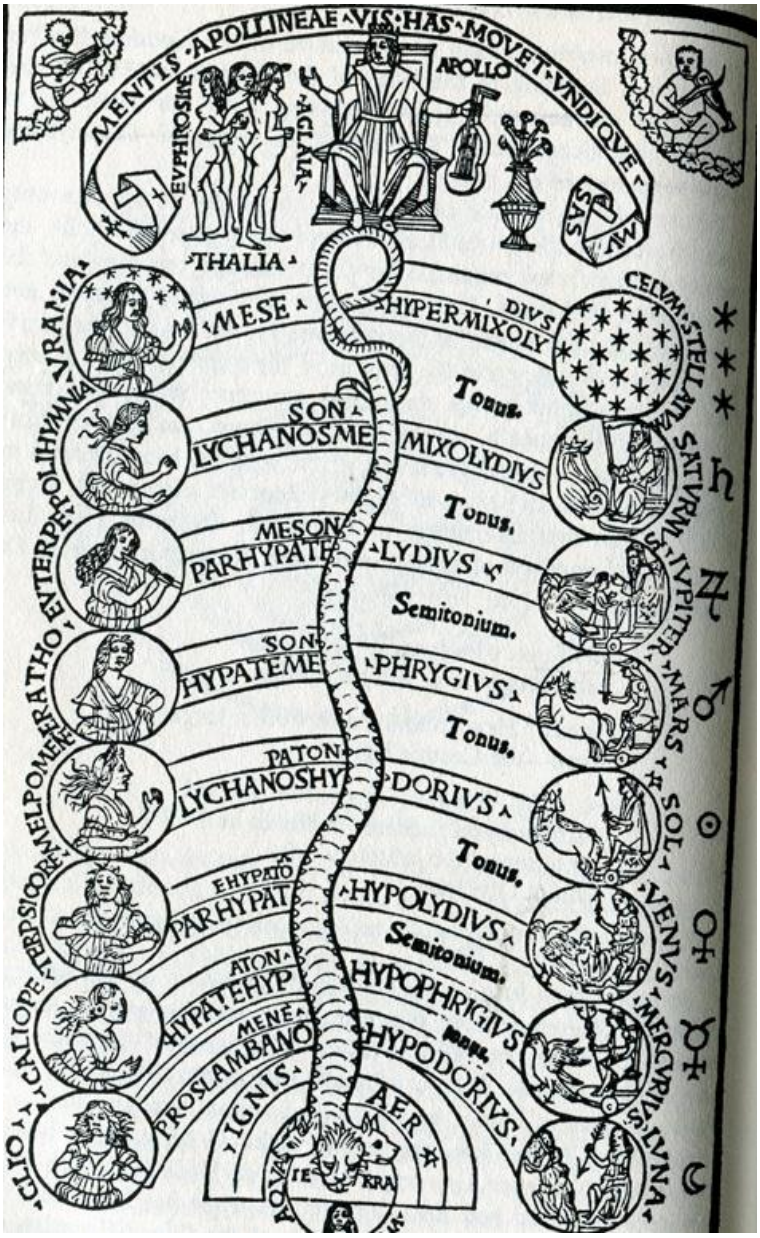
"The Music of the Spheres": Musical Theory and Alchemical Image
by Margaret Mendenhall



From *De Harmonia Musicorum Instrumentorum Opus.* Franchino Gaffurio. 1518.

Depicting the musical universe as the tones and modes of the musical scale that coordinate with the heavenly bodies, "The Music of the Spheres," as seen above, was originally a woodcut which served as the frontispiece of the treatise *Practica musice*

written by Franchino Gaffurio (1518: 94).[1] Gaffurio, also known as Gafurius, was the choirmaster of the Cathedral of Milan (Wind 1958: 129; Herlinger 2002: 181-82). His treatise was based on the hermetic tradition of Pythagoreanism, and the image he constructed to illustrate his thesis has intrigued alchemists for centuries (Herlinger 181; James 1993: 114). This paper will explore both the Pythagorean musical theory that the image was originally created to illuminate, as well as the alchemical symbolism that has fascinated scholars for the last five hundred years.

I. The Musical Theory Represented

To understand Pythagorean musical theory, we must of course begin with Pythagoras. While there is no direct surviving written documentation attributed to Pythagoras, we do have secondhand accounts of his teachings from his followers and commentaries from later philosophers. Also, although modern scholars are now divided on how much of his work can be attributed to a historical figure born in the sixth century BCE on the island of Samos, all ancient biographers do agree that Pythagoras studied geometry in Egypt and was the first outsider to be initiated into the mysteries of the Egyptian religion. He also received instruction in astronomy from the Chaldeans, acknowledged to be the masters of that science (James 1993: 21, 25-26).

