by: Unknown

Containing more real food for thought, and impressing on the receptive mind a greater truth than any other of the emblems in the lecture of the Sublime Degree, the 47th problem of Euclid generally gets less attention, and certainly less than all the rest. Just why this grand exception should receive so little explanation in our lecture; just how it has happened, that, although the Fellowcraft's degree makes so much of Geometry, Geometry's right hand should be so cavalierly treated, is not for the present inquiry to settle. We all know that the single paragraph of our lecture devoted to Pythagoras and his work is passed over with no more emphasis than that given to the Bee Hive of the Book of Constitutions. More's the pity; you may ask many a Mason to explain the 47th problem, or even the meaning of the word "hecatomb," and receive only an evasive answer, or a frank "I don't know - why don't you ask the Deputy?" The Masonic legend of Euclid is very old - just how old we do not know, but it long antedates our present Master Mason's Degree. The paragraph relating to Pythagoras in our lecture we take wholly from Thomas Smith Webb, whose first Monitor appeared at the close of the eighteenth century.

It is repeated here to refresh the memory of those many brethren who usually leave before the lecture:

"The 47th problem of Euclid was an invention of our ancient friend and brother, the great Pythagoras, who, in his travels through Asia, Africa and Europe was initiated into several orders of Priesthood, and was also Raised to the Sublime Degree of Master Mason. This wise philosopher enriched his mind abundantly in a general knowledge of things, and more especially in Geometry. On this subject he drew out many problems and theorems, and, among the most distinguished, he erected this, when, in the joy of his heart, he exclaimed Eureka, in the Greek Language signifying "I have found it," and upon the discovery of which he is said to have sacrificed a hecatomb. It teaches Masons to be general lovers of the arts and sciences." Some of facts here stated are historically true; those which are only fanciful at least bear out the symbolism of the conception. In the sense that Pythagoras was a learned man, a leader, a teacher, a founder of a school, a wise man who saw God in nature and in number; and he was a "friend and brother." That he was "initiated into several orders of Priesthood" is a matter of history. That he was "Raised to the Sublime Degree of Master Mason" is of course poetic license and an impossibility, as the "Sublime Degree" as we know it is only a few hundred years old - not more than three at the very outside. Pythagoras is known to have traveled, but the probabilities are that his wanderings were confined to the countries bordering the Mediterranean. He did go to Egypt, but it is at least problematical that he got much further into Asia than Asia Minor. He did indeed "enrich his mind abundantly" in many matters, and particularly in mathematics. That he was the first to "erect" the 47th problem is possible, but not proved; at least he worked with it so much that it is sometimes called "The Pythagorean problem." If he did discover it he might have exclaimed "Eureka" but the he sacrificed a hecatomb - a hundred head of cattle - is entirely out of character, since the Pythagoreans were vegetarians and reverenced all animal life.

Pythagoras was probably born on the island of Samos, and from contemporary Grecian accounts was a studious lad whose manhood was spent in the emphasis of mind as opposed to the body, although he was trained as an athlete. He was antipathetic to the licentiousness of the aristocratic life of his time and he and his followers were persecuted by those who did not understand them. Aristotle wrote of him: "The Pythagoreans first applied themselves to mathematics, a science which they improved; and penetrated with it, they fancied that the principles of mathematics were the principles of all things."

It was written by Eudemus that: "Pythagoreans changed geometry into the form of a liberal science, regarding its principles in a purely abstract manner and investigated its theorems from the immaterial and intellectual point of view," a statement which rings with familiar music in the ears of Masons.

Diogenes said "It was Pythagoras who carried Geometry to perfection," also "He discovered the numerical relations of the musical scale." Proclus states: "The word Mathematics originated with the Pythagoreans!"

The sacrifice of the hecatomb apparently rests on a statement of Plutarch, who probably took it from Apollodorus, that "Pythagoras sacrificed an ox on finding a geometrical diagram." As the Pythagoreans originated the doctrine of Metempsychosis which predicates that all souls live first in animals and then in man - the same doctrine of reincarnation held so generally in the East from whence Pythagoras might have heard it - the philosopher and his followers were vegetarians and reverenced all animal life, so the "sacrifice" is probably mythical. Certainly there is nothing in contemporary accounts of Pythagoras to lead us to think that he was either sufficiently wealthy, or silly enough to slaughter a hundred valuable cattle to express his delight at learning to prove what was later to be the 47th problem of Euclid.

In Pythagoras' day (582 B.C.) of course the "47th problem" was not called that. It remained for Euclid, of Alexandria, several hundred years later, to write his books of Geometry, of which the 47th and 48th problems form the end of the first book. It is generally conceded either that Pythagoras did indeed discover the Pythagorean problem, or that it was known prior to his time, and used by him; and that Euclid, recording in writing the science of Geometry as it was known then, merely availed himself of the mathematical knowledge of his era.

It is probably the most extraordinary of all scientific matters that the books of Euclid, written three hundred years or more before the Christian era, should still be used in schools. While a hundred different geometries have been invented or discovered since his day, Euclid's "Elements" are still the foundation of that science which is the first step beyond the common mathematics of every day. In spite of the emphasis placed upon geometry in our Fellowcrafts degree our insistence that it is of a divine and moral nature, and that by its study we are enabled not only to prove the wonderful properties of nature but to demonstrate the more important truths of morality, it is common knowledge that most men know nothing of the science which they studied - and most despised - in their school days. If one man in ten in any lodge can

demonstrate the 47th problem of Euclid, the lodge is above the common run in educational standards!

