

A question regarding Phi, the Pythagorean Comma & “The Grand Design”.

A debt to Pythagoras is acknowledged, but is not discussed at all in the book, ‘The Road to Reality’ by Roger Penrose.

However, it is acknowledged and discussed in ‘The Grand Design’ by Stephen Hawking, where he cites Pythagoras' discovery as the first instance of theoretical physics as follows: - *“According to legend, the first mathematical formulation of what we might today call a law of nature dates back to an Ionian named Pythagoras [who] is said to have discovered the numerical relationship between the length of the strings used in musical instruments and the harmonic combinations of the sounds. In today's language we would describe that relationship by saying that the frequency - the number of vibrations per second or 'Hertz' value - of a string vibrating under fixed tension is inversely proportional to the length of the string. One could call that simple mathematical formula the first instance of what we now know as theoretical physics.”*

This is a beautiful observation. Going deeper into the observation, precise & simple integer arithmetic shows that: -

- A. 7 Perfect Octaves (2^7) and 12 Perfect 5ths (1.5^{12}) *don't* commute, whereas . . .
- B. 7 Perfect Octaves (2^7) and 12 Well-Tempered 5ths (1.49831^{12}) *do* commute and that . . .
- C. The gap between A & B is what has been called the ‘Pythagorean Comma’.

If the first instance of theoretical physics gives a law where Perfect 5ths (that, for want of a phrase, are ‘an act of God’), then Well-Tempered 5ths are definitely ‘an act of man’. This gives rise to the well-known Well-Tempered tuning. This tuning system was adopted in music by J S Bach in his Well-Tempered Clavier and has governed at least all Western Music since that time.

What appears not to have been recognized anywhere is this: within this first law, as the Pythagorean Comma emerges, it also creates a ‘negative feedback’ to the self-referential value of ‘Phi’ (0.618) or the ‘Golden Section’ (see image next page).

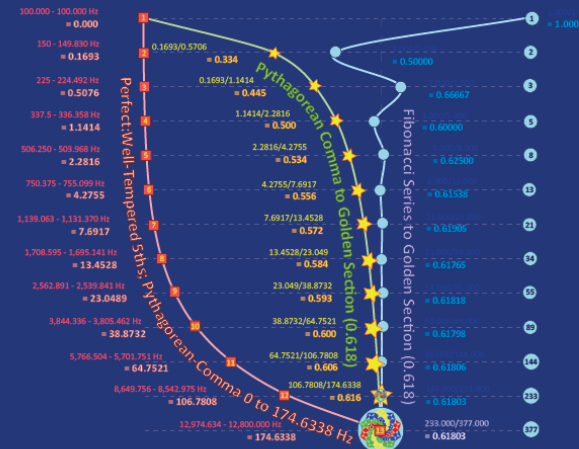
As ‘The Grand Design’ is significantly attentive to the influence of ‘Phi’ at all scales (organic and inorganic, sub-atomic to cosmological), does Stephen Hawking have any thoughts about that?

Nature's Smallest & most Beautiful Secret

Pythagorean Comma & Fibonacci Series converge on 'Golden Φ 0.618 Section'



The 'Golden Comma' Hz differences between a cycle of Perfect 5ths & Well Tempered 5ths emerge & are known as the 'Pythagorean Comma'. These also curve to Φ as a neg-entropic feedback (vide Schrödinger) to the Comma.



Φ 0.618



	PERFECT OCTAVES 2^7	PERFECT 5THS 1.5^{12}	5THS WELL TEMPERED 1.498^{12}	PYTHAGOREAN COMMA Differential	COMMA EMERGES TO GOLDEN SECTION Negative Feedback	FIBONACCI SERIES GOES TO GOLDEN SECTION Corroborates PC Feedback		
1	2.000	1.500	1.498	0.002	0.33352 = diff 0/diff 1	1	1.00000	1
2	4.000	2.250	2.245	0.005	0.44470 = diff 1/diff 2	2	0.50000	2
3	8.000	3.375	3.364	0.011	0.50028 = diff 2/diff 3	3	0.66667	3
4	16.000	5.063	5.040	0.023	0.53363 = diff 3/diff 4	5	0.60000	4
5	32.000	7.594	7.551	0.043	0.55587 = diff 4/diff 5	8	0.62500	5
6	64.000	11.391	11.314	0.077	0.57175 etc	13	0.61538	6
7	128.000	17.086	16.951	0.135	0.58366	21	0.61905	7
8		25.629	25.398	0.230	0.59293	34	0.61765	8
9		38.443	38.055	0.389	0.60034	55	0.61818	9
10		57.665	57.018	0.648	0.60640	89	0.61798	10
11		86.498	85.430	1.068	0.61146	144	0.61806	11
12		129.746	128.000	1.746	0.61573	233	0.61803	12
13		194.620	19.783	2.836	0.61940	377	0.61804	13

