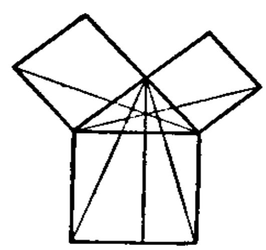
The 47th Problem of Euclid

By

H. Meij

Master, Harmony Lodge #18

August 2000



Portrait of Euclid according to an old European etching

Introduction:

There are so many symbols, words and phrases in Freemasonry used both as part of its rituals as well as part of its vocabulary, that studying and trying to understand the "meanings" them is a very worthwhile and a rewarding journey. One such prominent symbol and phrase, is the 47th problem of Euclid, which is one of the main symbols introduced in the Third Degree.

In the Blue Lodge, it is considered a great honor to be elected and serve as the Master of a lodge. It shows that the individual has attained maturity, leadership, charisma, and motivation, but above all, knowledge to be able to lead others. It is an initiation by itself, as the position brings with it a completely new set of responsibilities that are often not appreciated when accepting the position. At the end of serving as Master of a Lodge, many Past Masters are presented with a jewel, symbolizing the great appreciation of the Lodge towards their dedication. It also symbolizes something else ? that is that the individual has completed his “journey”, through the different positions of the Lodge, to a new plain.

The 47th problem of Euclid features prominently in many Past Master’s jewels. Selecting this symbol out of the thousands used in Freemasonry to represent one of its highest honors must mean that it is a very significant and central symbol of the Craft. Yet, sadly many Freemasons, even many Past Masters, do not know why it is so centrally featured in the Past Master’s jewel. Clearly the 47th problem is based on Geometry, and all Freemasons know that Geometry and Freemasonry are closely linked, but is this the only reason? What does the 47th problem of Euclid symbolize and mean? Of the 465 problems published by Euclid, why is the 47th so important? Why do Freemasons cherish it so?

(An example of a Past Master's Jewel featuring the 47th Problem of Euclid from England. Past Master's jewel used in the USA often do not show the 47th Problem anymore)

<u>The Foundation of Freemasonry?:</u>

The 47th problem of Euclid is often mentioned in Masonic publications. In Anderson's "Constitutions" published in 1723, it mentions that "The Greater Pythagoras, provided the Author of the 47th Proposition of Euclid's first Book, which, if duly observed, is the Foundation of all Masonry, sacred, civil, and military…". Being mentioned in one of the first "official" speculative Masonic publications clearly indicates that the 47th problem of Euclid must be important. It is also mentioned in the Third Degree lecture, where we are taught that the "47TH problem of Euclid…….taught us to be general lovers of the arts and sciences".

However, it is quite different to be referred to as the "Foundation of all Masonry, sacred, civil and military" that to be referred to as "taught us to be general lovers of the arts and sciences". Has the importance of the symbolism of the 47th problem declined over time for some reason?

In order to understand whether the symbol has declined in importance or not, we first need to look at the 47th problem of Euclid itself.

The Discovery of the 47th problem of Euclid:

Euclid wrote a set of thirteen books, which were called "Elements". Each book contained many geometric propositions and explanations, and in total Euclid published 465 problems. The 47th problem was set out in Book 1, which is also known as "The Pythagorean Theorem". Why is it called by both these names? Although Euclid published the proposition, it was Pythagoras who discovered it. We learn from the third degree lecture that:

> "This wise philosopher (Pythagoras) enriched his mind abundantly in a general knowledge of things, and more especially in Geometry, or Masonry. 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".

Actually, it was not Pythagoras who directly discovered the rule, as the Egyptians used the same principle for a very long time before Pythagoras, whereby they re-measured their fields after the annual flooding of the Nile washed out their boundary markers. Hence, Pythagoras is probably here referred to as being the one who proved that the process works.

History records that Pythagoras established a society with philosophical, religious and political aims. Shrouded in secrecy, they believed that only by truly understanding the universe could one achieve salvation of the soul, and as Divinity created all things, studying it over a period of several lifetimes, could bring one closer to Divinity itself. As such, it was believed that through study and reason could one start to understand Divinity. Clearly, reason is based on measurable things (such as through numbers and objects), and is easier to understand if expressed in that matter. Hence the society devoted much of its time to the mathematics, including Geometry. This line of thinking was incorporated in Freemasonry, which sets it opposite to the Church, which emphasizes faith over reason. Indeed, Pope Pius IX, in his encyclical, *Qui Pluribus*, dated 9 November 1846, attacked those who "put human reason above faith, and who believe in human progress." Many people consider this to be a reference to Freemasonry.

This is interesting, because in the Book of Wisdom 11:20 we read:

> "Even apart from these, men could fall at a single breath
> when pursued by justice
> and scattered by the breath of thy power.
> But thou hast arranged all things by measure
> and number and weight."

So the very "measurement of things" the Church objects to is mentioned in Scripture.

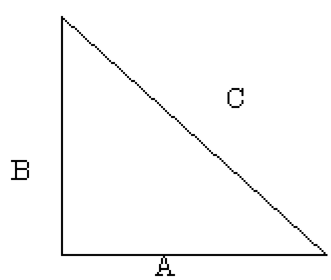
However, let us get back to how the 47th problem fits in Freemasonry.

<u>What Does the 47th say?:</u>

The proposition states that: "In right angled triangles the square on the side subtending the right angle is equal to the squares on the sides containing the right angle."

What? In other words $A_2 + B_2 = C_2$.

