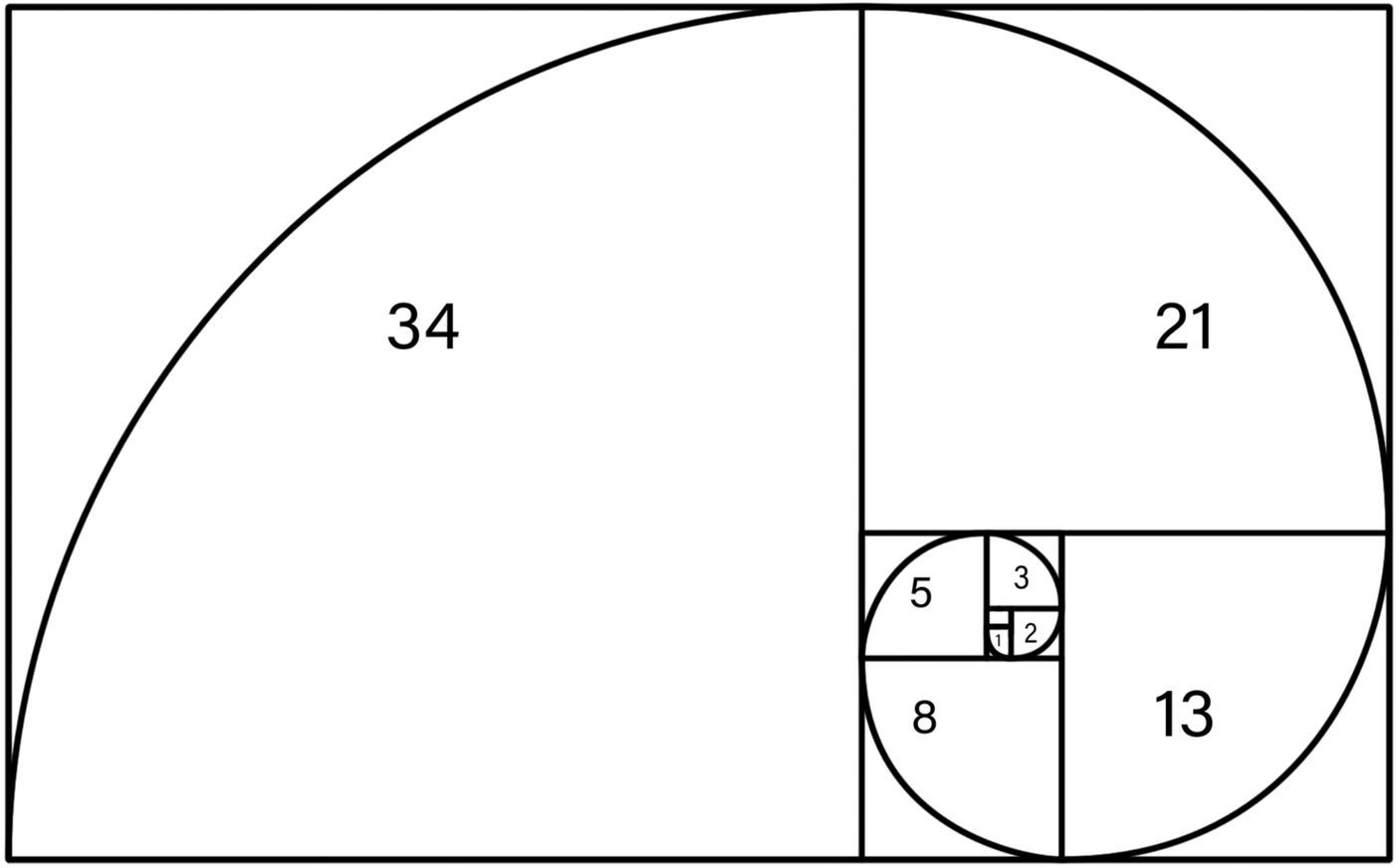
Fibonacci sequence

in nature



Julia Świtaj 2a

Important “golden” terms

Golden number = 1,618

Golden angle = 137,508°

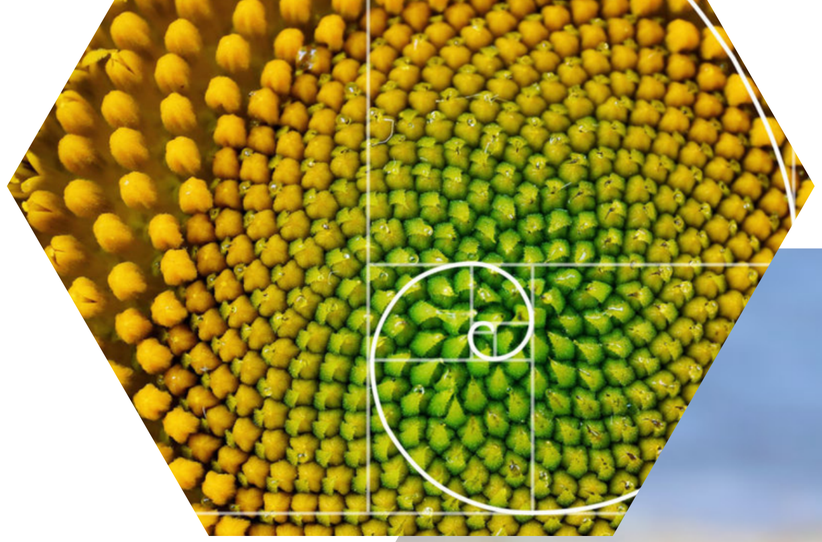
Golden ratio --> $\frac{a}{b} = \frac{a+b}{a}$

