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Introduction

The Fibonacci Ratio is an essential tool for any professional designer. Its many incarnations can be found in such things as the arrangement of sunflower seeds, the spiral of a seashell, and even the human anatomy. Enlightened artisans throughout the ages have used it to enhance their most sublime masterpieces. Amazing feats of architecture like the Great Pyramids of Giza and the Parthanon have fundamental proportions that invoke the Fibonacci Ratio. Indeed, the ratio is an innate and remarkably subtle part of life on planet Earth. A person that understands the philosophy behind the ratio can virtually tap a subconscious mainline of the public's aesthetic sense. Such a principle is invaluable in the field of design. This booklet is a graphical guide through every aspect of the amazing Fibonacci Ratio. From fundamental mathematical and geometric definitions, to examples of the Ratio in the natural world, and finally to the use of the Fibonnaci Tatio in some of the most famous works of art, this booklet will lend a concise yet thorough fluency in this powerful ratio. When you've finished reading this booklet and feel you have an understanding of the Fibonacci Ratio, look it over again

WHY IS IT CALLED THE FIBONACCI RATIO?

The Fibonacci Ratio is named for Leonardo Fibonacci Pizano, an enigmatic Italian mathematician. Almost nothing is known about Fibonacci except he was the author of *Liber Accabi,* a text that explained decimal numbers and decimal arithmetic, the concept of zero, and an explanation of the ratio that bears his name. These concepts were unheard of in 12th century Europe, and their publication helped fuel the Renaissance.

Fibonacci gained fame with the ratio, but it was not his creation. The artisans of Ancient Greece found rectangles with lengths of Fibonacci numbers to be the most visually pleasing. They called the relationship the Golden Ratio. Leonardo DaVinci called it the Divine Proportion, and used it frequently in for pleasing proportion and perspective.

What is the Fibonacci Ratio?

Part 1, the Arithmetic

To Understand the Fibonacci Ratio you must understand 2 things:

1: Fibonacci Numbers **&** **2: The Fibonacci Ratio**

Fibonacci Numbers are members of an increasing number sequence. Every Fibonacci number equals the addition of the two previous numbers.
Here is an example:
Note the first two numbers equal 1 so the sequence has somewhere to start.

#1 = **1,**
#2 = **1**,
#3 = #1+ #2 = 1+1 **= 2**,
#4 = #2 + #3 =1+2 = **3**,
#5 = #3 + #4 = 2+3 = **5**,
#6 = #4 + #5 = 3+5 = **8,**
#7 = #5 **+** #6 = 5+8 = **13**

So. The first 7 numbers of Fibonacci Sequence are: **1,1,2,3,5,8,13,**

The Fibonacci Ratio is a relationship between successive pairs of Fibonacci numbers. Each number is divided by the previous number in the series. The result is approximately the value of the Fibonacci Ratio. As the Fibonacci numbers get larger, the resulting division gets closer to the real value of the Fibonacci Ratio. This value is called Phi, and is approximately equal to 1.618. The symbol for Phi is: ∅
Confused? Just remember this:
The Fibonacci Ratio = Phi = ∅ ≈1.618
Note the *exact* value of Phi is

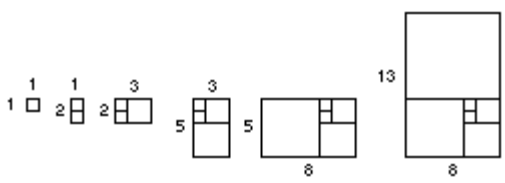
$$= \frac{1 + \sqrt{5}}{2}$$

the proof is beyond the scope of this text

Next comes the fun part.

Part 2, the Geometry

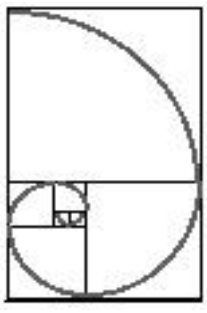
Remember the Fibonacci number sequence
Think of each number as a square's length.
Attach a new square with the length of the Next Fibonacci number.