Many readers will feel like they have been returned to Geometry class. A simple illustration will probably refresh our memories.



A2 + B2= C2

The proposition is especially important in architecture. Builders have since ancient times used the theorem in constructing buildings by a process known as "squaring a room." As the theorem states that 3 squared + 4 squared = 5 squared, a builder starts by marking a spot and drawing a line, say line A. This line is given the value of 3. The builder then marks another point, say point B and draws a line from it at a right angle to line A, and it is given the value of 4. The distance between line A and B is then measured, and if the distance between A and B is 5, then the room is squared. By inverting the process, a "squared" (or rectangle) room can be obtained.

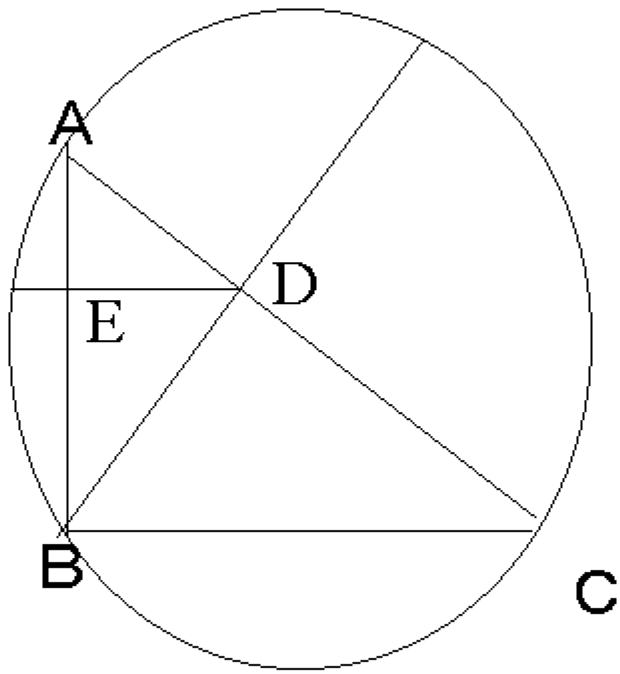
Engineers who tunnel from both sides through a mountain use the 47th problem to get the two shafts to meet in the center. The surveyor who wants to know how high a mountain may be ascertains the answer through the 47th problem. The astronomer who calculates the distance of the sun, the moon, the planets, and who fixes "the duration of times 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 predicted, tides are specified as to height and time of occurrence, land is surveyed, roads run, shafts dug, bridges built, with the 47th problem to show the way.

In some lodges, using this principle, a candidate symbolically “squares the Lodge” by being escorted around the Lodge three times during the Entered Apprentice ritual, four times for a Fellowcraft ritual, and five times for a Master Mason ritual, which completed his journey.

(1738 German Drawing depicting workmen using the 47th problem)

The 47th problem forms the basis of all ancient measurement units:

The 47th problem of Euclid formed the basis of a common set of measurements used by the Egyptians, especially in the building of the Great Pyramids. It gets a little technical, but a simple illustration will help us understand it better.



A-B = 300 A-D = 180 A-E = 108

B-C = 400 D-C = 320

A-C = 500 D-E = 144

Please see the illustration above, which is not accurate due to a drawing, but will serve to illustrate the point. If we take a circle and draw in it a triangle (triangle A- B-C) which perpendicular is 300, base is 400, and by the 47th problem, the hypotenuse becomes 500 (any combination such as 3,4,5 will also work ? higher numbers are used for ease of explanation). Then if we draw a line from the angle of the perpendicular and the base through the hypotenuse to the circle, this line will be equal to 480. The resulting two parts of the hypotenuse (A-D and D-C) will be equal to 180 and 320 respectively. Then if we draw another line from the point D (the intersector of the hypotenuse) to the perpendicular of the shortest side of the triangle (A-B), then line A-E will equal 108 and line D-E will equal 144.

Now we have all the measurements of the ancient world, that is 500, 480, 400, 320, 180, 144 and 108. Why is this important? If we take each unit to be a cubit (an ancient form of measurement), then 500 is the base of the Great Pyramid of Memphis. 400 cubits is the length of an Egyptian stadium (stadium is plural for stadia, and ancient measurement unit, based on a particular number of steps, also called a Khet by the Egyptians). 480 cubits is the length of the Ptolemy stadium, 320 cubits is the length of the Hebrew and Babylonian stadium. Furthermore, 180, which represents the smaller part of the hypotenuse, doubled gives 360 cubits, the Cleomedes stadium. By doubling 144 cubits gives 288 cubits, the Archimedes stadium. Finally by doubling 108 cubits we obtain 216 cubits, or the lesser Egyptian stadium.

In other words, this simple exercise formed the basis of all the lengths used by the Egyptians, and hence also once again indicates that its principle was well understood by the Egyptians, and hence taught by them to Pythagoras.

Conclusion:

Clearly, the 47th problem helps us look at the universe, and all that is in it, through a system that we can understand clearly, for it is measurable. The Master's jewel is the square, the base needed for the 47th problem (in many jurisdictions the square has the dimensions of 3:4 ? the Pythagorean dimensions). As the Master serves his position, he becomes more complete, and therefore the 47th problem of Euclid is dedicated on his jewel when he leaves office.

References:

Circumambulation and Euclid's 47th proposition, by Reid McInvale

Encyclopedia of Freemasonry, by Albert Mackey

Freemasonry, A journey through ritual and symbol, by W. Kirk

Master Mason, by Carl Claudy