Teaching Mathematics Christianly:

Some Starting Points

www.beaconmedia.com.au

Mathematics: A Child of Religion

Religion and mathematics were always linked. Only in this modern era have people wanted to separate theology, the apex of study, from other realms of intellectual pursuit. Archeologists in ancient civilizations of the Middle East, India, Pre- Columbian Americas and China all document this integral role played by mathematics.

Pythagoras was central to a cult based on mathematics. His disciples saw a mystical connection between music and numbers, and basically worshiped a deification of number. "Number is the ruler of forms and ideas, and is the cause of gods and daemons", (The Sacred Discourse). Plato gave us the notion that mathematics exists in another realm in a pure form. For Plato mathematics is uncreated and inherent in the eternal nature of our world.

Numerology has been made fashionable again today by some pop celebrities. Advocates of the Kabbalah claim its origins predate Pythagoras and count Melchizedek and Solomon among its devotees, invoking the theurgic powers of the Hebrew alphabet in a magical way, making esoteric connections of numbers to letters. There is no shortage of books and websites on numerical Bible codes revealing esoteric insights.

Today there is an emerging return to the inclusion of faith as people discover that mathematics and science failed to deliver sufficient predictability, contentment, meaning and security to our world. Mathematical insights have helped, but not triumphed, in imposing frameworks of order onto our insurmountably complex world. There is a move from purely rationalistic approaches to ones that see mathematics linked to Hindu and New Age philosophy, (e.g. The F Capra's *Tao of Physics*,) or emerging science and Christianity (e.g. Rupert Sheldrake's).

Mind Games

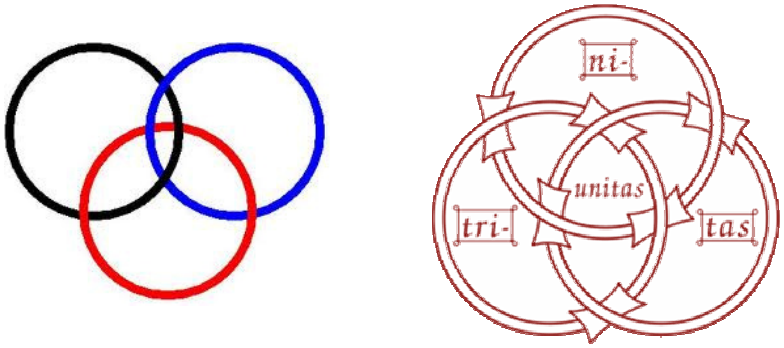
This stands in opposition to the contemporary viewpoint that mathematics is a clever human construct that exists only in the minds of humans, and who use the patterns they create for utilitarian purposes. The relationships and patterns don't have an empirical reality, it is argued. If all humans vanished then most mathematics would disappear as a cultural construct, this viewpoint argues. Mathematics is created and devised by mankind, not discovered in God's reality. Instead of faith in God, there is a faith in the rational thinking of rebellious people who, like Adam and Eve, desire to be totally independent of God. This philosophy of Constructivism is still dominant in much of educational practice. A deification of logic and reason occurs, and they become arbitrators of the new absolutes.

Euclidian deductions can lead to truth and mathematics can reveal laws; but these are not The Truth. Pythagoras's Trousers etc. is a book written from a feminist perspective arguing for more female involvement in the development of mathematics. It criticizes the rising presence of declared faith by male mathematicians.

Christian Nursery

Mathematics went through an explosive development stage, as did science. This occurred in the cultural framework of Christian Europe. Most of the prominent mathematicians were believers and people of faith.
http://godandmath.com/category/series/christian-mathematicians/

They understood that God enables us to decipher much of the numerical and special codes of His created world. Like Adam did, we name dimensions of reality by use of words and mathematical symbols, both functioning together as a language. Understanding that God created people in his own image, and endowed us with creative ability, meant that mathematicians developed their craft by "thinking God's thoughts after Him". This was achieved by using the mathematical language they formulated to be consistent with the order they discerned in creation.



