The Life and Times of Pythagoras

By

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On the 2nd of March, 1972 a keen-eyed observer standing on Ganymede, one of the twelve moons of the planet Jupiter, and gazing through a powerful telescope at planet Earth might have noticed a flash of light not far from the equator. Closer inspection would have revealed a small spaceship, no bigger than a Mini-Minor, accelerating through the Earth's atmosphere then turning and setting a course for Jupiter, a hazardous journey a billion kilometers long.

That journey certainly wasn't dull. Nearly every day the spaceship was struck by a meteorite and on July the 16th it entered a huge belt of asteroids, 300 million kilometers long. It sailed through these rocks like Captain Cook sailing through the Great Barrier Reef and emerged intact in 1973. Ten months later, as it approached its target, our keen-eyed observer would have seen it up in the sky and for a moment thought it was the 13th moon of Jupiter.

But Pioneer 10 wasn't just a temporary moon. It was busy transmitting colour pictures and information back to earth, which was the purpose of its travel. As that December day wore on and the transmissions were completed, the intense gravitational field of the largest planet accelerated Pioneer 10 like a stone whirled around on a piece of string and hurled it away, out of our solar system forever.

The spaceship's navigators who planned all this had also, just like children who cork up a message inside a bottle and cast it out to sea, engraved a message on the outside of the craft showing a man and a woman and some scientific data about our planet for anyone or anything out there who may be able to read it. It was the first man-made object to leave our solar system. It will outlast our puny works here on earth by millions of years and unless it makes an unlikely collision or is picked up by some intelligent beings, it will go on, beautifully preserved in a near perfect vacuum, sailing through the silent museum of space.

Whether we see this as a triumph for humanity, building its own 'Chariots of the Gods' or as a megalomaniac activity run by naïve technocrats oblivious to the pressing problems of humanity, it was still a very stupendous feat of navigation. Such navigation draws on so many fields and involves so many people that its success is a measure more of the power of human society than of the abstraction we choose to call science.

It embodies whole kingdoms of metallurgy, materials of technology, of instrumentation and control systems, of electronics and communications, of television and computing and very sophisticated optics. And these are all put together by a huge team of human beings: The New Navigators.

It seems a far cry from the ancient days of dead reckoning when a sailor steered by the stars, or later used a magnetic compass and a chronometer or still later radio aids such as radar, satellites and GPS. But it was the social importance of navigation that led to the scientific developments of navigational instruments and techniques.

There is a persistent myth that the first sailors who put to sea in boats got along by hugging the shore. On a strange coastline that was a sure recipe for going on the rocks and that particular myth reflects an ignorance of the ways in which early sailors navigated.

The Book of Genesis, in the story of the flood, tells how Noah stood on the deck of the ark and released first a raven and later a dove. What was he doing? He was simply carrying out a normal piece of navigation practice. Carrying a cage of land-sighting birds aboard a ship used to be a standard procedure. A bird rising to height of 200 meters could see a cliff over 60 kilometers away whilst an observer in a boat would not see it until it was within 15 kilometers.

Land-finding birds have long been abandoned in Europe but Pacific island navigators still get around by careful observance of their surroundings and building up a mental map from the observation of birds, the colours of the sea, phosphorescence, cloud and wave formation and, of course, the stars. On his first voyage Captain Cook took with him a Tahitian called Tupya, a man distinguished for his nautical knowledge of the stars for he could use them as a clock. On his later expeditions Cook carried a very accurate clock, the first chronometer designed by Harrison.

Astronomy was pursued by the ancient civilizations in two quite different ways and for two quite different ends. In those days the stars served for time-reckoning by sailors and peasants, whilst the movements of the sun and moon were used by the priests to work out the calendar.

About 4000 years ago came the heyday of the great sea-going civilization of Crete. Great palaces were built there and Cretan ships plied the Mediterranean from end to end. The ruins of the palaces and statues are still there today. There are engravings showing the large ships driven by sails and oars. The kings lived in the palaces; the navigators steered by the stars. But who pulled on the oars? Who really benefited from all this knowledge of the wind and the waves and the stars? Did the citizens of Crete all live in a golden age until a savage succession of earthquakes rocked that whole mysterious island – the home of the Minotaur – and sent the fabled land of Atlantis to the bottom of the sea?

