

STUDENT PROJECT
ON
PYTHAGORAS AND THEANO

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PYTHAGORAS AND THEANO



Project about the man, the mysteries about him and what he has contributed

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Introduction:

We chose to work with Pythagoras because we had heard about his school and his strange community. We wanted to know more about this strange and mysterious man.

And we have indeed found a lot of information! We had no idea when we started that there are so many words written about numbers... Our problem has not been only the extent of the info, but also that some of it gives different facts. Was Pythagoras born in 580 BC or 569 BC? Did he get killed when his school burnt down or as an old man in the northern Italy? We have written what we believe is closest to the truth. These details don't really matter. The most important is what he did for the history of mathematics.

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Pythagoras' life

One day about 580 BC the great Greek philosopher and mathematician Pythagoras was born on the isle of Samos. Here he spent his childhood - and he is now known as "the Samian". He was the son of Mnesarchus, and grew up in a moderately wealthy family. (Though other accounts says he was born a son of the god Apollo...)

Once when he was in Egypt, the great mathematician Thales recommended him to study there to enlarge his knowledge. On the way back to Samos, Pythagoras travelled to Lebanon. There he studies in the temples of Tyre, Sidon and Byblos for about 3 years, after being initiated into the Ancient Mysteries of the Phoenicians. Afterwards he did as Thales had recommended him, and studied for 22 years in Egypt.

When he tried to return back to Greece, he was for some reason captured - which made him study in Babylon for another 13 years.

At the age of 50, he finally got home to Samos. Then he found that the island was subdued under the tyrannical yoke of Polycrates. Despite of him being there, Pythagoras tried to found a school there. But he failed, and decided to leave and go to Crotona, in Southern Italy instead.

There he succeeded with establishing a famous school of philosophy, mathematics and natural science. Later on he married one of the female pupils there, and together they got at least two daughters.

Around 500 BC the school was attacked and burned down. It is yet uncertain whether Pythagoras was killed then, or if he died later.

His way of thinking and being

His way of thinking seems to be influenced by the East.

I.e., he believed that one's soul was going to be reincarnated. That is also what the Hindu religion tells as the truth. Pythagoras himself said that he had once before lived as a warrior in the Troja-war.

Also he believed that animals have got a soul.

He was a vegetarian, and he also refused to eat beans, as he thought human-souls were in them. Another thing he refused was to eat bread unless it was cut in a certain way.

His way of dressing was rather unusual for the time. He wore a gold diadem, a sweeping white robe and trousers, which was not common.

Of his work, nothing is left. All we know about what he found out is second-hand. That is why no one can be sure if the discoveries from his school came from him or from his students.

The Pythagoreanism

When Pythagoras settled in Crotona in 530 BC, he established his famous school -said to be the creator of mathematics as a science. This movement of his, known as the Pythagoreans, was almost like a religion where the numbers were regarded as gods.

This secret society was not a 'brotherhood', but a community of families. (Some believe that it later became the model of Plato's ideal society.) Everything was passed on by word of mouth; written accounts were forbidden. All Pythagoreans were under oath not to speak about their sacred knowledge. It is known that one of the men once told someone from the outside that the number of $\sqrt{3}$ can't really be told. He was killed.

The community was authoritarian and ultra-conservative, but they accepted women as equals on all terms. At least 28 of the students were female. It is also known that when Pythagoras died, his wife Teano (who had been a teacher at the school) ran the school together with her two daughters.

All property was held in common. The Pythagoreans' lives were led ascetic, and they were all vegetarians. They dressed simple, and it was important to examine your inner self frequently. The leaders were expected to live in celibacy and devote all of their time to numbers.

The Pythagoreans are known for the Pythagorean Theorem*, their knowledge about strings and harmony in music, the prime numbers*, the golden ratio* and they knew a lot about astrology*. (-This does not necessarily mean that they were *the first* to think all of this!)

* See other part of the project for more information about these subjects.

