a 'double strand' of fifths on the graph. Within this group of intervals, for example, is the Diatonic Semitone 3-4 (eg. E-F). If we now 'skip' a level we get the semitone associated with the Chromatic Genus - the Chromatic Semitone 5-#5 (eg. G-G#). Within the Chromatic grouping are the important Septimal intervals, for instance #2 and #6. Thus we can also associate the Diatonic with the '5-Limit' intervals, and the Chromatic with the '7-Limit' intervals. If we now jump one more 'vertical' level we integrate the Enharmonic intervals; for instance, we now have the Enharmonic 'semitone' between #7 and 1 (eg. C♮-C). We have jumped these levels in a 'northerly' direction, but we can also do so symmetrically in a 'southerly' direction. The notion of the three Genera is another result of the 'verticality' of the system.

The field of Just Intonation also embodies a similar structure, but it has in addition a 'horizontal' componant in the comma-altered regions. In 31-E.T. this horizontal componant is eliminated so that the 'vertical' componant takes on much greater structural importance. Hence we have the classification of patterns in the system according to the three Genera alone and not the additional comma-alterations. We will use the notion of Genus in investigating the intervals and also the more complex harmonic structures of the tuning system.

THE CLASSIFICATION OF THE INTERVALS

Musical intervals are the primary building blocks of a harmonic system. Hence an understanding of the interval types is essential in mastering the materials for composition. 31-E.T. offers a rich assortment of intervals, which may be grouped according to the notion of Genus.

It is helpful to group an interval with its inversion, so as to form a CLASS of interval type in aggreement with the principle of Octave Equivalence. Such a grouping of the intervals of 12-E.T. leads to seven Interval Classes, which may be ordered according to degrees of consonance. This order stems from the progressive appearance of the interval types within the Harmonic Series:

1. Unison - Octave } Perfect
2. Perfect Fifth - Perfect Fourth } Consonances
3. Major Third - Minor Sixth } Medial (Imperfect)
4. Minor Third - Major Sixth } Consonances
5. Wholetone - Minor Seventh } Dissonances
6. Halftone - Major Seventh } Dissonances
7. Tritones } Dissonances

In order to classify the intervals of 31-E.T. we may keep this overall pattern, but superimpose over it the notion of Genus. Hence the Class 6 intervals (the Wholetones-Minor Sevenths) have a

Diatonic version, a Chromatic version, and an Enharmonic version. All of this information may be conveniently laid out in the form of a table which is Figure 7. Note that the numerical notation is useful here since it indicates the size of the interval (the number of steps involved in making up the interval). Only the first and Second Class intervals do not have representatives in all three Genera.

The Class 3 and Class 4 Intervals have been somewhat 'shuffled' to reflect the fact that the Major Third and Major Sixth embody more consonance than the Minor Third and the Minor Sixth. The Chromatic and Enharmonic forms of the Thirds and Sixths obviously fall within the status of dissonances rather than consonances, with the neutral (Enharmonic) forms exhibiting strong dissonance.

In spite of the notion of Octave Equivalence, the particular voicing of the interval is a big factor in judging the strength of its consonance. The Minor Third is the most significant example. In closed position the Minor Third embodies more consonance than its Chromatic cousin, the Septimal (or Sub-Minor) Third; however, in open or compound form (as a Minor Tenth) the Sub-minor form gains in consonance over the Minor form. This Sub-Minor Tenth is on the verge of being considered as a consonance, just as the Diatonic Minor Sixth is on the verge of being considered as a dissonance. Some intervals gain in their compound expression (eg. Fifth, Major Third, Wholetone) and others lose (eg. Fourth, Major Sixth, Minor Sixth, Minor Third).

Of course, the intervals can also be arranged according to their size, leading to Figure 8. This table is the appropriate place to include other technical information relating to the 31-E.T. scale. The Fractional Ratios are useful for tabulating positions in the layout of fretboards. The Frequency numbers are useful for synthesizer tuning programs which have the option of direct input of frequency data. The two columns on the right indicate the size of the interval in Cents and also the size of closely related Just intervals in Cents, so that we can compare the deviation of 31-E.T. from Just.

DIFFERENCES BETWEEN TRUE MEANTONE AND 31-E.T.

It is useful to conceptualize the extended meantone fabric and 31-E.T. as equivalent because they are sonically almost identical. However, we should keep in mind that, strictly speaking, subtle distinctions exist between the two tunings. The 'true' extended meantone fabric is essentially a line of musical Fifths each of which is flattened by exactly one quarter of a Syntonic Comma. Such a line of Fifths will never meet to form a circle. In the 31-E.T. tuning the size of the musical Fifth is slightly altered from 'pure' meantone so that a circle of fifths results. The 31-E.T. Fifth is widened by about 0.19 Cents (an amount which is sonically imperceptible) from the meantone Fifth. All of the intervals of the two systems are hence slightly skewed to each other.

