Fibonacci numbers and the golden ratio 1.618033...

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Italian Mathmatician
Leonardo Pisano (Fibonacci)
(c. 1175 - c. 1240)

Leonardo, also known as Fibonacci introduced Europe to the inherent advantages of using the decimal system and hindu / arabic symbols for numeric calculation.

How many pairs of rabbits are created by one pair in one year? By posing and solving this question, Leonardo of Pisa also introduced Fibonacci numbers to western mathematics in the 13th century.

To find the pattern add:

$0 + 1 = 1$

$1 + 1 = 2$

$1 + 2 = 3$

$2 + 3 = 5$

$3 + 5 = 8$

$5 + 8 = 13$

$8 + 13 = 21$

$13 + 21 = 34$

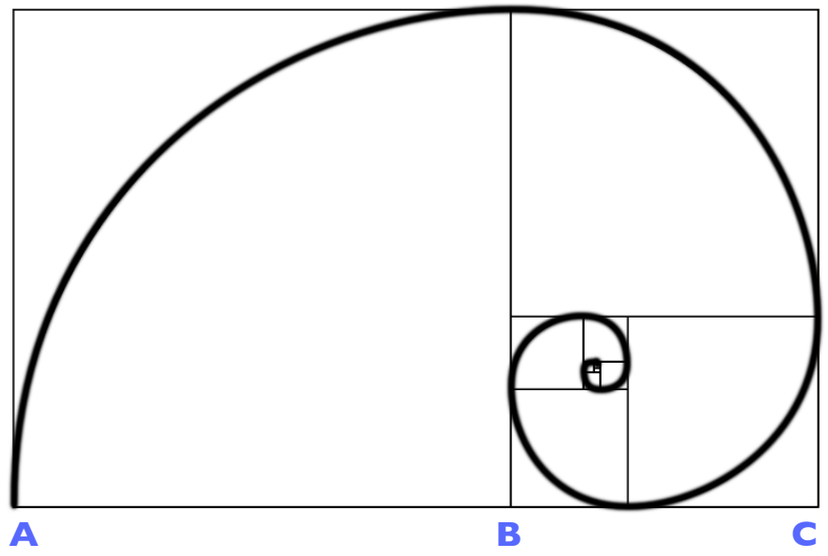
continue the pattern...

as the sequence develops, the ratio between each number settles into phi, the golden ratio.

AB / BC –

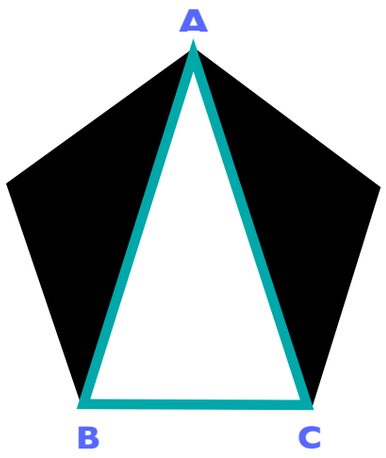
1:1.6180339887...

