A Beginner's Guide to Constructing the Universe: Mathematical Archetypes of Nature, Art, and Science Study Guide

A Beginner's Guide to Constructing the Universe: Mathematical Archetypes of Nature, Art, and Science by Michael S. Schneider

BOOKRAGS

Contents

A Beginner's Guide to Constructing the Universe: Mathematical Archetypes of Nature, Art, and Science Study Guide....1

Contents....2

Plot Summary....3

Chapter 1: Monad - Wholly One....4

Chapter 2: Dyad - It Takes Two to Tango....6

Chapter Three: Triad - Three-Part Harmony....8

Chapter 4: Tetrad - Mother Substance....10

Chapter 5: Pentad - Regeneration....13

Chapter Six: Hexad - Structure-Function-Order....18

Chapter Seven: Heptad - Enchanting Virgin....21

Chapter Eight: Octad - Periodic Renewal....24

Chapter Nine: Ennead - The Horizon....27

Chapter 10: Decad - Beyond Number....29

Characters....31

Objects/Places....34

Themes....36

Style....39

Quotes....41

Topics for Discussion....43

Plot Summary

A Beginner's Guide to Constructing the Universe - The Mathematical Archetypes of Nature, Art and Science by Michael S. Schneider describes in great detail the importance, usage, meaning and myths that relate to the numbers one through nine and the decad which is created by leaving the realm of the single digits and moving on to the number ten. Each chapter is devoted to the mathematics and geometric shapes that are based on each of the numbers.

The story of numbers begins appropriately with the number one. The number is referred to as the monad. The first principle of the monad is the beginning of light, space, time and power and in all directions, and is symbolic of the entire universe. The monad is the backdrop for the creation of all the succeeding numbers.

The number two, or the dyad, follows. It is through the interplay of the monad and the dyad that the birth of the rest of the single digits is made possible. The monad and the dyad are, at times, referred to as the mother and father and the remaining single digits numbers are their children. The dyad is associated with polarity. Although it strays from home, the dyad still has ties to home and maintains a need to stay connected to the monad.

Together the monad and the dyad create the next seven single-digit numbers. The triad is the breakthrough number that gets us past the polarization of the monad and the dyad. Three symbolizes our connection to the universe although we recognize that we are separate entities. The tetrad represents volume and dimension. The pentad represents life itself.

The hexad brings structure, function and order to the mix. The heptad is the "enchanting virgin." It is "untouched" because none of the other single digit numbers can divide it. The octad provides the means for self-renewal and infinite growth. The ennead is the penultimate number and represents the greatest achievement possible for man. It is also considered the horizon number because when going beyond the number nine, man enters into two digit numbers and a new reality. Ten is also known as the decad. The decad encompasses all the single digits within its realm.

The book provides the strengths, uses and myths connected with each of the numbers as well as the geometric polygons that are based on them. The reader learns the ties that man has to the cosmos and to the numbers that are the underlying connective tissue of the universe and everything in it. The book teaches the reader to look for the numbers and geometry in everything. The polygons that are based on the numbers can be seen in every entity from the galaxies and man to the animals and plants, providing evidence that we were all connected by design.

Chapter 1: Monad - Wholly One

Chapter 1: Monad - Wholly One Summary and Analysis

The Circle Draws Us

The appeal of the circle is tied to our desire for oneness with the universe and represents infinity. Man recognizes himself in circles and spheres. A young child relishes drawing circles once he realizes that he can draw a line that connects to itself. To ancient mathematicians and philosophers, the circle symbolized the number "one." The Greek term for the elements of the circle was "Monad." The ancient scholars referred to the Monad as The First, The Foundation and the Immutable Truth and Destiny. The circle represents heaven and enlightenment in religious art.

Important Tips on Using the Geometer's Tools

The three ancient tools of geometry were the compass, straightedge and pencil. The center of the compass represented the eye of God. The legs of the compass represented God's grace shining down on earth. The straightedge was used to create points where circles intersect. The pencil was the tool that brought divine and eternal ideas onto paper. In ancient times, the center of a circle symbolized God. Geometric construction can be soothing and used in meditation. The circle is like a body of water, peaceful and still without a ripple. The circle is considered as a whole, as the universe. Focus can also be placed inside the circle by viewing the center as one's own gravitational center. The center symbolizes inner awareness and peace.

To the Margin Dance

After the center point of a circle is established, the compass is held straight up and it legs adjusted outwardly. Making the circle signifies equal expansion in all directions. In ancient times, drawing the circle or expanding from the center represented God's creation of the universe. The first Biblical command is, "Let there be light." In Hindu mythology, the Brahma said the word, "aham" or "I am" which symbolized the three parts of a circle: the center, the radius and the circumference. The circle is the first evidence of God's light and existence of the universe. As a compass is opened, it represents the first principle of the Monad - the beginning of light, space, time and power and in all directions, i.e., the universe.

The Wheel Whirl'd

The second principle of the Monad is the rotary motion of the circle. While the center remains strong and stationary the circumference represents the cycles of life and the orbits of the planets - the rhythm of life. All cycles rise and decline. Every process known to man is fundamentally a cycle.

Perfect Space for a Universe

The third element of the Monad is the area within the circumference. The circle is symbolic of earth, the perfect place for man to live and function. This area represents maximized efficiency. Circles, spheres and cylinders are everywhere in our world. Here are a few objects that are designed with the basic elements of a circle: The earth, dinner plates, pizza, cups, shields, manhole covers, rings. It is not surprising then that the Monad, or oneness, expressed in the circle is the foundation for geometrically constructing the universe. All things seek oneness or unity: individuals, governments, religions.

Chapter 2: Dyad - It Takes Two to Tango

Chapter 2: Dyad - It Takes Two to Tango Summary and Analysis

The Birth of the Other

"The circle is the womb and cradle of our symbolic universe" (p. 22). A pebble tossed into a lake produces more images of itself. The process of replication is accomplished in geometry by the line. A true line is one-dimensional. It only has width but no thickness. The point/circle and the line are the parents of succeeding geometric designs.

The Dual Throng

The ancient Greeks referred to a form other than a circle as the Dyad. They were not as comfortable with a shape that did not have the a divine center as that of the circle. They thought of the Dyad as audacious and bold for separating from the whole. The Greeks had a real problem with a departure from the Monad. They referred to any such deviation as "falling short" or "the lie" or "the illusion." Phrases like "two-faced" and "speaking with a forked tongue" originated from the Greek's view of the Dyad.

The fundamental element of the Dyad is polarity. It is the basis for the manner in which man lives - separate and independent. However, like man who has a connection to home and family, there is still a strong desire to return to the whole, to the Monad. Thus, it represents both separateness and unity. The influence of the Dyad is felt when one is both repulsed by and attracted to something. It represents man's dual nature: light and dark, ego and shadow. The Dyad has a strong element of unity in that it represents the joining of two entities.

In order to create new life, it takes two - a man and a woman who form a union to create new life. The Dyad is fundamental to every creative process. And it is a reality that every entity has an opposite - but that opposite makes it complete which supports the notion of the Dyad's strength in unification. The Dyad has two poles and both poles are lured by the Monad. The Dyad's basic characteristic is the existence of a pair of equal opposites.

The Door of Hydrogen

Hydrogen is like the Monad in that it is the first element on the periodic chart. It mirrors the Dyad in that it is the only element that is comprised of just two elements. Like the Monad, Hydrogen has a middle comprised of a stationary object - a proton - and a charged electron that orbits it, like the circle with its center point and circumference. Its Dyad nature is evidenced by its urgency to unite with an element with a polar opposite.

The Birth Portal

In ancient times, the number words for one and two were the same for man and woman. In modern times, we look at numbers as just numbers with no other underlying meaning. In Ancient Sumeria numbers were symbolic facts of existence. Early mathematicians considered the Monad and the Dyad, not as numbers; rather, they were considered the parents of numbers. There was a religious aspect to the Dyad. The almond shape that is formed by the intersection of two circles is called the Mandorla which symbolizes unity and rebirth. The Vescia Piscis is a yoni (Sanskrit for female reproductive organs) and was believed to be the entity through which all shapes in the universe are created.

