Life is Number: the Universe is Music

Caterina Autelitano, adapted by Mary Jones, S.R.C.

In this study of Pythagoras and his teachings, we look at his theories concerning numbers and music. "To Pythagoras, music is a representation of cosmic harmony, a microcosmic representation of the macrocosm. He and his followers speculated that the entire universe is built on mathematical principles."[1]

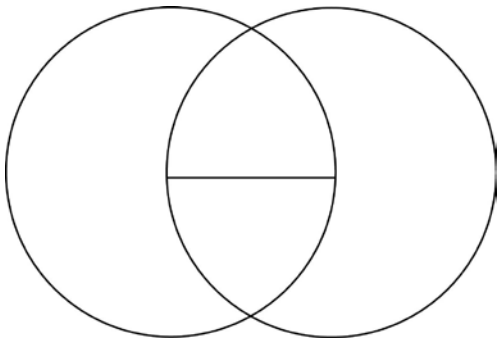
Like many of the brilliant minds of ancient Greece, we sorely lack detailed information about Pythagoras. All we know in abundance is that he was an extraordinary individual, a spiritual person who was far in advance of others of his time in every way. Even during his lifetime, he was imbued with an aura of mystery and admiration and has been held up by generations since as an ethical, intellectual, and spiritual model of human life.

Certain aspects of his life are very nebulous, while others are clear and unexceptional. And this side of his life and teachings give us much to reflect upon.

As with so many persons of the ancient world, it is difficult at times to separate myth from fact, and that applies equally to various stories concerning Pythagoras's life. In this article we will look at some of the main points characterizing his doctrine—a doctrine that synthesized different aspects of knowledge, applying principles that enabled his followers to become initiated into the cycles of nature, music, mathematics, and science. He proposed a special way of life and inspired a well-defined political ideal. In his communities of followers, into which both men and women were admitted, his teachings were studied primarily for moral elevation, but also for the renunciation of passion and purification of the body.

Living as a Pythagorean disciple meant living under severe limitations. Amongst

Fyodor Bronnikov, *Pythagoreans Celebrate Sunrise*, 1869.



A modern representation of the Dyad.

several other practices, his disciples engaged in silence (known as *echemythia*), daily examination of their consciences, abstained from the eating of meat, and lived exclusively on a diet of fruit and vegetables. This ascetic life was aimed at the elevation of the soul during its temporary union with the body. It maintained the soul and made it immune from corruption, ensuring it could return to its divine origin and enjoy supreme beatitude, the contemplation of universal harmony. So severe was the regime that if the soul became "contaminated" in any way, the sentence was immediate damnation. But if the guilt was lighter, the soul would undergo certain purgatory-like tests during which it would incarnate many times into the bodies of animals and vegetables, thereby allowing it at some later stage to merge with the divine.

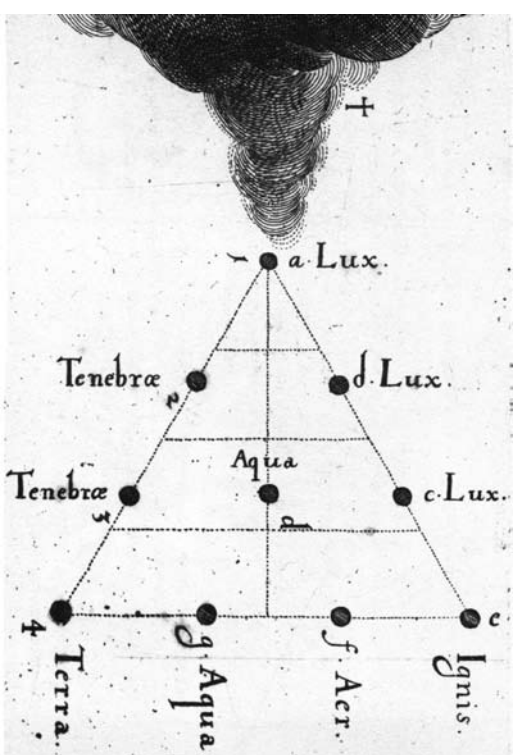
The fundamental basis of Pythagoras's teachings taught that truth alone was to be spoken. Then, through silent contemplation, facts could be verified according to personal experience and wisdom. Gradually the student acquired confidence in his or her own convictions, eventually becoming independent of the beliefs of others. In this way knowledge became intimately and indelibly imprinted in the mind of the initiate. This period of autonomous meditation, together with the observance of certain rules of life lasted between two and five years.