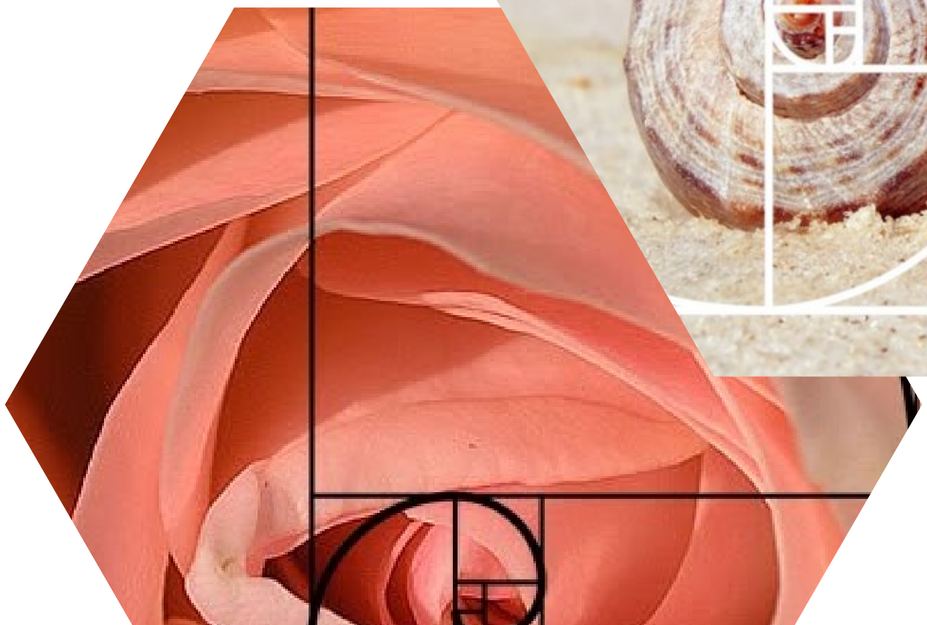
Fibonacci sequence - a sequence of natural numbers defined recursively as follows:

The first word is equal to 0, the second is equal to 1, each subsequent word is the sum of the previous two.