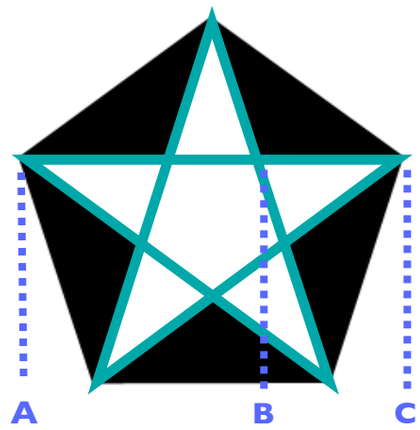
$\Phi\varphi$

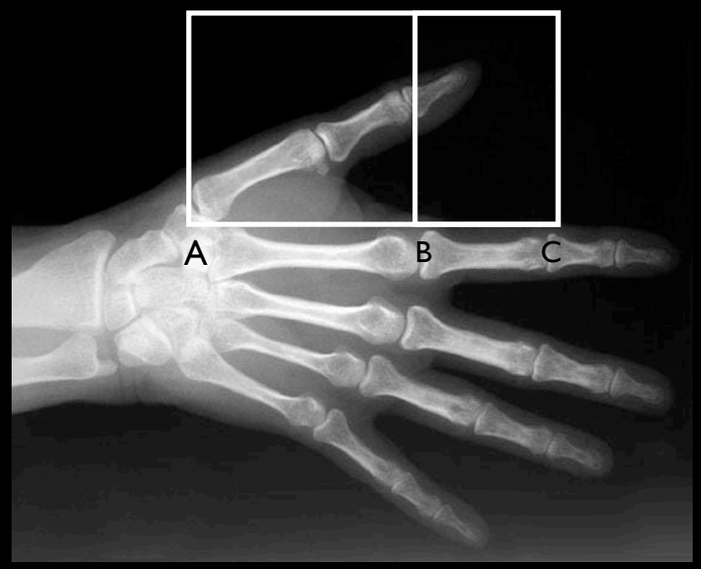


$$AC : AB = AB : BC$$

The golden ratio can be geometrically established a number of ways by creating a golden rectangle, triangle, or pentagon.