The Birth of Many

When a stone is thrown into a pond, a series of rings will expand out from the center. The geometric relationships among these circles remains the same no matter what the size or distance between them. The Pythagoreans believed that the first ten numbers were seed patterns for the entire cosmos. By duplicating the basic shapes of the cosmos, a geometer could symbolically recreate the universe. The first three forms created through the Vescia Picis were the triangle, square and pentagon. All other forms can be created from these basic forms.

The Way Through

The dual nature of the Dyad is evidenced by the fact that the it both unites and separates. In terms of the mathematical metaphor, the Dyad is the door that leads from the one (Monad) to the many.

Chapter Three: Triad - Three-Part Harmony

Chapter Three: Triad - Three-Part Harmony Summary and Analysis

One, Two, Through

Sir Percival of King Arthur's Round Table found the Holy Grail. He was able to break through the mountains and find the treasure when no one else could. The name Percival, means "pierce the valley." He also pierced polarity which is something we do whenever we count past one and two. By attaining "three" we pass the polarized threshold of two.

Three Cheers! (Not Two or Four)

Triads, or series of threes, appear everywhere in our lives: beginning, middle and end; birth, life and death; length, width and height. We have three daily meals. A traffic light has red, green and yellow lights. "Ready, get set, go!" "Three strikes and you're out!" The Olympics awards Gold, Silver and Bronze medals. In religious terms, Christianity is based on the Father, Son and Holy Spirit. There is a positivity about the number three: "Third time's a charm." And the genie grants three wishes when someone releases him from his bottle. Society has learned to react to these cultural triads and, on some level, is sensitive to the deeper and buried meanings they represent.

The Birth of the Triangle

The calling card of the triad is the triangle. The first triangles were created by the intersection of two circles. Beginning at one of the points where they cross, the triangle is formed by continuing that line on to each point of intersection. The Greeks created the first triangle called a trigon. In contrast with the circle, the triangle encloses the smallest area for the greatest perimeter. There are only three types of triangles: the equilateral, all three sides are equal; the isosceles, two sides are equal and the third side is different; and, the scalene which has no equal sides. Since the triangle exuded a sense of balance, the ancients referred to the triad as prudent and wise. It was a symbol of piety, friendship and harmony.

The Arch of Experience

The triangle is important in creating self-supporting structures because it is the polygon that is structurally sound by virtue of its geometry alone. Many modern structures are supported by a triangular design which resolves opposite tensions into one solid body.

Discover the Tripartite Pattern in Natural Forms

The triad is a natural design that is seen in nature and science. Insects are divided into three body sections. Fruits begin as three-petaled flowers. The heart muscle has three layers. Cracks created in everything from eggs to concrete splinter into triangles.

Three Remembers the One

A knot can have no fewer crossings than three. The word "trinity" means unity or three as one. The three becomes one concept can be studied through the sign known as the Borromean Rings. It was based on the family crest of the Borromeo family of Italy. Upon close inspection, one can detect that although the rings in the crest intersect, they are all separate. The triad is based on a structure that uses one element to unify the others. The Dyad is made whole by the third line or ring which then makes it whole and reunited with its original source, the Monad.

In modern times, we are constantly reminded of the triad, a form that takes two opposites and unites them. Physicists refer to action, reaction and resultant, philosophers to thesis, antithesis and synthesis. The triad presents three sides but yearns to return to the Monad. Color is based on three primary colors: red, blue and yellow. The human body seems way more complex than a triad but its overarching lifespan consists of emergence, development and dissolution, i.e. birth, growth and decay. Our government is comprised of three branches: executive, judicial and legislative.

Einstein's theory of relativity is based on light, mass and velocity. A triad design was often used in ancient Egyptian jewelry. The most famous symbol of the ancient advanced culture of Egypt, of course, is the pyramids which are in the shape of triangles and, with some restorations from time to time, have survived the ages - a testament to the strength of the triad design. Threeness demonstrates that we are tied to the universe although we are each a separate entity.

Chapter 4: Tetrad - Mother Substance

Chapter 4: Tetrad - Mother Substance Summary and Analysis

In Search of the Depth

Three points define a flat form. To define depth, there must be another point. The archetype of fourness is called the tetrad which is an expression of volume. The tetrad can have a varying number of sides. The tetrahedron is a volume of four identical triangular sides. The hexahedron is the most common structure of volume and has six sides. Like the other forms, variations of the tetrad occur naturally as well as by human design. The tetrahedral is seen in the six-legged insect. The lotus position in yoga is another example. There are four ways to view a three-dimensional object: as points, lines, areas and volume. Their basic structure can also be described as corners, edges, faces and center.

Physicist Joseph Antoine Plateau dipped a wire-framed tetrahedral into a soapy solution and was surprised to see that the filmy substance created an internal structure in addition to the external one. The tetrahedron occurs naturally in chemistry. Some elements, including methane, ethane and ammonium have its structure. Diamonds, the world's hardest natural substance, are structured as a tetrahedral network of carbon atoms. We travel by the compass that has four sides.

Back to Square One

The square conjures up many images and concepts of a positive nature: square deal, square meal, and fair and square to name a few. Being square with someone is being honest and open. In fact, to the Pythagoreans, a square represented justice. Fourness represents association with the stable, solid earth. In nature, there are four states of matter: ice, water, steam and fire although there are hundreds of elements. Our sidewalks are a series of squares. New housing developments are plotted on square grids. The square can be observed in sporting and recreational events. A baseball diamond is actually a square. The boxing ring is a square. Games like Monopoly are played on square boards. Origami art works always begin with squares.

The Weave of the Goddess

The ability to construct a square brings the Tetrad to our world. Volume can be created and donned with the four states of matter. The ancients represented this process through weaving. In ancient Egypt the goddess of weaving, war and wisdom was Neith who wore a headdress that symbolized progeny or the multiplication of man. The headdress consisted of a large "X" over a square. The symbol "X" used to signify multiplication originated from her headdress. For over fifty centuries, craftspeople and architects have used geometry as the foundation for their work.

Mater Makes Matter

All things that were created have an urge to create and all creation is based in polarity. A woman needs a man to have a baby. While modern science understands the universe as the synchronizing of electronic power and magnetic fields, the ancient bards sang of the Great Mother and the Great Father. They believed that the universe was created in three stages: a field of light arose, it became energized and life began to develop. The universe could not be constructed without volumization. The field where the patterns first appeared was a Monad.

Nature's patterns are based on three-dimensional math. Its process of creation is the development of volume. The universe or cosmos was represented by a pentagon with the volume of a dodecahedron; fire by a triangle with the volume of a tetrahedron; air by a triangle with the volume of an octahedron; water by a triangle with the volume of an icosahedron; and, earth by a square with the volume of a hexahedron (cube). Math has proven that there can only be five possible equal divisions of three-dimensional space. In ancient times, the study of these five volumes was considered the ultimate in geometric knowledge. These forms are either triangles, square or pentagons. They are the basis for all crystals, the orderly arrangement of atoms.

The first creations of the universe are geometric. At the borderline between nonliving and living forms are viruses, AIDS, and other diseases that are not alive but behave as though they are. They take on a Platonic volume. The cube or the hexahedron is the most common Platonic volume. We see the shape in six-sided dice and in salt crystals. The simple beauty of the crystal is its stringent mathematical structure. Deltahedra represents the three Platonic volumes with triangular faces.

Four Corners of the Youniverse

A common notion in worldwide mythology is that the human is a miniature replication of the universe. The ancient philosophers saw themselves as having the same principles in their spiritual lives as was found in geometry and nature. Early philosophers placed themselves on the spot where four and five intermingled, somewhere between the Triad and Tetrad. Three Borromean Rings intersect at four places. The triangle denoted the divine trinity above a square that contained elements of familiar human nature. This image is mimicked on US currency by the symbol of the pyramid on the Great Seal of the United States; an eye representing God is positioned high above its square foundation which represents earth.

The Four Elements Within

The ancient philosophers saw earth, water, air and fire as part of man's soul. The earthen nature within represented man's reluctance to change. Water stood for man's emotions. Air was man's hopes and dreams and flight of fantasy. Fire was wisdom and intuition. There are four castes of Hindu Vedic society - priest, warrior, merchant and servant. In medieval European society men were categorized as monk, knight, burgher and peasant. Like the temple and cathedral, ancient society was designed like the man

and the cosmos. Carl Jung identified the four orienting functions as sense, emotion, thought and intuition.