The Pythagoreans believed in five basic ideas:

1. The university was created, and continues to exist on the basis of a *divine plan*. The ultimate reality is not material but spiritual; it consists of the ideas of number and form.
1. The human souls are spiritual entities; a self-moving number which passes from body to body. *All souls are eternal*.
2. There is an inner harmony and order in the universe, resulting from the *union of opposites*.
3. *Friendship and modesty* are most important in human relations.
4. *The divine ideas*, which created and maintain the universe, *are those of numbers*.

The last principle was the most important one, and sprung from the Pythagoreans experiences with possibility to explain music (how the harmonies are related to the length of the strings) and astrology from numbers.

As the Pythagoreans' recognition increased politically, so did their enemies. There were several attacks at the school, as the dissatisfaction among the 'outsiders' grew stronger. Then, around 500 BC the enemies of the school put it on fire, and killed many of the Pythagoreans. Some of them managed to escape, and even though they did not have a school any more, the Pythagoreans continued to exist as a group until 400 BC.

The Pythagoreans' special numbers

1

The number *one* was very special to the Pythagoreans. It was the first number to be created, and they considered it much more than a number. Like Adam in the Old Testament, the number one was created in the image of God. This number had divine qualities; it was a symbol of unity, wholeness and priority.

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2

Two was the first of the even numbers, which were considered as the 'male numbers'. This was a special number too, but it didn't have as many divine qualities as number one.

Tetraktos

The fact that the sum of the four first numbers is ten (1+2+3+4) meant something special to the Pythagoreans. In Greek they called this sum *teatraktos*, and this was one of the innermost secrets of the group.

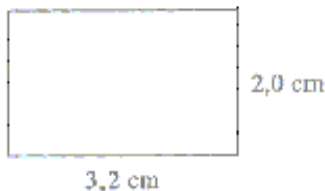
Perfect numbers

They also operated with so-called *perfect numbers*. A perfect number is a number whose factors sum up to the number itself. (6: 1+2+3) Between one and 10,000 there are only four of these; 6, 28, 496 and 8,128. The Pythagoreans compared this to humans: very few are perfect, good and beautiful. But imperfection in numbers is common, just like evil and ugliness in people.

The Golden Ratio

$$(\sqrt{5} + 1) / 2 = 1.618$$

If you divide the longest side of a square with the short side of the square and get ca.1.618 the square has a Golden Ratio. Here is an example:



If you divide 3.2 cm with 2.0 cm you get 1.618. Therefore the square is considered as a pretty one.

Most people find things with a golden ratio beautiful. If you divide your height with the height from your feet to your bellybutton and get 1.618, you're "perfect". You'll also find the golden ratio in snails houses and in different other subjects in the nature.

Division of numbers

The division of numbers started with *even* ('male', who can be divided by two) or *odd* ('female', not dividable by two) numbers. Then the numbers were separated into *even-odd* numbers (dividable by two only once), *even-even* numbers (can be divided by two until one is reached) *odd-even* numbers (can be divided by one several times without ever reaching one) and *odd-odd* numbers (products of two odd numbers). Like this they found out that some numbers can not be reduced by any number but the number itself or one. These are the *prime numbers*.

Even 4 6 8 10 12

Odd 3 5 7 9 11

Even-odd 6 10 14 18 22

Even-even 4 8 16 32 64

Odd-even 12 20 28 36 42

Odd-odd 9 15 21 27 33

Prime numbers 3 5 7 11 13

Astronomy

The Pythagoreans developed some important ideas in Astronomy. They were the first to think that the earth is round. They came to this because they looked at the shadow of the moon during a lunar eclipse.

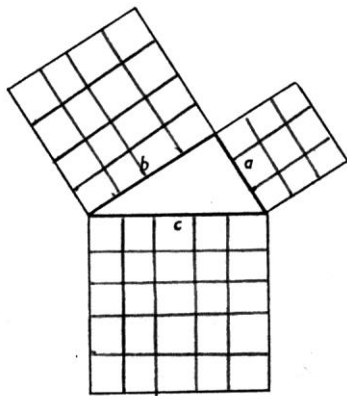
As they knew the earth was round, they used this and math to develop the idea that the sun and the other planets were round too and that they went in circles around a central fire.

