The Golden Ratio, by Dan Brandner

What It Is

The Golden Ratio, often represented by the Greek letter phi(Φ), an irrational number of approximately 1.618..., was known as early as Euclid's time. He referred to it as the "Extreme and Mean Ratio", while Luca Pacioli, an Italian mathematician and contemporary of Leonardo da Vinci referred to it as the "Divine Proportion". The reason is that the proportion shows up in geometry quite frequently and also in nature. In 1202, Leonardo Fibonacci introduced the Fibonacci sequence to the western world where later a German mathematician, Simon Jacob (1564) noted consecutive numbers in the series converged to the Golden Ratio. See **Fig. 1** where the line representation is Euclid's and the Continued fraction is Fibonacci's.

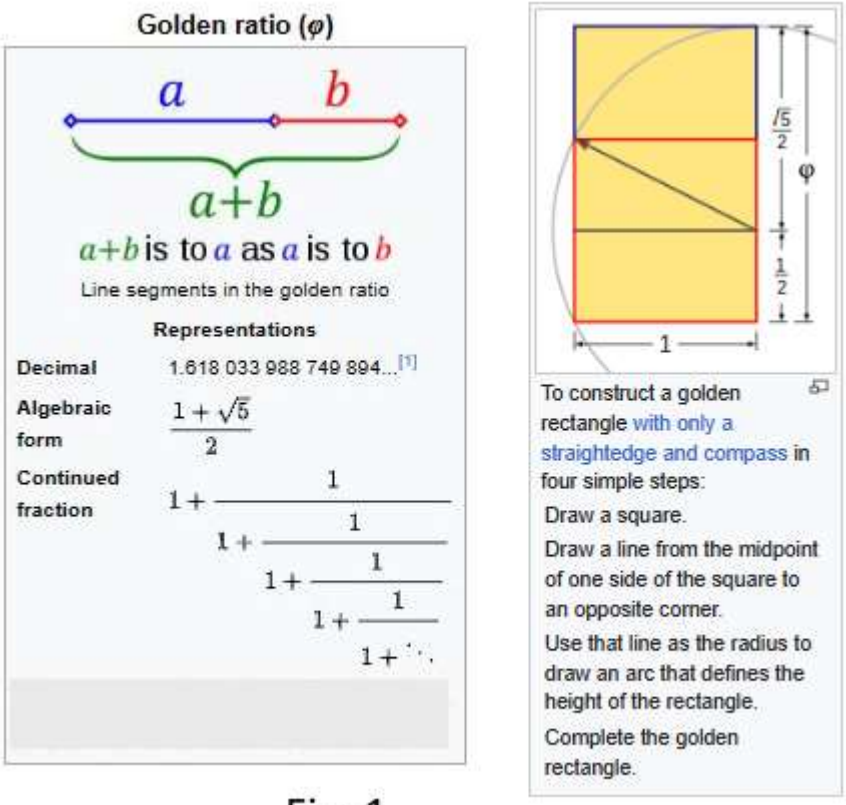


Fig. 1

Why It Is Special

Johannes Kepler pointed out the Fibonacci sequence in nature, using it to explain the pentagonal form of some flowers. The Golden Angle, where the two arcs of a circle are in the ratio of phi(Φ), occurs in patterns of plant growth as the optimal spacing of leaf shoots around plant stems so that successive leaves do not block sunlight from the leaves below them. See **Fig. 2** where the Golden Angle comes from dividing a circle by the Golden Ratio, lengths of a/b= phi(Φ). dividing a circle by the Golden Ratio, a/b= phi(Φ).

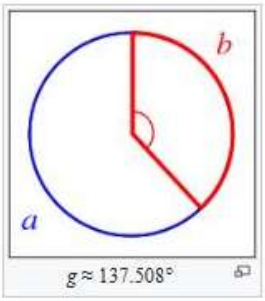
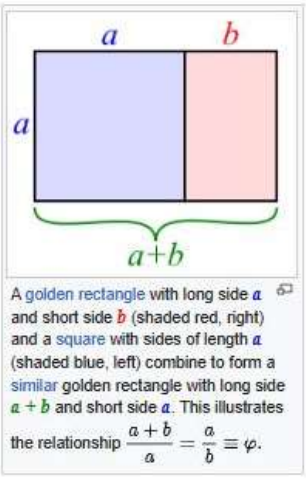
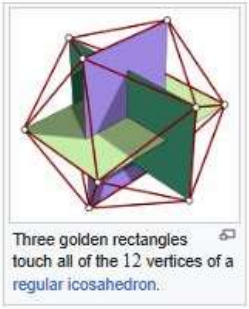
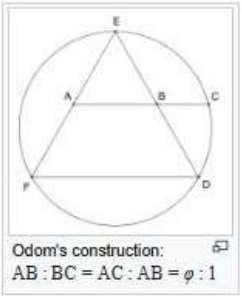