Chapter 5: Pentad - Regeneration

Chapter 5: Pentad - Regeneration Summary and Analysis

Coming to Life

The pentad represents life itself. Five is a common number in man's life. He has five fingers on each hand. Stars, like those on a flag, have five points. Its basic form is the pentagon or the pentagram. Philosophers have viewed the pentagon as the fifth element of nature encompassing the four elements, solids, liquids, gases and fire and bringing them to life.

Seeing Stars

We see stars everywhere. Stars are used on national flags and evoke emotions and patriotism. Stars are also used in company logos which signifies that marketing companies understand the appeal of the form. In ancient times, the star was thought to have the power to ward off evil. The star appears in literature: Goethe's Faust used a pentagram to protect him from evil. An inverted star, called a witch's foot, was associated with devils and demons. The Egyptian underworld known as the duat is symbolized by a circle within a five-pointed star. The duat represents our subconscious. In ancient Greece, the star was associated with Pan, a sprite that evoked panic and pandemonium.

The pentagram was a symbol of humanity and health to the Pythagoreans who wrote the name of the goddess Hygeia around its shape. The pentagon shape is seen throughout nature. Most leaves are in the shape of a pentagon. The bottom of many pieces of fruit have the remnants of the five petals of the flower that preceded it.

The creation of the pentagon has, at times, been so revered it was kept secret by some societies who believed it to be potent and powerful. It wasn't until 1509 when the monk Fra Luca Pacioli published the steps to take in creating a pentagon that the secret was revealed.

Wholes in Nature's Fabric

Cosmic philosophy is expressed in nature through geometry. The power of the pentad is found in certain creatures in nature that regenerate themselves. Some insects can regenerate new life from body parts. Some plants send out roots to create new plants. The starfish can grow a new "leg." Looking closely at a bunch of broccoli, a series of pentagons within pentagons can be detected. The whole-in-part principle is the foundation of bonsai, the Japanese art form that creates miniature trees from the branches of normal-sized trees. One characteristic of a living form that aligns with the

geometric properties of the pentagram is the creation of an infinite number of smaller and larger versions of itself.

The Rabbit Riddle

The key to the regeneration of the pentagon is tied to a particular self-generating number series known as the Fibonacci sequence. Until the twelfth century, European commerce used Roman numerals to track their finances—a rather clumsy process. Leonardo of Pisa, a mathematician, published a book in 1202 that convinced the businessmen to convert their financial accounting over to the number system we still use today. Leonardo's father was nicknamed Bonaccio which meant "man of good cheer." Leonardo was known as the son of Bonaccio or filius Bonaccio which then morphed into Fibonacci. The Rabbit Riddle was a word game that asked how many rabbits could be produced in a year starting with just one male and one female rabbit. Bonaccio reinvented the puzzle by assigning number values to each pair. The Fibonacci sequence begins with the sum of zero plus one entity. That sum is added to another entity and the sequence goes on.

This principle of growth from within is the foundation of the pentad's principle of regeneration. It appears everywhere in nature - plants, music, galaxies, the human body and everything associated with the fiveness in nature.

The Golden Mean

When the Fibonacci sequence is converted into decimals, the end result is the ideal 1.62, known as the golden mean, or the perfect balance. It is also symbolized by the Greek letter Phi. Approaching Phi, we are led to its source in the infinite. The golden mean maintains a single relationship with all the parts and to the whole. It is mathematical harmony and balance. It is the core basis of nature's self-replication and is the heart of the archetype of the Pentad. In olden times a device known as calipers was used by artists for laying out their compositions. They can be used to explore Phi relationships in geometry, nature and art eliminating the necessity of having to make any mathematical calculations.

Discover Phi in the Human Body

Ancient Greeks learned from the Egyptians that the structure of the body is based on the golden mean. Taking the average measurements of many people, we find that the body is divided in half at the navel . This average number is equal to the golden mean. Phi is a proportion found in growth. Golden mean measurements are found in other parts of the body including the hands. Bodies that are well-developed like dancers and athletes demonstrate the results of self-growing symmetry.

Phi and the Body of the Solar System

The Phi ratio is seen in space. It is most clearly demonstrated in the planets nearest to the sun but the ideal, or golden mean, breaks down when applied toward the outer planets. The recognition of our Phi relationship with the nature and the planets gives

insight into ourselves. But how exactly does a mathematical ratio really impact us? The answer is through beauty. Art, nature and science evoke a deep sense and understanding of the beauty of the golden mean. It is evidence that there is an aesthetic, subliminal appeal for the golden mean. When asked to select a rectangle from a series of different sized rectangles, the majority picked the rectangle whose ratio was closest to Phi.

Discover Phi in Classic Art, Crafts and Architecture

Ancient philosophers influenced art, crafts and architecture with their extensive studies of geometry and nature. The designs are comprehensive and appealing to the eye because of the harmony created by the geometry of self-replication.

Discover Pentagonal Composition in Art

Of all the ancient people, the Egyptians were most skilled at integrating geometry, symbolism and art in their works. Pentagonal symmetry allows each small part of the whole to be an entity of its own. After Pacioli's published account of pentagon creation, artists gained knowledge of the star's construction and in arranging space in beauty and harmony. Raphael used the pentagon's harmony in many of his works. In his "Dispute over the Holy Sacrament" he used the regenerating pentagram structured within a circle.

Unraveling Spirals

Spirals are the purest expression of moving energy. Unbridled energy will eventually form into a spiral. Like the pentagram star, the spiral expresses the geometry of self-similarity. There are three facts about all spirals: "Spirals grow by self-accumulation; every spiral has a calm eye; and, clashing opposites resolve into spiral balance." (139)

Spirals wrap around a fixed point at a changing distance. The rate of this wrapping varies in each spiral. There are two main types of spirals: the Archimedian spiral and the golden spiral. The Archimedian spiral was named after Greek mathematician Archimedes. The distance between each wrap of this spiral is always the same as in the coil of a rope, record grooves, or a roll of paper towels. The golden spiral is the most common spiral found in nature. The spirals of the golden spiral grow wider apart as the spiral increases in length. This spiral can be seen in nature in sea shells, ram's horns, spiral galaxies and whirlpools.

Into the "Eye" of the Storm

Spirals have a calm eye - like the eye of a storm. Its core is of a different composition than that swirling around it. The calm eye corresponds with the zero in the Fibonacci sequence. The Hindu religion refers to the unmanifest and the manifest in nature. The unmanifest is called Nirguna Brahma or Brahma without qualities, the unknown. Saguna Brahma is Brahma with qualities, all that is knowable. These beliefs can be compared to the spiral (unknown) and its eye (known). Scientists call the golden spiral's eye an asymptote, or a place that is approached but never attained. Leonardo da Vinci wrote,

"A vortex, unlike a wheel moves faster toward its center" (p. 147). This can be witnessed by watching water rush down a drain. The narrower the center or eye is the faster the water flows. The spiral is "balance in motion" (p. 147): the speed of a spiral may change but its orientation does not. The spiral also can represent self-replicating balance: if a spiral is disturbed and split apart, it can recover and a second spiral is created with the same properties as the original.

This balance can be observed in nature - in animal horns, sea shells and galaxies. Divers often observe schools of fish form into a spiral. Marine biologists theorize that the fish may be mimicking an unseen energy field (water or air) in the seawater. The human ear is an example of a spiral as are curls and cowlicks. The nostrils are vortexes. Chinese acupuncturists map a spiral of the body onto the ear and treat illness on the corresponding section of the ear. The Pythagoras claimed that musical notes could be expressed in mathematical ratios. When the notes are graphed by vibration frequency, the resulting graph is a golden spiral. The human heart is a spiral vortex. All the matter of the universe which is represented in the Periodic Table is comprised of small spirals whirlpools that together create a larger whirlpool.

The Dance of Spirals

Spirals are created from the intersection of opposites. There are four types of spirals that appear in nature: the whirlpool eddy, the wave, the mushroom vortex and the vortex street. A mushroom vortex forms when cold cream is poured into a hot cup of motionless coffee. The cream forms a vortex that resembles a mushroom. The mushroom vortex symbolizes a set of twins in the womb.