Formally:

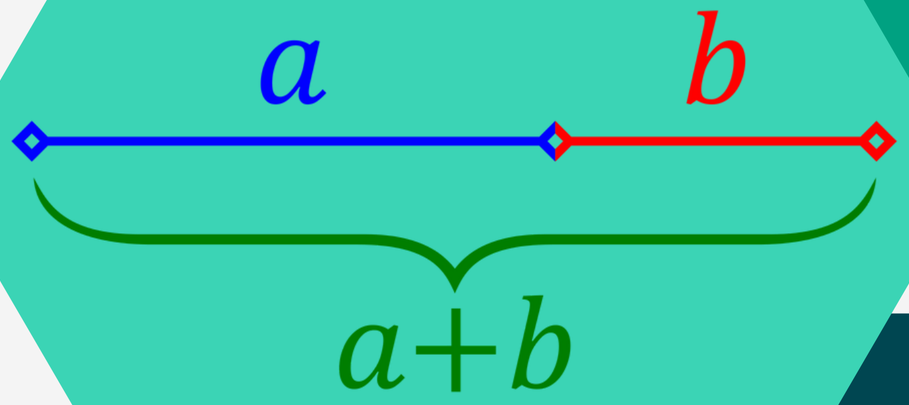
$$F_n = \begin{cases} 0 & \text{dla } n = 0, \\ 1 & \text{dla } n = 1, \\ F_{n-1} + F_{n-2} & \text{dla } n > 1. \end{cases}$$





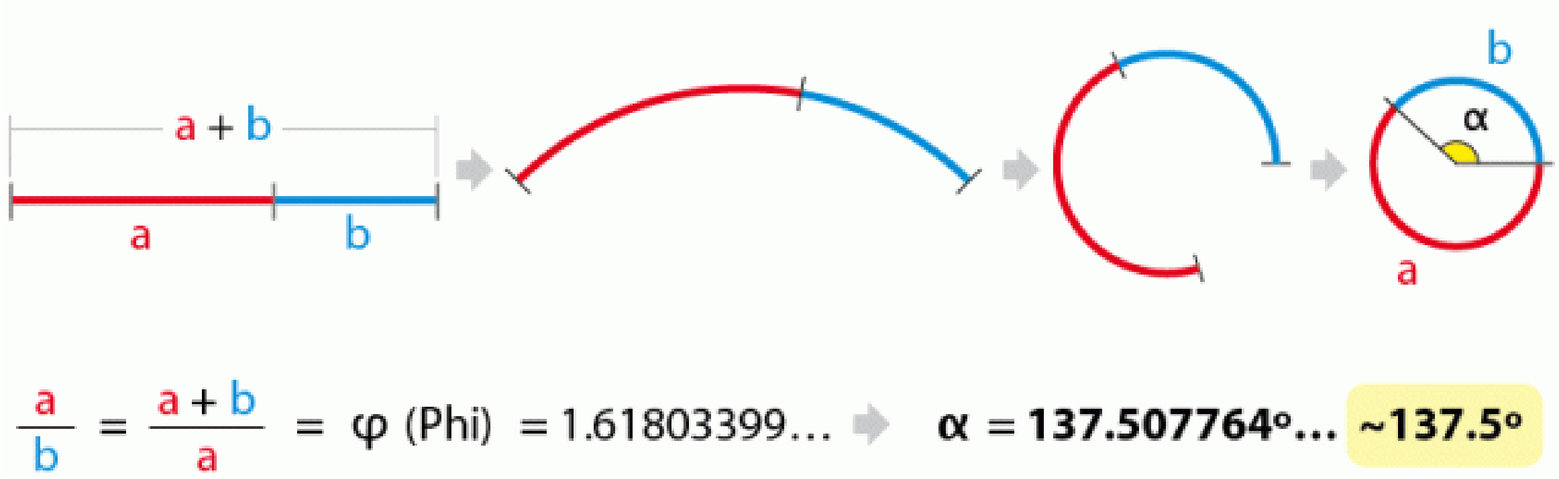
The Golden Ratio

The golden ratio is the division of a segment into two parts so that the ratio of the length of the longer part to the shorter part is the same as the ratio of the whole segment to the longer part.



Golder Angle

137,508° - This is the so-called Golden Angle, which determines the direction of plant growth. As it turns out, it also contains the Fibonacci sequence - the golden ratio for the division of a circle.



