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Abstract: Background information on Greek philosopher and mathematician Pythagoras is presented. Pythagoras was an ancient Greek philosopher famed for his mathematical knowledge and mystical philosophy. The article discusses how Pythagoras founded a number of quasi-religious societies throughout the ancient world that were dedicated to philosophy. Information on Pythagoras' early life, education, and career development is reviewed.

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Pythagoras

Background

Pythagoras was an ancient Greek philosopher famed for his mathematical knowledge and mystical philosophy. He was born around 570 BCE and died around 490 BCE. These dates place him more than a century before Socrates and Plato.

Pythagoras was born on the island of Samos, where he spent his early life. Samos lies just off the coast of what is now Turkey. Interestingly, this island was near Miletus, a major Ionian colony. Ionia was home to many of the earliest Greek philosophers, and is famous for being the birthplace of Greek philosophy.

When he was around forty years old, Pythagoras left Samos to escape the increasingly tyrannical rule of its dictator. He traveled to the western part of the Greek world, southern Italy. There, in the town of Croton, he established a community that was part school and part religious group. Over the centuries, many of these Pythagorean communities would be established throughout the ancient world.

The Pythagorean communities followed a strict religious lifestyle, and carried out investigations into math and science. Little is now known of the schools' specific lifestyle and religious teachings. This is due in part to the vow of secrecy taken by members. It is certain that the members considered themselves to be an elite group, perhaps even a ruling class, by virtue of their knowledge and talent.

Members of Pythagorean societies often became involved in the political life of the cities in which they lived. This generated resentment among non-members, and conflicts (sometimes violent) occurred. After one such conflict in Croton, Pythagoras fled the city to nearby Metapontium, also in southern Italy. He set up another community before dying there.

Pythagoras was famous during his lifetime. He was reputed to have traveled widely, and may in fact

have made a trip to Egypt. After his death, many myths and legends were attached to him. He was rumored to have had a thigh made of gold. He was said to have been seen in two different cities at the same day and time, and was believed to have been spoken to by a river he was crossing in a boat. All of this makes it difficult to determine the facts of his life.

Pythagoras is also difficult to study because he wrote nothing that has survived. In fact, there is no evidence he wrote anything that didn't survive. It is possible that, in line with the code of secrecy he instituted among his followers, all of his teachings were communicated orally.

Moreover, no detailed account of Pythagoras comes to us from his contemporaries. All the accounts we have are from later writers. A few centuries after his death, a number of forgeries were written in his name, making matters even worse.

The confusion surrounding his life is made worse by the fact that Pythagoras set up communities of followers that continued to work long after his death. Many of the teachings of these followers have been misattributed to Pythagoras himself. So when we speak of Pythagoras, it must be kept in mind that we are speaking of the larger philosophical tradition he founded, and not necessarily the man himself.

Mathematical Philosophy

The most famous accomplishment attributed to Pythagoras is the one which was named after him: the Pythagorean theorem. Traditionally, Pythagoras is credited with having discovered, and then proved, that the sum of the squares of the lengths of the two shorter sides of a right triangle is equal to the square of the length of the longer side (hypotenuse) of the triangle.

In its most common form, the theorem says: $a^2 + b^2 = c^2$, where a and b are the lengths of the legs of the triangle (the sides that form the right angle) and c is the length of the hypotenuse (the side opposite the right angle).

The best historical research indicates that this is too much credit to give to one man. Pythagoras probably did not provide a formal proof of the theorem. Aside from a proof, the theorem's simple mathematical truth was known before Pythagoras' time in other cultures. So in all likelihood, while Pythagoras or later Pythagoreans may have known of this theorem, they did not discover it. It is more likely a case of it being attributed to him by later generations.

Scholars are on firmer ground with the next philosophical claim that Pythagoras made. It is quite likely that he did in fact teach, as history records, that the world is basically mathematical.

Pythagoras is said to have claimed that everything is numbers. What he meant by that is a little more complicated than it seems. Pythagoras was referring to ratios and numerical relationships. Numbers were understood geometrically, as points arranged in patterns. The number four, for example, was expressed as two rows of two points each, forming a square. Three was expressed as a triangle of three points, one in the top row and two underneath.

Pythagoras believed that such relationships underlay everything in the world. Indeed, the research Pythagoreans carried out in astronomy, music, and other fields was mathematical in nature. Astronomy could be understood mathematically by focusing on measurements and their ratios to determine the size, speed, and distance of the heavenly bodies.

In music, Pythagoras and his followers made one of their more famous discoveries: that the notes produced by certain instruments are related to one another mathematically. Certain important notes produced by plucking a string, for example, are influenced by the length of the string. Perfect consonances on the musical scale (intervals called the fourth, the fifth, and the octave) can be expressed as ratios. An octave, for example, is a ratio of 2 to 1, in terms of string length.

These mathematical patterns were taken to be the foundation of music. What was true of music was projected to be true of everything else in the world, that ultimately, everything could be reduced to numbers and ratios.

Pythagoras and his followers saw a mathematical "harmony" behind all these natural phenomena. This harmony was paralleled in the body and in the soul. They considered medicine to be the art of restoring harmony in the body between different tendencies and extremes. In dealing with the soul,

they taught skills and values designed to promote temperance and self-control, in order to create and preserve a balance between different passions.

Pythagoreans also saw numbers behind social phenomena, although these ideas are less clear to us. Justice, for example, was related to the number four, which was the square number. In some way they saw two rows of two dots, forming a square, as an embodiment of balance and harmony.

While the Pythagoreans may have gone more than a little beyond the available evidence in their thought, they did make a key insight. Today's physicists still describe the physical world with numbers and equations.

Religious Teachings

In terms of religious teachings, Pythagoreanism was similar in many respects to the philosophical teachings of Eastern traditions. The teachings focused on ritual, diet, and personal behavior. In some way, all of these were related to Pythagoras' theory of the soul.

Pythagoras taught reincarnation, the movement of the soul into another living body after the death of the current body. He believed the soul was indestructible, and that after death it passes into the body of another man or animal, and may even go to join the gods. This was possible, he thought, because every soul is made of the same material. That is, "life" is the same in gods, men, and animals.

Depending upon how well it achieved harmony in life, the soul moved up or down the scale of beings in the next life. When a soul achieved divinity, it could escape the cycle and go to live with the gods. Pythagoras and his followers taught ideas and practices intended to improve the soul as it journeyed across its various lives.

In terms of ritual, sacrifices played a large part in the religion of the Pythagoreans. Other rules pertained to appearance and dress.

On the personal level, Pythagoreans valued silence, secrecy, and friendship. Members were supposed to be exceptionally silent, at least outside the community. Some reports claim that new members were required to maintain a silence for years. Secrecy about the teachings and activities of the society was required, and a great value was placed on personal friendship between community members.

Diet was clearly of great importance to the Pythagoreans, although the specifics are not nearly as clear. Some sources claim they were vegetarians; others say that only some meats were forbidden. Beans were also controversial. Some sources claim they were forbidden; others say that eating beans was promoted. These rules may have changed over time and in different locations.

Pythagoras also taught a version of the "eternal return," the belief that everything that happens has happened before and will happen again. Time is not viewed as a line that moves from the beginning to the end, but as a circle, without beginning or end. Parallels to certain Eastern philosophies are obvious. But a more immediate influence may have been Egyptian thought, which seems to have had a similar notion.

Finally, we can note that the Pythagoreans granted women an unusual (for that time and place) amount of respect. They taught that wives must be treated well. Some Pythagorean women even became famous themselves and were written about by later writers. This was highly unusual in ancient Greece.

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By Ed Downey

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