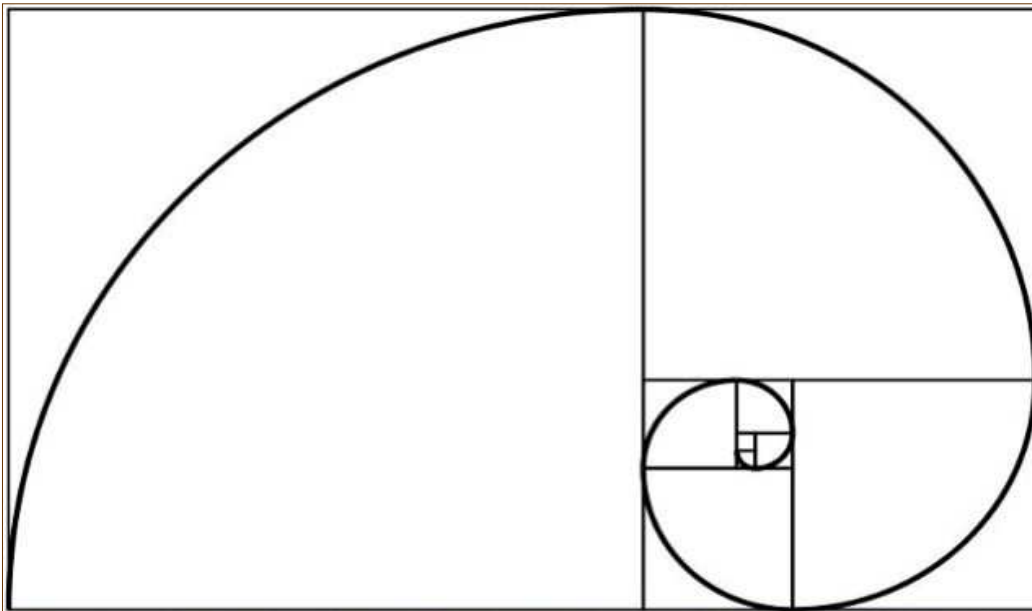


The Eternal Golden Ratio

And other numbers God favors in His Creation

By Gerald H. McKibben



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God Reveals Himself in His Creation—Romans 1:20 states that God’s “invisible” attributes—His eternal Deity and power—are “clearly seen” in the things which He has made. What are these things that are “clearly seen”? The psalmist David was obviously impressed by the heavens; the moon and the stars (Psalm 8:3,4; 19:1,2). And the earth itself is also a powerful testimony to God’s power.

Being made in God’s image, we seem to appreciate things of beauty as God Himself does. The fine arts appeal to us through our built-in senses. How many times do the terms “beauty” or “beautiful”, “sweet-smelling”, “music”, etc., occur in the Bible? Why is it that the most popular yard ornaments—at least in the U.S.— seem to be plants? Genesis 2:9 is insightful: “And out of the ground the Lord God made every tree grow that is **pleasant to the sight** and good for food. “

Beauty is built into nature—This is a gift from God; things both He and ourselves appreciate and enjoy. These include but are not limited to birds, flowers, mountains, beautiful sunsets and sunrises, and cloud formations. These all appeal to our sense of beauty. And they tell us something of His power and deity. The earth, though under the curse described in Genesis and Romans, still has an intrinsic order and beauty evident to those who choose to notice.

Inherent rationality—But what other things in the world tell about His great power and deity? For those who look in the right places, there is an inherent rationality built into the universe; an eternal golden thread winding its way throughout God’s wonderful creation. For He has created a universe whose foundation is mathematics; a foundation which we didn’t invent but only discovered. Let’s look first at some numbers which God seems to favor in His Creation.

Pi— Known since 2,000 BC or earlier, the assignment of the Greek letter “ π ” to the value was made in the early 1700’s. Dividing a circle by its diameter yields a constant value for all circles. This value, rounded off to two decimal places, is 3.14. We seem to have a strange fascination with Pi. The U.S. Congress passed, several years ago, a non-binding resolution proclaiming March 14 as National Pi Day, providing mathematics students an opportunity to purchase and wear T-shirts advertising the day.

Because its definition relates to the circle, π is found in many formulae in trigonometry and geometry. But it is also found in formulae used in other branches of science such as cosmology, number theory, statistics, fractals, thermodynamics, mechanics and electromagnetism.

