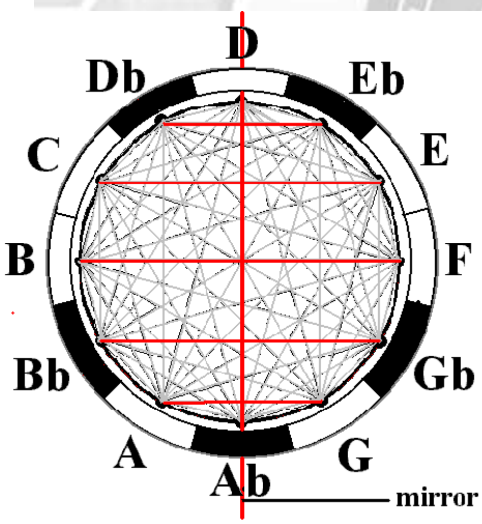
12-Tone and 7-Tone Scales

The 12-tone musical scale labeled alphabetically as:

This is called the "chromatic" scale — 12 equal-interval steps up the scale (called "half steps"). As you can see, there are seven letters (A B C D E F G) and five sharps and flats (i.e. A#/Bb). The seven letters comprise the 7-note "diatonic scale" we're all familiar with as "do, re, mi, fa, sol, la, ti…do." In the key of C, these are C D E F G A B…C (the ending C is the beginning of the next "octave" wherein the pattern repeats at double the pitch (frequency) of the previous scale). This 7-tone scale consists of a combination of whole steps (two-note intervals) and half steps (one-note intervals) along the 12-tone chromatic scale. This 7-tone pattern is the same in all twelve keys.

The mathematics of the harmonisphere are amazing. It is all about symmetry and mirrored pairs. Each line on the harmonisphere measures two intervals, depending upon which note is on top. The line that measures up a minor third (three semitones) also measures down a major sixth (nine semitones). The mirrored pairs are:



Minor	2nd	-	Major	7th
Major	2nd	-	Minor	7th
Minor	3rd	-	Major	6th
Major	3rd	-	Minor	6th
Perfect	4th	-	Perfect	5th

The diminished 5th is its own mirrored image. In fact, the dim 5th is the mirror.

Note	A	A	D	F	E	C	E	C#	F#	C#	D	F
Interval	root	octave	4th	aug. 5th	5th	minor 3rd	5th	3rd	6th	3rd	4th	aug. 4th
Fibonacci ratio	1/1	2/1	2/3	2/5	3/2	3/5	3/8	5/2	5/3	5/8	8/3	8/5

Tri-Tones

Music is a system of relationships, these being the harmonic intervals between notes and the combination of these intervals to create melodies and harmonies. One of the primary interval relationships is called the tri-tone due to it being an interval of two notes that are 3 whole steps apart. Given that 3 whole steps is equal to 6 half steps, we find that these two notes exactly divide the 12-tone scale in half. As such, they can be seen as two primary “opposite” notes. In fact, the tri-tone interval, when sung or played on an instrument, is perhaps the most unresolved harmonic relationship in all of music. It is full of tension and dissonance, and yet is it present in almost every piece of music composed.

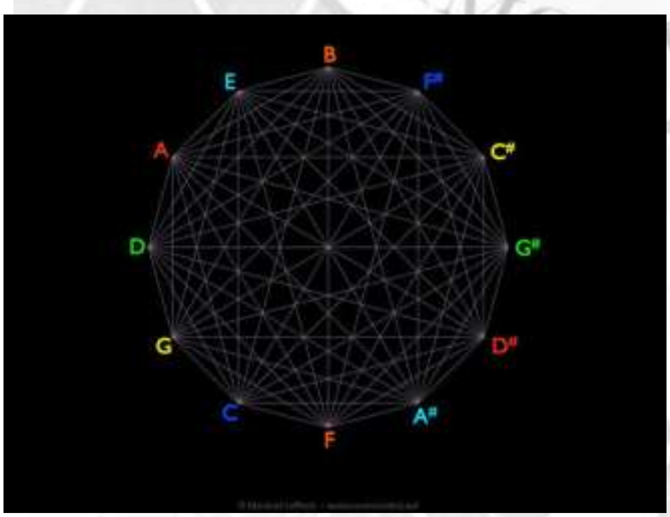
Being that the tri-tone consists of two opposite notes in the 12-tone system, it’s obvious then that there would be six pairs of these tri-tone intervals. These are colored coded in the diagram below as A/D#, A#/E, B/F, C/F#, C#/G, D/G#.

