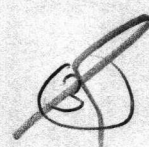


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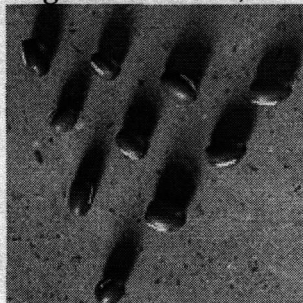
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In the Pythagorean tradition, astronomy is interpreted as magnitudes in motion, geometry as magnitudes at rest, arithmetic as numbers absolute, and music as numbers applied.



I. **Pythagoras of Samos** was born about 580 - 569 BC. Son of a grain merchant who been granted Samoan citizenship for bringing grain to the city at a time of famine. Pythagoras evolved a whole way of looking at life from counting beans. He founded a school of philosophy at Samos until a change of regime forced his exile to Crotona, an important Greek colony on the foot of Italy. Here his school flourished as a semi-monastic centre of study until it was suppressed in about 508 BC. Pythagoras is said to have taken refuge in Metapontum where he died in about 475 BC. His school was sacked and followers persecuted. An attitude imputing value to number can always be seen as threatening..

Teachings were transmitted orally and the doctrine is only available through later writings. There was a french Baroque revival [see below]. Atributed with being the first to call himself *philosophos*, lover of wisdom, rather than *sophos* or wise man, and to use the term *cosmos* a word implying the beauty and order of the universe. 'Communion and friendship and orderliness and temperance and justice bind together heaven and earth and gods and men and this universe is therefore called *cosmos* or order.' [1] The Timaeus of Plato is accepted as a representation of Pythagorean thought. The Pythagoreans are credited for having brought measure to music through the study of the monochord, pipes, and bells.

< Pythagoras is here shown quantifying the weight of the bells, and glasses, plucking the monochord with measured weights, and arguing the finest points of dissonance [comparing flute lengths] with Philolaus

Clockwise from top left: the hammers in Jubal [Tubalcain] smithy, playing tuned bells and



water filled cups,
experimenting with weights on
the end of fixed length strings,
and on the length of pipes to
determine the exact ratios of
consonant sounds one to
another [from F Gafurio
Theorica Musice 1492] [rep.
Wittkower 1949.]

Modern assessments of Pythagoras vary considerably. Legend has been attached to him. Burkert in 1972 observes that 'the material seems to fall into the pattern each enquirer is looking for. Pythagoras the scientist... the mystic... the Basic Idea... the shaman, etc.' He concludes that 'the tradition of Pythagoras as a philosopher and scientist is, from the historical point of view a mistake' [2]

But the system of thought represented by a **Pythagorean tradition** has been of great importance to discussions of harmony, during the middle ages via Boethius, and the renaissance and Baroque periods, and into the modern age.

Archytas, a Pythagorean c428-347 BC describes **mathematics as being composed of the four related studies: astronomy, geometry, arithmetic and music**. [3] Boethius 480-524AD talks of the 'four mathematical disciplines of which music is one' and goes on to observe that 'the other three are concerned with the investigation of rational truth, but music concerns not only speculation but also human behaviour... so we can understand what was said.. by Plato, that the soul of the world is knit together by the harmony of music' [4] Music occupies a key position, it is the one mathematical discipline available directly and precisely to the senses and influencing the soul. It is a fulcrum between the material world and the meta-reality of number, contributing to the dialogue of correspondence between the two.

Andre Dacier in 1706 writes 'If we ought to measure the Glory of a Philosopher by the Duration of his Doctrine, and by the extent of the places that embraced it, nothing can equal that of Pythagoras, since most of his opinions are at this day literally followed in the greatest

part of the whole world. ...Socrates and Plato followed his doctrine and his method of explaining it' [6].

In the Pythagorean tradition, astronomy is interpreted as magnitudes in motion, geometry as magnitudes at rest, arithmetic as numbers absolute, and music as numbers applied. In searching for the links between architecture and music we are trying, in a sense to link **magnitudes at rest**, with **numbers applied**. It perhaps worth exploring some Pythagorean concepts of number.

- [Pythagoras II - The value of number](#)
- [Pythagoras III - Number Applied](#)

Pythagoras links:

- [A biography of Pythagoras with links to related sites - by J J O'Connor and E F Robertson, St. Andrew's University](#)
- [Pythagoras Music and Space by J. Boyd-Brent,](#)

Notes:

[1] Plato Georgias 507D - 508A]

[2] Burkert Lore and Science in Ancient Pythagoreanism Tr EL Minar, Harv. U.P 1972 p482.]

[3] Archytas 428-347 BC frag.1 in Kathleen Freeman 'Ancilla to the Pre-Socratic philosophers HUP 1948 p78]

[4] Boethius quoted in Acoustics. Historical and Philosophical development by RB Lindsay [ed] Dowden Hutchinson and Ross]

[5] SK Heninger Jr Touches of Sweet Harmony, Huntingdon 1974 p32]

[6] Andre Dacier Life of Pythagoras 1706 London 1707 reprinted 1981 ISBN 0-87728-286-2]

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Pythagoras evolved a whole way of looking at life from counting beans.