To quote the words of William Blake:

> Who built the seven gates of Thebes? The books are filled with names of kings
> Was it kings who hauled the craggy blocks of stone?
>
> And Babylon, so many times destroyed, who built the city up each time?
>
> In which of Lima's houses, that city glittering with gold, lived those who built it?
>
> In the evenings when the Chinese wall was finished, where did the masons go?
>
> Imperial Rome is full of arches of triumph. Who reared them up? Over whom did the Caesars triumph.
>
> Byzantium lives in song, Were all her dwellings palaces?
>
> And even in Atlantis of the legend the night the sea rushed in, the drowning men still bellowed for their slaves.

After these disasters Cretans migrated eastward from their island, landing in Greece, Ionia and Palestine. They became a threat to the Egyptians who called them the Philistines, the people of the sea.

In this bronze age a nation survived by its ability to sail its fleets for trading and for war. Sea battles were romanticised in legend. Helen of Troy launched her thousand ships but that very same war exhausted the Greeks and the role of dominant sea power was taken over by the Phoenicians; master traders, sailors and navigators.

We might get the impression that Greece now entered on a dark age – over four centuries of obscurity. What this really means is that there were no great calamities, no national disasters, wars or rebellions. In short, no melodrama of the kind loved by authors of old-fashioned history books. Whether the lot of the ordinary Greek during these four centuries was better or worse than before – who can tell? What we can say is that during that period Greece achieved two social developments which were to transform western civilization.

Taken together they form the first link in a chain that extends right up to the launch of Pioneer 10. The first development was the adoption by the Greeks of the Semitic alphabet; they took it from the Phoenician traders and completed it by adding the vowels. The second development was a revolutionary concept and explosive in its effect. It also arose from the operation of trading. It was the invention of coined money. It took place not in mainland Greece but in Ionia, the land that today forms the west coast of Turkey.

We now need to sharpen our focus in time and space. In space, onto a small region of the Ionian coast flanked by the Aegean Sea, down to a large seaport called Miletus and the nearby city of Ephesus. Just offshore lies the island of Samos. The time 600 BC.

Miletus was then a lively crossroads of trade. To the south-east lay Cyprus and Egypt, to the North, the Dardenelles and the Black Sea.

Westwards the mainland of Greece and the island of Crete. The port of Miletus was thronged with the sails of many nations and her warehouses were stocked with goods from all over the known world. With the newly invented money as the universal means of storing value we can perhaps understand how it was that the Milisians were the first to ask the fundamental questions of philosophy and science.

"All things are made of water" – said Thales of Miletus, one of the seven wise men of ancient Greece. Not an unreasonable hypothesis in terms of modern science nor for that matter in the view of someone who lived on that hot and dusty plain and saw the vital role of water both in the ocean and in various forms all around him. "Philosophy" said Bertrand Russell, begins with Thales. Thales was a sort of Leonardo of Ionia: politician, engineer, military man, scientist and philosopher. Travelling through Egypt he became aware of many geometrical ideas, such as the congruence of triangles. But in contrast to the Egyptians he made practical use of this knowledge.

And so it was that the generalisation known as geometry found its way into the problems of navigation.

But Miletus was not the only place where things were happening in the 6th century BC. Enormous changes were taking place in religious and philosophical thinking all over the civilized world. India saw the birth of Buddha and the cult of Zarathustra; China, the rise of Confucius and Lao Tse. And in striking contrast to the materialistic Milesians was the culture appearing just across the water on the island of Samos.

Samos is the birthplace of Pythagoras and this event occurred in or around 581 BC – some sources say 570 BC. The capital of Samos was at one stage known as Pythagorean after Pythagoras. The town itself had a woefully inadequate water supply, which made life difficult in the hot dry summers. The mountains behind the town had a plentiful supply from the storms, which broke over the mountain tops. So a tunnel well over a kilometer long was bored through the mountain. In fact, two tunnels each about three meters wide were bored from opposite sides and with astounding precision met deep within the mountain. In later years when Samos was besieged by an invader, the surrounding army had given up all hope of ever seeing the city surrender. The invaders asked for a hostage while they withdrew their forces. The Samians sent an old and unpopular man who they were rather glad to get rid of anyway. But he was so embittered and so angry about it that after he had been handed over he revealed the secret of the water tunnel. The

besiegers blocked the tunnel and Samos was forced to capitulate. The moral of the story-- 'Do good to them that hate you'.