And yet the 47th problem is at the root not only of geometry, but of most applied mathematics; certainly, of all which are essential in engineering, in astronomy, in surveying, and in that wide expanse of problems concerned with finding one unknown from two known factors. At the close of the first book Euclid states the 47th problem - and its correlative 48th - as follows:

“47th - In every right angle triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.” “48th - If the square described of one of the sides of a triangle be equal to the squares described of the other two sides, then the angle contained by these two is a right angle.”

This sounds more complicated than it is. Of all people, Masons should know what a square is! As our ritual teaches us, a square is a right angle or the fourth part of a circle, or an angle of ninety degrees. For the benefit of those who have forgotten their school days, the “hypotenuse” is the line which makes a right angle (a square) into a triangle, by connecting the ends of the two lines which from the right angle.

For illustrative purposes let us consider that the familiar Masonic square has one arm six inches long and one arm eight inches long. If a square be erected on the six inch arm, that square will contain square inches to the number of six times six, or thirty-six square inches. The square erected on the eight inch arm will contain square inches to the number of eight times eight, or sixty-four square inches.

The sum of sixty-four and thirty-six square inches is one hundred square inches.

According to the 47th problem the square which can be erected upon the hypotenuse, or line adjoining the six and eight inch arms of the square should contain one hundred square inches. The only square which can contain one hundred square inches has ten inch sides, since ten, and no other number, is the square root of one hundred. This is provable mathematically, but it is also demonstrable with an actual square. The curious only need lay off a line six inches long, at right angles to a line eight inches long; connect the free ends by a line (the Hypotenuse) and measure the length of that line to be convinced - it is, indeed, ten inches long.

This simple matter then, is the famous 47th problem. But while it is simple in conception it is complicated with innumerable ramifications in use.

It is the root of all geometry. It is behind the discovery of every unknown from two known factors. It is the very cornerstone of mathematics.

The engineer who tunnels from either side through a mountain uses it to get his two shafts to meet in the center.

The surveyor who wants to know how high a mountain may be ascertains the answer through the 47th problem.

The astronomer who calculates the distance of the sun, the moon, the planets and who fixes "the duration of time and seasons, years and cycles," depends upon the 47th problem for his results. The navigator traveling the trackless seas uses the 47th problem in determining his latitude, his longitude and his true time. Eclipses are predicated, tides are specified as to height and time of occurrence, land is surveyed, roads run, shafts dug, and bridges built because of the 47th problem of Euclid - probably discovered by Pythagoras - shows the way.

It is difficult to show "why" it is true; easy to demonstrate that it is true. If you ask why the reason for its truth is difficult to demonstrate, let us reduce the search for "why" to a fundamental and ask "why" is two added to two always four, and never five or three?" We answer "because we call the product of two added to two by the name of four." If we express the conception of "fourness" by some other name, then two plus two would be that other name. But the truth would be the same, regardless of the name. So it is with the 47th problem of Euclid. The sum of the squares of the sides of any right angled triangle - no matter what their dimensions - always exactly equals the square of the line connecting their ends (the hypotenuse). One line may be a few 10's of an inch long - the other several miles long; the problem invariably works out, both by actual measurement upon the earth, and by mathematical demonstration.

It is impossible for us to conceive of a place in the universe where two added to two produces five, and not four (in our language). We cannot conceive of a world, no matter how far distant among the stars, where the 47th problem is not true. For "true" means absolute - not dependent upon time, or space, or place, or world or even universe. Truth, we are taught, is a divine attribute and as such is coincident with Divinity, omnipresent.

It is in this sense that the 47th problem "teaches Masons to be general lovers of the art and sciences." The universality of this strange and important mathematical principle must impress the thoughtful with the immutability of the laws of nature. The third of the movable jewels of the entered Apprentice Degree reminds us that "so should we, both operative and speculative, endeavor to erect our spiritual building (house) in accordance with the rules laid down by the Supreme Architect of the Universe, in the great books of nature and revelation, which are our spiritual, moral and Masonic Trestleboard."

Greatest among "the rules laid down by the Supreme Architect of the Universe," in His great book of nature, is this of the 47th problem; this rule that, given a right angle triangle, we may find the length of any side if we know the other two; or, given the squares of all three, we may learn whether the angle is a "Right" angle, or not. With the 47th problem man reaches out into the universe and produces the science of astronomy. With it he measures the most infinite of distances. With it he describes the whole framework and handiwork of nature. With it he calcu-lates the orbits and the positions of those "numberless worlds about us." With it he

reduces the chaos of ignorance to the law and order of intelligent appreciation of the cosmos. With it he instructs his fellow-Masons that “God is always geometrizing” and that the “great book of Nature” is to be read through a square.

Considered thus, the “invention of our ancient friend and brother, the great Pythagoras,” becomes one of the most impressive, as it is one of the most important, of the emblems of all Freemasonry, since to the initiate it is a symbol of the power, the wisdom and the goodness of the Great Articifer of the Universe. It is the plainer for its mystery - the more mysterious because it is so easy to comprehend.

Not for nothing does the Fellowcraft’s degree beg our attention to the study of the seven liberal arts and sciences, especially the science of geometry, or Masonry. Here, in the Third Degree, is the very heart of Geometry, and a close and vital connection between it and the greatest of all Freemasonry’s teachings - the knowledge of the “All-Seeing Eye.”

He that hath ears to hear - let him hear - and he that hath eyes to see - let him look! When he has both listened and looked, and understood the truth behind the 47th problem he will see a new meaning to the reception of a Fellowcraft, understand better that a square teaches morality and comprehend why the “angle of 90 degrees, or the fourth part of a circle” is dedicated to the Master!