

Guide to Lecture 18: Pythagorean Music and the Tetraktys

A) Pythagorean Music

i) Introduction. The notes played use modern tuning, not Pythagorean tuning.

(1) Some links:

(a) <http://www.pyxidium.u-net.com/Acoustics/MusicMaths/MusicMaths.html>

(b) <http://www.music.sc.edu/fs/bain/atmi02/pst/index.html>

(c) [http://en.wikipedia.org/wiki/Mode_\(music\)#Greek](http://en.wikipedia.org/wiki/Mode_(music)#Greek)

(2) Harmony. Not a mere metaphor from music, but is a unity of multiplicity and contraries. Heraclitus and Pythagoras insist on its metaphysical importance.

(3) Number not just quantitative, but experiential and qualitative; links to ethics and health.

ii) The Monochord. A one-stringed instrument illustrating the Pythagorean Limit and Unlimited, and the construction of the scale.

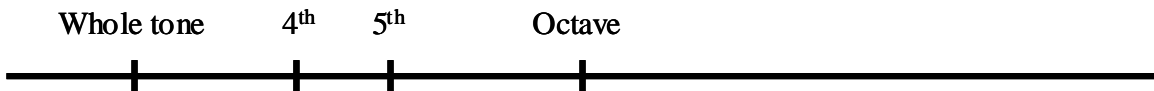
(1) The Tetraktys (numbers 1-4) contains the ratios for the basic harmonies.

(2) But the ratio 8:9 must be added to get the whole tone: 6:8::9:12 (see diagram below).

(3) The left-over intervals or *lemmas* are treated as “half-notes” today in modern tuning, but in Pythagorean tuning they were unequal intervals; slight differences between interval values make playing certain chords and combinations awkward-sounding in Pythagorean tuning.



Octave		1:2 or 6:12
Perfect 5th		2:3 or 6:9
Perfect 4th		3:4 or 9:12
Whole tone		8:9

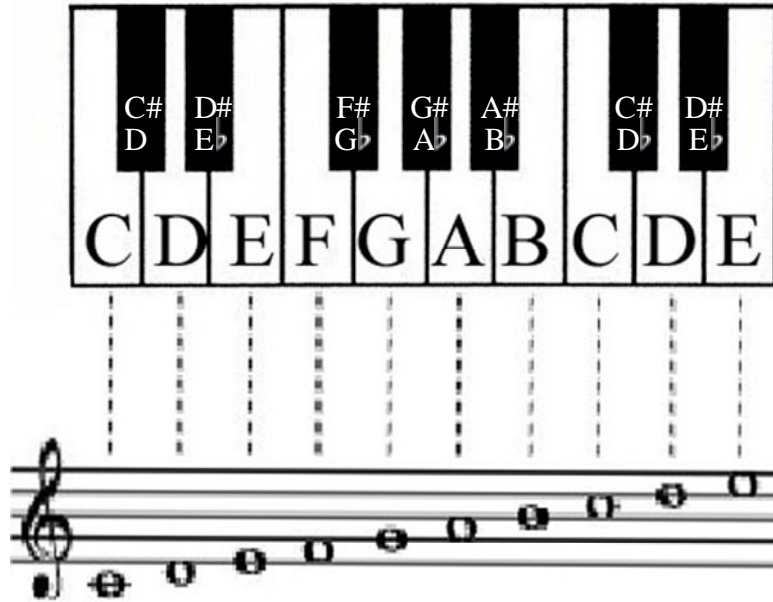


B) **Music of the Spheres.** An attempt to relate musical ratios to the distances or speeds of the planets; some thought the planets actually vibrated at hard-to-hear frequencies. Bode's Law and Plato's vision of Sirens singing notes on the planetary spheres; travelers in Plato's vision see things on days corresponding to the perfect 4th and 5th.

- i) **Type A (Pythagorean):** relates planetary distances to notes.
- ii) **Type B:** relates planetary speeds to notes.
- iii) **Planetary days.**
- iv) **Type C (other).**

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Pliny: D E F F# A B C C# E
 ⊕ ☽ ♀ ♀ ⊙ ♂ 4 5 ✱

Censorinus: D E F F# A B C C# D
 ⊕ ☽ ♀ ♀ ⊙ ♂ 4 5 ✱

Nichomachus I: E F G A B_b C D
 5 4 ♂ ⊙ ♀ ♀ ☽

Nichomachus II: E F G A B_b C D
 ☽ ♀ ♀ ⊙ ♂ 4 5

Al-Kindi: G A B_b B D D_b E
 5 4 ♂ ⊙ ♀ ♀ ☽

Dio Cassius: B C D E F G A
 5 4 ♂ ⊙ ♀ ♀ ☽

C) **The Tetraktys and Proportions.** “Ten is complete at four.”