This wasn't the last time that the Samians had to defend themselves. In 479 BC Samian ships defeated the Persian Navy outside of the harbour and 2303 years later in 1821 they defeated the Turkish navy in exactly the same place.

But the offshore islands and Samos in particular were less materialistic, more mystical than their mainland rival Miletus. For the Melisians philosophy was an intense practical matter. On Samos the school which developed around Pythagoras had ideas more in the tradition of their orphic religion and their philosophers-scientists were bound together by the bonds of shared belief around the figure of Pythagoras. The significance of Pythagoras lies in the way he developed his science in harmony with his religious beliefs. He was, in a word, the founder of pure science; in contrast to Thales and the Ionians who were the founders of applied science.

In his book 'The Sleepwalkers' Arthur Koestler throws Pythagoras into dramatic perspective against the thriving Greek societies of Ionia.

"The 6th century BC scene evokes the image of an orchestra expectantly tuning up; each player absorbed in his own instrument only, deaf to the caterwauling of others. Then there is a dramatic silence. The conductor enters, raps three times with his baton and harmony emerges from the chaos. The maestro is Pythagoras of Samos, whose influence on the ideas and thereby on the destiny of the human race was probably greater than that of any single man in history before or after him. Pythagoras succeeded in putting science and religion together in a way that seems almost unbelievable in our present cynical age. He was the creator, not only of a new religious philosophy, but also of what we now understand as pure science. For him, of course, there was no distinction between the two.

The Pythagorean vision of the world still permeates our thinking, even our very vocabulary. The term philosophy is Pythagorean. The essence and power of that vision lies in its all-embracing unifying character. It unites religion and science, mathematics and music, medicine and cosmology, body, mind and spirit in an inspired and luminous synthesis.

Can we detect here a similarity between Pythagorean thought of the 6th century BC and modern day Freemasonry? We certainly can.

It was music that held the key. Pythagoras discovered that the pitch of a musical note depends on the length of the string which produces it, and that the harmonies of intervals in the musical scale are produced by simple numerical ratios. This discovery was epoch-making and was the first step to mathematization of human experience, and thus it was the beginning of pure science. Anyone who can read music or can play a musical instrument would understand this more fully.

Pythagoras said, "All things are numbers". Thus to understand the world around us we must find the number in things. Once the numerical structure is grasped we have control over all our comprehension. This, indeed, is a profound concept. But surprisingly it was lost sight of for two thousand years. Only recently was the idea revived and it now become a keystone in modern western thought.

As Herodotus put it; "The Pythagoreans explored the beauty of numbers by playing a sort of game". And this is exactly what they did by using pebbles laid out on the ground. Putting pebbles in lines of one, two, three, four and so on they could create all sorts of figures and shapes and a series of right-angled triangles. The numbers 1+2+3+4 = 10 and this was the magical triangular number, the Tetraktys, the

magic number by which the Pythagoreans swore. This eventually linked up with the famous theorem of Pythagoras that the square on the hypotenuse equals the sum of the squares on the other two sides.

Jacob Bronowski in 1973 referred to this theorem as the most important single theorem in the whole of mathematics.

The story runs that when Pythagoras proved his theorem he offered a thousand oxen to the muses in thanks for the inspiration. Nowadays we do not make animal sacrifices but there are countless numbers of schoolchildren who have succeeded in reproducing a proof of this theorem with a similar feeling of relief.

But this diagram, which you see here, has both a modern and an ancient application. In ancient times as well as today it is the jewel, which is suspended from the collar of the immediate past master of every Masonic Lodge. In modern times it was the symbol engraved on the side of Jupiter 10 and which is now hurtling through space billions of miles away.