Borromean rings: Geometric representation of the Trinity in a 13th Century manuscript

God is the artist

Many great classical artists used mathematical principles like the Divine Ratio and geometrical shapes to create the framework of their paintings. Likewise architects have used the Golden Mean in the construction of buildings and garden surrounds; they were not just functional but designed on mathematical ideals. Music too, has predictable mathematical patterns and these were put to use in the composition of hymns and symphonies.

God made mathematics. ***God is The Mathematician***. God is triune and this reality means that there is unity and both plurality in the cosmos. In Him all things hold together (Col 1:7) and all things were made by Him (Col 1:6). Moreover God sustains all things including relationships. Just as there are moral laws, so to there are laws of physics, chemistry and mathematics.

Mathematics is one of the Creator's "fingerprints". The Judeo-Christian God is not capricious or erratic like other gods; He is a God of order, He can be known intimately, and He is reliable and dependable in His nature. The laws He uses to sustain the cosmos are not variable but unchanging; they exist not on a whim but declare His wisdom. He is faithful in the regular way life is sustained. Mathematics assists us in contemplating the infinite. Transfinite numbers enhance our appreciation of the majesty and glory of God. The concept of infinity is a challenge to secular mathematicians pointing them to something beyond the temporal and rational. Ecclesiastes 3:11 informs us that God has indeed set eternity in the hearts of people.

$\infty + \infty + \infty = \infty$ and also $1 \times 1 \times 1$ are analogies of the Trinity

Those enamored by mathematics see within it an inherent beauty, and whose forms and relationships produce aesthetic attractiveness evoking wonder and delight. St Augustine argued that our sense of the infinite implies the existence of an infinite being. Although lacking full understanding, we are fascinated with the infinite and we continue to "see through a glass darkly."

Our captivation with the infinity is the result of a purposeful imprint on our minds by God. Analysis and speculation about infinity, produces a level of humility in the proud secular mind.

Just as we can learn about an author from studying their books, or an artist from listening to their music and analyzing their paintings, we can learn something of the nature and acts of God through the study of mathematics. He reveals Himself through his creation, (Rm 1:19-20).

Truth, Absolute Truth

Pythagoras devised a geometry, which was based on five self-evident truths of the created world, and extended these through to 465 theorems (proved statements) using the deductive method of proof. Mathematics is seen by many as the most certain route into truth, an intellectual pursuit pure of human bias. There is plenty of debate about mathematics by its most notable practitioners about the base for certainty that mathematics rests upon. As mentioned in the start of this presentation, some see mathematics as a cultural artifact, which if created by intelligent jellyfish, or some other highly evolved being, would be of a very different fundamental nature. The utilitarian value of ideas of the mind being able to describe aspects of the world and so manipulate it, is something that secular mathematicians wonder about and can't explain.

How can it be that mathematics, being after all a product of human thought which is independent of experience, is so admirably appropriate to the objects of reality?"
Albert Einstein

All the subjects which we create for a school curriculum are permeated by God's truth. Jesus is not an abstract truth but Truth incarnate.
John 14:6 - Jesus said, "I am the way, the truth and the life."
Mathematics is an art as well as a science. School textbooks present mathematics as a done deal, but behind what students see is a story of development, revolutions, disputes amongst the mathematics fraternities, puzzles that have taken hundreds of years to solve, riddles and predictions still challenge the best and brightest mathematicians of our age. Intuition, dreams and leaps of insight have advanced science and mathematics; it is untrue that all breakthroughs occur from painstaking work in laboratories endlessly testing a hypothesis.
All of us live by faith; faith that there is no God, faith that rationality-logic-mathematics opens the way to the only reliable truth, or faith that mathematics can be a stand alone independent source of truth.