Pythagoras was the first to call himself a *philosophos*, meaning "a lover of wisdom." His predecessors merely called themselves, *sophoi*, the wise (James 1993: 22). Of the many distinctions given to Pythagoras as "a primary thinker in philosophy, mathematics, music, and cosmology," perhaps the most significant one is that he did not like to make them, instead he taught of "the interrelatedness of all human knowledge"

[1] Although this image was first published in Gaffurio's earlier treatise *Practica musice*, the illustration reproduced here also appeared in his later work, *De Harmonia Musicorum Instrumentorum Opus*, which has been digitalized by Google and is available online.

(James 23). Pythagorean philosophy was based on dualism, specifically ten dualities, the first and most important one being the relationship between the limited and the unlimited. Pythagoras was the first to express this concept in numbers and one of his most important numerical symbols was the *tetractys* of the decad, an arrangement of points in the shape of a triangle (James 28; Nolan 2002: 273). (To visualize this figure, imagine the placement of pool balls within the triangle just before the break.)

Regarding music, Pythagoras believed that it could be divided into three basic types: *musica instrumentalis*, the music made by playing instruments; *musica humana*, the unheard continuous music made by each human organism, especially the resonance between the soul and the body; and *musica mundana*, music made by the cosmos, which would come to be known as the music of the spheres (James 1993: 31). Aside from these classifications, Pythagoras' broadest contribution to musical theory was his discovery of the relationship between mathematical ratios and harmonic intervals (James 32; Zuckerkandl 1956: 25).

The story of how Pythagoras came about this breakthrough is legend. Paraphrasing the tale from a retelling by Iamblichus, a biographer of Pythagoras and a student of Porphyry, it goes as follows. One day Pythagoras was out walking, thinking about whether it would be possible to create a way to balance and measure the differences between musical notes. As he was considering this, he happened to pass a blacksmith's shop and heard hammers beating out harmonizing sounds. He went in and asked the smithy how was it possible that the hammers were all making different sounds. The smithy then showed Pythagoras that the different hammers were of different weights. A twelve pound hammer was twice as heavy as a six pound one and had a ratio of 2:1,

which Pythagoras recognized as sounding at the interval of an octave; an eight pound hammer and a twelve pound one had the ratio of 2:3, which Pythagoras heard as a major fifth; while a nine pound hammer and a twelve pound tool had the ratio of 3:4, which produced a major fourth. Pythagoras, as legend has it, went home to experiment. He tested his theory on another of his inventions, the monochord. The monochord was made up of one stretched out "gut-string" and a moveable bridge that enables one to shorten the length of the string plucked (James 1993: 32-36, Nolan 2002: 272). This same device was used from Pythagoras' time up until that of Gaffurio to test harmonic laws (Herlinger 2002: 168).

Also important to the symbolism of Gaffurio's image, Pythagoras conceived the relationships between the distances between celestial bodies in his music of the spheres.

> Counting outward from the earth to the outermost sphere of the fixed stars, Pythagoras fixed the musical intervals as follows: from the earth to the moon was a whole step; from the moon to Mercury, a half step; Mercury to Venus, another half step; from Venus to the sun was a minor third, which is equal to three half steps; the sun to Mars, a whole step; Mars to Jupiter, a half step; Jupiter to Saturn, a half step; and from Saturn to the sphere of the fixed star, another minor third. (James 1993: 40)

Pythagoras' followers codified his wisdom in the Golden Verses of Pythagoras, which were considered sacred and "not meant to be exposed to the profane gaze of the uninitiated" (James 1993: 115). Pythagoras' concepts were also adopted by Plato in his *Timaeus*, where he used them in his own model for the creation of the soul of the universe (James 41-42; Mathiesen 2002: 115). The Pythagorean mystery cult survived the centuries, with one of the most important prophets of Pythagorean-like ideas being Hermes Trismegistus himself. In *Corpus Hermeticum* Hermes adopted the idea of cosmic harmony in order to use its "magic" powers to divert cosmic energy for use on earth.