The Pythagoreans were divided into an inner circle called the *mathematikoi* (mathematicians) and an outer circle called the *akousmatikoi* (listeners). In the two degrees of Pythagoreanism the *mathematikoi* were supposed to extend and develop mathematical and scientific work, while the *akousmatikoi* focused more on the religious and ritualistic aspects of the teachings.

Acquisition of Knowledge

Like Plato, Pythagoras regarded the acquisition of knowledge as necessary preparation for the more serious task of looking within oneself—eventually moving away from preoccupation with the natural and mutable things of the phenomenal world to an investigation of fundamental reality. This involved among other things, an in-depth contemplation of mathematics, music, cosmology, and the ceaseless rhythms of the stars.

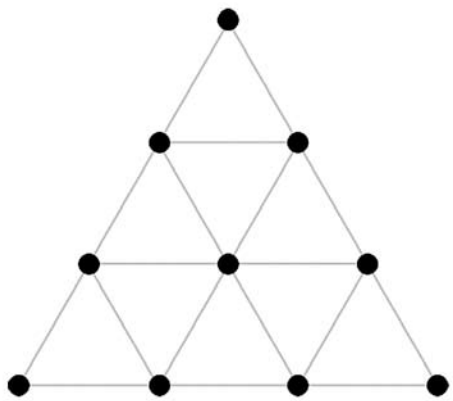
Pythagoras was said to have been able to translate the fundamental principles of the universe into the language of music and mathematics, and communicated them



Robert Fludd, F.R.C., *The Pythagorean Tetrad* from *Philosophia Sacra et Vere Christiana Seu Meteorologica Cosmica*, page 33, 1626.[a]

effectively to his disciples. The Pythagoreans were not hermits; they did not live detached from the world. They could stay in the school and devote themselves entirely to the initiatic disciplines or return to everyday life to continue their development at home.

Pythagoras also expressed his views on politics: power had to reside with the wise, and these were the initiates who had received enough of the teachings to be able to exercise public powers in order to establish a non-tyrannical regime. Government was to be oligarchic (governed by only a few) in character, with a background based on theocracy (divinely guided) and wisdom.



The Pythagorean Tetraktys.

Numbers and Harmony

One of the basic elements of Pythagoras's doctrine is that number is not only a quantitative arithmetic entity, but also a qualitative metaphysical principle. Numbers are the essence of all things, and their role is to induce harmony and regulate the universe. It was within this harmony that the Pythagoreans believed that opposites could be reconciled.

For example, the concepts of the boundless and the limited are, from a numerical point of view, a simple opposition of odd and even. The *dyad* (that consisting of two parts) was a source of opposites and the Pythagoreans composed tables representing these opposites, which together suggested harmony. Rosicrucians will recognize in this the "Law of the Triangle," where one thing combines with another to produce harmony in a third phase. Pythagoras taught his students that by focusing on numbers, they could calm and purify the mind and ultimately experience true happiness.

This "doctrine of opposites" was fundamental for the Pythagoreans. They understood that the ultimate substances of all things, both material and immaterial, are numbers, which have two distinct and complimentary aspects: the physical and the abstract individualized as dyads: left and right, male and female, etc. Because his students were sworn to secrecy and nothing he taught was written down, the inner workings of the Pythagorean number philosophy were lost within a few generations of his death. But we do know that the first ten numbers were of particular significance. Together they constituted the *tetraktys* (a triangular figure consisting of ten points arranged in four rows: one, two, three, and four points in each row) which, according to Pythagoras, was an image of the created and eternal realms.

One denotes the primordial unity at the basis of creation. *Two*, the dyad, represents the first step of creation: duality. *Three* represents bringing into being (the Rosicrucian Law of the Triangle). *Four* represents completion. *Five* represents reconciliation and concord. *Six*, the first perfect number, represents a state of health and balance. *Seven* represents virginity; as it can't be divided by any other number other than itself, it brings order to nature. *Eight* is associated with safety and steadfastness, balancing and regulating everything in the universe. *Nine* brings things to fruition. *Ten* is the greatest number of all, for it holds the universe together and manifests all the laws of nature.