Painting of God creating earth using geometric tools and laws
"As a physicist, I look at nature from a particular perspective. I see an orderly, beautiful universe in which nearly all physical phenomena can be understood from a few simple mathematical equations. I see a universe that, had it been constructed slightly differently, would never have given birth to stars and planets, let alone bacteria and people. And there is no good scientific reason for why the universe should not have been different. Many good scientists have concluded from these observations that an intelligent God must have chosen to create the universe with such beautiful, simple, and life…."
William D. Phillips a Nobel Laureate in physics 2012 Templeton address

Precise purpose through randomness

Randomness is an absence of discernable pattern and a high level of unpredictability. For an omniscient God, randomness can have deep patterns within it that the human mind does not perceive. God can be working His purpose through apparent random events. In the conception process for humans there is a random process at work determining whether a female or male is conceived. As it turns out the odds are in favour of females with only a 100 males being conceived in comparison with the more favoured 107 females. However when this fact is taken from being set alone, and extrapolated to the reproductive age of males and females, the ratio evens as out as the more reckless and adventurous males have found that mortality claims the additional seven. So God's higher purpose ensures sufficient fertile pairs are available at the optimal breeding age. Randomness doesn't have to equate with purposeless activity. Humans use randomness in games, like a dice or coin toss to put players on an equal status, and introduced random factors ensure that a survey is reliable and without bias. Banks rely on random code creation devices to ensure security of their data and valuables.
Beauty can co-exist with randomness too. A field of wildflowers distributed randomly by vectors can be even more splendid and engaging than a meticulously crafted garden with geometrically arrayed blooms.

God is determining and creating things, achieving His purposes through randomness. Chaos and design, and beauty coexist, in an ongoing dance of necessity and interrelationship

The Divine Proportion

Throughout the universe, in micro and macro instances God has used the Divine Proportion as an architect's device to shape two and three-dimensional entities. Fibonacci is remembered for developing his sequence of numbers, 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987, 1597, 2584, 4181 .....

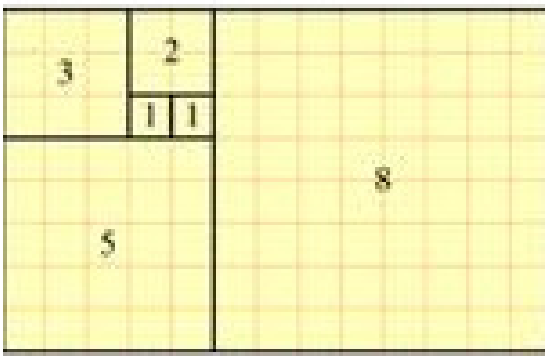
Each number in the series is achieved by adding the former two numbers together.

When you take the ratio of two successive numbers in Fibonacci's series, (1, 1, 2, 3, 5, 8, 13, 21, 34 ……) and divide each by the number before it, the following series of numbers emerge:

$^{1}/_{1} = 1$, $^{2}/_{1} = 2$, $^{3}/_{2} = 1{\cdot}5$, $^{5}/_{3} = 1{\cdot}666...$, $^{8}/_{5} = 1{\cdot}6$, $^{13}/_{8} = 1{\cdot}625$, $^{21}/_{13} = 1{\cdot}61538...$

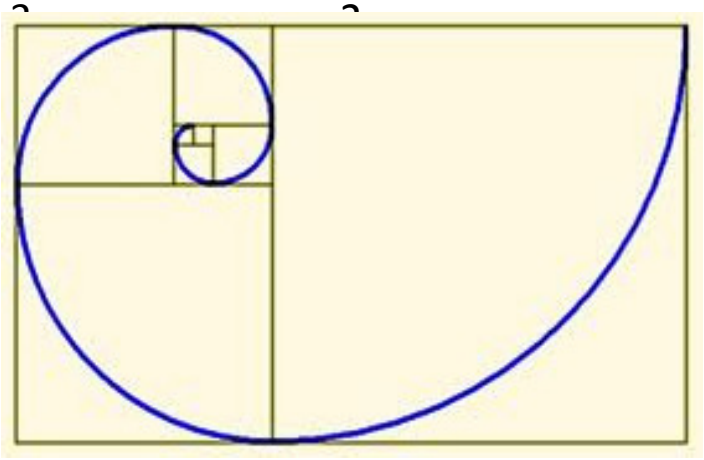
They progressively get ever nearer to:

Phi Φ =1·61803398874989484820.....