Pythagoras was the first to see that Venus as an evening star is the same as Venus as a morning star.

Pythagoras Theorem

The Pythagoras theorem states that the sum of the squares of the lengths of the two adjacent legs of a right triangle is equal to the square of the length of the hypotenuse.

$$a^2 + b^2 = c^2$$



The sum of square C is equal to the sum of square A and B. ($25 = 9 + 16$)

The Egyptian surveyors, the Chinese and Babylonians knew this rule already about 2000 BC, but they couldn't prove it. The first people we know proved it is the Pythagoreans, it might have been Pythagoras himself. Thereby they raised the rule to the status of a theorem.

The theorem is important to the evolution of the Greek concept of number and the proof demonstrates how the Greeks used such proofs.

Pythagoras theorem can also be used for triangles that aren't right. Then it goes:

$$c^2 = a^2 + b^2 - 2ab$$

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Conclusion & Source list

It was interesting for us to work with the person and the stories *behind* the numbers for once.

Mathematics is more than numbers!

Source List

Books:

- Problems in paradise- numbers according to Pythagoras

John McLeish

- The story of numbers

Carl B. Boyer

- A history of Mathematics

Jamie H. Eves

- An introduction to the history of mathematics with cultural connections

Jan K. Sanander

- Alt er tall- Innføring i matematikk for barn

Encyclopaedia

- Aschehoug & Gyldendals leksikon
- Britannica
- Kunnskapsforlagets matematikk leksikon

Internet

- [www.geocities.com/Cape Canaveral/Haugar/3736/pytagora.htm](http://www.geocities.com/CapeCanaveral/Haugar/3736/pytagora.htm)
- homepage of Seth Yoshioka-Maxwell
- and other different pages

Theano of Crotona

Theano of Crotona was the wife of Pythagoras, and an equal to him intellectually. She lived during the 6th century BC, in Greece. Theano began as a student to Pythagoras and then later married him.

Theano and Pythagoras created a school which taught astronomy, music, mathematics and philosophy. These were considered to be important topics for men AND women to understand and expand. Theano and her three daughters, Arignote, Myia, and Damo, were all well known philosophers.

Pythagoras' work is still well known today. He created the pythagorean theorem and worked with right triangles. His wife was instrumental in much of this work. They also worked together on the "Golden Mean", a basis of Algebra.

When Pythagoras passed away, Theano took over the director post at the school.

Theano (mathematician)

From Wikipedia, the free encyclopedia

Jump to: [navigation](#), [search](#)

Theano (last part of the 6th century BCE) was one of the few women in ancient [mathematics](#) and is also thought to have been a physician.

[\[edit\]](#) Life and work

The best known interpretation of her life is that her father Pythonax of Crete (an Orphic philosopher and physician) was a great supporter of [Pythagoras](#). She was first a student of Pythagoras, and supposedly became his wife. It is often said that she and her two daughters took over the Pythagorean school after his death. In other traditions she is said to be the daughter of [Brontinus](#) - Pythagoras successor, or the daughter of Pythagoras and wife of Brontinus.

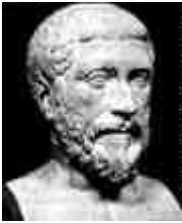
In the Greek school of philosophy run by Pythagoras there were many women who joined in as teachers and scholars. Those in his school lived in a communal manner and published all their writings under the name of Pythagoras. Today, then, it is difficult to determine who actually did which work.

No writings of Theano are extant, although [apocryphal literature](#) written in her name does exist. McLemore writes that her most important work was related to the principle of the [Golden Mean](#).

