THE ALPHABET AND THE GOLDEN RATIO

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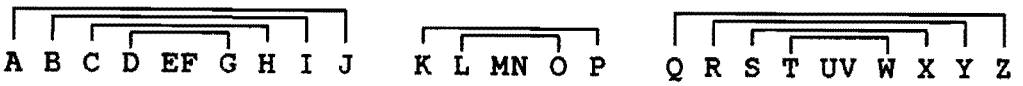
Place the letters of the English alphabet (capitals) in a row and count five letters inward from either end. You will arrive at letters which are quite similar to their neighbors (on their inside), E to F and V to U. There is one other adjacent pair of letters resembling each other--M and N. Because M and N mark the center of the alphabet, the three couples EF-MN-UV induce a natural pairing of the entire alphabet:



But there's more! The Pythagoreans, a secret, mystical brotherhood of ancient Greece, chose the pentagram (five-pointed star) as their symbol because it so dramatically embodied the golden ratio. The motto of this brotherhood is said to have been "All is number", and the roots of modern number symbolism can be traced to it.

A line segment is cut in the golden ratio if it is cut into two pieces in such a way that the ratio of the longer piece to the original segment, and the ratio of the shorter piece to the longer piece are the same. The exact value of that mutual ratio can be determined by high school mathematics, but we will settle here for its approximate value of 0.618. For example. if we start with a segment one foot long and cut it in the golden ratio we will have pieces approximately 0.618 ft. and 0.382 ft. long:

Check with your pocket calculator and you will see that 0.618/1 = 0.382/0.618. Yes. the two are not **quite** the same, but that's only because the value for the golden ratio we used was only correct to the nearest thousandth. If the mathematically precise value were used the equality would be exact.

For centuries, the golden ratio has been a source of endless fascination to mathematicians and non-mathematicians alike. Artists, musicians. and architects have incorporated it in their work, and nature seems to have a whimsical preference for it. It can be found in such things as the shapes of seashells, the way twigs grow on branches. the arrangements of seeds in sunflower and daisy heads, etc. Entire books have been written on this magical ratio, and the bibliography contains a list of some of them. For a superb introduction, see the articles by Martin Gardner. Discus-

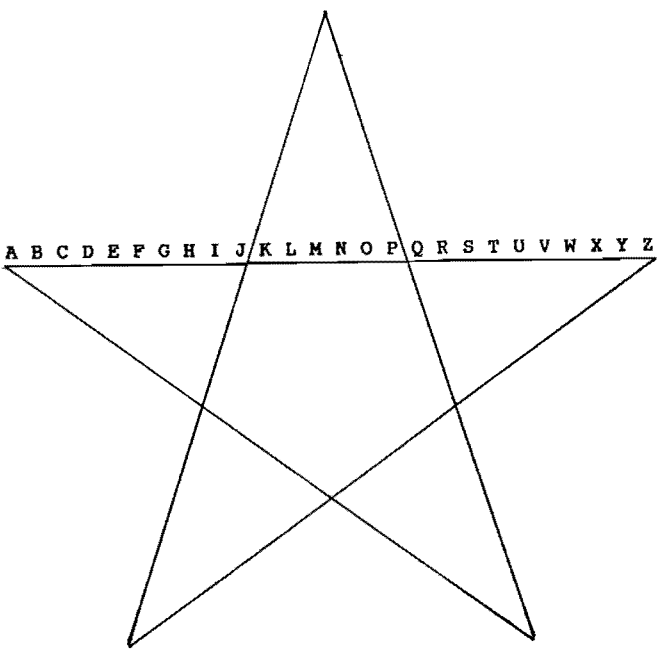
sions of how it was incorporated into the musical compositions of Bartok and the modular architecture of La Corbusier can be found in the book by Kappraff.

How does the golden ratio relate to a pentagram? Form a pentagram by equally spacing five points around the circumference of a circle. and then connecting every other point. Each side of the resulting pentagram cuts the other two sides it intersects in the golden ratio (in the pentagram below, the line segments AQ/AZ = AJ/AQ = 0.618, JZ/AZ = QZ/JZ = 0.618. Obviously, because of the symmetry of the figure, these relationships hold on any of the five sides, similarly labelled.

Let's apply the golden ratio to the alphabet by cutting the alphabet at the "right distance" from either end. The ratio 16/26 is approximately 0.615, only three thousandths from being golden. This means one cut must occur just after P, the sixteenth letter. For the other cut we measure an equivalent distance from the end of the alphabet, taking us to just past (left) of the letter K:

A B C D E F G H I J | K L M N O P | Q R S T U V W X Y Z

Amazingly, this produces exactly the same division of the alphabet as the seemingly-natural one induced by the three pairs of similar letters, and so the alphabet superimposes as shown on a pentagram:



Let's take things a step farther and examine the pairings of letters this special division naturally induces. In view of the duality which pervades this planet, and the **two** cuts which caused these pairings, it is appropriate that the following words are suggested: BInary, SeX, TWo, MaN, FEmale. Even the LO combination, written

in lower case, suggests the two binary digits, 1 and 0, which together form the binary representation for the number two. That is, in the binary system of number representation used by all computers, 10 represents a two.

The highest aspirations of humanity are suggested in GoD, CHrist, LOve. Note that the GD and LO combine to form GOLD, taking us back to the ratio which brought this pairing about.

The "odd balls", the only letters not appearing on the telephone, choose to pair here as well: QZ.

The alphabet exhibits its preference for the golden ratio in yet another way. Write down the consonants in the first half of the alphabet, then the vowels (include Y), and finally the remaining consonants. Alpha-cadabra! The same proportional division of the alphabet as was obtained above by two other means appears.

B C D F G H J K L M | A E I O U Y | N P Q R S T V W X Z

Put another way, if we extract the vowels from the alphabet and place them "smack dab" in the middle of the consonants, they perform a golden cut of the alphabet before our eyes.

B I B L I O G R A P H Y

Theodore Andrea Cook, The Curves of Life (Dover, New York, 1979)

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H. E. Huntley, The Divine Proportion (Dover, New York, 1970)

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D'Arcy Wentworth Thompson, On Growth And Form (Cambridge University Press, New York, 1966)