Music and Harmony

While the early Chinese, Hindus, Persians, Egyptians, Israelites, and Greeks

Numbers	1	2	3	4
Magnitudes	Point	Line	Surface	Solid
Elements	Fire	Air	Water	Earth
Figures	Pyramid	Octahedron	Icosahedron	Cube
Living Things	Seed	Growth in Length	In Breadth	In Thickness
Societies	Human Being	Village	City	Nation
Faculties	Reason	Knowledge	Opinion	Sensation
Seasons	Spring	Summer	Autumn	Winter
Ages	Infancy	Youth	Adulthood	Old Age
Parts	Body	--	Three Parts of the Soul	--

Ten Sets of Four Things. Based on the Tetraktys ("a set of four things"), the Pythagoreans identified ten such sets as arranged in this table.

employed both vocal and instrumental music in their religious ceremonies, as well as to complement their poetry and drama, Pythagoras raised the art to its true dignity by demonstrating its mathematical foundation. He is now generally credited with the discovery of the *diatonic scale* (the seven-note musical scale used in Western music).

Having first learned the divine theory of music from the priests of the various Mysteries into which he had been accepted, Pythagoras pondered the laws governing consonance and dissonance for several years. How he stumbled upon the answer to these reflections is unknown, but the following explanation is given by Iamblichus:

"One day, while Pythagoras was passing a blacksmith's shop, he heard the sound of hammers striking a piece of iron against an anvil. He noted that the sounds made by the hammers were all different but that except for one, they were in perfect harmony. He recognized the consonances: the octave, fourth and fifth, while he noticed that the dissonance was the whole step between the fourth and fifth. Realizing that with divine help he had discovered what he had been searching for, he entered the shop. After carefully observing the blacksmith's work, and after a lot of tests, he found that the tone depended on the weight of the hammers."[2]

By noting the variances in pitch between the sounds made by large hammers and those made by smaller implements, and carefully estimating the harmonies and discords resulting from combinations of these sounds, he gained his first clue to the musical intervals of the diatonic scale. After carefully examining the tools and noting their weights, he returned to his house and constructed an arm of wood so that it extended out from the wall of his room. At regular intervals along this arm he attached four cords, all of like composition, size, and weight. To the first of these he attached a twelve-pound weight, to the second a nine-pound weight, to the third an eight-pound weight, and to the fourth a six-pound weight. These different weights corresponded to the sizes of the blacksmiths' hammers.

Pythagoras then discovered that the first and fourth strings when sounded together produced the harmonic interval of the octave, for doubling the weight had the same effect as halving the string. The tension of the first string being twice that of the fourth

string, the ratio of their tension was 2:1, or duple. Similarly, he ascertained that the first and third string produced the harmony of the *diapente*, or the interval of the fifth. The tension of the first string being half again as much as that of the third string, the ratio of their tensions was 3:2, or *sesquialter*. Similarly, the second and fourth strings, having the same ratio as the first and third strings, yielded a diapente harmony.

Continuing his investigation, Pythagoras discovered that the first and second strings produced the harmony of the *diatessaron* or the interval of the third; and the tension of the first string being a third greater than that of the second string, their tension ratio was 4:3, or *sesquitercian*. The third and fourth strings, having the same ratio as the first and second strings, produced another harmony of the diatessaron. According to Iamblichus, the second and third strings had the ratio of 8:9, or *epogdoan*.

F. Gafurio, *Pythagoras Experimenting*, 1492. *Theorica Musice.* Clockwise from top left: the hammers in Jubal's [Tubalcain's] smithy; playing tuned bells and water filled cups; experimenting with weights on the end of fixed length strings; and on the length of pipes to determine the exact ratios of consonant sounds one to another.

The key to harmonic ratios is hidden in the Pythagorean tetraktys already mentioned. The tetraktys is made up of the first four numbers—1, 2, 3 and 4—which in their proportions reveal the intervals of the octave, the diapente, and the diatessaron.[3]

Raphael Sanzio, Detail from *The School of Athens*, 1511, Vatican City. The Tablet being held at the feet of Pythagoras while he is explaining musical ratios to a student. It shows the mathematical and musical harmonies of the Universe, with the Tetraktys at the bottom.

Healing Music

Pythagoras cured many ailments of the soul, mind, and body by having certain specially prepared musical compositions played in the presence of the sufferer or by personally reciting short selections from such early poets as Hesiod and Homer.