It is easy to make a picture showing the Fibonacci numbers 1,1,2,3,5,8,13,21,.. by starting with two small squares of size 1cm next to each other. On top of both of these draw a square of size 2cm (=1cm+1cm). Then proceed to draw a new square - touching both a unit square and the latest square of side 2cm - so having sides 3 cm long; and then another touching both the 2cm-square and the 3cm-square (which has sides of 5cm units). Continue adding squares around the expanding diagram, each new square having a side which is as long as the sum of the latest two square's sides. This set of rectangles, has sides, which are two successive Fibonacci

numbers in length, and they are composed of squares with sides, which are Fibonacci numbers. The width 3+5 then, of the rectangle above is 3+5 =8 cm and the length of the rectangle above is 3+2+8 =13 cm. Both 8 and 13 are sequential numbers in the Fibonacci series. When this 8 cm is divided by 5 cm the phi number is seen again, 1.6180



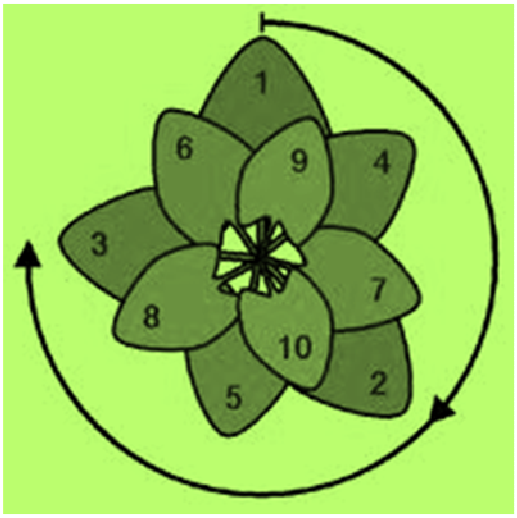
A spiral can be drawn through the squares within the overall rectangle created by joining the six squares seen above. This spiral, like the phi proportion, can be seen throughout creation. Their presence is ubiquitous throughout all of living and non-organic creation. There is a symmetry, inspiring beauty, and mathematical precision that is remarkable and not open to a ready explanation from evolutionists.

Plants emerge from the ground. A monocotyledon begins with a lone leaf and a dicotyledonous plant with two. These often then grow leaves in the Fibonacci sequence. A spiral with a constant expansion factor along a central line stem is created.

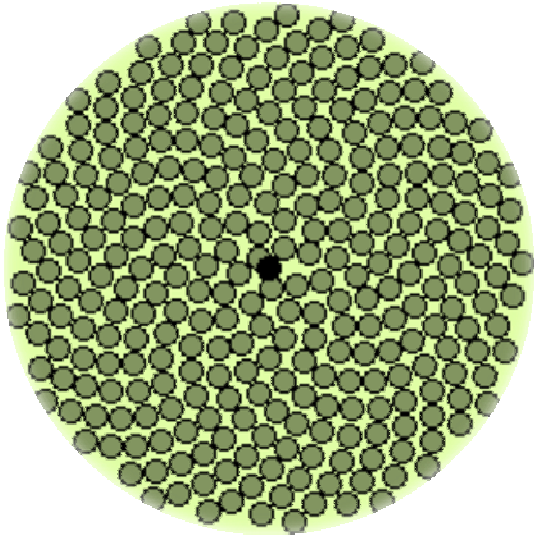
The two dicotyledon leaves are on the base and soon to drop off the bean seedling. The two real leaves will be augmented with three more and the stem will then bud leaves in the sequence of the Fibonacci series as can be seen from the bird's eye view of the plant.