The vortex street can be witnessed when observing a rowboat oar cutting through the water and leaving behind a daisy-chain of eddies. A series of sand dunes in the desert is a vortex street and is formed by the wind. Another example of a vortex street is the shape of geese flying in a V-formation.

The veins in many leaves resemble the vortex street, as does the branch that the leaves grow on. The suckers on an octopus' tentacle and the tread on a radial tire also resemble the vortex street.

Rhythms of Manifestation

Challenges at the end of the twentieth century present environmental problems to humanity - global warming, pollution, ozone depletion. Instead of creating ways to fix problems, we should work with nature on an on-going basis so that the problems do not occur in the first place. Being in touch with nature and observing its energy and rhythms will help man to better understand nature and its needs. For example, the pinecone, when observed closely, each bract (seed cover) lies on a spiral of bracts winding from the top to the bottom of the pinecone. Counting the number of parallel spirals in opposite directions yields a sequence of numbers with an average that is close to the golden mean. The rhythm of nature is much like our own. By getting close to nature and

making a connection with it, we can understand its needs and take preemptive steps that will avoid calamity.

The Calm "I" of the Storm

The more important lesson of the spiral is that everything is a process and not just an object. And though seemingly inert, each object has a dynamism. By being in touch with the real world as it exists as both a microcosm and macrocosm, we will learn more about ourselves. At our center, we are like the eye of the whirlpool, calm and wise. We learn that the further we roam from that inner tranquility the more psychological turmoil we will face. It is natural to leave our center and venture out from time to time but we, like the Dyad, must listen to our inner self and return to the one, our peaceful center, and not ignore its call.

Chapter Six: Hexad - Structure-Function-Order

Chapter Six: Hexad - Structure-Function-Order Summary and Analysis

Six Appeal

Hexagonal or six-sided forms are found in nature and in human design. The beehive is an example of nature's utilization of the form. Designer six-sided faucets are man-made hexagons. The Hexad has an intimate relationship with the Monad and the Triad, the circle and triangle as well as other characteristics like balanced structure and unity. The message that the hexad sends is one of structure, function and order.

Multiples of six - twelve, twenty-four, thirty-six - have the same properties as the hexad. The hexagon is a natural foundation for math and art. The Zodiac has twelve signs and it takes travel through all of them for the earth to orbit the sun. There were the Twelve Tribes of Israel. There are many epic tales with twelve parts. The ancient Greeks devised a twelve-step process to create the perfect man. In the modern world, it is a twelve-step program that saves man from addiction.

The Perfect Six

Six possesses unique number qualities. Six is a doubling of three and therefore inherits the Triad's balanced structure. Six is both the sum and product of its divisors. "The Hexad expresses its self-similarity in self-reinforcing structure-function-order" (p. 182). The Hexad rests on a solid foundation.

Human Hexagons

The hexagon contains three distances: the length of its side which is equal to its own radius, its diagonal which is twice the length of its radius and the distance between the alternate corners of the form. Hexagons are a favorite of human invention because using them in design provides the maximum and most efficient use of space. The single hexagon is used in designs that require strength and stability. Multiple hexagons are used in the design of bicycle wheels and cameras.

When hexagons are designed in a repeating pattern they tessellate meaning they arrange in a honeycomb-like pattern which allows more hexagons to be included in the pattern than an arrangement where the forms are aligned in straight rows. It is the most efficient use of space and limits wasted space in the pattern.

Hexagons Naturally

The hexad appears naturally in both living and non-living forms. Molecules and crystals commonly contain the tessellating hexagonal pattern. It occurs in wood cellulose, coral configurations, fish and snake scales and tortoise shells. The striped muscle that occurs throughout the body is in an hexagonal pattern and allows for maximum voluntary movement. Single hexagons are seen in fruit and insects and sponges. One of the most dramatic examples of hexagonal patterns in nature is the snowflake.

Honey Space

The most famous and recognizable hexagonal pattern is that of the nests and hives built by bees, hornets and wasps. The bee's structure is commonly known as the honeycomb. The honeycomb is one of nature's best use of space which is made possible by the hexagonal pattern.

Dodekad - Twelve - The Framework Number

The Greek word for Twelve is Dodekad. As a double-six, the Dodekad refines the hexad's structure-function-order efficiency. Since twelve can be divided by so many numbers, it is the supreme number framework of math and geometry. It has been the number of symbolic measurement and has been considered sacred since prehistory.

Twelve and Thirteen

There is a natural relationship between the mighty twelve and the notorious thirteen. Twelve is the solar number while thirteen is the lunar number because there are thirteen lunations during a twelve month cycle.

Zodiacal Societies

Ancient societies relied on the constellations in organizing their lives. They often modeled their communities after the twelve constellations of the zodiac. Communities were often divided into twelve provinces each corresponding to a zodiacal month. These provinces were divided into thirty clans which matched the days in the month. These divisions were beneficial to the community as a whole since different functions could be assigned to each province or clan. Multiple civilizations have organized their cultures around the twelve-fold pattern. The Olympian pantheon housed twelve gods and goddesses who were ruled by Zeus. Roman legend held that twelve vultures appeared to lead Romulus to the seven hills on which Rome was to be built. The legend of King Arthur is a twelve-part epic and twelve knights sat at the King's round table. The important symbols and art of societies that worshiped a sun king were often designed in the hexagonal pattern.

Breathing with the Cosmos

The ancients applied the twelve-fold cosmic laws to every aspect of their lives. They used them in weights and measures and even in language by using letters as numbers. Over time, measurements have changed but the original pound was twelve ounces. In England, there were twelve pence to the shilling and twelve shillings to the pound

sterling. In the days before long-distance communication was possible, it is fascinating to realize that civilizations vast distances apart had the same appreciation of twelve. China, Babylon, Egypt, Greece and India all divided the day and night cycles into twelve hours each.

People of ancient cultures saw themselves in sync with the earth and stars. There are endless examples of the multiples of six and twelve throughout the lives of these early people. Temples and society were both in harmony with the heavens. There is vast evidence in the Gothic cathedrals and temples of yore that the architects and builders had a sophisticated knowledge of the cosmos. The "squared circle" was a symbol of reconciliation with the heavens. Therefore, it is not surprising that many churches displayed this symbol. The geometry of this form represented the harmony of the earth-moon relationship.

The ancients were not aware of the twelve chemical steps in every turn of the DNA spiral. But they sensed that twelve was an important number and one that all numbers were grouped around. Twelve reflected the cosmos as well as human self-knowledge. Twelve appeared in most legends: twelve signs of the Zodiac, twelve disciples of Jesus, twelve tribes, twelve gods and goddesses of the pantheon to name a few. Ancient Chinese acupuncture recognized twelve meridians of the body.

Remnants of these ancient cultures and their obsession for the number twelve have survived through the years and exist in legend and myth today. Instead of categorizing these tales as merely entertaining and fundamentally meaningless, modern man should consider exploring the number twelve and discover it anew.

Chapter Seven: Heptad - Enchanting Virgin

Chapter Seven: Heptad - Enchanting Virgin Summary and Analysis

Seven is the most revered number of ancient times. Its appeal is seen in modern times as well: Lucky number seven, seven-year itch and the seven angels before the throne. The Bible contains literally thousands of references to the number seven. Joshua's seven trumpeters circled Jericho. There were seven voyages of Sinbad. Clean animals were admitted onto Noah's ark by sevens if they were healthy; by twos if they were unhealthy. Today, many people believe that a dog's life equals seven years of that of a human. Seven created a comfortable rhythm. There are seven days in a week, the seventh of which is the Sabbath. Modern justice systems often have laws that reach their statue of limitations at the seven year mark.

Mathematics of the Virgin

In the Dekad, the seven occupies a position that is both a link and a chasm. The ancients referred to seven as the virgin because it is untouched by other numbers because no number less than seven divides it or enters it. The heptagon is the only polygon that cannot be constructed using the normal tools of design. The ancients looked to the gods and goddesses for guidance and principles. The relationship with the gods and goddesses mimicked the relationships between numbers and shape and math and geometry. Athena was the goddess of war and she taught the science of numbers.

Enchanting Lyre

Both the math and the myth of seven and twelve are associated, having the interplay of the triad and the tetrad and triangle and square. The twelve vultures guided Romulus to the seven hills on which Rome was to be built. The Greek pantheon of twelve deities was translated on earth to the seven wise men. The Greek took note of seven wandering (nomadic) planets among the twelve constellations of the Zodiac. The modern seven-note diatonic musical scale has a connection to the twelve-note chromatic scale.