In his university at Crotona it was customary for the Pythagoreans to open and close each day with songs. Those in the morning were calculated to clear the mind from sleep and inspire it to the activities of the coming day. Those in the evening were of a soothing, relaxing mood conducive to rest. At the vernal equinox, his disciples gathered in a circle around one of the initiates who led them in song while playing a lyre.

Pythagoras's therapeutic music is described by Iamblichus as follows:

"And there are certain melodies devised as remedies against the passions of the soul, and also against despondency and lamentation, which Pythagoras invented as things that afford the greatest assistance in these maladies. And again, he employed other melodies against rage and anger, and against every aberration of the soul. There is also another kind of modulation invented as a remedy against desires."[4]

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Music of the Spheres

Pythagoras conceived the universe to be an immense monochord, with its single string connected at its upper end to absolute spirit and at its lower end to absolute matter. The cord, in other words, stretched between heaven and earth.

Counting inward from the circumference of the heavens, Pythagoras, according to some, divided the universe into nine parts, or according to others, into twelve parts. The twelvefold system was as follows: The first division was called the *empyrean*, or the sphere of the fixed stars, and was the dwelling place of the immortals. The second to twelfth divisions were (in order) the spheres of Saturn, Jupiter, Mars, the Sun, Venus, Mercury, Earth's Moon, and fire, air, water, and earth.

The names given by the Pythagoreans to the various notes of the diatonic scale were, according to Macrobius (a fifth-century CE Neoplatonist philosopher), derived from an estimation of the velocity and magnitude of the planetary bodies. Each of these gigantic spheres as it rushed endlessly through space was believed to sound a certain tone caused by its continuous displacement of the *aethereal diffusion*. As these tones were a manifestation of divine order and motion, it must necessarily follow that they partook of the harmony of their own source. Thus Saturn, the farthest planet, was said to give the flattest note, while the Moon, the nearest, gave the sharpest.

The Pythagoreans believed that everything in existence had a voice and that all creatures were eternally singing praises to the Creator.

The Greek initiates also recognized a fundamental relationship between the individual heavens or spheres of the seven planets, and the seven sacred vowels. The first heaven uttered the sound of the sacred vowel A (Alpha); the second heaven, the sacred vowel E (Epsilon); the third, H (Eta); the fourth, I (Iota); the fifth, O (Omicron); the sixth, Y (Upsilon); and the seventh heaven, the sacred vowel Ω (Omega). When these seven heavens sing together, they produce a perfect harmony which ascends as an everlasting praise to the throne of the Creator. Although not explicitly stated, it is probable that the planetary heavens were considered as ascending in Pythagorean order beginning with the sphere of the moon, which would be the first heaven.

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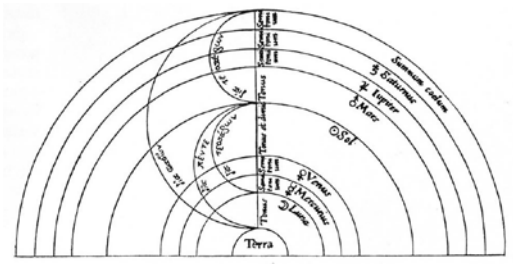


The Music of the Spheres.[b]

melodies because our souls are enmeshed in the illusion of material existence. When we liberate ourselves from the bondage of the lower world with its sense limitations, *the music of the spheres* will again be audible as it was in the Golden Age. Harmony recognizes harmony, and when the human soul regains its true estate, it will not only hear the celestial choir but also join with it in an everlasting anthem of praise to that Eternal *Good* controlling the infinite number of parts and conditions of Being.[5]

The Dream of Scipio

Among the many writers who were inspired by the Pythagorean teachings, the most important was the Roman statesman and philosopher Cicero, who wrote the Somnium Scipionis (The Dream of Scipio) found in the sixth and final chapter of his work De Republica (On the Republic, 54-51 BCE).