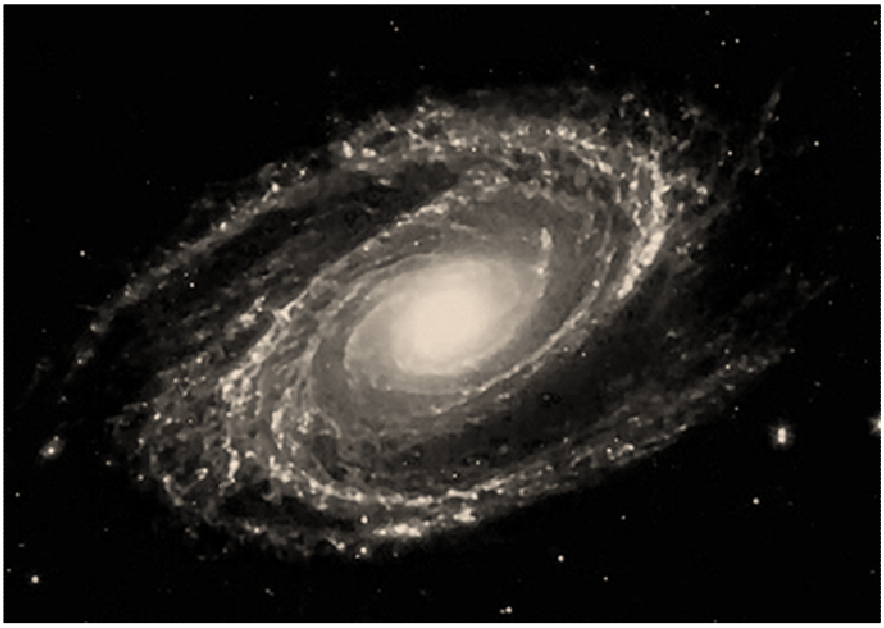
The leaves open up along the stalk or branch in this format as it maximises access to sunlight and minimalizes overlap. This is seen also in flowers and fruit. Sepals usually protect flowers and some sepals are modified petals

Fibonacci numbers can be seen in the arrangement of seeds in the head of flowers, when counted in clockwise and anticlockwise spiral rows. It seems that this arrangement keeps the seeds uniformly packed no matter how large the seed head.



When these spiral rows of seeds are counted in each direction, you will discover that in most cases that their numbers, depending upon the size of the flower, will be of the following ratio: 34 and 55 for smaller flower heads; medium sized 55 and 89; for larger ones 89 and 144. The sequence can be seen too in the growing tip of plants and in branching patterns from a trunk.

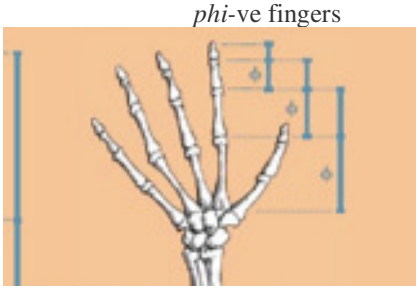


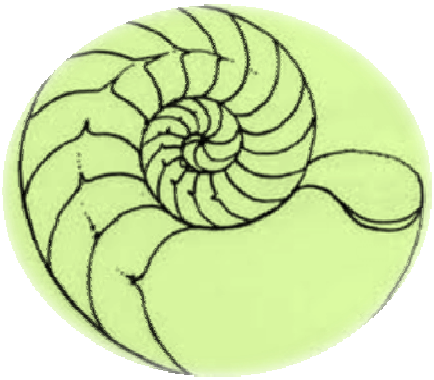


This Divine Proportion and its associated Fibonacci sequence can be detected in the shape of galaxies and even the solar system! When the time period of each planet's revolution around the sun is compared in round numbers to the one adjacent to it, their fractions are Fibonacci numbers! Beginning with Neptune and moving inward toward the sun, the ratios are 1/2, 1/3, 2/5, 3/8, 5/13, 8/21, 13/34. Waves breaking onto a sandy beach, whirlpools, the shape of animal tusks and your ears, the curve of a foetus, the branching of alveoli in your lungs…all display these patterns.

Your body is an array of numbers from the sequence. Most of your body parts follow the numbers one, two, three and five. You have one head, two ears, three parts to you arm and leg, and five fingers on your hand. The spiral of hair on your scalp is of this sequence. Moreover the ratio of your finer bones to each other is in the Divine Proportion. So is the shape of your two front top teeth. DNA molecules follow this sequence, measuring 34 angstroms long and 21 angstroms wide for each full cycle of the double helix.

phi-ve fingers





Many shells display the spiral drawn out of the Fibonacci sequence. This short video clip has no commentary but it is great at teaching the concept