How it works in nature

As plants develop, they are growing more stems from one central point spreading out at an angle. This angle is approximately 13.5 degrees to the earlier steam or petal.

The simplest method of calculating

We calculate the values of the sequence in order: F1, F2, F3, F4 and so on up to Fn each time using what we have already calculated. It is not even necessary to remember all the values calculated so far, as the last two will be enough.

Fibonacci Number Sequence

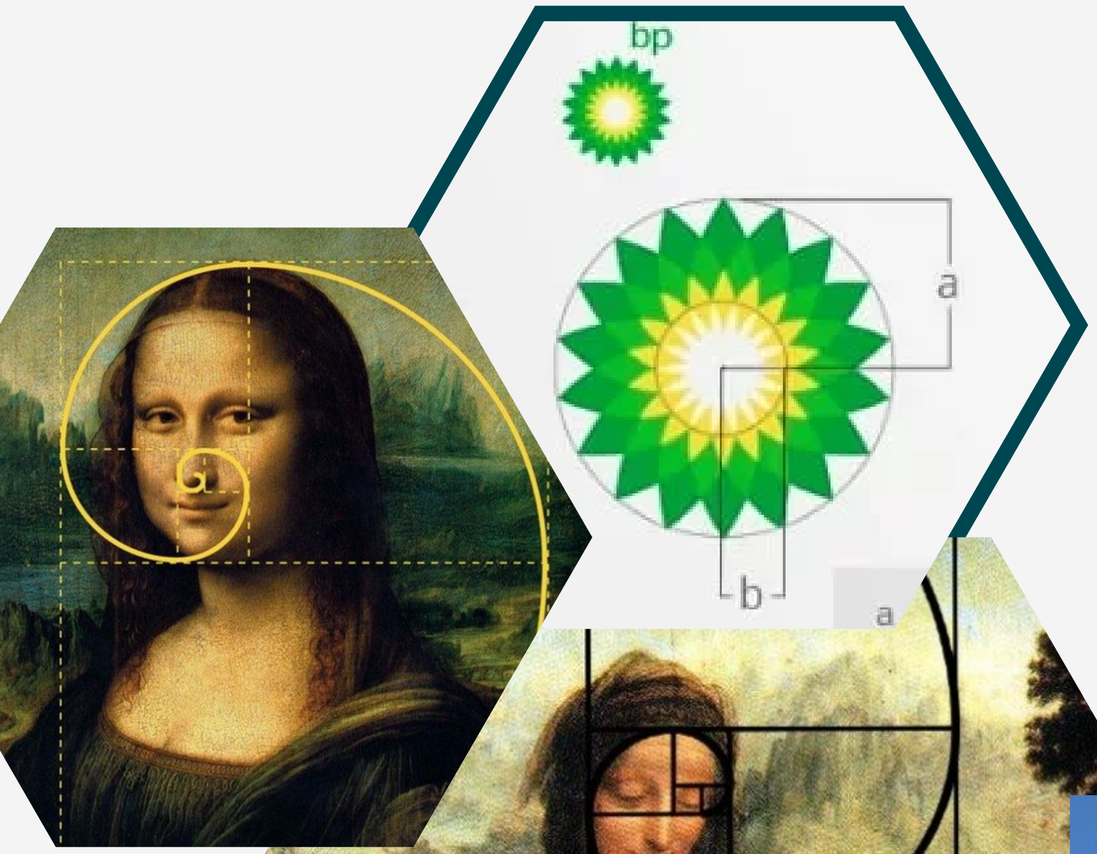
The proportion of longer segment and sum of both segments is getting closer to the golden number when segments are longer and numbers bigger.