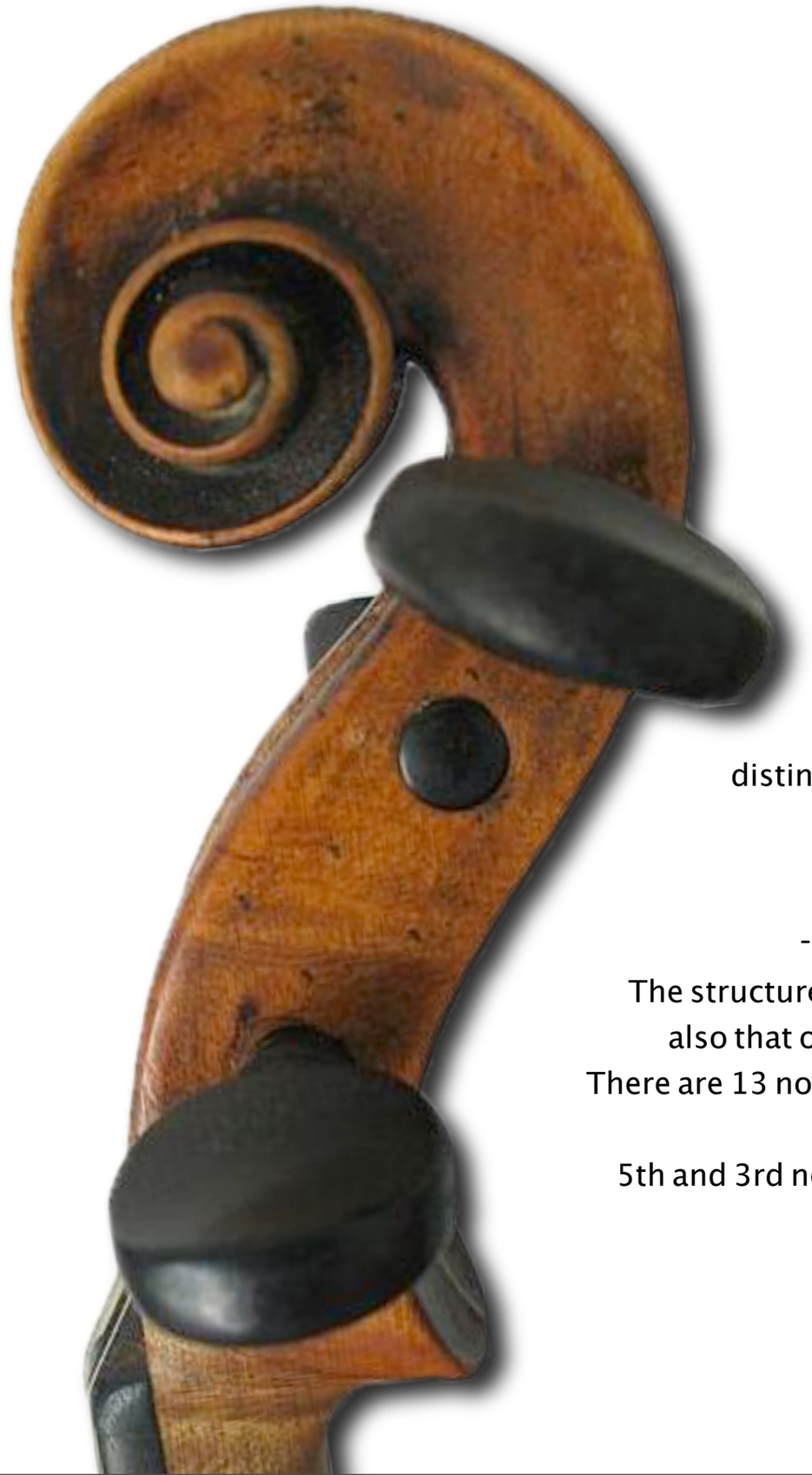




Φ

The golden ratio is evident in patterns of organic growth, from bone proportions to botanical growth patterns such as the sun flower example, the fibonacci sequence and phi can be found in many manifestations of nature.

Count the number of opposing spirals in each direction in the seed pattern of a sunflower. Invariably, you will find two consecutive Fibonacci numbers.



Phi and Music

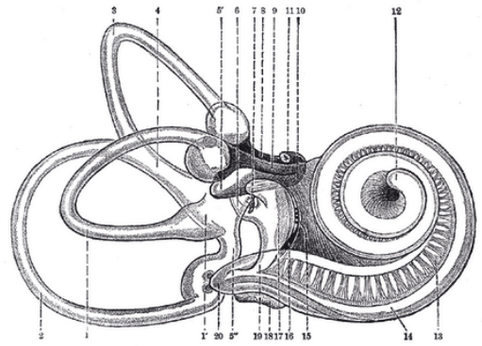
Phi has a deep relationship to music. The harmonics of the western scale are based on Phi, as are many other scales utilize around the world. The physical shape of the of the inner ear reflects the golden ratio.

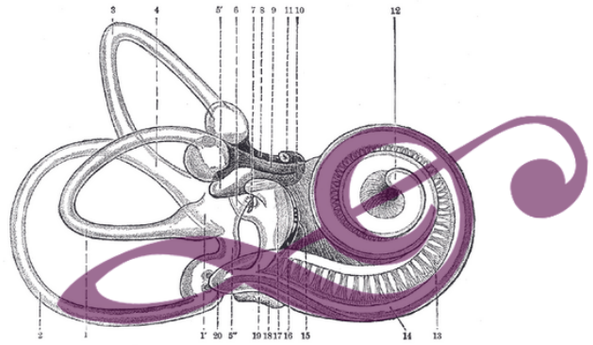
“Consider the cochlea of the inner ear, which distinguishes various pitches. Looking rather like a snail, it is a logarithmic spiral, proportioned according to the Golden Ratio”.