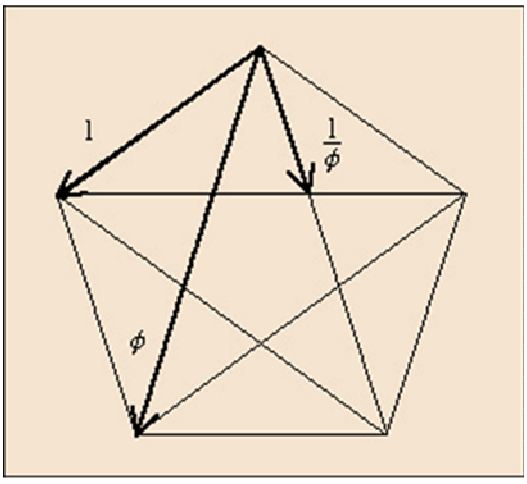
http://vimeo.com/9953368

This shows you in a simple explanation more about the Divine Proportion in the construction of your lungs, bones, face, and body anatomy.

http://www.youtube.com/watch?v=085KSyQVb-U&feature=player_embedded

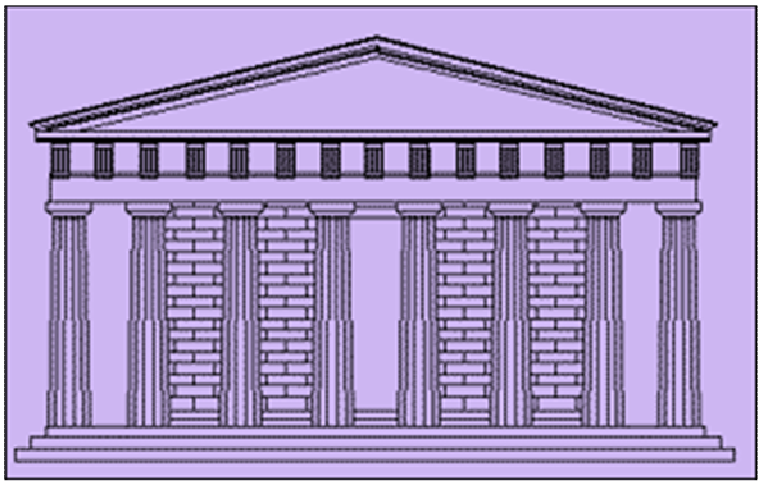
Your body is indeed fearfully and wonderfully made as the psalmist wrote ages ago, Psalm

http://www.dipity.com/timeline/Golden-Ratio/

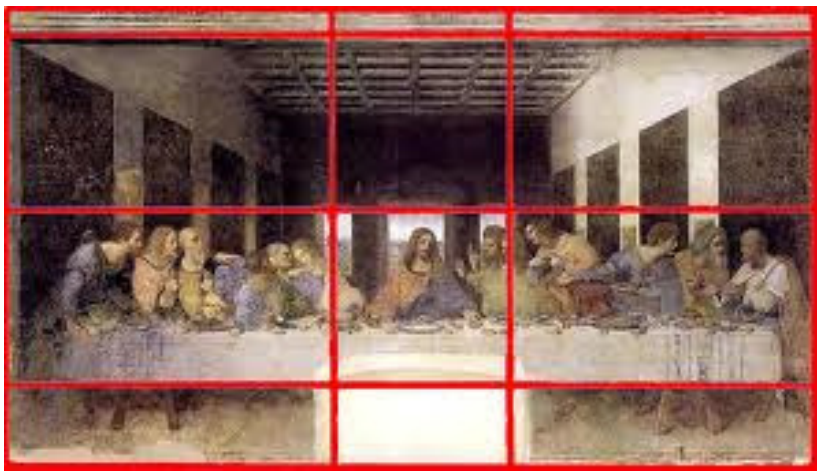


The pentagram, used to represent the five wounds of Jesus in his passion, is also associated with magic. It contains the divine proportion within its properties. Many national flags contain this pentagram star in their designs.

Divine Proportion in Art , Architecture and Music



Art and building structures from ancient civilisations show understanding of the aesthectics of the Divine Proportion. The Partheneon exhibits these ratios as does the modern day business card. Photographers use the ratio in setting up their subject. Loeonardo Da Vinci's painting *The Last Supper* contains the Divine Proportion in many places: where the disciples sit about Jesus, and the ceiling placement. Likewise his *Mona Lisa* shows these ratios.