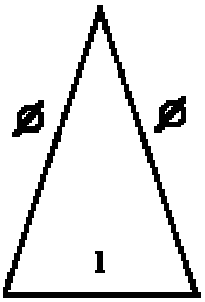
1

Every rectangle
Has this exact
Proportion.
The proportion
Is called the
GOLDEN RATIO
And it equals
∅:: 1
(phi to one)

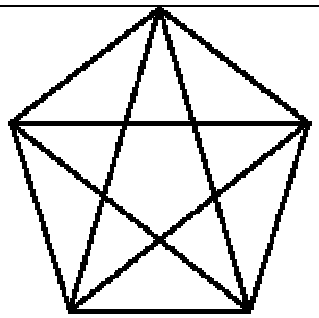
Notice as this progresses it creates a perfect spiral.



Here is another method of geometrically depicting the Fibonacci Ratio:
Make an isosceles triangle with sides equal to ∅, ∅, and 1.

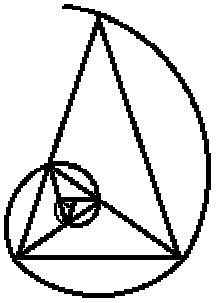


This is the
GOLDEN TRIANGLE
It is no coincidence that
This triangle is *EXACTLY*
The proportions of one the
Points of a 5-pointed star.



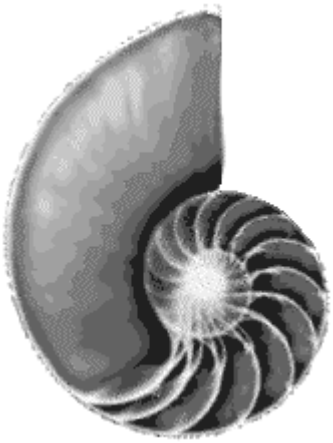
There is another interesting thing about this triangle:

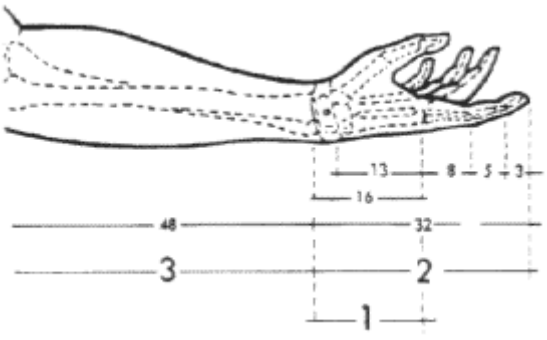
If successively smaller Golden Triangles are placed inside each other in a recursive clockwise Motion, then the point of the triangle can be connected to form a perfect

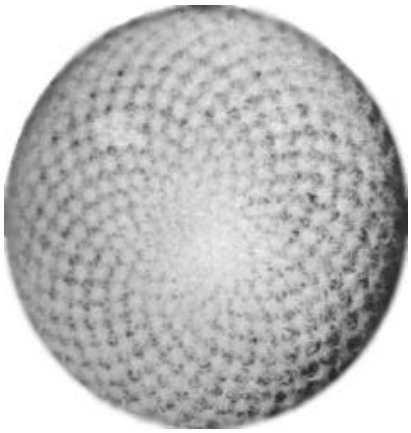


You might have noticed that the Golden Rectangle and the Golden Triangle create the exact same spiral. Does the spiral look familiar? If not, read on