Why Pi? But why would God plant this value here and there throughout His Creation in systems not apparently related to a circle? Its appearance in unexpected places fascinates mathematicians. Two examples are given below.

An equation known as Euler’s Identity, $e^{i\pi} + 1 = 0$, has been called by mathematicians a foundational equation that bespeaks of the beauty that is inherent in math. We’ll take their word for that, but what is pi doing in such an equation? Could it be one of the Creator’s indelible marks on His creation, part of an eternal thread of rationality He built into the universe? If so, we wonder how many more there are not yet discovered.



Another Example: Buffon’s needle—Buffon was an 18th century French naturalist, mathematician, cosmologist, and author of a nine-volume book on birds. He was fascinated by the results of dropping a sewing needle onto a piece of paper on which had been drawn a series of parallel lines spaced at about the same distance as the length of the needle. He recorded the number of times the dropped needle’s position intersected one of the parallel lines. After many drops, he concluded that the probability of the needle intersecting a line could be calculated with the simple equation $P = 2 / \pi$, which gives a value of 0.64, or 64%. He confirmed the results by dropping the needle many times. So π turns up again!

Other strange ‘coincidences’ - Brownian motion— In 1827 Botanist Robert Brown was studying, through his microscope, pollen grains suspended in water. He noticed that the pollen grains, instead of remaining stationary, were in constant, seemingly random movement, jerking this way and that. Though the scientific world didn’t know what caused this curious movement, it was termed “Brownian motion”.

It was Albert Einstein who, many years later, pointed out that the motion Brown observed was caused by the action of the water molecules as they moved about and collided with the pollen grains. It was Einstein and others who informed us that everything is composed of tiny particles. Even solids like metals, if we were to zoom in deeper and deeper, would be seen to be composed of atoms and molecules. Molecules are a collection of atoms chemically bonded to one another, and all matter is mostly space, including our own bodies!

But even stranger - A formula for pricing stock market options won the Nobel Prize in economics for Myron Scholes and Robert Merton in 1973, and they derived their formula from the key equation used to describe Brownian motion! So there's that continuous thread of rationality running throughout the world of math, describing our universe. And perhaps even stranger, the same equation applies also to the motion of stars in star clusters! Our God is not only the God of the immensity of outer space, but of infinite detail.

The Golden Ratio— What is there about 1.62 that God likes? He obviously favors it because it is so prevalent, so ingrained throughout nature that it shows up in the most unexpected places. Its value was known by the ancients (Plato and Euclid, for example), and is a common thread that permeates the Creation in the design of natural objects such as plants and even the bodies of humans and animals.

The Golden Ratio (GR) has fascinated mathematicians, artists, biologists, astronomers, sculptors, psychologists, and others for centuries. Famous Astronomer Johannes Kepler (1571 – 1630) is remembered as the formulator of the three laws of planetary motion. He believed the universe represents a reflection of its Creator. He believed that the Golden Ratio “served as a fundamental tool for God in the creation of the universe.”

The Golden Ratio in Nature— The Chambered Nautilus pictured on the cover illustrates one of the best known examples. The shell forms as the animal grows, forming bigger and bigger chambers. The ratio of the dimensions of the innermost chamber divided into the that of the next larger one turns out to be 1.62—the GR. The same applies to each succeeding chamber. Spiral Galaxies seen through the telescope and Hurricanes when looked down upon from satellite cameras show the same relationships.

In our own bodies many features demonstrate the same ratio; for example, if you measure the first segment of your fingers and divide that in to the length of the next larger segment, it approximates the same 1.62 Ratio.

The Golden Ratio in Everyday Objects – Why do credit cards, cereal boxes, electric wall plates, tables, calculators, coffee pots, playing cards, and many other objects often show the Golden Ratio (GR) in their proportions? Is there something in our makeup that causes it to appeal to us? Is this some manifestation of our being made in the image of our Creator?

Are the numbers of flower petals ordained by God? – Many flowers have petals that correspond to a certain series of numbers called Fibonacci numbers. The series begins with 0,1,1,2,3,5,8,13,21,34,55,... where each number is the sum of the two preceding numbers. At this point we are reminded of the harmony designed into the creation by the fact that by dividing one Fibonacci number into the next larger one in the series (after passing '3') yields 1.62—the GR!