Note for later that the color coding is intentionally spectral.

Circle of Fifths

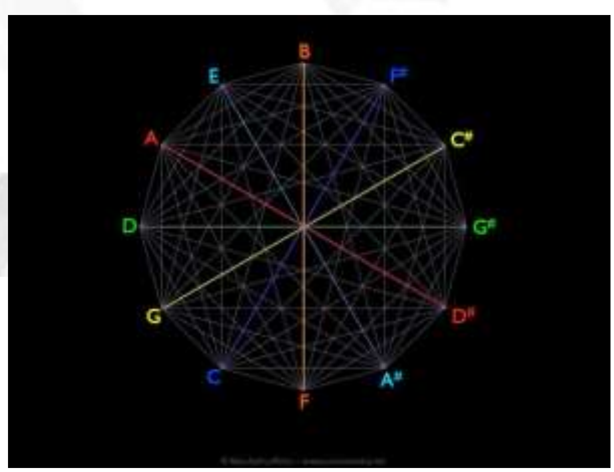
Another very basic harmonic relationship is called the **fifth**. Simply, it’s the interval between the first and fifth notes of a major scale. For example, in the key of A the fifth note is E (A=1, B=2, C#=3, D=4, E=5, etc). This interval is so primary and profound in music it is actually called the “perfect fifth.” In the world of classical music theory, one of the ways to show fundamental relationships is to array the 12 notes around a circle following a sequence of fifths, as in the illustration below. This shows that there is a progression in music that naturally moves or cycles through all 12 keys in a way that is harmonically pleasing to our senses (it is also referred to as the cycle of fifths).

Using the 12-around-1 matrix pattern as our guide, the circle of 5ths looks like this (with the spectral color-coding as mentioned above):



And this illustration shows that the tri-tone intervals are exactly opposite each other in the circle of fifths:

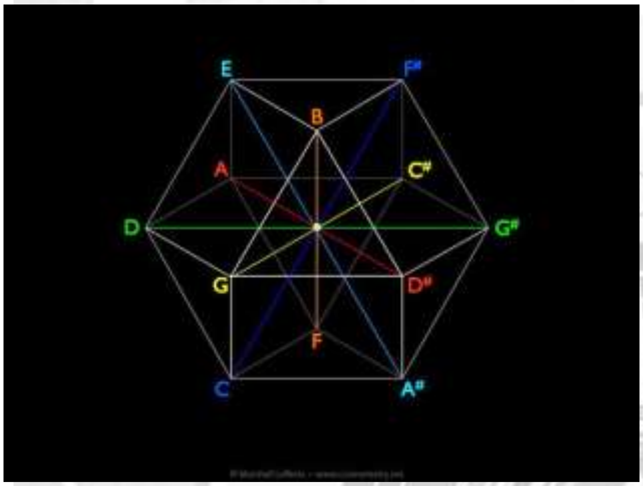
The same holds true when the 12-tone system



is arrayed chromatically around the circle.

In this way we can easily see the six pairs of opposite notes that comprise the basic 12-tone system of music.

