

Pythagoras and the Pythagoreans: A Brief History

by Charles H. Kahn

2001

Introduction

- Pythagoras was one of the most famous and fascinating figures of antiquity,
 - One of the greatest scientific minds of early Greece
 - Known as the prince and father of Divine philosophy
- Some view Pythagoras as more of a religious and cultural leader than a mathematical thinker
 - Walter Burkert's 1962 book, Lore and Science in Ancient Pythagoreanism, is an important and fundamental work on Pythagoras.
 - Burkert sees Pythagoras more as a religious and cultural leader than a scientist, as a shamanistic figure and charismatic spiritual leader rather than as a mathematical thinker
- Pythagoras was known to be legendary in his own time but very little direct written evidence of his life and teaching that are available.
- Much of what we know about Pythagoras has shifted across time, being altered by his followers as it suited them.

Key Ideas from Pythagoras

- Explained the nature of things in mathematical terms
- The importance of number and the nature of the cosmos as an ordered whole.
- Observed the numerical ratios or musical consonances (*harmoniai*) and connected that with celestial phenomena (music of the spheres)
- Conception of the soul as immortal and divine
 - Taught on immortality and reincarnation, a radical break from the Homeric view of the psyche as being a shade or phantom in Hades.
 - He probably was influenced by the ancient Egyptians and may have also traveled to India.
- Kinship between all living beings (*homogenes*) – we all belong to the same family

Influence on Plato

- One reason he was remembered for so long is that he was very influential on Plato and his followers
 - In *Phaedo*, Plato expands on the Pythagorean view of the soul
 - In *Timaeus*, he elaborates the world soul as being structured by musical ratios and the world body organized by elementary triangles
 - Also, ideas in *Meno*, and the *Republic*
 - So it is really Plato's view of Pythagoras that prevailed throughout antiquity

Pythagoras and the Pythagorean Way of Life

- The Life Of Pythagoras
 - Born on the island of Samos in the middle of the 6th century BCE.
 - Settled in southern Italy (Magna Graecia) Croton
 - Left Croton for Metapontum when he experienced persecution
 - Sometimes considered as a charlatan
 - Women were active participants in the Pythagorean community
 - Pythagoras' wife and daughters were renowned for their wisdom
- Cult practices:
 - Came together in an assembly hall where they heard the *akousma*, the hearing.
 - The *akousmata* were sayings and injunctions for his followers, i.e., do not eat beans and other culinary injunctions
 - Aristotle assembled a list of the *akousmata*
 - Protected by a vow of silence
 - Long period of initiation before being permitted into the inner circle or to meet the master
 - Eat only the flesh of animals that can be sacrificed. (maybe designed not to conflict with the civic religion.)

Pythagoras, Mathematician and Cult Figure

- With Plato, the view of Pythagoras shifted from being a religious leader and prophet of reincarnation to the creator of mathematical philosophy.
- Plato emphasized, as Pythagoras did, that the mathematical sciences are seen to be the “sister studies”, astronomy, geometry, arithmetic and music
- But what can we know about to what extent Pythagoras really was a mathematical thinker?
 - Aristotle reports that there were two rival schools of Pythagoreans
 - *Akousmatikoi* – faithfully preserve the rituals and taboos
 - *Mathematikoi* – claim they are more truly representative of Pythagoras’ teaching
 - Heraclitus and other early historians of the Greek enlightenment report that he was renowned for his wide knowledge (polymathie)
 - Empedocles, a parallel figure and well-known religious leader two generations after Pythagoras combined cosmology with philosophy of nature so it is entirely possible that a philosopher of that time would combine both
- In his own time, he was an intellectual figure of extraordinary stature, based on all the references to him. It is reasonable to assume that this conception of the cosmos and musical harmony goes back to him.

Were Pythagoreanism and Orphism Connected?

- Both believed in immortality by transmigration and hence in dietary restrictions, ceremonies of ritual purification, etc.
- However, Orphism was based on a legendary singer of a heroic age.
- Orphism is inherently based on written texts, the poems of Orpheus, whereas there are no Pythagorean written texts.
- Orphism more associated with the Bacchic cult of Dionysus whereas Pythagoreans more associated with Apollo and the Pythia.
- The lyre of Orpheus did eventually come to be associated as the symbol for Pythagorean cosmic music.