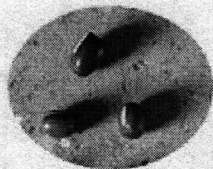
II. Pythagoras 2: Discerning value in number.



One is a whole in itself. In contemplating a bean's one-ness we are comparing it to itself. We can observe that it is not uniform, but whole - if you plant it instead of eating it contains the potential for many beans. The 'one-ness' of one, in practical, experiential terms, means 'me' the 'I am', and also 'the whole world viewed as one' the *cosmos*. Musically it is the whole of a piece of music, architecturally, the whole of the building, or the whole of a city. In Greek the *Monad*. The **number**: < one > gives the **geometric** < locus, **point**, circle, sphere > and 0-dimensional space, that is to say there is only <here>.

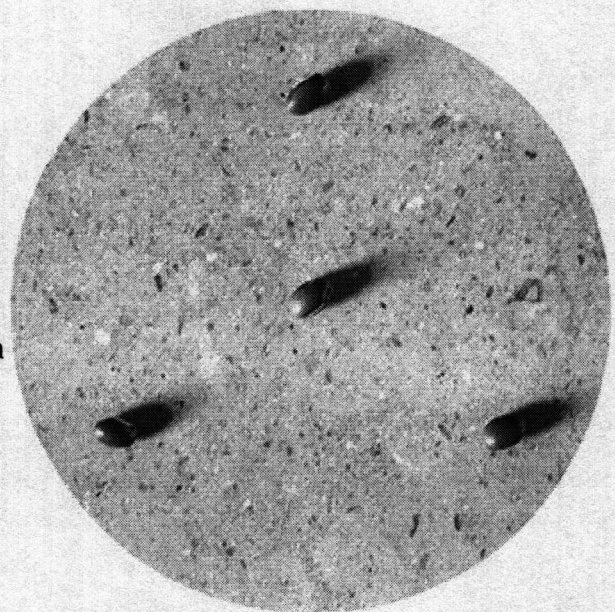


Two enables comparison of one thing to another. In practical terms. 'You and I', and also 'night and day', 'male and female' and so on. Musically it is <this and then that>, architecturally, <solid and void> and so on. In Greek the unlimited *Dyad*. The **number**: < two > gives the **geometric** < **line** > and 1-dimensional space, that is to say <here and there> and all points in between.

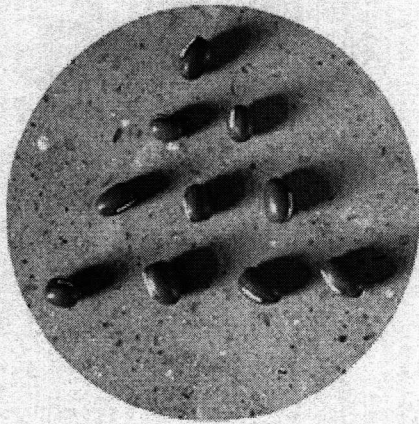


Three enables comparison of you, me and something else, everything that comes in threes. In Greek the *Tryad*. The **number**: < three > gives the **geometric** <plane > a triangle, and 2-dimensional space, that is to say <height and width>

Four gives everything that comes in fours: the four seasons, the four points of the compass, and so on. The **number** four gives three dimensional **space** (a tetrahedron) height width and depth.



All these are combined into the decad, within which are endless inter-plays of these four numbers.



One can see that this way of thinking about number is at the same time very practical, embodied, matter of fact, and also profound. It is not just that one has experienced this, or thought in those terms, one has actually been it [1]

In the next page we examine number applied.

Pythagoras links:

- A biography of Pythagoras with links to related sites - by J J O'Connor and E F Robertson, St. Andrew's University
- Pythagoras Music and Space by J. Boyd-Brent - Scottish Arts,

Notes:

[1] As an egg, a fertilised egg, a two-celled creature, mind body and spirit, and so on.

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III. Pythagoras 3 Number Applied

Without hindsight it must have been far from obvious that humans would be highly sensitive to the minutest inexactness in the proportion between one note and another. But it is so. When two notes are sounded together and they are of the same size [1] they sound wonderful, when they are slightly off they sound awful (at best interesting). You can test this by singing a note and getting a friend to sing the same note with you and then drift off. And the thing is they sound more unstable the nearer the notes come together, until, suddenly, *basta* everything is in glorious technicolour. One can understand from a musical perspective, the social implications of this, if one sings in a choir one will know the loss of self and collective unity that comes from singing together.

...

The harmonic theories of Rameau acoustic experiments of Sauveur, and the musical aesthetics of Helmholtz and his followers are directly descended from the contemplation of the inner harmonics of a stretched string.

Internal links:

- [Pythagoras I - Pythagoras of Samos](#)
- [Pythagoras II - Number](#)
- [Pythagoras III - Number Applied](#)

Pythagoras links:

- [A biography of Pythagoras with links to related sites - by J J O'Connor and E F Robertson, St. Andrew's University](#)
- [Pythagoras Music and Space by J. Boyd-Brent,](#)

Notes:

[1] See the paper on wavelength

- [index](#)

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