Sometime around AD 1460 Cosimo de'Medici obtained an almost complete manuscript of *Corpus Hermeticum.* Medici gave the Greek text to Marsilio Ficino to translate, and it became a sensation among the Florentine literati (James 116-18). Ficino, an ardent believer in sympathetic magic in his own right, adopted Plato's concept of the world having a single, indivisible soul from *Timaeus*, and used music to explain the cosmic spirit, or *spiritus mundi*, that was constantly flowing "in and around the sublunary world" (James 119-20).

Returning to the ancient Greeks, two things should be noted about their classical music theory. As alchemically fascinating as Pythagoras' ideas are, there were three competing schools of thought on the subject of musical intervals. There was the Pythagorean concept of the relationship between music ratios and the cosmos; the tradition of the Harmonicists, which as the name indicates, had to do with the science of harmonics; and the Aristoxenian School, which was based on Aristotelian principles. Secondly, much of Greek musical theory was theoretical, as opposed to practical; that is having to do with the tuning of actual musical instruments in order to play them (Mathiesen 2002: 112, 114).

Eventually, these classical Greek music concepts became the foundation for the theories of canonics in the Middle Ages and the Renaissance, canonics being the study of pitches, intervals and their ratios. During the period from AD 1000 to 1500 there were roughly 150 different treatises written on the subject. Gaffurio's *Practica musice,* written in 1492, was one of them (Herlinger 2002: 168-69, 181, Mathiesen 2002: 110).

Gaffurio in his *Practica musice* disagreed with a competing treatise, *Musica practica,* written by the Spanish musical theorist, Bartolomeo Ramis de Pareia. Gaffurio

used “The Music of the Spheres” to demonstrate the superiority of his theory, based on traditional Pythagorean ratios, which favors pure octaves, fifths and fourths, over Ramis’ concept of a “just” tuning by pure thirds. As the woodcut so beautifully illustrates, Gaffurio held fast to his belief in the theory of Pythagorean tuning in relation to the structure of the cosmos, even though he admitted that in practice, it was Ramis’ tuning method that was actually used to tune the organs of the time (Herlinger 2002: 181-82). Although the idea of ratios to interpret intervals became a foundation for Western musical theory, the actual formulas were improved upon using something that was not available to Pythagoras, irrational numbers. Currently, the use of contemporary mathematics has also reunited musical theory and actual musical practice (Herlinger 188; Bower 2002: 164).

II. Alchemical Symbolism

While the Pythagorean ratios incorporated into “The Music of the Spheres” may have been improved upon over the centuries (Bower 2002: 164), the alchemical symbolism of the woodcut is still intriguing; apart from the representations of the musical interludes, the image is rife with figures of other relationships and numeric formulas.

The descending serpent bisecting the image, cuts through the spheres of the four elements at the bottom of the illustration and then divides into three animal heads, the lion in the center, the wolf on the left and the dog on the right. In *Creative Mythology*, Joseph Campbell indicates that Gaffurio identified this serpent with the three-headed guard dog of Hades, Cerberus. The heads of the beast represent “Devouring Time in its three aspects – Present, Past, and Future” (99, 101). In *Pagan Mysteries in the Renaissance*, Edgar Wind, in addition to the identification Gaffurio made with Cerberus,

also characterized this triple-headed monster as a cousin of Cerberus, the attendant of the god at the great temple of Serapis at Alexandria. Wind makes this additional connection by explaining that Plutarch, whom he feels Gaffurio could have been familiar with, determined that the deity at this temple was a sun god, and therefore associated the Serapis monster with Apollo. Whichever interpretation of the serpent is preferred, at the top center of the image Apollo rests his feet on the curve of its tail, which when portrayed as turning back on itself, as it is here, represents "eternity or perfection" (259, 265-66).

Returning to the upper part of the image, to the left of Apollo are the Three Graces: Euphrosyne – Mirth; Thalia – Abundance; and Aglaia – Splendor. Joseph Campbell relates these figures not only as the Three Graces, but also as different aspects of the biblical Eve. The central figure, Grace Thalia would represent Eve in her state of purity; Mirth, to the left of her and turned away from the god, indicates Eve's rebellious nature; whereas Splendor, gazing at the god figure, represents to him Eve as the Virgin Mother Mary. The female head at the very bottom of the illustration also labeled "Thalia," here refers to the first of the nine Muses, and in Campbell's biblical symbolism, under the power of the serpent, also symbolizes Eve in exile (1968: 101).

