Pythagoras, Sacred Geometry, & Masonry

By

Donald L. McAndrews, PM, KYCH, OPC

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In the Senior Deacon's Fellow craft Lecture, we are recommended to the study of the seven liberal arts and sciences: Grammar, Rhetoric, Logic, Arithmetic, Geometry, Music and Astronomy. When received in the East, the new Fellow craft is particularly recommended the study of geometry with an extensive lecture on this science. The amount of time devoted to the Geometry Lecture would indicate there is something of importance in this subject. So, let us examine Geometry a little more deeply.

The word itself is interesting: Geometry. "Geo" means "earth" and "metry" means "measuring." Taken together the word literally means "measuring the earth." Now, many of you may have bad memories of geometry in Jr. High or High School. But when you really stop to consider it, geometry underlies all of the other six arts and sciences.

Classical geometry begins with axioms which are definitions and accepted basic truths. From here we progress to theorems or speculations, which end up as proofs, or new truths. This whole system employs a great deal of logic to arrive at these truths, rhetoric to express these truths, and arithmetic to actually prove them. So where does grammar fit in? Grammar deals with the logic and structure of our language, just as geometry deals with logic and structure.

This finally brings us to Music and Astronomy. The latter is a no-brainer. When scientist talk about thrust, orbits and trajectories, the geometry of it is pretty obvious. And with the many satellites circling our planet, measuring its topography, light, heat and radiation, these astronomical endeavors perfectly fit the definition of "measuring the earth."

But, where does music fit in? This is actually a close connection with our ancient friend and brother, Pythagoras. He is considered to be the father of music because of his seminal work in the geometry of music and his developing the very first system of musical notation. Pythagoras took harp strings of identical length and stretched them to equal tensions. When pinching off one of the strings in its exact center, he made the exact same tone only and octave higher. In fact, he discovered the concept of the octave. It was not an arbitrary division of eight steps in the scale, but the discovery by trial and error that the pleasing tonal progressions were perfectly even numbered relationships in the lengths of the strings. Consequently music and astronomy share the very closest relationship with geometry, geometry being the means by which the other two are expressed.

The Pythagoras connection to Freemasonry is obvious through the association with Geometry. But, why not Euclid who organized Geometry into the science we know and study today? That's because there is another connection with Pythagoras and King Solomon's Temple. After the Temple was destroyed by the Babylonians in 587 BCE, Pythagoras was visiting in Egypt and, according to our Masonic tradition, was being initiated into several orders of Priesthood. The priests in Egypt were the scientists of the day and closely guarded their various fields of knowledge. It was most likely here that Pythagoras discovered what the Egyptians had long kept secret and that is the power and properties of the 3-4-5 right triangle, the basis of what we now call the Pythagorean Theorem. During this time, the Jews remaining in Jerusalem rebelled against Babylon by making an alliance with Egypt. The Babylonians not only attacked Jerusalem again, they also took their troops south to teach Egypt a lesson. During the attack on Egypt, Pythagoras was taken captive back to Babylon to be released later with the Jews who were released by King Cyrus.

Now we have a double connection between Pythagoras and Freemasonry, namely Geometry and the leaders of the Temple Cult of King Solomon's Temple. The Jews taken into captivity were not field workers or common craftsmen, they were the social elite and leaders, the most highly educated people of Israel. They were not kept as menial slaves engaged in common labor, they led successful and highly productive lives, even rising to prominent political positions. In fact, many chose not to leave Babylon when freed by King Cyrus. During his mingling with these highly educated Jews, Pythagoras may have been introduced to the secret mysteries of the Temple Cult. Our Masonic tradition reports that he was raised to the sublime degree of Master Mason.

But, there is another aspect of geometry with very close relationships to both Pythagoras and Freemasonry. This is the ancient subject of sacred geometry. Where classical geometry deals with the niceties and uniformities of our universe, sacred geometry deals with the uneven, unknowable, and incomprehensible irrational numbers. For convenience we call these numbers pi and phi. They describe the most pleasing and the most commonly occurring relationships in our world, but their exact mathematical values have never been perfectly calculated, not even by super computers.

Most people are well acquainted with the value of pi, the relationship of the circumference of a circle to its diameter. For convenience we give pi the value of 3 .14, however the decimal points go on to infinity. Because this number cannot be fully expressed with absolute accuracy, it makes the algebraic or geometric calculation of squaring the circle impossible, that is to draw a square and a circle which enclose identical areas. We can come very close, but approximation is the best we can do. Of course, this same irrational problem comes with measuring volumes of cubes and spheres.

Less popularly known is the value of phi. This is a relationship of two segments of a line to each other and to the whole such that the shorter segment is to the longer segment as the longer segment is to the whole. For convenience we give phi the value of 1.6, but once again the decimal points go on to infinity. This relationship is also known as the Golden Mean which has been widely used throughout history in architecture because of its pleasing appearance, usually in the height of a building to its width. In 1202 an Italian mathematician named Fibonacci discovered an interesting sequence of numbers, now called the Fibonacci Sequence. It was actually known to the ancients in India and this may be where Fibonacci got his inspiration. The sequence begins with 0 followed by 1 and continues by adding the two previous numbers to come up with the next in the sequence. This produces the following: 0-1-1-2-3-5-8-13-21-34-55 and on to infinity. When you move beyond the first few numbers, you will find the ratio of adjacent numbers to be very close to 1.6. Further, this sequence of numbers appears considerable frequency in nature. Look at the plants around you and you will find that most stems bear a number of leaves which is a Fibonacci number. Remember this is frequent and not universal, hence the rarity of a 4 leaf clover which is not a Fibonacci number. The spiral curve of shells, such as the conch or chambered nautilus, is formed by a Fibonacci sequence and happens to be the identical spiral to be found in galaxies.