Pythagorean Philosophy Before Plato

- First known Pythagorean book in the Pythagorean tradition is from Philolaus in the 5th century BCE
 - The doctrine of first principles (*archai*) in Philolaus specified that “Nature in the world-order (*kosmos*) was fitted together harmoniously from unlimited things (*apeira*) and limiting things (*perainonta*).
 - *Harmonia* has the function of producing unity out of multiplicity
 - Harmony is numerical in form – discusses musical consonances and ratios.
 - Discusses the perfection of the number 10 and its relation to the planets and the universe
- Pythagorean Cosmology
 - Had the view that the earth rotated around a central fire, a belief also attributed to Pythagoras. It is unclear, however, whether this was scientific astronomy or symbolic speculation
 - The Pythagorean cosmology tells us how the first ten integers came to be constructed as a fundamental part of the cosmic order.
 - Limiting (odd) and Unlimited (even) numbers make up the cosmos.

Pythagorean Philosophy Before Plato (cont'd.)

- Ancient practice of representing positive integers by dots or strokes. The figure used by the Pythagoreans was the *tetraktys*, an equilateral triangle where there are 4 dots on each side.
 - Complete symbol for the musical numerical order of the cosmos - represents numerical ratios: 2:1, 3:2, 4:3.
 - It is present among the *akousmata* and is a representation of cosmic music and probably goes back to the earliest stratum of Pythagorean tradition.
- Pythagorean theorem probably known well before Pythagoras
 - For example, 3-4-5 is a triplet known to the Babylonians, useful for carpenters – this is a convenient device for constructing right angles
 - It is probably Pythagoras' mythical status that is the reason that he is represented as the source of everything essential in philosophy and mathematics
- Importance of certain numbers
 - 5: signifies the marriage of limiting (odd) and unlimited (even) principles
 - 7 and 10
- Heraclitus, who lived just one generation after Pythagoras, was familiar with connections between numerical proportion, musical resonances, and the cosmic order and probably go back to the master himself.

Pythagorean Philosophy: Archytas and Plato

- Plato's *Timaeus* and general conception of mathematics is probably heavily indebted to Archytas
 - Earliest known solution of the duplication of the cube or the “Delian problem”
 - Archytas of Tarentum lived in the time of Plato and was an outstanding scientist and mathematician, known for studying mathematical harmonics and being a pioneer in solid geometry
- Plato alluded to “the ancients, the superiors, who dwelt nearer to the gods, who passed on their knowledge to us
- According to the ancient teaching, the soul learned everything in a previous existence and our learning in life is really recollection. Plato transformed this magical notion into an epistemology of innate ideas and a priori knowledge.
 - There is a prenatal acquaintance with eternal forms in Plato
 - Plato also discusses the idea that the rewards and punishments of the transmigrating soul are an incentive for the practice of virtue – *homoiosis theoi*, the imitation of God

Plato, Mathematics, and Number

- Mathematics as the key to knowledge gets complex treatment in Plato.
 - Mathematics is preliminary to dialectic, designed to turn the mind from the realm of visible change to the universe of unchanging being and forms.
 - Arithmetic, geometry, astronomy, and music are the sister sciences which lead us to the world of dialectic and incorporeal form.
- Doctrine of first principles, The One and the Dyad. Other numerical principles are generated from these first principles – where all things come from, either from unity or indefinite plurality –
 - The One and the Many
 - Limit and Unlimited
- The idea that the mathematical order of nature is the work of a creator God anticipates the work of Kepler and Newton, that “God geometrizes.”
- Start to see the idea that the Pythagorean tradition is a kind of channel to the wisdom of the Gods, first hints of Pythagoras with legendary semi-divine presence.

The New Pythagorean Philosophy in the Early Academy

- How did Pythagoras become a late Platonist?
 - Continued interest in Pythagoras in the philosophic schools around Aristotle and Plato
 - Speusippus is said to have replaced the Platonic forms with numbers and mathematical objects, attributing these principles to the ancients
 - Wrote a book *On Pythagorean Numbers* devoted to the glories of the decad
 - The five platonic solids were discussed and assigned to the cosmic elements
 - The point is that the myth of Pythagoras as an archetypical Platonic philosopher was born during Plato's lifetime.
- Aristotle attributed a table of ten opposites in *Metaphysics* to Pythagoras
 - Limit / Unlimited
 - Odd / Even
 - One / Plurality
 - Right / Left
 - Male / Female
 - At Rest / Moving
 - Straight / Crooked
 - Light / Darkness
 - Good / Bad
 - Square / Oblong
- Plato's follower, Heraclides, was the first to refer to Pythagoras as *philosophos*, or a lover of wisdom.
- Aristoxenus of Tarentum – was one of the first to write a *Life of Pythagoras*.
 - By this time, Pythagoras had become a mythical figure
 - However, this did establish that Plato was commonly viewed as a follower of Pythagoras