Music was important to the ancients as it was pleasing to both humans and gods. Music of the lyre accompanied the voice. Apollo was the god of harmony and was given the lyre by Hermes. Apollo used the lyre to teach harmony on earth. The lyre had seven strings, each one was given a vowel to identify it. The Three Fates invented five vowels and Apollo the other two, which totaled the seven.

The ancient Greeks identified seven modes of the musical scale, each with twelve notes. The notes were believed to represent the seven human moods. When a note was struck, it was intended to heal the particular mood it stood for.

Seven Crystal Systems

In constructing a universe, no seven-sided crystal systems would be included. From quartz to gold, none are seven-sided. Their irregular shape cannot cover a flat surface and therefore leave too many gaps rendering them inefficient. But seven distinct stages can be seen in other parts of nature. On the musical scales, after seven tones are played and the eighth step is taken, the octave is achieved. Mathematicians have confirmed that a deck of cards needs to be shuffled seven times in order to give every card the equal probability of being dealt. Rituals conducted in every culture and religion often have seven steps. There is a fundamental quality about seven. There are the Seven Stations of the Cross and there are seven basic ballet steps.

Light Fantastic

The most dramatic expression of a heptad is the rainbow. The Greeks thought rainbows were messengers from Iris to Zeus. Unlike other light that thickens into energy, the rainbow never materializes and remains only a sevenfold pattern of energy. Sunlight is whole light and is representative of the Monad. The seven colors of the rainbow are red, orange, yellow, green, blue, indigo and violet. The red arc is the longest and the violet the shortest. We see only seven colors because that is the maximum number of colors that our retinas can perceive. The planets beyond earth have the same color sequence as a section of the rainbow: Mars - red, Jupiter - orange; Saturn - yellow; Uranus - green, and Neptune - blue.

The Rainbow Bridge

Only in recent modern times has it become acceptable and even encouraged to explore one's inner self. In olden times, the deeper meaning of self was kept behind temple walls and church facades. The significance of the number seven to our self-knowledge was hidden as well. The seven centers of gravity are often associated with the human body: the spine, genitals, solar plexus, chest, throat, brow and crown of the head. Self-transformation was at the heart of the mythical "rainbow bridge" of the Greek Isis, the Norse god Odin and Native Americans who linked heaven and earth.

Understanding of our sevenfold nature can be found in the astrological symbolism of seven planets, the seven Greek vowels from Alpha to Omega. The seven liberal arts of Medieval education - grammar, rhetoric, logic, arithmetic, geometry, music and astronomy - were meant to liberate man from his mundane existence. Man is inspired by the Seven Wonders of the World. While modern man looks for the roots of science and math in Ancient Greece, terms for our inner self originate from Vedic priests. The Sanskrit term chakra (wheel) is used to describe man's seven centers because seers saw them as spinning wheels and fireworks.

The most recognizable symbol to survive from olden times is the caduceus, the universal icon of medicine and healing. It was the staff of authority carried by the messenger gods Hermes and Iris. It was adapted by Hippocrates as a symbol of health.

The notion that we have seven centers of our inner selves is not myth or magic. These centers represent the psychological motivations in the form of emotions, desires, thoughts and intuitions. The Pythagoreans referred to the number seven as the vehicle of life which was a direct reference to the seven levels of motivation within us. In addition to the psychological aspect of this subliminal source of energy, there is a physiological element as well. Phrases like "thinking with his groin," "gut feeling," "have a heart" all illustrate this connection.

There is a misunderstanding in the final chapter of the New Testament when John describes a book sealed with seven seals. John was proclaiming that man was the book. As John goes on to describe the opening of the seven seals, each is a metaphor about transformation that in reality refers to the seven meridians of the human body.

The ancients were concerned with the soul's development and purification. The task of symbolically constructing the universe for them was to reconstruct themselves. By looking inward, man could see himself directly rather than through the filter of society.

Chapter Eight: Octad - Periodic Renewal

Chapter Eight: Octad - Periodic Renewal Summary and Analysis

The promiscuous eight is the opposite of the virginal seven. It has more divisors than any number of the decad. Eight was thought to represent justice in ancient times. Common sayings with eight are rarer than the other numbers. A figure eight is a skating feat and being behind the eight ball means you're in trouble. Turning the figure eight on its side, the symbol for infinity is displayed. In the days when pirates were on the high seas, they pursued gold also referred to as pieces of eight. References to the number eight are more common in the East. The Chinese honor the Eight Immortal saints, eight symbols of a scholar and eight directions of wind. Buddhism speaks of the Eightfold Path that leads to enlightenment.

The Breath of the Compassionate

The Islam religion teaches that there are 100 names for god but only 99 can be known or spoken. One of these is "The Compassionate." The pattern known as the "Breath of the Compassionate" is often seen in Islamic art and architecture. To construct this pattern, three factors of eight are used. More than just decorative, this pattern symbolizes the "interplay of polarities that manifest form" (p. 276). The eightfold pattern is a direct replica of Aristotle's diagram of the four elements: earth, water, air and fire intersecting the four qualities: cold, hot, wet and dry. Aristotle learned this symbolism from Plato who had studied the Pythagorean culture on borrowed knowledge from the Egyptians. Eightfold geometry symbolized the great Mother Goddess as nourisher in ancient times.

The spider is an arachnid and has two body sections and eight legs. The spider is often a symbol of mystery and evil. The spider goddess was believed to hang from the heavens and lure the unsuspecting man into her web transforming him there. The octopus with its eight arms is also seen as a symbol of transformation.

The Periodic Table of Elements

Scientists group elements with similar physical properties together on the periodic chart. They noted that grouped elements repeated similar periodic cycles. They also observed that the properties of the atoms recurred in cycles of eight and that elements in the same rows have the same number of atoms - between one and eight.

Resonance: The Same But Different

The number eight itself has a relationship with the Monad. Eight results from a triple-doubling of the one: 1 - 2 - 4 - 8. Life mimics this process when the sperm fertilizes the egg to form a cell. This cell doubles to become two cells, then four, then eight and so

on. Any such cyclic process involving polarity such as this follows the principles of the octad.

The numbers seven and eight have a mathematical relationship. Dividing 1 by 49 (which is 7 x 7) results in an infinite decimal based on the process of doubling and starts with 2, then 4, then 8, etc. We see evidence of this doubling in nature. A wave breaks when the distance to the bottom equals half the surface distance.

Humans experience resonance on very personal levels. Our inner world is a dynamic system and without words our feelings and emotions are telegraphed to others. Taking the eighth step in myths and religious ceremonies alike is associated with the elevation of the human spirit. In architecture, we often see a solid square supporting an octagon that supports a sphere, a structure that represents earth and heaven.

Harmony of the Cosmic Breath

The Chinese book I Ching or Book of Changes, is regarded by many as superstition. The book contains many expressions of the octad. However, upon closer inspection, the work is actually a cosmological model and in many ways resembles the Periodic Table of Elements. Both works are based on various combinations of polarity and periodic renewal. The I Ching focuses on stages of transformation which is the process that links separate entities. The book is based on polarity - dark and light; man and woman; motion and tranquility - the yin and the yang. The I Ching contains a rudimentary binary system that modern mathematicians will recognize. In today's world, a computer byte is eight bits.

The first ruler of China, Fu Hsi, arrived in a tortoise shell. He was also the author of the I Ching. The tortoise shell is comprised of tessellating hexagons. Fu Hsi looked deeper into the hexagonal shell and saw two opposing hexagon shapes that were the inspiration of the yin and yang. He developed the yin and yang as a cycle of the stages of any process. This process was comprised of eight stages which were believed to hold the essential structure of every cycle found in nature.

All cultures have come to recognize that the involvement of polarities is a basic requirement in creating a viable process. It is true in nature as well as in math and science. Modern science has learned that DNA is composed of sixty-four six-part codons or genetic words. The six-part codon is a direct reference to the hexagon while the number sixty-four is arrived at by multiplying eight by itself.

