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GOLDEN RATIO AND ITS APPLICATION

“There is no art without mathematics”
Luca Pacioli

What is perfection? Why is Mona Lisa's smile so attractive? What is a secret of the Great Pyramid of Giza, things of everyday life and adornment from the tomb of Tutankhamen? Why do proportions of some things look perfect, but other things do not attract our attention? Humanity has been thinking about these questions for many centuries. A great number of scientists tried to explain these things. But mathematicians gave an answer to these questions by the language of numbers. It leads to so-called “golden cut”. The essence of the golden cut is that segment AB is divided by interior point C into two parts, so that $AB: AC = AC: CB$. If we indicate this ratio $AB: AC = x$, we get an equation of the “golden cut”. A positive root of the equation is $\varphi = \frac{\sqrt{5} + 1}{2} = 1,618\dots$ [2, p. 56-57].

There are many different names for the golden cut, such as the golden ratio, phi, the divine proportion, the golden section, the golden proportion, etc.

Ratio of the golden cut is denoted by letter φ in honour of ancient Greek architect Phidias (490-430 BC). He made the Parthenon statues that seem to embody the golden cut [3, p. 45].

There are many golden figures, such as the golden rectangle that is the rectangle with proportions that correspond to two consecutive numbers of the Fibonacci sequence. If the golden rectangle is split into two triangles, so we will get golden triangles [1, p. 35-37, 91-92].

The golden cut is used in all spheres of our life, especially in art and architecture. For example, the Great Pyramid of Giza was built around 2560 BC and it is one of the earliest examples of the use of the golden cut. The length of each side of the base is 756 feet, and the height is 481 feet. So we can find that the ratio of the base to height is $756/48 = 1,5717 \approx 1,6$ [1, p. 12-14].

Pythagorus, the Greek mathematician, was especially interested in the golden cut, and proved that the proportions of the human body are based on it. Pythagorus's discovery had a great effect on the Greek art. Every part of their major buildings, including the smallest details of decoration, was constructed on the basis of the golden proportion.

Nobody had remembered about the golden ratio for some time. In the 16th century, Luca Pacioli, a great geometer and one of the most famous Renaissance painters, rediscovered the “golden secret”. His publication devoted to number phi, “De Divina Proportione”, was illustrated by Leonardo da Vinci [1, p. 25].

The golden ratio was widely used by Leonardo da Vinci. You can notice how all key details of the room, the table and ornamental things in Da Vinci's “The Last Supper” were based on it.

In famous masterpiece “The Mona Lisa” Leonardo also used golden proportion. This picture includes lots of golden rectangles; the base of one of them extends from the woman's right wrist to her left elbow and extends the rectangle vertically until it reaches the very top of her head. Thus, we get a golden rectangle [3, p. 46-47].

We can find a lot of examples of using golden cut in artworks or in music, in the structure of plants or in the body of the animals, in the proportions of human body or in viscera etc.

So, it is true that the golden ratio is the law of harmony and beauty!

LITERATURE

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