The Survival of Pythagoreanism in the Hellenistic Age

- Pythagoras remained influential into the Roman period 300 BCE to 100 BCE.
- He had survived among the Bacchic cults of Italy
- There arose a tradition of the creation of pseudonymous works attributed to Pythagoras
 - Lasted for a millennium
 - Testament to the enduring prestige of the Pythagorean name

The Pythagorean Tradition in Rome

- Continuing Pythagorean influence in Rome and Italy
 - The Pythagorean order was created in Italy, in Magna Graecia.
 - Pythagoras remained in vogue in Rome for 2 centuries
 - A statue of Pythagoras stood in the Roman forum for two centuries
- Evidence of Pythagoras with Roman thinkers (Ennius, Cicero, Nigidius)
 - With Ennius, the figure of Pythagoras was introduced into Latin literature in the great historical epic, the *Annales*.
 - Cicero had distinct Pythagorean sympathies and tells us of a definite Pythagorean ritual community in Rome (also Nigidius, and Varro)
 - Nigidius
 - Theological work connecting Roman religious tradition with Greek myth, Etruscan ritual, ideas from the orient, and astrology
 - Cicero also refers to a Pythagorean custom of taking stock of one's own moral improvement each day.
 - In *De Senectute*, Cicero referred to this practice which was recognized as Pythagorean
 - Pythagoras is associated with a tradition of moral consciousness, inwardness, and self-criticism

The Neopythagorean Philosophers

- Defined as those thinkers in the Platonic tradition who derived Plato's philosophy from Pythagoras –
- Eudorus
 - These people prepare the way for Neoplatonism
 - Socrates and Plato agree with Pythagoras in that the telos is *homoiosis theoi* is only possible by means of wisdom
 - The point is that in the Roman period, the name Pythagoras became a code word for the tradition of transcendental Platonism
 - Eudorus articulates a philosophy based on the conception of a Supreme One, located above the dualism of Monad and Dyad, the source of everything else
 - A proponent of transcendental monism that leads the system of Plotinus in which the divine One occupies the highest position

Philo of Alexandria

- Made use of Greek philosophy and Greek allegorical technique of finding moral and cosmological doctrine in Homer to provide a systematic reading of the Hebrew Bible, giving the Bible a secure place in the Greek intellectual world
- Example Alexandrian Platonism in the first century AD (50BC to 50 AD)
- Philo, like Eudorus, attributes Plato's transcendental tendency as inherited from Pythagoras
- Philo discusses musical ratios, numerology, God as unnameable and unspeakable. What we know of God is his *logos*. Just as the forms are conceived of as ideas in the mind of God.
- The demiurge, the creator of our world, is removed from the One unknowable god.
- Incorporeal essences of number make possible the creation of the physical world and our understanding of it.

Emergence of Neopythagoreanism (cont'd.)

- Moderatus – 1st century – sophisticated reinterpretation of Pythagorean number theory – mysteries of numerology are hints of the principles of cosmic order
 - The One is above Being
 - Matter is a form of not-being, whose primary form is quantity. Therefore quantity is a formal expression of Not-Being
 - Negative view of matter is less Gnostic than Neopythagorean
 - Establishment of the One above the Forms in Moderatus anticipates the hierarchical system of an intelligible cosmos later found in Plotinus
- Nichomachus – 2nd century AD – Introduction to Arithmetic and Handbook of Harmonics
 - Influential writer on arithmetic, music, and theological numerology
 - More interested in the mystical rather than the mathematical side of numbers
 - Harmonics preserves the notion of the motion of celestial spheres in terms of musical numbers (which work will be continued in Ptolemy and Kepler)
 - Quotes Timaeus for distinction between unchanging noetic being and corporeal being
 - The divine intellect (the nous) creates the universe according to pre-existent patterns
 - Reinterprets gods of Pagan polytheism in terms of numbers

Emergence of Neopythagoreanism (cont'd.)