Seventh' Tetrad (alluded to earlier in the article). They are presented as Figure 11 and Figure 12. Note that a typical

region of the circle. Strong harmonies tend to be tightly grouped 'clumps' of vectors; whereas, dissonant harmonies tend to be 'spread out' forms of vectors. These wide 'splays,' for example the Tetrad in Figure 12, define a domain of the circle of Fifths in which the dissonance has its most natural resolution. (Of course, some would argue, that this particular pattern is not a dissonance at all, and that it has no natural tendency to resolve like its Diatonic cousin. Even if we grant this value to the Harmonic Series Seventh Tetrad, it still most naturally 'progresses' in the way outlined).

The Wheel of Fifths gives information which is purely 'harmonic' or abstract, much like the triad lattice mapping of the pattern. The lattice and the Fifths Wheel are closely related. The study of the pattern on both models together indicates a clear mapping of the harmonic 'tendency' of the pattern. This inherent tendency to movement is then 'expressed' through a specific function and a specific voicing.

AN ABSTRACT TOPOLOGY OF 31-E.T. TRIAD MODULATION

We have emphasized elsewhere that meantone tuning is more conducive to an extended tonality (or modality) than to atonality. Since it is a PRIME SYSTEM, it embodies no 'reductionist' functions which play such a pivotal role in the structure of 12-E.T. Every type of chord displays 31 possible functions, and there can be no ambiguity of functional intent. This situation does not mean, however, that tonality must necessarily follow traditional channels. The gravitational pull of tonality may be greatly diffused by using dissonant patterns and distant modulations. Nevertheless, some form of tonality has a tenuous hold on meantone progression.

The tendency of 12-E.T. patterns toward atonality is also aided by the 'restless' nature of the major and minor triads, with their significantly tempered thirds. 31-E.T. triads, on the other hand, are much more euphonious and 'restful.' Hence the status of the triad patterns is characteristically enhanced in meantone harmony. This situation also contributes to the tendency for meantone music to explore 'extended tonality' rather than atonality.

The early history of the use of meantone harmony was closely associated with the choral traditions of Renaissance and Baroque music. It could even be argued that this choral tradition was made possible through the implimentation of this tuning system over the medieval 'Pythagorean' tuning system. Anyone who has worked with meantone is aware of the eminantly 'singable' quality of the triads. The 31-E.T. triads are truly a treasure, having a 'sweetness' unmatched by other systems of temperament.

The quality of these triads means that progressions connecting such chords are natural to the system. Indeed, the music of the 16th and 17th Centuries was largely triadic for probably this very reason. In the article on GESUALDO I examined

the types of chord progressions between major and minor triads which prevailed througout the 16th Century. These progressions may be conveniently and systematically organized according to their relations on the triad lattice. Such a structuring of progression types is a topology of relations between triad chords.

The topology presented in that article was not comprehensive, since my interest was specifically the 16th Century. Only such experimental composers as Gesualdo at the end of the century ventured into the more 'distant' progressions. As usual, this abstract topology of triad progression can be organized according to Genus. Figure 15 is a comprehensive reworking of this topology to include all of the possible 'progression types' between major and minor triads. Note that the majority of the 63 progression types fall in the Enharmonic Genus. Most of these progressions were largely untried before meantone went out of fashion in the 18th Century, although Gesualdo used some of the enharmonic progressions in the 16th Century. Thus we can see the immense scope for original harmonic progressions in the meantone system.

As an example of an unusual triad progression from this topology, I refer you to the progression marked as number 56 in the series. Here we have the unique situation in which a Major Triad moves to a Minor Triad (or the reverse in which a Minor Triad moves to a Major Triad) in such a way that all of the intervals shift by an enharmonic alone. Thus, for example, we have the move from C♯ Minor Triad (C♯-E♮-G♯) to C Major Triad (C-E-G). Such a progression is peculiar to meantone tuning.

Of course, I do not want to leave the impression that only triad progression is possible in the meantone system. The vast array of possible structures in this system is truly dazzling. A new and largely unexplored universe of harmony is opened up - a universe which has many inhabitants, both beautiful and bizzare. It is hoped that the use of the triad lattice and the Fifths Wheel introduces a sense of order to this complexity. The movements of meantone harmony can be guaged according to these criteria. Rather than dictate as to matters of style, the aim is simply to create an awareness of the structure of the movement, so that the composer can make intelligent choices.

CONCLUSIONS

This article has served as an introduction to the structure of the meantone system. Due to the vast assortment of materials in the tuning, only the conceptual framework has been given, along with a few examples to illustrate the concept. The real 'meat' of the system lies in the Functional Tables, with their delineation of 'mode' and pattern. These Tables rightly accompany this article, and this article properly serves as an introduction to the intelligent use of these Tables. Such tables are by their very nature voluminious, even if they are easily organized into books of Triads, Tetrads, Heptads, etc. The composer will find in these patterns not only the material for new composition, but also the

basis for an intelligent analysis of past composition, in whatever style the composer had used.

It is hoped that this conceptual framework compliments the Fokker notation for the system, a notation which has done so much to improve the intelligability of the system, and make it applicable to the musical Staff. The combination of a clear notation, a clear comprehension of structure, and a suitable keyboard technology for the composer's exploration, opens the pathway to a glorious future in the evolution of musical harmony.