Fig. 2

Some examples from geometry are, in a regular pentagon the ratio of a diagonal to a side is the golden ratio, while intersecting diagonals section each other in the golden ratio. Here are some other examples, **Fig. 3**.







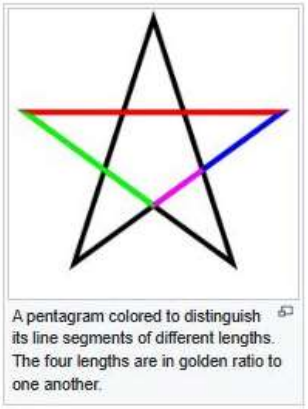
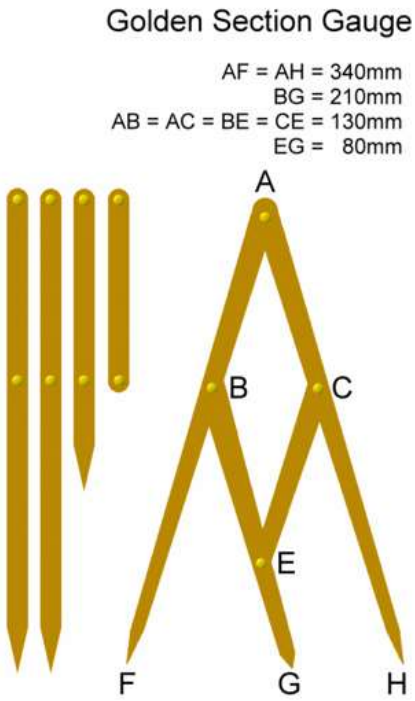


Fig. 3

An Aesthetically Pleasing Ratio.

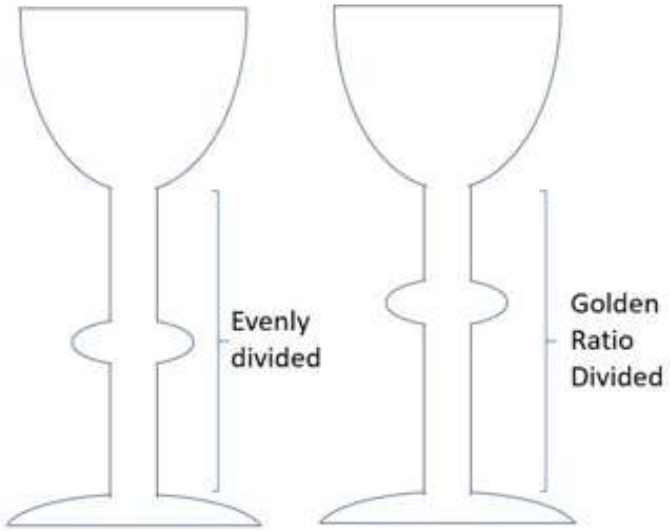
Some have said the ratio shows up in the Great Pyramid of Giza, or in the height to width ratio of Athens Parthenon's facade, though actual measurements show this to not quite be true. Some artists and architects, including Leonardo da Vinci, Le Corbusier and Salvador Dalí, have proportioned their works to approximate the golden ratio, believing it to be aesthetically pleasing, and this has persisted to modern times.

My conjecture is that as it is common in nature our eyes might find the ratio familiar and therefore pleasing. To that end, people have constructed dividers like the one shown in **Fig. 4**, which make it relatively easy to transfer the ratio to a divided line segment of any length, such as Joe did during his turning presentation. We can leave it up to you to turn two different spindles, say with a bead in the middle vs. a bead at the Golden ratio and let you decide which is more appealing. See **Fig. 5**.



Golden section Gauge or Fibonacci Divider.
The ratio of the space FG to GH is phi(Φ).

Fig. 4



Do you find one of the goblet stems more aesthetically appealing?

Fig. 5

References

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https://en.wikipedia.org/wiki/Fibonacci_number
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