[\[edit\]](#) References

- Ogilvie, Marilyn Bailey (1986). *Women in Science*. The MIT Press. [ISBN 026215031X](#)
- [Encyclopaedia of World Biography Entry](#)
- McLemore, Ethel W. "Past Present (we) - Present future (you)," Association for Women in Mathematics Newsletter, 9(6) (Nov/Dec 1979), 11-15.

The Life of Pythagoras



Pythagoras of Samos was one of the greatest mathematicians and philosophers of all time. Apart from his many contributions in those fields, he was highly unusual amongst the great prophets of history for being an accomplished musician. He played the kithara, an ancient form of the guitar, and often sang as he played. He is reputed to have been able to soothe both animals and people when he did and should rightly be regarded as the founder of music therapy.

There are four principle sources from antiquity regarding the life of Pythagoras:



Porphyry (233-c.305)

Iamblichus (c.250-c.325)

Diogenes Laertius (fl. 3rd Century)

Anonymous work preserved by **Photius** (c.820-889)

This outline of the life of Pythagoras draws on all of these sources. Iamblichus gives the most complete account. There are also numerous other references to the famous philosopher and his teachings in the great books of classical antiquity.

The name Pythagoras comes from: "pithia", Apollo's temple, and, "agoras", the [people's] place.

One line of thought gives to Pythagoras the task of bringing Apollonian wisdom to the people.

Pythagoras was born in Samos in about 580 B.C.E. The city was an important commercial centre of perhaps 200,000 people and a focus of panhellenic religious festivals. His father, Mnesarchus, was reputedly a merchant who originally came from the Phoenician city of Tyre, while his mother was Pythais and she was a native of Samos.

Diogenes Laertius mentions, however, that Mnesarchus was a gem cutter, and in light of the concomitant knowledge of metallurgy and other secrets not available to most, it seems not improbable that such was the background of Pythagoras.

There are many legends concerning auspicious signs and early indications of divinity, claims that even ancient authors are usually wary of, while admitting that the soul of Pythagoras was from the domain of Apollo, with whose oracle at Delphi his wisdom would ever after be associated. As a child Pythagoras spent his early years in Samos but travelled widely with his father. There are accounts of Mnesarchus returning to Tyre with Pythagoras and that he was taught there by the Chaldaeans and the learned men of Syria. It seems that he also visited Italy with his father.

The most important of his teachers was Pherekydes the Syrian. In his later youth Pythagoras spent time in Miletus, a Greek city on the coast of Asia Minor which can be regarded as the epicentre of Hellenic science, where he was very much influenced by two prominent philosophers there, Anaximander and Thales.

Iamblichus has left us the most complete account of the biographical details of Pythagoras' life. According to his account the sage sailed away from Samos when he was still young and first landed in Phoenicia at Sidon. He spent time there and at Byblos and Tyre as well, where he consulted with the descendents of the great physiologist Moschus and attended the mysteries and rites observed there. Iamblichus is quick to point out that although he was fascinated by their rituals, he had no interest in mere superstition, but simply took in whatever learning anyone had to offer, and upon seeing that Phoenician learning derived so much from Egypt he determined, after a sojourn at Mount Carmel, to continue his journey there.

By about 535 B.C.E. Pythagoras was in Egypt and Iamblichus claims that he spent twenty-two years there by the end of which time he had visited every place where he might have learned something and consulted with virtually every important figure in that country. Virtually all authors agree that he met the Amasis (Ahmose III), the same pharaoh who Herodotus credits with giving Naukratis to the Greeks as a trading station

near the dynastic capital at Sais, though Greek merchants and mercenaries had been active in the country for some time.