The Geometry of Chess

Arranging squares in the 8 x 8 configuration results in a form that resembles a chessboard. The chessboard is a symbol of polarity in that one side is opposed against the another. The game of chess was invented in the sixth century in either India or Persia. The board represents the universe and the chess pieces represent lives in transformation. The King represents the sun and our higher self. The Queen is the most powerful piece and is the mother goddess.

Lunar Geometry in Art

More universal than seeing a man in the moon is seeing the image of a hare in the moon. The eight-sided mirror from the Tung dynasty depicts the hare in the moon with a mortar and pestle depicting man and woman, or polarity.

The Octad's role in the universe is to provide the means for self-renewal and infinite growth.

Chapter Nine: Ennead - The Horizon

Chapter Nine: Ennead - The Horizon Summary and Analysis

Nine is the largest and penultimate single digit in the Decad. Ancients referred to nine as the end or the "finishing post." The nine is composed of three trinities. Nine was considered by some early religions as thrice blessed. Since nine is the last single digit it is symbolic of the highest achievement attainable by man. Nine is a number seen in folklore and expressions throughout the centuries. It has a mystical aura - a cat has nine lives. The cat runs out of lives and luck when he loses his ninth life. The ultimate punishment in some cultures was the cat-o'-nine-tails. Going the whole nine yards translates to going as far as possible. When we are on cloud nine, we have reached the zenith of happiness. Dressed to the nines is the ultimate in stylishness. The ultimate in any subject is often referred to as the "nth degree."

Nine and ninety-nine are both considered horizon numbers in that departing them leads to a new place. Once nine has led to ten, a Decad has been produced. Once 99 turns into 100, a new level of numbers - three digits - has been attained. In each case nine sits before a horizon and has achieved the ultimate in its own classification. Nine is the horizon to infinity.

The Scandinavian god Odin hung nine days on the world axis so he could gain the wisdom of mankind. According to Homer, the city of Troy was under attack for nine days. Odysseus wandered for nine more years after the battle ended. The Greeks depicted the earth as so deep that it would take nine days for an anvil to fall to the bottom. The Greeks also honored the nine muses who represented the arts and sciences.

The Native American, Aztec and Mayan cultures all believed in nine cosmic levels - four above earth, earth, and four below earth. Christian symbolism seemingly covers all angles of the number nine. There are "nine orders of angelic choirs in nine circles of heaven and nine order of devils within nine rings of hell" (p. 305). In the Catholic religion, believers sometimes say a novena which is a special prayer that last nine days.

There is a mysticism about the number nine. A superstition among composers warns against numbering a symphony past the number eight. American baseball lasts nine innings with nine players on the field playing defense. Three strikes makes the batter out on the baseball diamond which is really square-shaped. There are very few occurrences of nine in nature.

Using nine expresses the most or the best, a belief that stems from long-held values that many cultures held for the number.

The Horizon Number

The ancients revered the nine because it was a sign of success, completion and new beginnings. The Hindus were so enamored with the nine that they used it to set standards for the rhythm of their poetry, design of their temples and their measurements.

The ancient mathematicians were drawn to the geometric shapes that corresponded to numbers. The square and the cube, indicates nine's link to the earth, materialization, matter and form.

The World Labyrinth

Nine is used to create the labyrinth, based on the St. Andrew's cross which is in the shape of an "X." The design was an important foundation for the architecture found in ancient Egypt, Sumeria, Greece, Rome and other early cultures. The labyrinth is different than a maze in that it has a single route that spirals to the center of the form. The labyrinth represents man's passage through the world to god.

The Birth of the Nonagon

The nonagon is another configuration created with the use of nine. There is a star version of the nonagon that can be constructed from the basic design.

The Ennegram Process

The principles of the ennead can be examined through the arrangement of points around a circle. The form was introduced to the West by Georges I. Gurdjieff who learned of it in Central Asia in an ancient monastery. The enneagram permits the observer to see the organization of any whole event in terms of its most important characteristics. Many religious holidays of ancient cultures were held over forty-five days grouped around each of the nine points of the enneagram.

Nine represents the zenith of possibilities and achievements and completes the numbers that are associated with nature. Just like developing for nine months in the womb, once nine is arranged man is ready to go beyond the Decad and on to the horizon.

Chapter 10: Decad - Beyond Number

Chapter 10: Decad - Beyond Number Summary and Analysis

New Beginnings

Ten takes us to a new place beyond the basic numbers. It represents a recap of the whole. Symbolically, it encapsulates two parents and their seven children. Ten makes a portrait of the whole family. To the ancients, it wasn't a number but the epitome of numbers. It was known since the Golden Age of Greece as the Decad. It was often referred to as the world or as heaven - indicating its power and position. Much of its strength is its connection with the Monad because it is comprised of a 1 and a zero. It creates a natural flow and a unity with the original beginning.

The English word, ten, has a root in the Indo-European word "dekm" which means two hands. Our two hands have ten fingers and are the only part of our body that can reach other parts. Multiplying by ten does not change ten's basic structure, only strengthens it. To the Pythagorean culture, ten was the perfect number. The phrase "perfect ten" is familiar in modern times. When something is good, we may say that it's ten times better than another choice. When something is decimated, it is relegated to a lower place, or symbolically reduced to one-tenth its original value. Ancient cultures often maintained large multiples of ten and ways to express them as astronomical cycles.

The Past Tens

Number symbolism was used in ancient cultures to express alignment with the cosmos. The Babylonians celebrated the gods with ten day festivals. There are many references to ten in the Bible in terms of fulfillment and perfection. Abraham's faith was tested ten times. When he was one hundred (10 x 10) he accepted God's covenant, fathered Isaac and began the Jewish religion whose laws are contained in the Ten Commandments. Egypt was assailed by ten plagues before the Exodus. Jews must have a group of ten men in order to hold a unified service. There are ten Christian graces. Ten veils keep the Sufis from seeing the world and god. It is common for religions to suggest that members tithe ten percent of their earnings.

The Tree of Life

A well-known cosmological model based on the Decad is the Kabalah, the ancient system of mystical Judaism. Students of the Kabalah must be at least forty (4 x 10) years old to begin this journey of learning. The Kabalah teaches that the Unknowable God can only be known by his ten lights in the world. The Kabalah is closely associated with the Decad, the Monad and the Dyad. There are thirty-two paths to the divinity and sixty-four stages of transformation, similar to the I Ching and the checkerboard. The Tree of Life, with focal points on ten body parts, is reminiscent of the caduceus, the

modern medical symbol. The Kabalah is a complicated religion and requires much study and a lifetime of devotion.

The Tetraktys

The tetraktys is a universal creating process based on the completeness of ten points unfolding on four levels. It served as the foundation of the Pythagorean schools of science, mathematics and philosophy. The process is symbolic of unity.

The Big T.O.E.

The Big TOE has been sweeping the world of theoretical physicists. The acronym stands for Big Theory of Everything. It is based on the concept that the fundamental building blocks of the universe and everything in it are small loops of mathematical strings that twist themselves and eventually transform into familiar configurations of matter. This theory is also known as the String Theory. At this point in time, there is not enough evidence to confirm the veracity of the theory.

Tres Riches Heures

The decagon is found in the painting of paradise entitled, "Tres Riches Heures du Duc de Berry" which was created in the fifteenth century. The work depicts different stages of Adam and Eve in the Garden of Eden. The decagon is a symbol of transcendence and fulfillment. At the last stage, Adam and Eve wind up at a new beginning beyond the gate of a ten-pointed circle representing paradise.

The Cathedral of St. John the Divine

One of the most famous cathedrals in America is the Cathedral of St. John the Divine in New York. It is a replica of European cathedrals. The cathedral incorporates the twelve types of stone referred to in the Revelations of St. John in the last chapter of the Bible. Like most cathedrals, St. John's is built to signify man's reaching toward heaven. It is 601 feet in length which corresponds with the Greek word kosmos or cosmos. Designing such a massive cathedral is based on the long tradition of temple building and geometric design.

Characters

The Pythagoreans

The Pythagoreans were followers of Greek philosopher Pythagoras whose theories were heavily influenced by math. Their influence on math, philosophy and science is without question. The Pythagoreans were the the first sect to recognize that the structure of the universe had its foundation in the numbers one through ten. The Pythagoreans attached human life to to polygons structured on the basis of numbers. They believed the square to be a symbol of justice because of its strength and solidity. They adorned the pentagram with the name of the Goddess Hygeia who ruled over humanity and health. The word "hygiene" has its root in the Goddess Hygeia.