Fibonacci Ratio in Nature

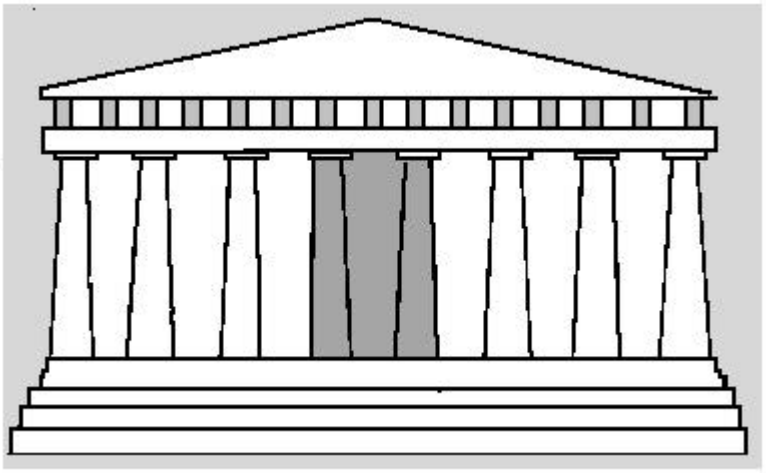






Fibonacci Ratio in architecture

The Parthanon

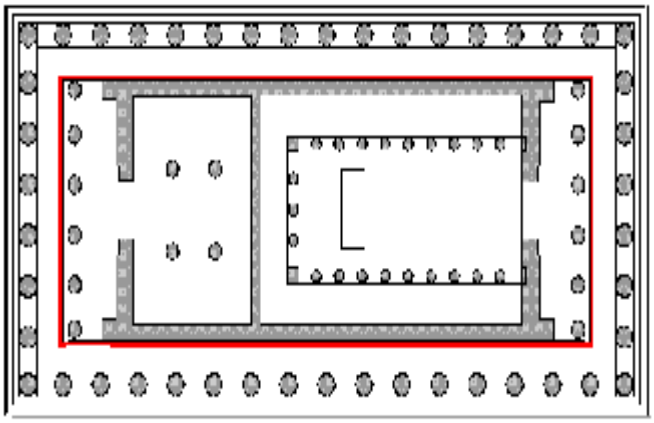


Front of Parthanon

Notice the Golden Rectangles

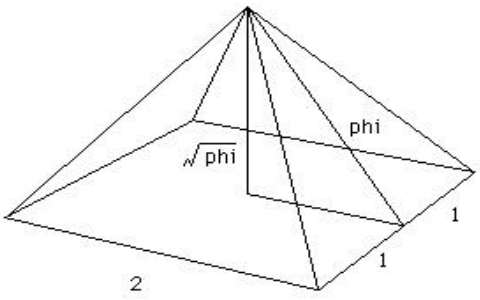
1. On the outside diameter,
2. The supporting roof beams.
3. The space between the outside of the pillars

Observe that not only the outer perimeter is a Fibonacci Ratio, but that there are multiple Fibonacci Ratios inside.



Floorplan of Parthanon

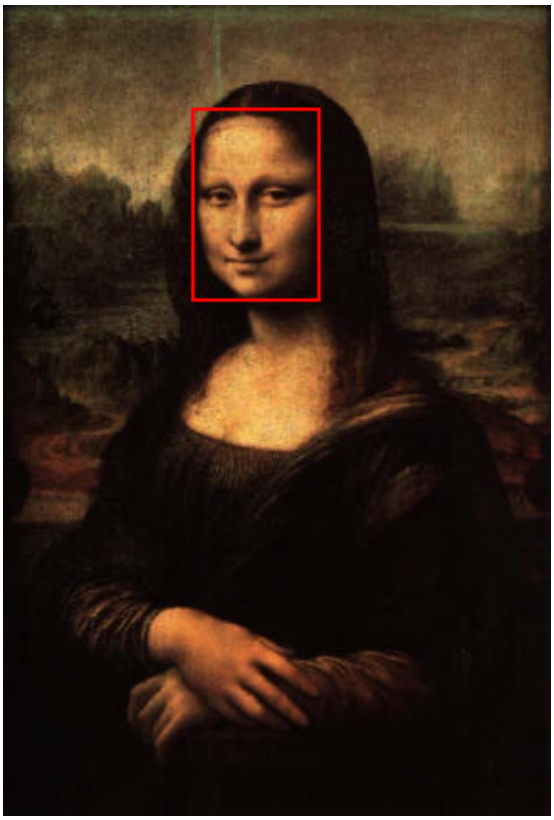
The Great Pyramid



The Great Pyramid of Giza stands as one of the most astounding feats of architecture. Without modern computing power Egyptian architects designed and implemented a mammoth structure whose walls had exact Fibonacci proportions. Not only that, but the pyramid's height is exactly the square root of phi.