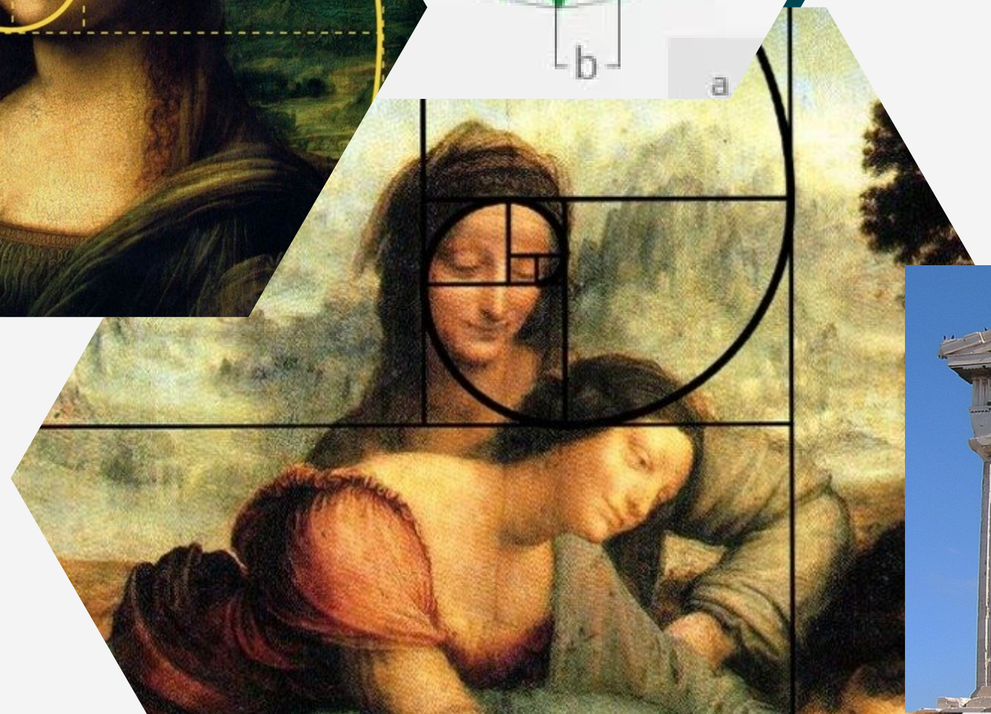
1	1
1	1
1+1=2	1/1=1
2+1=3	2/1=2
3+2=5	3/2=1.5
5+3=8	5/3=1.667
8+5=13	8/5=1.6
13+8=21	13/8=1.625
21+13=34	21/13=1.615
34+21=55	34/21=1.619
55+34=89	55/34=1.618
89+55=144	89/55=1.618

Examples

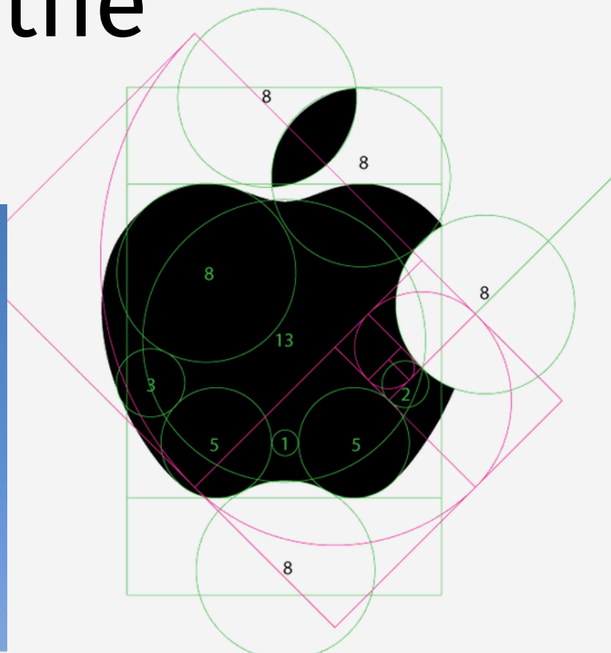
We can observe the influence of the Fibonacci sequence on cones, plants, worms shells, galaxy, hurricanes, animals, whirlpools, even human hands.

Where it is currently used?





The Fibonacci sequence is used in the logos. It was used a very long time ago in art. Even in the construction of the Pantheon.



Thank you for your attention

Sources:

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