Pythagoras' interest was not limited to math and science. He was the first to discover that musical notes could be expressed in mathematical ratios. The Pythagoreans delved into the psyche and found symbiosis with the number seven which they referred to as the vehicle of life based on their theory that there were seven levels of motivation within man.

Pythagorean culture based some of their theories based on borrowed knowledge from the Egyptians. They Pythagoreans developed the concept of eightfold geometry symbolized by the great Mother Goddess as nourisher in ancient times. Perhaps the man's fascination with the decad was due in part of the Pythagorean culture which considered ten to be the perfect number. The phrase, "perfect ten," carries that sentiment to modern day.

The tetraktys served as the foundation of the Pythagorean schools of science, mathematics and philosophy. The universal creating process is based on ten points unfolding on four levels which relates to the Pythagorean attraction to the number ten as a symbol of unity.

The Egyptians

The Ancient Egyptians were looked to as an advanced society by early cultures. Premier among some of their amazing accomplishments were the Great Pyramids, vast structures that were built as tombs to honor their dead leaders. The pyramid, to this day, remains one of the most renowned, intriguing and successful architectural triumphs of all time. In fact, the pyramids which are in the shape of triangles and thereby connected to the triad or number three, have withstood the challenge of time and the decline of Egypt. The Egyptian pyramids are a testament to the strength of the triad design and the innovation of the Egyptians.

The Egyptians had a strong connection to the number five, the pentad which stood for regeneration. The Egyptian underworld, known as the duat, was symbolized by a circle within a five-point star. For the Egyptians, the duat represented man's subconscious and

his connection with the departed. The Egyptians were advanced in math and developed the theory of the Golden Mean, a process to calculate the averages of measurements and numbers.

But the Egyptians were never confined to just one discipline. Their innovation and interests reached into a myriad of pursuits. The Egyptians discovered the advantage of applying knowledge learned in one area to another even though their connection was not initially apparent. In fact, of all the ancient people, the Egyptians were most skilled at integrating geometry, symbolism and art in their works.

Giotto

Italian painter Giotto submitted a simple circle to Pope Benedictus XII who called for samples of work from artists who wanted to work for the Vatican. Despite the simplistic design, Giotto, a master of design and composition, won the position.

Leonardo of Pisa

Leonardo of Pisa convinced European commerce to convert their number system to the one we use today. He also developed an integer sequencing system known as the Fibonacci Sequence.

Sir Percival

According to legend, Sir Percival was one of the only three knights of King Arthur's Round Table to find the Holy Grail. His name stands for ending conflict.

Joseph Antoine Plateau

Belgian physicist Joseph Antoine Plateau discovered that minimalist geometry resides within larger polygons.

Plato

In his Timaeus, Plato describes a scientific experiment that proves that there are four phases of matter: solids, liquid, gas and fire.

Carl Jung

Renowned Swiss psychiatrist Carl Jung saw the fourfold nature of Hindu and Buddhist mandalas as symbolic of the self. He connected them to the psyche and re-labled them as sense, emotion thought and intuition.

Albert Einstein

Albert Einstein developed the theory of relativity which is E=MC2 but ancient geometers had already explored these elements as a triad using their tools: the compass, the straightedge and the pencil.

Odin

According to myth, the Norse God Odin, ruler of nine Scandinavian worlds, hung nine days on the world axis to win the secrets of wisdom for mankind.

Objects/Places

Monad

The ancient mathematicians referred to the Monad as "The First, "The Seed" and "The Immutable Truth and Destiny - the number one."

Dyad

The Ancient Greeks referred to the number two as the Dyad. It was the number that brought polarity to the Monad.

Mandorla

The Mandorla was a religious symbol that unified God with man. The almond shape that is formed by the intersection of two circles is called the Mandorla which symbolizes unity and rebirth.

Vescia Piscis

The Vescia Piscis is a yoni (Sanskrit for female reproductive organs) and was believed to be the entity through which all shapes in the universe are created.

The Borromean Rings

The "three becomes one" concept can be studied through the sign known as the Borromean Rings. It was based on the family crest of the Borromeo family of Italy which illustrates that although the rings in the crest intersect, they all remain independent entities.

The Golden Mean

The Golden Mean is the number 1.62, symbolized by the Greek letter Phi. The golden mean maintains a single relationship with all the parts as well as to the whole. It represents mathematical harmony and balance.

The Fibonacci Sequence

Leonardo of Pisa convinced European commerce that used clumsy Roman numerals for their calculations to convert to the number system we use today. He also developed an integer sequencing system known as the Fibonacci Sequence.

The Horizon Number

Nine is the horizon number. It is the last single-digit number and symbolizes man's attainment of the ultimate in his original realm and his venture into the next realm of two-digit numbers.

The Tetraktys

The tetraktys served as the foundation of the Pythagorean schools of science, mathematics and philosophy. The universal creating process is based on ten points unfolding on four levels which relates to the Pythagorean attraction to the number ten as a symbol of unity.

Decad

The number ten was known as the decad by the Ancient Greeks. It represented the world and heaven. Its strength was attributed to its connection back to the Monad. It is the first two-digit number and is a departure from the realm of the single digits.

Themes

God in the Numbers

One of the main focuses of A Beginner's Guide to Constructing the Universe - The Mathematical Archetypes of Nature, Art and Science by Michael S. Schneider, is the strength of Monad also known as the number one. The work describes man's attachment to the decad, the numbers one through ten, over the eons from prehistory onward, and his return to the Monad for the unity and comfort that the original number, their creator, provides. Although Schneider did not intentionally weave a theme of divinity within his work, the material presented does that for him.

The first number, called the Monad by the Greeks, is the creator of the succeeding numbers. Monad is a metaphor for God, the creator. The number one exists within every number that follows. Without "one" none of the other numbers could exist. As other numbers are created, they become independent entities and have their own strengths and purposes. However, throughout the work there are constant references to the lure that the Monad has for them, compelling them to return and reunite. The Dyad, the Greek term for two, was a departure from the "one" and presented a polarity that was impossible for the one to evoke without it. The Dyad is treated metaphorically like man who has strayed from his creator but maintains within him the urge to return to the origin.

Although the work was written as a scholarly and historic work - with possible conclusions and theories suggested - the parallel between the creation of the number one with God the creator is undeniable. With the second number, God creates the possibility for more numbers to follow. Dyad is like the errant many who stray from the creator and, at times, reject him. However, the powerful force of "the one" always brings Dyad back to the fold. The triad breaks the polarity of the Dyad and returns it to the comfort of the creator.

Ten was known in ancient Greece as the Decad and was referred to as the world or as heaven - indicating its impact on man. When we learn that ten, the ultimate number that departs from the realm of the single digit, owes its strength to the Monad because it creates a natural flow and a unity with the original beginning, the reference to the creator once again parallels God and man's origin.

Personification of Numbers

By the end of the last chapter of A Beginner's Guide to Constructing the Universe by Michael S. Schneider, the reader has to be reminded that the focus of the book was numbers not people. Throughout the book, the numbers are personified and given human strengths and motivations. The numbers are so often compared to man and his

characteristics that this intermingling at times confuses the two and begins to blur the definitive line between them.

The number one is portrayed as the creator or God. That the rest of the numbers are given characteristics of humans is undeniable. The Dyad, the number two, is referred to as the means by which the other numbers are created. It is often repeated in the work that the Dyad gives birth to the other numbers through the Vescia Piscis (Sanskrit for female reproductive organs). The Dyad is portrayed as independent and even caprice in its off and on relationship and loyalty to the Monad. The triad, or the number three, is described as evoking unity and harmony and loyal to its creator.

The number four, which is required to form a square, brings strength and solidity to the numbers. The pentad is authoritative and evokes loyalty and patriotism. The six is the disciplinarian of the single digits and brings order, structure and function to the group. Seven is the revered virgin. It is innocent and untouched because no other number can be divided into it. The opposite of seven, the eight is referred to as promiscuous because so many numbers can be divided into it. The nine is the penultimate number in the group but is the ultimate in man's achievement. It is accomplished and strong and brave and is prepared to travel beyond the boundaries of safety and become a two-digit number.