- Numenius- 2nd century
 - Belief in the profound wisdom of earlier ages
 - Monad / Dyad
 - “The Good” is achieved by removing one from the things of sense and devoting oneself enthusiastically to learning sciences and studying numbers, to attain a knowledge of what is Being
 - Doctrine of three gods
 - Reinterprets Plato’s *Timaeus* and the role of the demiurge or worldmaker – (Plato says the transcendental forms are the model for the demiurge’s creation)
 - The first God is removed from creation, idle, apart. Below the 2nd and 3rd gods are the intelligible world and matter
 - Anticipates Plotinus’ *Nous* that both looks up to the One but also looks down towards matter –
 - Implies that human souls are parts of the cosmic Intellect
 - The being that possesses knowledge from the first God is the soul
 - The human soul is made from the same mixture of Forms as the cosmic soul – the nous comes to us from the highest god
 - There is a good human soul and a bad human soul because the independence of matter sets limits to how good the cosmic product can be
 - After Numenius, the Neopythagorean tradition is fully absorbed into Neoplatonism (Porphyry, Iamblichus, and Plotinus)

The Pythagorean Heritage

- Beyond Philosophy, Pythagoras had impact in 3 other areas:
 - Occult and supernatural
 - Transmigration and vegetarianism
 - Mathematical and musical traditions
- 2nd Century interest in sages in the domain of religion and the occult continues – There is a rising tide of irrationalism that is characteristic of Roman society at the end of the second century AD –
- Apollonius of Tyana and Alexander of Abonuteichos are examples of *sophoi* sages; they are not philosophers. But they show the continuing influence of Pythagorean, although in a diluted form into the 2nd century AD.
 - Widespread reverence for Apollonius of Tyana (who lived in 2nd half of the first century)
 - Preached transmigration, benevolent deeds, abstinence from meat, wine, and sex
 - Seen as having divine nature and performing supernatural feats
 - Ascetic lifestyle releases the soul from the prison of the body
 - Continues to use a conception of a transcendent god that is one and separate from all things

The Pythagorean Heritage

Transmigration and Vegetarianism

- Ovid includes a Pythagoras figure in his great poem, *The Metamorphoses*
 - The belief in transmigration disappears with Christianity and its more individual conception of salvation and personal survival.
 - The vegetarianism continued to attract attention – this theme predominates in Ovid's presentation of Pythagoras
 - Vegetarianism had become quite fashionable in Roman circles in the first century AD.
 - Some were out of respect for animal life
 - Others focused on the ascetic discipline for spiritual purposes (Apollonius)
 - Xenocrates – don't contaminate humans with the meat from irrational animal beasts.
- The point is that some Neoplatonists (such as Porphyry) were influenced by The Phaedo which supported spiritual disciplines to purify and reach moral excellence. Abstinence from meat is part of a purification.
- With the rise of the Neoplatonist Iamblichus, however, transmigration and vegetarianism tend to disappear from the Neoplatonic tradition.

Mathematics, Music, and Astronomy

- These ideas from the Pythagorean-Platonic tradition continue on, influenced more by the *Timaeus* than the *Phaedo*
- The Pythagorean, Nicomachus's work *Introduction to Arithmetic* continued to be part of the educational curriculum, even into the Latin middle ages and into the Renaissance in the works of Augustine and Boethus.
- Augustine was very fond of the allegorical interpretation of Biblical numbers by reference to Pythagorean ideas.
- Music and harmonics continued to be of interest, particularly in the work of Ptolemy in the 2nd century AD.
 - Discussed the psychological consequences of harmonic theory
 - How mathematics and music apply to the zodiac and planetary motions

Influence on Modern Science

– Influence on Copernicus

- Copernicus repeatedly invoked Pythagorean antecedents for his theory of the earth's motion and his heliocentric view of the universe –
- his secrecy and reluctance to publish his ideas, he felt, was also justified by Pythagorean precedent –
- sympathy for Pythagorean secrecy

– Johannes Kepler

- Kepler's god, like Plato's demiurge who builds the world out of number series and geometric shapes, Kepler's God is also a geometer
- The archetype for creation in the mind of God must be mathematical in form.
- Explains the planets in terms of the five Platonic solids
- Wrote Harmonics of the World – the notion of cosmic music
- Cosmic harmony was at the center of Kepler's 3 laws, including his discovery of the elliptical orbit of the planets
- Kepler can be said to be the last Pythagorean in that Newton's principle of gravitation depended not just on the motions of the planets being guided by numbers or geometry but involving physical forces.

– Modern Science

- Einstein – scientist depends upon logical simplicity and in that sense is a Platonist or Pythagorean
- Whitehead – the importance of mathematics in the formation of science