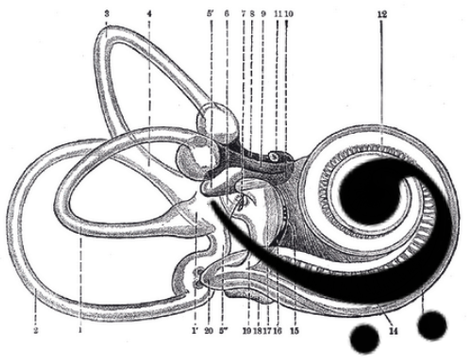
- Piano Studio, Peterborough, Ontario, Canada

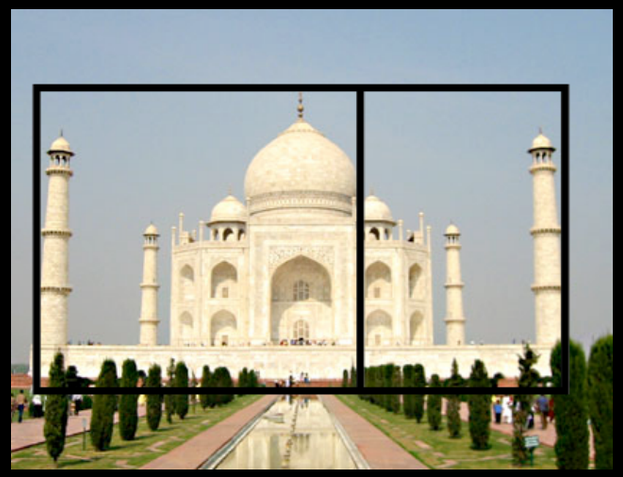
The structure and organization of the notes of a scale, and also that of a piano is related to the fibonacci sequence. There are 13 notes in the span of any note through its octave. A scale is comprised of 8 notes, of which the 5th and 3rd notes create the basic foundation of all chords, and are based on whole tone which is 2 steps from the root tone, that is the 1st note of the scale; all these numbers are Fibonacci.