i) **Some correspondences of the Tetraktys.**

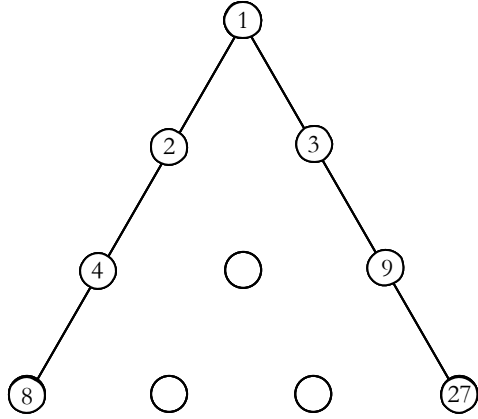
●	Point	<i>Keter</i>	<i>Atziluth</i>
● ●	Line	<i>Chokmah-Binah</i>	<i>Briah</i>
● ● ●	Plane	<i>Chesed-Geburah-Tiferet</i>	<i>Yetzirah</i>
● ● ● ●	Solid	Four lowest <i>sefirot</i>	<i>Assiah</i>

ii) **Types of Proportions.**

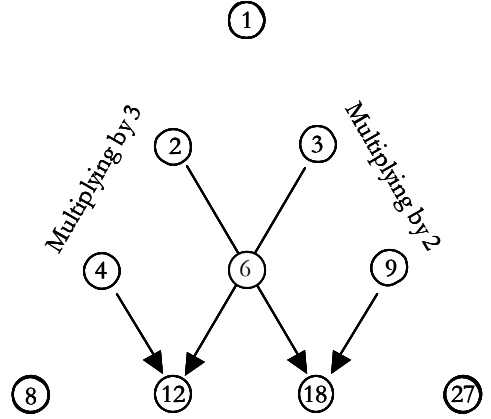
- (1) Arithmetic Proportion: b is greater than a by the same amount that c is greater than b , so that $c/b < b/a$. Example: $6/4 < 4/2$
- (2) Harmonic Proportion: b is greater than a by a proportion of a , such that c is greater than b by that same proportion of c . Example: 6-8-12. 8 is greater than 6 by $1/3$ of 6, and 12 is greater than 8 by $1/3$ of 12.
- (3) Geometric proportion: $c/b = b/a$, so that the relation is $a:b::b:c$. Example: $27/9 = 9/3$.

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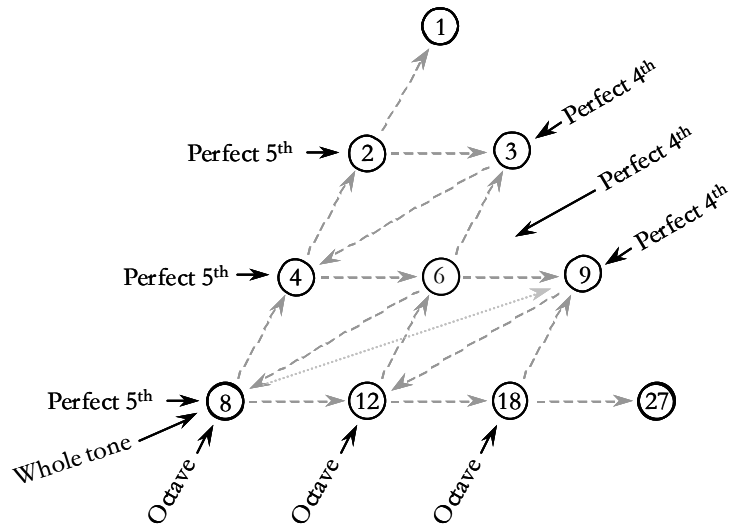
Plato's Lambda



Completed Lambda



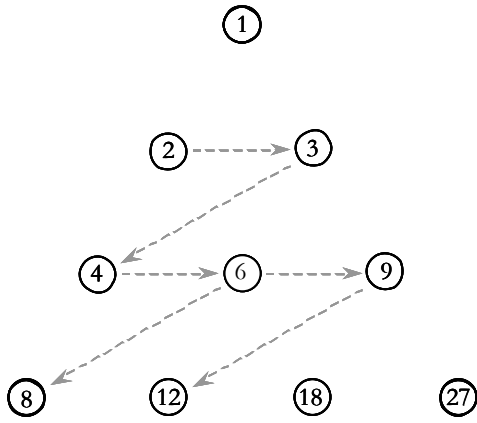
Musical Ratios



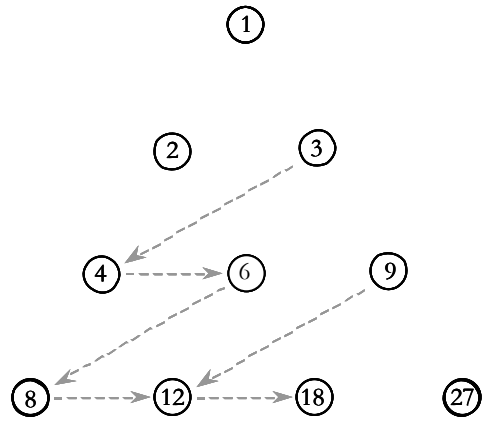
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Arithmetic Means



Harmonic Means



Geometric Means