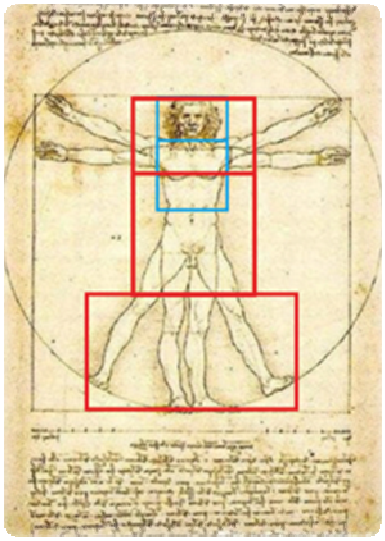
A special device http://www.goldenmeangauge.co.uk/
which is like a three pointed caliper exists to assist art layouts

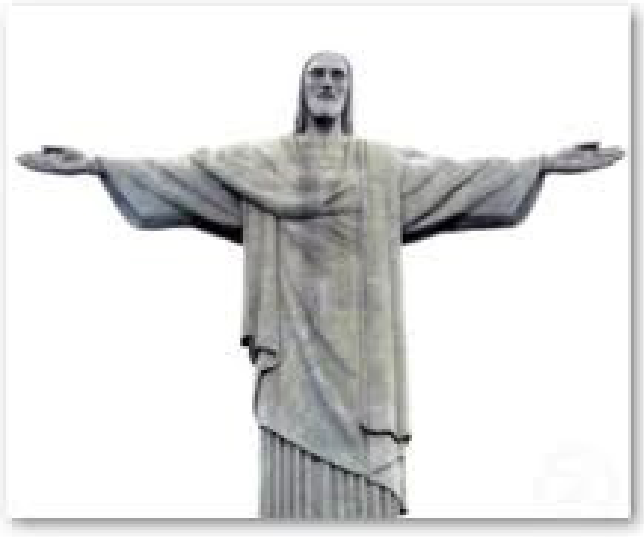
Vitruvian Man, a study in proportions of the ideal body by Leonardo Da Vinci

The large statue of *Christ the Redeemer* on its mountain top in Rio de Janeiro is majestic and uses the ratio of its height to the outstretched arms of 1.618

http://www.youtube.com/watch?v=2pbEarwdusc&feature=fvwrel

This video clip explains the Divine Proportion's expression in music.





"Music is the pleasure the human mind experiences from counting without being aware that it is counting" G W Leibniz

The capacity to do mathematics and to use it is a gift from God. Its content and source is God. God gave mathematics to humans as a dominion tool so that it could be used to manage the earth and to enable the blessing of the application of this knowledge for humankind's benefit. Mathematics is a gift enabling us to use this tool to enrich life on our planet.

In our post Fall world it has turned out to be a Faustian deal with mathematics being used to depersonalize people. Through computerized statistics and illicit removal of personal privacy rights, customers are open to manipulation. In totalitarian states mathematics is used to oppress and dehumanize opponents of the regimes. This was seen in the Nazi concentration camps and Gulags in the last century, where mathematics made possible the necessary statistics, procedures, logistics, design of infrastructure, and personal identification systems for the extermination of human beings.

Mathematics provides a sound analytical way to study issues of social and economic injustice. Realistic, just and mathematically sound ways can be articulated to address these issues. Military budgets can be compared with welfare and aid ones. The impact of casinos, lotteries and gambling are open to analysis and appraisal through Christian moral lenses. Geometry is useful to examine neighbourhoods and serve critical thinking about the location and quantity of unhealthy businesses, alcohol outlets, fast food-junk food shops, socio economic patterns of settlement, and quantity of church ministries serving the area. Graphs can assist analysis of crime rates, poverty, levels, and racial concentrations in communities and between nations.
http://www.radicalmath.org/ is a site with lots of examples of the use of ethics in mathematics classes.