Why Five? - The most prevalent number of flower petals in my own modest survey was five. There are many studies of the numbers of petals, and the surprising frequency with which they correspond to Fibonacci numbers (Science News 2006). In my own informal survey, I examined photos of wildflowers in which it was possible to count the numbers of petals. In 45 examples, 35, or 78%, had five petals. Overall, 39 out of 45, or 87%, of the flower species had a number of petals corresponding to a Fibonacci number.

Daisies tend to have many petals, and these numbers often correspond to larger Fibonacci numbers such as 21, 34, 55, and 89 (Garland 1987). In a survey of brown-eyed susans (*Rudbeckia* species) growing near my house, the number of petals ranged from five to 19. Fifty out of 118 flowers (42%) had 8 petals, and 58 out of the 118 (49%) had numbers of petals corresponding to a Fibonacci number. (Only three out of the 15 numbers, or 20%, in the range of 5—19 are Fibonacci numbers, ruling out a random effect.)

Sunflowers—The large showy blossoms of this plant develop into seed heads that have two distinct spirals of seeds, one going clockwise and the other counterclockwise. The usual number of spirals in a sunflower head is 34 going one way and 55 going the other. Giant sunflowers have 55 going one way and 89 going the other; all Fibonacci numbers (Garland 1987). Similar patterns have been reported in pine cones of many species.

Examples from Music and Art – Several notable composers have been mentioned in connection with their music reflecting some aspect of Fibonacci numbers or the GR. And Garland (1987) relates proportions used in both art and music based on the GR. Olsen (2006) states that the horizon of many paintings is at the GR of their height, and some see the ratios and proportions in art as embodying harmonic principles of nature itself. The mathematical investigations of Leonardo da Vinci and other Renaissance artists were related to the GR. Some authors credit da Vinci with inventing the term “Divine Proportion”.

Fibonacci Numbers in Poetry – The Limerick, an example of popular poetry, is made up of five lines with a total of 13 beats grouped into 2’s and 3’s, all Fibonacci numbers. The following original example is presented without any claims to literary excellence:

The Petal Counter	
	Beats
There once was a man, a sage	3
Who counted petals for his wage	3
Many had three	2
It was easy to see	2
But the sunflower was difficult to gauge!	3
Total	13

Garland (1987) mentioned the Limerick, and then presented a more sophisticated example of poetry in Virgil’s *Aeneid*, the epic Roman poem written in about 20 BC. She quotes Professor G. E. Duckworth of Princeton University who, in 1962 discovered “frequent use of the Fibonacci sequence to create golden proportions” in Virgil’s work. Other poets of Virgil’s time were also analyzed by Duckworth and found to use these proportions in their poems.

The Violin - Antonio Stradivari took special care to place the “eyes” of the f-holes of his violins at positions determined by the GR (Livio 2002). I decided to measure my own violin (definitely not a Stradivarius) to see if gross aspects of its structure reflected the GR. To keep things simple I measured from the tip of the scroll to the main body (23.336 cm), and the length of the main body (35.242 cm). When I divided the total length (58.578 cm) by the length of the main body, the result was 1.66, very close to the GR.

Examples from Commerce - For a more prosaic example, until the late 1980’s motor oil came in one-quart cans with cardboard sides and metal tops and bottoms. Later they were replaced with plastic bottles. I was able to examine two antique cans from two major oil companies and found the ratios to be 1.36 and 1.42, good approximations of the GR.

The dimensions of oil cans is especially interesting because the most efficient shape for a cylindrical container from a materials standpoint, using calculus – ignoring materials cost - is one where the height equals the diameter (Thomas 1972). In general we seem to prefer cans that are taller than they are wide, whether they contain motor oil or soup. The fact that the design of objects as diverse as violins and oil cans contain the GR - or close approximations to it – is what has fascinated us for centuries.

When we consider the sometimes surprising mathematical principles that show up in unsuspected (to us) places, it is easy to suspect that there may be some things mysteriously appealing to us that are hard-wired into our psyche. Is it possible that our spirits resonate with that of our Maker and that this response, like that to art and music, is a manifestation of our being made in the image of God?

*The heavens declare the glory of God;
 And the firmament shows His handiwork.
 Day unto day utters speech,
 And night unto night reveals knowledge.
 There is no speech nor language
 where their voice is not heard.
 Psalm 19:1-4 NKJV.*

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