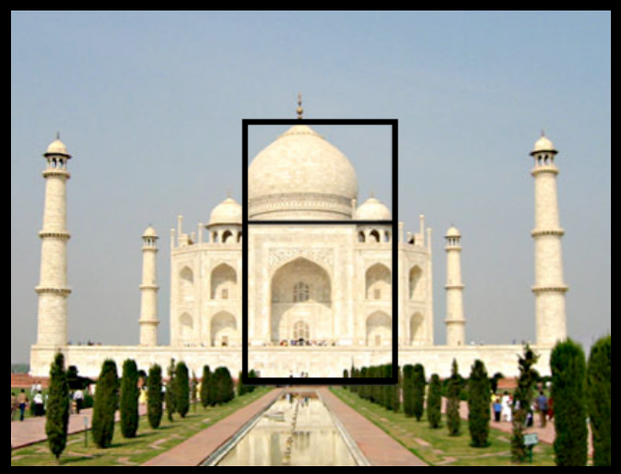
↓ diagram of the inner ear



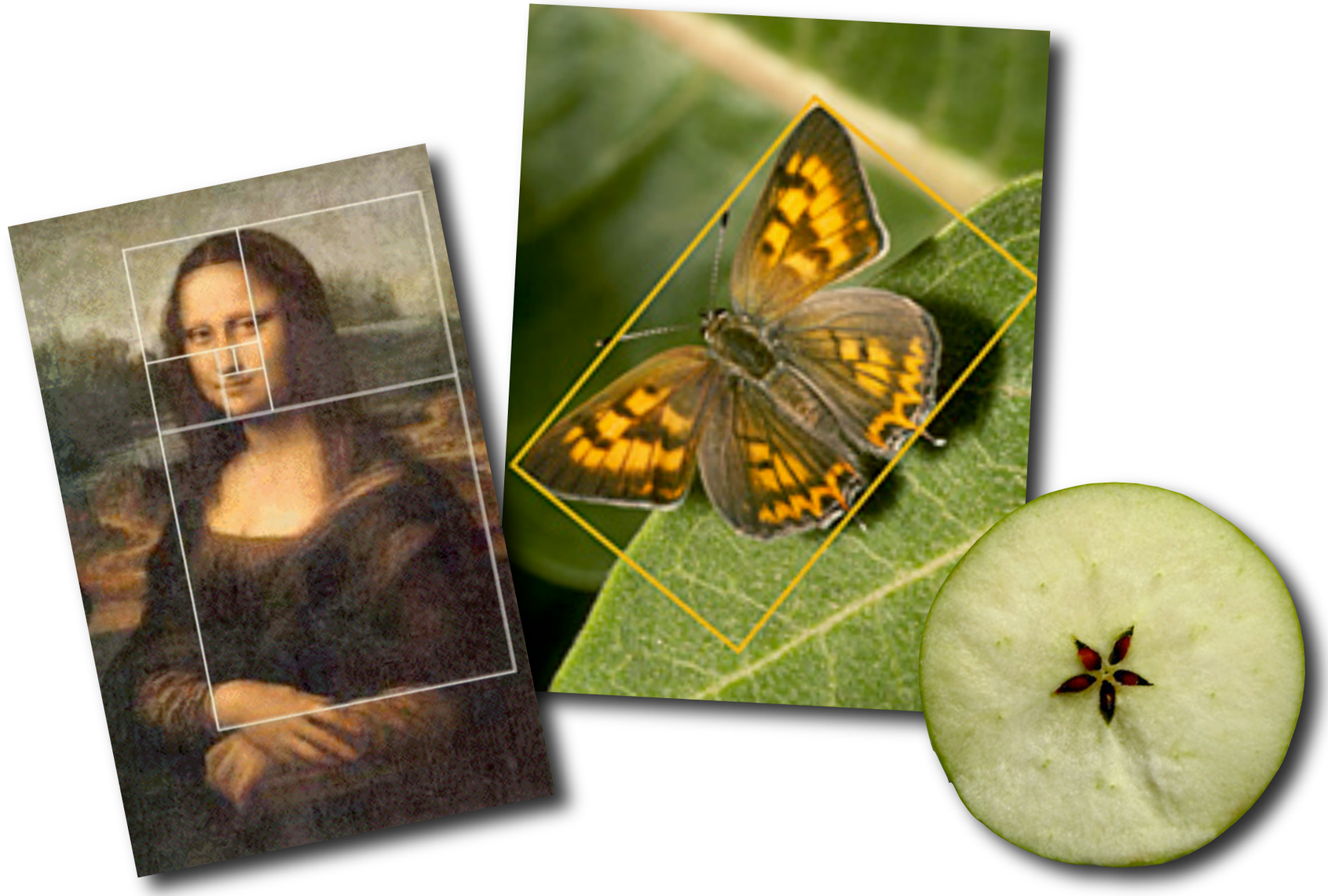




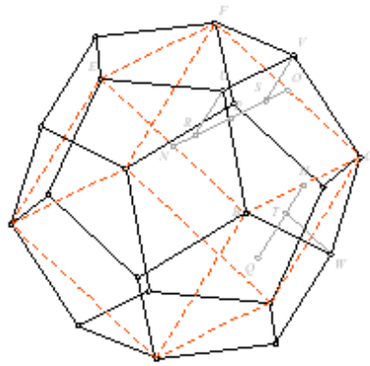




Known for its harmonic spaces and balanced proportion, The Taj Mahal, in Taj Mahal Agra, Uttar Pradesh, India.



Look for manifestations of Φ in nature, biology, mathematics, geometry, art, architecture, music, and yourself.



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2	http://en.wikipedia.org/wiki/Golden_ratio
2	The European Mathematical Information Service http://www.emis.de/
3	sunflower photo from: http://www.flickr.com/photos/lucapost/694780262/ sunflower quote: http://www.onereed.com/articles/fib.html
4	http://pianostudioone.ca/page6.html http://goldennumber.net/music.htm
5	Golden Ratio in Art and Architecture By Samuel Obara, http://jwilson.coe.uga.edu/EMT668/EMAT6680.2000/Obara/Emat6690/Golden%20Ratio/golden.html
5	http://makingsenseofmaths.com.au/wp-content/photos/fib_apple_1.jpg
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