Extending this into the 3-dimensional space of the vector equilibrium, one of the primary components of cosmometry, we can map these pairs like this (notice that the circle of fifths is maintained in the sequence of notes as they are arrayed visually around the center):

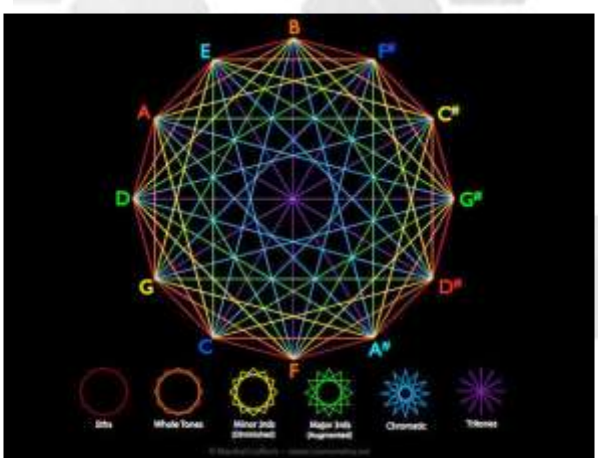


Basic Interval Polygons

With the interconnecting lines of the 12-around-1 matrix as our guide, we can then see that there is a set of basic interval relationships that map out polygonal patterns corresponding to specific intervals. As seen below, these are:

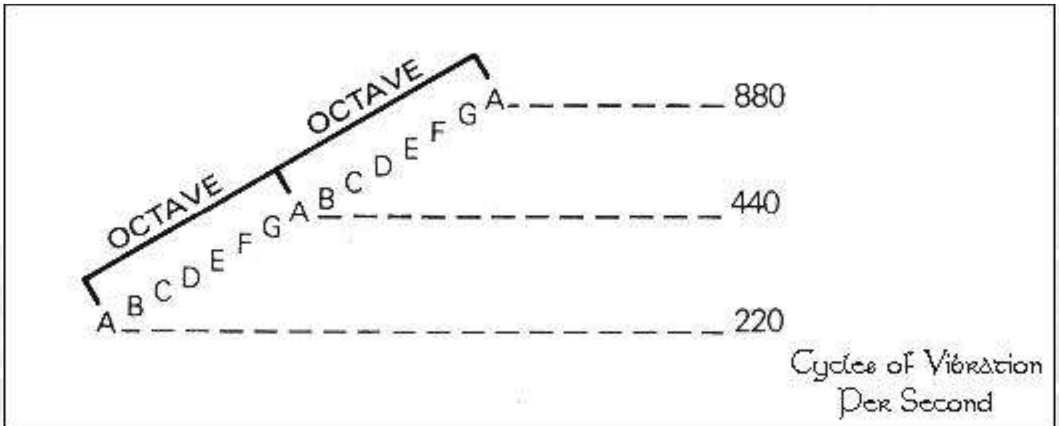
- One 12-sided dodecagon ringing the outside… circle of fifths
- Two 6-sided hexagons… showing two sets of whole-tone (whole step) scales
- Three 4-sided squares… showing three sets of diminished (minor third) chords
- Four 3-sided triangles… showing four sets of augmented (major third) chords
- One 12-pointed dodecagram… showing the chromatic sequence of intervals
- Six lines… showing tri-tone interval pairs

Note that the color-coding of these polygons is not coordinated with the above color-coding but is simply to make them easier to see in this illustration.



Every note, whether A, B, C, D, E, F or G, will be doubled in its value in the next octave.

Since the octaves are continually doubling in their vibration, there are only a handful of octaves within the range of human hearing. Above a certain point the vibrations will become too fast for human ears to detect, even though they will still exist all around us.



Sacred Geometry	Number	Tone	Color Range	Frequency	Resonance
Vesica Pisces (Mandorla)			Purple		
Triangle		F#		180 Hz	
		A		220 Hz	
Circle				360Hz	
Pentagon		D		540 HZ	
Hexagon				720 HZ	
		A		880 Hz	
Heptagon				900 HZ	
Octagon				1080 Hz	

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