Human characteristics were not assigned to the numbers by author. He draws on myths, legends and the history of the ages for the descriptions that humanize numbers. Why did man in so many different times and places have a similar tendency to humanize numbers? Perhaps there exists an internal affinity within man for numbers. To many scientists, the cosmos is a creation of math and science and man is part of the cosmos. We are numbers and numbers are us!

The Impact of Numbers

Without exception, each of the numbers one through ten have common sayings or meanings attached to them. References to numbers are part of our culture but we don't stop to think about their origin or if there is really any substance or deeper meaning to them. Learning the roots of this aspect of our culture is enlightening and is helpful in understanding the importance that the numbers, one through ten, once held in cultures. The impact of numbers has survived the ages and they have become entrenched in our culture. Common sayings that are familiar and are metaphorical in nature have universal meaning and are relied upon by everyone as an easy and efficient way to convey one's thoughts.

Most appropriately, the number one is referred to as "the one." In modern society, "the one" is important as it often refers to the love of one's life. When a person is deemed to be "number one" it is a sign of success and admiration. The number two, which is also referred to as the dyad, has a dual nature which indicates that evoking it could hold good or bad meaning. The sayings associated with it certainly confirm that contention. "Two is better than one" and "two for the money" are upbeat and positive while

"speaking with a forked tongue" and "two-faced," sayings which were inspired by the number two, are decidedly negative in nature.

The three evokes harmony and breaks the polarity of one and two. There are many three-word phrases that were inspired by the number three: "ready, set, go," and "hip, hip, hooray." Three is also used in metaphors like "three strikes and you're out," "as easy as one, two, three." In literature children read about the three bears, the three blind mice, three little kittens and three little pigs.

The polygon that is based on four, the strongest foundation, provides some common sayings: "Square meal," "fair and square" and "being square" with one another. The pentad represents strength. The star is used to described the famous and admired. Five-star generals represent authority. Six represents structure and order. Multiples of six are everywhere: twelve signs of the Zodiac and the Twelve Tribes of Israel. Most epics were written in twelve episodes. The Greeks developed a twelve-step program to create a perfect man. In today's world there are twelve-step programs that save man from addiction.

Seven has long been considered the favorite number. It is innocent and untouched. It is often referred to as "lucky number seven." Laws reach the statute of limitation in seven years. There were seven voyages of Sinbad. Today, many people believe that a dog's life equals seven years of human life. Seven creates a comfortable rhythm. There are seven days in a week, the seventh of which is the Sabbath. Eight represents our connection with the universe: the figure eight represents infinity when turned on its side.

The nine is the ultimate number: Dress to the nines, to the nth degree, the nine lives of a cat all refer to the most or the best. Ten is the decad which encompasses and oversees all the single digit numbers. "Top ten" and "perfect ten" are phrases that allude to the number ten's importance.

Style

Perspective

A Beginner's Guide to Constructing the Universe - The Mathematical Archetypes of Nature, Art and Science by Michael S. Schneider is written in the first person narrative. The non-fiction book is an accumulation of the legends, myths and history of numbers as they are linked to mankind. The author describes the benefit of numbers and how man has related to and relied upon them since prehistoric times.

Schneider is well-credentialed to tell this story of the single-digit realm. He is an educator and is on the cutting edge of new and innovative perceptions of nature, science, art, mathematics and how their interplay relates to man and how important they have been to the world.

Schneider presents the information without basis and strikes a tone and style that is professorial and instructive. He has a Bachelor of Science degree in Mathematics form the Polytechnic Institute of Brooklyn and a Master's Degree in Math Education from the University of Florida. His international background, having been a Fullbright Scholar in India where he taught school, brings depth and range to the work. Much of the book focuses on the forms that are created with the numbers. His background in geometry led to his being called upon to design the statues at the entrance of St. John the Divine Cathedral in New York City.

Tone

A Beginner's Guide to Constructing the Universe - The Mathematical Archetypes of Nature, Art and Science is written in a professorial, scholarly style and tone without any apparent bias or slant. Mathematics, art and science are serious subjects and the author, Michael S. Schneider, gives them their due respect. Schneider brings his skills as an educator to a lofty subject that is complex, provocative and thought-provoking.

The author does not offer his own theories or conclusions about the numbers one through ten and their meaning and importance; he only suggests possible scenarios and presents evidence and the centuries and centuries of history in which man has been greatly impacted by numbers.

As Schneider delves into the past and evokes the beliefs, symbolism and emotions that were attached to numbers and geometry, there is no sense of condescension. Instead, he presents the legends and myths about the numbers that have existed for eons and the thinking behind them and raises the possibility that the ancients weren't necessarily wrong. He presents these cases in a even manner and suggests that modern man should not summarily reject the notions that early man had about numbers but explore the theories with an open mind and embrace the portions of them that may be found to have validity.

Structure

A Beginner's Guide to Constructing the Universe - The Mathematical Archetypes of Nature, Art and Science by Michael S. Schneider is, as its subtitle suggests, a voyage from 1 to 10. The structure of the book is very organized. The book covers the numbers one through ten and is accomplished in ten chapters, each chapter covering a number. As the story of one chapter ends, the author provides a brief statement about the succeeding number and chapter.

Before the beginning of the actual book is an Acknowledgments section in which the author expresses his gratitude for the team that helped him amass the resources and materials for the book and for those who helped him throughout his life. There is an essay entitled "Geometry and the Quest for Reality" by John Michell which follows next. In the Introduction, the author writes a preface to the main book. The main book is followed by a brief epilogue which discusses the science geometry referred to in the work. A section entitled "Credits" that lists references and resources is the last of the book.

There are hundreds of illustrations and graphics used throughout the book. They range from comic strips of Calvin and Hobbs to depictions of ancient artwork and images of the geometric polygons which are one of the main focuses of the book.

Quotes

"'You cannot conceive the many without the one. . . The study of the unit is among those that lead the mind on and turn it to the vision of reality.'"
~ Plato (Chapter 1, page 1)

"'God makes himself known to the world; He fills up the whole circle of the universe, but makes his particular abode in the center, which is the soul of the just.'"
~ Lucian, Christian theologian (Chapter 1, page 8)

"'The One engenders the Two, the Two engenders the Three and the Three engenders all things.'"
~ Tao Te Ch'ing (Chapter 3, page 38)

"'One cannot help but be in awe when one contemplates the mysteries of eternity, of life, of the marvelous structure of reality.'"
~ Albert Einstein (Chapter 4, page 60)

"The ancient philosophers saw their inner lives arranged according to nature's own harmonies, for in nature, geometry, and their spiritual lives they discovered the same principles."
(Chapter 4, page 89)

"Rising higher on the spiral of experience, a new world requires a transformed vision based on cooperation or partnership with nature, not exploitation."
(Chapter 5, page 164)

"A father has twelve children. Each has thirty daughters, one side white, the other side black, and though immortal, they all die. Who is the father? Answer: The Year."
(Chapter 6, page 200)

"The rainbow provides a transitory glimpse into eternal principles. Light touches everything. Anything can stop it, yet nothing can pollute it."
(Chapter 7, page 252)

"Islamic tradition holds that there are one hundred names of God but only ninety-nine are knowable and speakable, and they are called the 99 Beautiful Names of Allah."
(Chapter 8, page 274)

"In their cosmological models all cultures recognize the interplay of polarities as the most fundamental aspect of creating process."
(Chapter 8, page 291)

"Possession is nine points of the law."
(Chapter 9, page 301)

"Ten takes us beyond the realm of number itself, above the fray of ordinary numerical interactions and geometric relationships. It is a new beginning, a journey into limitlessness."
(Chapter 10, page 324)

Topics for Discussion

What is the monad? What is the dyad? Explain the significance of both and how they interplay with one another.

What is the horizon number? Why is this number referred to as the horizon number? What does the position of this number signify?

What does the phrase "tessellating hexagon" mean? What are examples of this design in nature? Why is this design strong and the best use of space?

Describe the Chinese book The I Ching. Why is it also called the book of changes? Who created it and why could it have significance in modern times?

What does the pentad represent? What is the rabbit riddle? What are the Fibonacci sequences?

Why is the seven referred to as a virgin? Why is the eight called promiscuous? What legends are attached to each?

What is the decad? Symbolically the decad is said to contain a family. What is that family and why is it referred to in that sense? What is the strength and meaning of the decad?