The Myth

All life in the cosmos is mechanical. We are organic machines, driven by our selfish DNA; there is no love only sex drive. Life as we know it is traced to individual genes, each seeking to confer advantage on the 'replicator', which carries the genes, in order to survive through reproduction. Consciousness is just the noise our nervous system makes. We invent mathematics to help control our environment and serve the needs of our tribe/socio economic class. Other humans who don't contribute to our immediate welfare are just meaningless consignments of bio-chemicals. Any sense of our own significance is a delusion, and nature is without purpose. Physics and its leading ally, mathematics, will eventually yield the organising principles of the universe and all organisms therein.

The Reality

Humans have an inner spirit as well as a body and consciousness. Love is the most important and most powerful emotion and social force for God is Love, ref. God made our brains with the capacity for intuition, spiritual insight and rational thinking. These attributes allow us to perceive mathematical relationships, which God built into the cosmos. We are to use our mathematical insights guided by the gospel ethic. Our destiny is that due to God's love in providing the atonement, His people will spend eternity with Him; meanwhile the creation is groaning as it awaits the return of Jesus.

> The ultimate achievement of reason … is to recognise that there is infinity of things that surpass it. Blasé Pascal 1623-62

Two decades ago the literature of the Christian School movement had odd chapters and commentaries on teaching mathematics Christianly. Now there is a growing library of quality books and articles, some of which are listed in the bibliography of this essay.

Capra F *The Tao of Physics: An Exploration of the Parallels between Modern Physics and Eastern Mysticism* Shambala Publications 2010

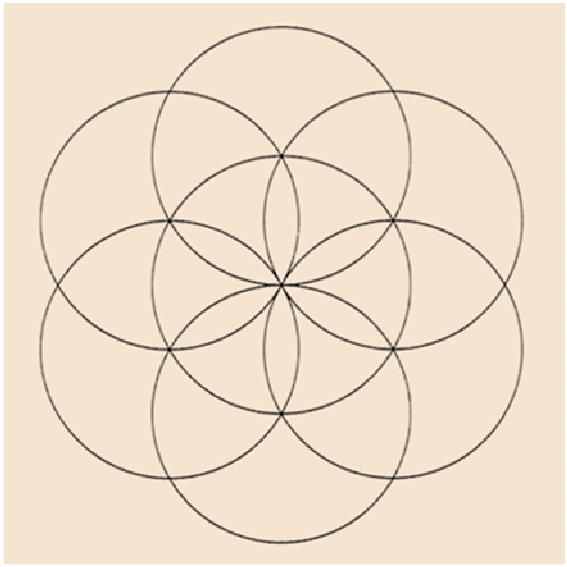
Nickel J *Mathematics: Is God Silent?* Ross House Books 2011

Sheldrake R *The Science Delusion* Coronet, 2012

Wertheim M *Pythagoras's Trousers: God Physics and the Gender War* W.W. Norton & Company, 1997, New York, NY

"As far as the laws of mathematics refer to reality, they are not certain, as far as they are certain, they do not refer to reality." Albert Einstein

Six days of creation with day of day of rest in centre, hexagonal shape



Recommended reading, that is not too difficult to understand or too ponderous!

Haycock R C *Encyclopedia of Bible Truths, Science/Mathematics* ASCI 2005

Loop K *Beyond Numbers* Christian Perspective 2011

Nickel J *The Incarnation of the Word and the Transformation of the Landscape of Mathematics* 2012 Kindle

Tiner J H Exploring *the World of Mathematics* Math Concepts from a Biblical Worldview New Leaf Publishing 2004

http://godandmath.com/ also visit their Facebook site

Great site with lots of useful links

http://www.acmsonline.org/index.html

Association of Christians in Mathematical Sciences

http://christianmathematician.com/Christian_Mathematician/Christian_Mathematician.html

Devotions from a mathematics perspective

http://www.biblicalchristianworldview.net/Mathematical-Circles.html

Dr James Nickel's site with plenty to make it worthwhile to regularly visit

http://www.calvin.edu/kuyers/math/lessons.html

9 fabulous lesson unit planners for free from Kuyers Institute, suitable for senior math classes