He frequented many of the temples and taking an active part in discussions with the priests there. According to Porphyry, however, Pythagoras was given a letter of referral by pharaoh and then shuttled around to all the important temples and consistently refused admission until he finally ended up at the one with the most venerable and honoured traditions of them all, that at Diospolis (i.e., Thebes) where he was accepted into the priesthood of that most ancient and respected centre of hermetic practice after completing the necessary rites, the first foreigner ever to do so. There seems to be no question that many of his beliefs, especially those concerning the morality of eating animal flesh, were a result of his experiences there. Perhaps the exchange of ideas between Egyptians and Greeks was not considered to be entirely one-way, though, since Amasis underwrote the rebuilding of the Temple of Apollo at Delphi after a disastrous fire destroyed it in 548 B.C.E.

In 525 B.C.E. Cambyses II, King of Persia, invaded Egypt. Polycrates, ruler of Samos and probably at least partially responsible for getting Pythagoras to Egypt in the first place, abandoned his alliance with that country and sent 40 ships to join the Persian fleet against the Egyptians. After Cambyses had won the Battle of Pelusium in the Nile Delta and had captured Heliopolis and Memphis, Egyptian resistance collapsed. In fact it is interesting to note that with the exception of a brief resurgence of native rule Egyptians did not serve as leaders in that country for some twenty-five centuries when in our own time, Egypt once again became an independent country.

Pythagoras was taken prisoner and carried off to Babylon. Babylon was certainly the largest and most sophisticated city in that part of the world in those days and it is likely that he partook in discussions with the magi there, whose knowledge of astronomy, for example was the most advanced anywhere. There is no indication from our sources how Pythagoras won his freedom again, but by 520 B.C.E. he was back in Samos, which by this time was also under Persian control. The political affairs of his native city were not conducive to philosophy so in less than two years he left for the Greek colony of Croton

(now Crotone, on the heel of southern Italy) where he was received enthusiastically and formed a philosophical school that soon had many followers.

Pythagoras was the head of the society with an inner circle of followers known as the *mathematikoi* (Students). The *mathematikoi* lived permanently with the Society, had no personal possessions and were vegetarians. They were taught by Pythagoras himself and obeyed strict rules and were bound by secrecy not to reveal sensitive information that could be misinterpreted without proper training and might compromise the Society. Both men and women were permitted to become members of the Society, in fact several women Pythagoreans later became famous philosophers and it is perhaps appropriate to mention here that one of them was the wife of Pythagoras, Theano. The outer circle of the Society were known as the *akousmatics* (Hearers) and they lived in their own houses, only coming to the Society during the day. They were allowed their own possessions and were not required to be vegetarians.

The secrecy of the Society and over twenty-five centuries that separate us from his time make it difficult to establish Pythagorean thought with absolute certainty. We can, however, state with confidence that the main beliefs that Pythagoras held were:

- That reality is, at its deepest level, mathematical in nature. Divinity and order is revealed through the study of numbers and harmonious relationships.
- That the soul is an eternal, self-moving number which passes from body to body through metempsychosis, or transmigration.
- That after spiritual purification the soul will dispense with reincarnation and eventually unite with the Divine.

In ancient times there were in supplementary beliefs connected with the above:

1) That certain symbols, the Tetraktys in particular, have a mystical significance connected to the mathematical and musical relationships found in the throughout the kosmos.

2) That abstention from wrong-doing in this life will help to purge the soul of its bodily accretions and improve its prospects of a final disembodied existence.

Mathematics is regarded as the single most fundamental and important area of study for Pythagoreans and the society made many important contributions to this science. As great as his contributions to mathematics may have been, however, it is as a philosopher that we most revere Pythagoras.

Pythagoras lived in Croton until his death at the age of around 100 years, leaving Italy only once in 513 B.C.E. to nurse his old friend and teacher Pherekydes who died in Delos.

The Pythagorean Society remained active for about fifty years. After a time, however, the sect incurred envy amongst some. Porphyry says that Cylon, an aristocratic Crotonian, incited the populace against the Pythagoreans after he was refused admission. In the end it was violently suppressed, its members killed or exiled. Pythagoras himself was refused refuge at nearby Tarentum and fled to the temple of the Muses at Metapontum, where after forty days without food he starved to death. Others say he died of grief from the loss of so many friends.