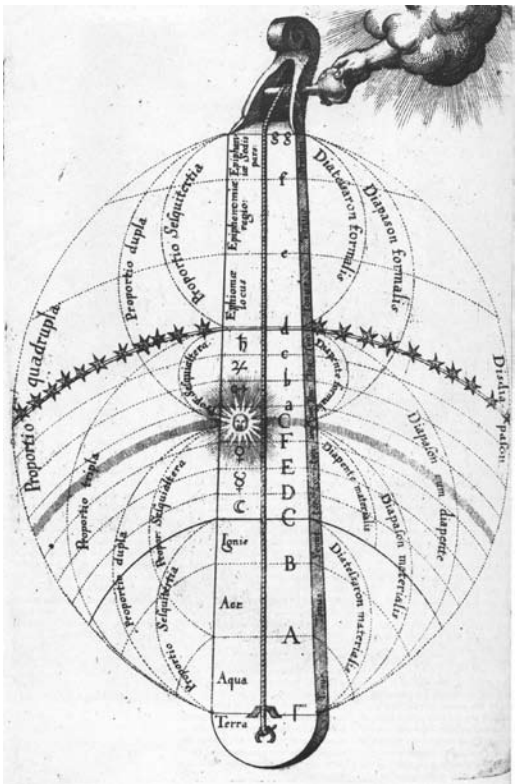
Modeled on Plato's Republic, it tells a story about Publius Cornelius Scipio Aemilianus, the destroyer of Carthage, who was discussing some philosophical and political topics with friends. He narrates a dream he had had a few years before while serving in North Africa as military tribune of the fourth Legion. During his time there, he had paid a visit to Masinissa (238-148 BCE), the king of Numidia (present-day Algeria), a great friend of his grandfather, Scipio Africanus. On one occasion while at dinner the king had praised his grandfather. Following this, Scipio retired for the night and dreamt that his grandfather appeared and conducted him on a journey to the Milky Way, the dwelling place of the souls of the departed who awaited rebirth. Here Scipio Africanus showed his grandson the arrangement of the planets and the music of the spheres, with the purpose of spiritually raising him and to demonstrate how unimportant terrestrial things are in comparison with the celestial.

In his Somnium Scipionis, this is how Cicero speaks of the music of the spheres:

"That is the sound produced by the impetus and momentum of the spheres themselves. It is made up of intervals which, though unequal, are determined systematically by fixed proportions. The blend of high and low notes produces an even flow of various harmonies. Such vast motions cannot sweep on in silence, and nature ordains that low notes should be emitted by one of the boundaries and high noted by the other. From the uppermost of the heavenly orbits (that which carries the stars) comes a high note with frequent vibrations, in that its cycle is more rapid. The deepest note emanates from the lowest orbit, that of the moon.

"The earth, which is the ninth sphere, remains fixed and immobile in one place, filling the central position of the universe.

Macrobius, *Commentary on the Somnium Scipionis*, 1150. Copenhagen, Det Kongelige Bibliotek. The Universe, the earth in the center, surrounded by the seven planets within the zodiacal signs, carried on the shoulders of four giant figures.



Robert Fludd, *The Divine Monochord* from *History of the Macrocosm and the Microcosm*, Tractate I, page 90, 1617.[c]

Those eight rotating spheres of which two (being an octave apart) produce the same effect, give out seven distinctive sounds [diatonic scale]. According to their intervals, that number is more or less the lynchpin of everything. By imitating this system with strings and voices, experts have succeeded in opening up a way back to this place [the divine], as have others who, in their life on Earth, have applied their outstanding intellect to heavenly subjects.

"Filled with this sound, people's ears have become deaf to it. Hearing, in fact, is the most easily impaired of all your senses. For instance, where the Nile comes hurtling down from the mountain peaks at a place called Catadupa, the local inhabitants have lost their sense of hearing because of the loudness of the roar. The noise of the whole universe then, revolving as it does at enormous speed, is so loud that human ears cannot take it in, just as you cannot look straight at the sun because your sight and vision become overwhelmed by its rays."[6]

Dante, in his Divine Comedy (written between 1308-1321 CE) describes heaven as an eternal world of light and music. He writes of light, the symbol of spiritual elevation, reaching through the path that features in the Divine Comedy. The music of the spheres is illustrated as a choir of the angels, of the saints, and of the blessed ones.

Both these writers, while presenting the glory of God, introduce those dreams that Macrobius classified as the three true dreams:

1. The *somnium* dream, to be deciphered as that which is given by nature (as in the *Somnium Scipionis* and from the pedagogic character of the work of the *Divine Comedy*).

2. The *oraculum* dream, the prophecy on the future as in the case of Scipio Africanus (in the *Somnium*) and Brunetto Latini, Guido del Duca, and Cacciaguida (in Hell, Purgatory, and Paradise in the *Divine Comedy*).