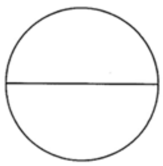
A close approximation of the phi ratio is also found in the vesica piscis which approximates to the value of 1.7. This value can be geometrically drawn by intersecting two circles with the same radius, intersecting in such a way that the center of each circle lies on the circumference of the other. The portion belonging to both circles is the vesica piscis which is Latin for "fish bladder" which it resembles. This creates a ratio of a line drawn between the points of intersection and a line drawn perpendicular to that line at its center. Further, if the perpendicular line is used as the base for adjacent triangles whose vertices are the points of intersection of the circles, you have created two identical equilateral triangles.

The Sacred Cut was used by the ancients in building and was an integral part of their secret or sacred geometry. This can be used to create a square which is double the area of another square with a very small error factor. For example, if we start with a square of 10 units on each side, we know it has an area of 100 square units. It is quite simple to divide this square into quarters, each of which logically has an area of 25 square units. If we take the diagonal of this quarter square (the ancients refer to the diagonal of a square or rectangle as its diameter) and strike a circular arc, where it transects the adjacent sides of the larger square, we can draw a square which is 7 units on each side. This may well be one of the principal reasons that 7 in all ages have been considered a sacred number. It certainly coincides with astronomy in that the moon runs a 28 day cycle, one fourth of which is a week of 7 days. But, back to the areas of squares, this central square has an area of 49 square units which is extremely close to double the quarter square, and half the large square. This one per cent deviation from the large square is actually an acceptable deviation in construction even in the 21st century.

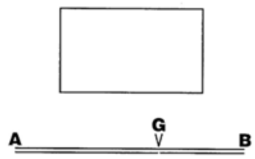
The practical use of the 3-4-5 triangle is commonly seen in construction today. This is a quick way to determine if an angle is truly square by marking on two sides at 3 and 4 feet and measuring between the marks to see if the diagonal is 5. Another quick way to determine if a square of any size is true, is to measure the diagonals - they should be equal whatever their length. In ancient times, the 3-4-5 triangle was used to quickly layout the foundations of buildings. Using the three different angles, it is easy to quickly layout a perfect square, a 1x2 rectangles or a 1x3 rectangle. See the attached illustrations. Our Operative traditions say that this was the precise way in which King Solomon's Temple was laid out, it being a lx3 rectangle measuring 20 cubits by 60 cubits. The ritual of the modem Operatives for constituting a new Assemblage demonstrates this in detail.

Finally, the eight-pointed star, which is a common decorative motif from ancient times, is actually accomplished by drawing 4 isosceles triangles within a square, each having a side of the square as its base and the center of the opposite side as its apex. The transections of these triangles provides the basis for dividing the square into equal portions, and with the addition of the sacred cuts, it can be even further divided. Employing this method, any square can be divided in two, three, four, five, six, seven, eight, nine, and ten. Using stakes and strings, the ancients could mark off the proportions of a building quickly with very few measurements.

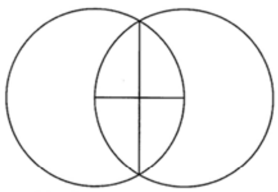
The Great Architect of the Universe has given us an understanding of geometry as the under girding of everything in His creation. He has also given us sacred geometry to remind us of our limited ability to understand and comprehend. The study of geometry is well recommended, for through it we better understand and appreciate God's creation. And this understanding and appreciation brings us closer to the Almighty.



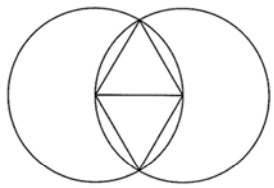
Pi = 3.14~



Phi = 1.6~

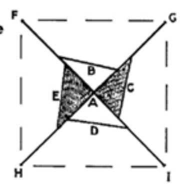


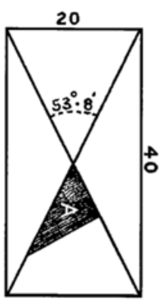
Vesica Piscis = 1.7~



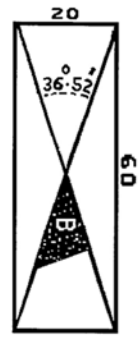
Vesica Piscis

Laying or Proving a Square

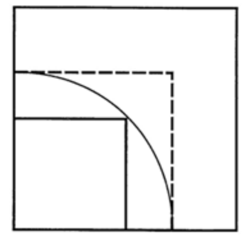




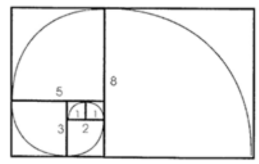
Laying a 1x2 Rectangle using the Larger Acute Angle of the 3-4-5 Triangle



Laying a 1x3 Rectangle using the Larger Acute Angle of the 3-4-5 Triangle



The Sacred Cut



0 1 1 2 3 5 8 13
21 34 55 89 144 233 377

Fibonacci Sequence