The Fibonacci Ratio in Art

The Mona Lisa



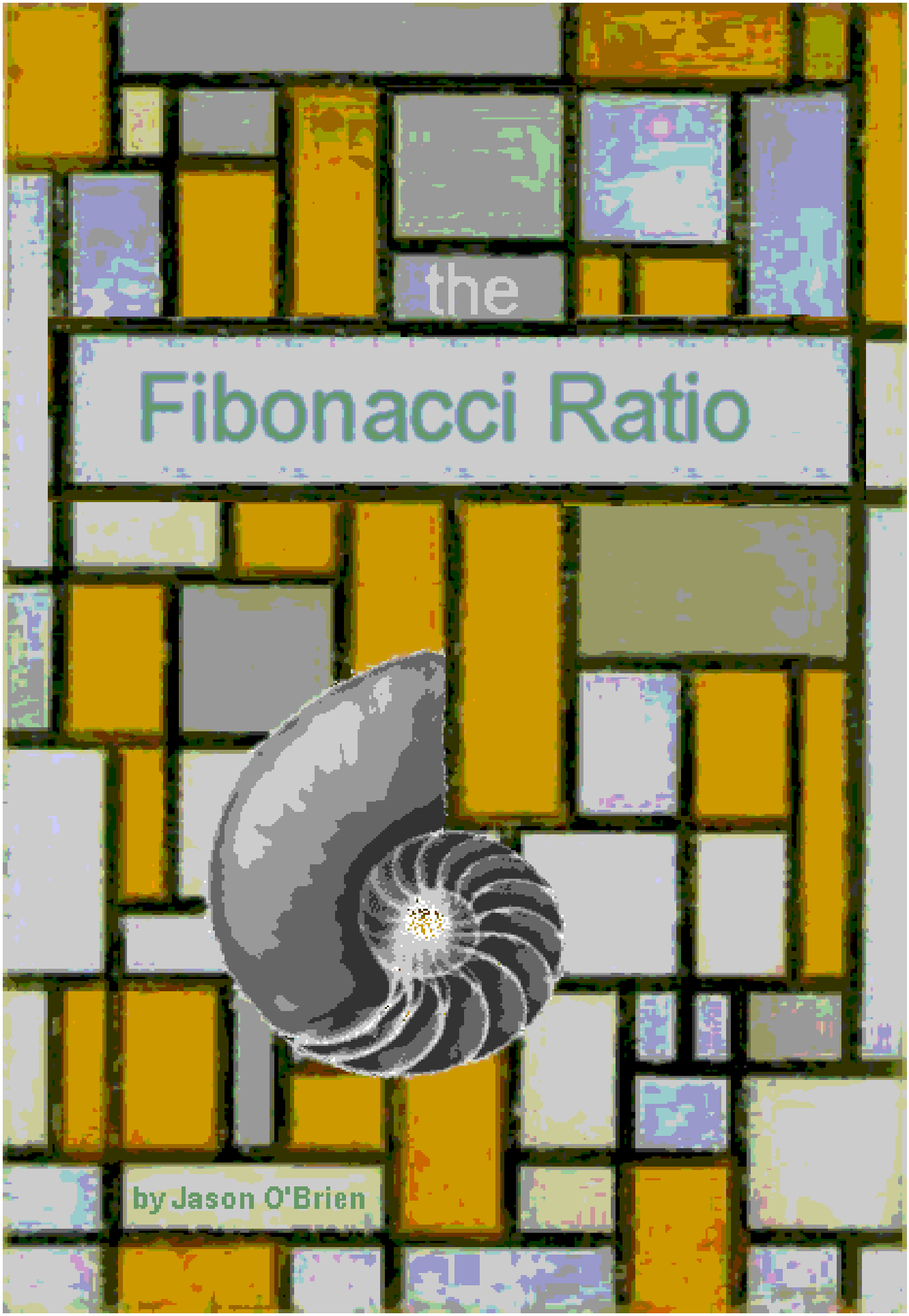
Considered the quintessential expression of human proportion, the Mona Lisa perfectly shows the value of the Fibonacci Ratio. Notice the canvass is a Golden Rectangle, and look at the red rectangle, which emphasizes Mona's face as a Golden Proportion. Also note one could draw a line directly across the brow and create another perfect Fibonacci

The Last Supper

The Last Supper has So many Fibonacci ratios it is hard to begin to list them. Look at the back wall, the ceiling, the tapestries, and the proportions of Jesus himself.

Conclusion

Once exposed to the Fibonacci Ratio, it is hard not to see it in almost everything. It is a mathematical ratio that people have used to chart the stock market. Physicists find that sounds with Fibonacci proportion start to propagate intense harmonic convergence, creating an all new type of sound wave. If one delves far enough into esoteric writings they inevitably come to a reference about the fibonacci ratio. All this, and it looks neat. I am resolved that knowledge of the Fibonacci will greatly increase the effectiveness of artistic design. I hope you I adequately conveyed the beauty of the amazing number theory. If you have any questions don't hesitate to contact me at futomaki@texoma.com or 903.893.9112


the
Fibonacci Ratio
by Jason O'Brien