Pure science in the hands of the Pythagoreans and his brotherhood was no idle phrase. Reacting against the Bacchanalian rites and orgies they aimed at purifying the soul. This would be achieved by contemplating the essence of reality, the harmony of forms, the dance of numbers. Pure science was to be both an intellectual delight and a way of spiritual belief. The function of geometry, said Plutarch, when talking about the Pythagoreans, is to draw us away from the world of the senses and of corruption to the intellect and the eternal.

The Pythagorean concept of harnessing science to the contemplation of the eternal entered via Plato and Aristotle into the spirit of Christianity and played a big part in the making of the western world.

Harmony was the basic Pythagorean concept. Their view of the heavens was a harmony of the spheres: Sun, moon and planets revolve in circular orbits, each on the surface of a different sphere. The swift revolution of each of these causes a musical hum in the air. Evidently each planet will hum at a different pitch, depending on the size of its orbit, just as the tone of a string depends on its length. Pythagoras had the ability of understanding what we call "The music of the spheres". Two thousand years later Shakespeare makes mention of this when in The Merchant of Venice he has Lorenzo whispering sweet nothings in the ear of Jessica.

Was this harmony of the spheres just a poetic fantasy, or was it a scientific concept? Or can the two perhaps turn out to be the same thing.

As Shakespeare was writing a young German astronomer, Johannes Kepler, also became captivated by the Pythagorean dream. On this foundation of fantasy he built the basis of modern astronomy, physics and navigation.

Out of this, three centuries ago, our present form of society emerged. But we should remember that it really starts not with Kepler, Galileo and Newton, nor even with Shakespeare but back on the coast of Ionia with Thales of Miletus and above all on the island of Samos. There is a phrase well known to all Freemasons that "Learning originated in the East and thence spread its benign influence to the West".

But what else was happening in the world at this time? The year of the birth of Pythagoras saw the destruction of the Temple at Jerusalem by Nebucadnezzar. Forty-five years later when the school of Pythagoras was established the Jews were returning to Jerusalem after their captivity. The first circumnavigation of Africa occurred. The hanging Gardens of Babylon, one of the seven wonders of the ancient world was built whilst another, the Temple of Artemis at Ephesus was constructed. The first

sundials came into use. Ore smelting was discovered. Rome became a republic and Aesop's fables were written.

Ionic and Doric styles of architecture were established, and Persepolis was built by Darius.

Someone is bound to ask me 'What about Euclid?' Euclid was to Pythagoras what Kochel was to Mozart. When Mozart died in 1791 he was penniless and was buried in a paupers grave. He was also a Freemason and wrote some of the best Masonic music ever written. Ludwig Kochel was born nine years after Mozart's death and devoted much of his life to constructing a chronological catalogue of Mozart's work, for they were all in a bit of a mess. When you see or hear the letter K and a number after a Mozart work it simply means as catalogued by Kochel. In later years many mistakes were found in this catalogue and they were corrected by another well-known scientist, astronomer and mathematician named Albert Einstein.

The mathematics of Pythagoras has not come to us directly. It fired the imagination of the Greeks but the place where it was formed into an orderly system was Alexandria. The man who made the system and made it famous was Euclid about two hundred years after the death of Pythagoras.

The impact of Euclid as a model of mathematical reasoning was immense, particularly his book 'Elements of Geometry' which was translated and copied more than any other book except the Bible. None of the works of Pythagoras have survived but those of Euclid which were prolific have and we have to thank him for our knowledge of Pythagoras and his work.

In his later life Pythagoras left Samos to escape the tyranny of Polycrates and established a number of schools in Crotona in southern Italy where he remained until his death at about the age of 82. But during his life he traveled widely, particularly to Egypt, especially Alexandria.

Two thousand five hundred years ago Pythagoras combined logic, mathematics, astronomy, geometry, science and philosophy with the obvious intention of making the world a better place. Did he succeed? None of us can answer that for out of scientific research comes good and evil- atomic power or atomic weapons, drugs to heal or drugs to destroy, spaceships or guided missiles and so on. The researchers, even Pythagoras could see all this but did not terminate their studies which would have proved futile in the long term.

But is this combination of sciences and philosophy so different to the traditions and principles at the very heart of Freemasonry? Probably not.

So we have those early navigators with their birds, the modern navigators with their science and in the middle the founder of pure science around whom and since whom everything has developed into the civilization that we recognize and live in today.

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