3. The *visio* dream, the vision of what will happen, gives a vision of the ultra mundane reality or the Milky Way (in the *Somnium*) and Hell, Purgatory, and Paradise (in the *Divine Comedy*).

Afterword

In modern times we have photographed the music of the cosmos with the Chandra X-ray Orbiting Observatory, in the rippling of the dust and gas clouds in the constellation of Perseus, for example. Or we can hypothesize it, as did the French physicists Marc Lachièze-Rey and Jean-Pierre Luminet in the immensely small subatomic world of superstrings. To many people we have lost the sense of the infinite that exists both within and beyond us, and the beauty of the "truth" of which we are all a part. As the German poet and philosopher Novalis (1772-1801) said: "Within and around us is eternity with its waves, its past, and its future."[7]

ENDNOTES

Notes (Text):

[1]Nicholas Cook, *Music, A Very Short Introduction*, (Oxford: Oxford University Press, 2000).

[2]Iamblichus, *Life of Pythagoras*, chap. 26.

[3]This section adapted from Manly P. Hall, "The Pythagorean Theory of Music and Color," in *The Secret Teachings of All Ages* (Los Angeles: Philosophical Research Society, 1928).

[4]Iamblichus, *Life of Pythagoras*, chap. 25.

[5]Ibid.

[6]Cicero, "Somnium Scipionis" 10-12 in *De RePublica* 6:18-20. Available at http://ancienthistory.about.com/library/bl/bl_text_cic_scipiodream.htm

[7]This article originally published in *Rosa+Croce*, No. 30 (Winter 2007), 7-19; first English-language adaptation in *Rosicrucian Beacon*, 17:4 (September 2008), 5-11.

Notes (Images):

[a]"The Pythagorean Tetrad: "Another model of creation is the mathematical one whose source is the Pythagorean number-philosophy handed down in Plato's *Timaeus*. The Monad generates the Dyad, and the Triad and Tetrad follow, the arithmetical progression continuing indefinitely. In the plate the absolute darkness precedes the Monad, the first created light. The Dyad is the polarity of light and darkness, with which the Humid Spirit makes a third. The polarization of the four elements concludes the foundation of the world, bringing the number of principles up to ten. Fludd borrowed this mathematical philosophy from Francesco Giorgio, whose *De Harmonia Mundi* (1525) also supplied him with his ideas of musical proportion as a universal schema."–Joscelyn Godwin, *Robert Fludd* (London: Thames and Hudson, 1979), 31.

[b]In the Pythagorean concept of the music of the spheres, the interval between the earth and the sphere of the fixed stars was considered to be a diapason, the most perfect harmonic interval. The following arrangement is most generally accepted for the musical intervals of the planets between the earth and the sphere of the fixed stars: From the sphere of the earth to the sphere of the moon, one tone; from the sphere of the moon to that of Mercury, one-half tone; from Mercury to Venus, one-half tone; from Venus to the sun, one and one-half tones; from the sun to Mars, one tone; from Mars to Jupiter, one-half tone; from Jupiter to Saturn, one-half tone; from Saturn to the fixed stars, one-half tone. The sum of these intervals equals the six whole tones of the octave.

[c]The Divine Monochord of Robert Fludd: "The three realms with their divisions are set out along a monochord. To the immediate left of the string Fludd specifies the members of each realm (giving to the empyrean hierarchy the Greek names of Epiphaniae (apparitions), Epiphonomiae (voices), and Ephiomae (acclamations). To each is assigned a note of the scale, from low G for the Earth (the Greek letter Gamma) up through two octaves to 'gg' for the highest division of the empyrean. The proportions work as follows: the Proportio dupla (2:1) from the Earth to the Sun becomes the octave interval from Gamma to G. On the right are the Greek names of the musical intervals corresponding to each proportion: Disdiapason (double octave = 4:1); Diapason (octave = 2:1); Diapente (fifth = 3:2); and Diatessaron (fourth=4:3). There is however an error in the Diapente materialis: it should join the Sun's G to the C of fire, as should the corresponding proportio sesquialtera. And for the tones and semitones to be correct (to the right of the string), we have to imagine the Fs as sharp." –Joscelyn Godwin, *Robert Fludd* (London: Thames and Hudson, 1979), 44-45.