To the right of Apollo is a vase filled with flowers, which during the Renaissance symbolized the virtues of the soul. This vase contains six flowers and when combined with the Three Graces add up to nine, the number of Muses. In a sublime allusion to Pythagorean theory, the triad of Graces corresponds to the three tones, and their representative Muses, that create the octave and the perfect fourth that separates them, with the remaining six Muses identified as the flowers in the vase. Additionally, the placement of Apollo between the Muses and the flowers harkens back to Boticelli's

Primavera, which placed Venus between the Graces and Flora to symbolize her spiritual and sensuous powers. Wind also suggests an even stronger relationship between "The Music of the Spheres" and the *Primavera,* in the possibility that the painting was meant to have a musical interpretation, with the eight characters in the painting representing an octave in the key of Venus. If this was then transposed into the key of Apollo, then the muse Urania would be the highest note of the octave and Clio the lowest. Gaffurio compared Clio to Proserpina, in breaking the silence of the earth, which in his image was represented by the silent muse in the underworld, Thalia (Wind 1958: 129-30, 268).

As Thalia, the first Muse – she is the inspiration for Bucolic Poetry and Comedy, even when, as identified in this illustration, she is silent and in the underworld. The remaining eight Muses are each associated with a particular art, a particular pitch in the Western A minor scale, a Greek musical mode, a metal, and a god, as well as a celestial body with its related musical frequency caused by the motion of its revolution (Campbell 1968: 101-03; Wind 1958: 267).

Moving up from the bottom, the second Muse, Clio, the Muse of History, presides over the moon and controls the tides of time. Her note is Proslambanomenos, or A, and matches the Hypodorian mode; her metal is silver. Following Clio, Calliope, the Muse of Heroic Poetry, corresponds to Mercury, the guide to souls beyond the temporal sphere. Her note is Hypate hypaton, or B, and matches the Hypophrygian mode; her metal is quicksilver. Terpsichore, the Muse of Dance and Choral Song, corresponds to Venus and Cupid. Her note is Parhypate hypaton, or C, and matches the Hypolydian mode; her metal is copper. Melpomene, the Muse of Tragedy, corresponds to the Sun. Her note is Lichanos hypaton, or D, which matches the Dorian mode; her metal is gold. Erato, the

Muse of Lyric and Erotic Poetry, which corresponds to Mars, the god of war. Her note is Hypate meson, or E, which matches the Phrygian mode; her metal is iron. Euterpe, the Muse of Flute Music, corresponds to Jupiter. Her note is Parhypate meson, or F, which matches the Lydian mode; her metal is tin. Polyhymnia, the Muse of Sacred Song, corresponds to Saturn. Her note is Lichanos meson, or G, which matches the Mixolydian mode; her metal is lead. Finally, Urania, the Muse of Astrology, corresponds to the Stars. Her note is Mese, the A an octave above Clio, which matches the Hypomixolydian mode, not one of the seven classical Greek modes, but a super-numerary mode from Ptolemy, that was added by Gaffurio so that fixed stars would not be without music (Campbell 1968: 103; Wind 1958: 267).

Gaffurio's concept of the ladder of the planets was known as far back as the time of the Stoics and was developed in Cicero's "Dream of Scipio Africanus the Younger" which he used to conclude the argument of his *Republic* (Campbell 1968: 103; Campbell 1964: 325).

Africanus the Younger was said to have lived circa 185-129 BCE and as the story goes, in his dream, he saw the vision of his dead grandfather, Africanus the Elder, who many years earlier had invaded Africa and defeated Hannibal. The vision urged him to think beyond the earth, to the "marvels of a universe of nine celestial spheres." The vision of Africanus the Elder told his grandson that the fixed stars revolved above the seven spheres: Saturn, Jupiter, Mars, the sun, Venus, Mercury, the moon; which in turn revolved around the earth, which remained immovable (Campbell 1964: 325).

Then Africanus the Younger asked the vision of his grandfather what was the agreeable sound that he was hearing. The grandfather's reply is a poetic retelling of Pythagoras' concept of the music of the spheres:

> That is produced by the onward rush and motion of the spheres themselves; the intervals between them, though unequal, being exactly arranged in a fixed proportion, by an agreeable blending of high and low tones various harmonies are produced. For such mighty motions cannot be carried on so swiftly in silence; and Nature has provided that one extreme shall produce low tones while the other gives forth high. Therefore this uppermost sphere of heaven, which bears the starts, as it revolves more rapidly, produces a high, shrill tone, whereas the lowest revolving sphere, that of the moon, gives forth the lowest tone. For the earthly sphere, the ninth, remains ever motionless and stationary in its position in the center of the universe; but the other eight spheres, two of which move with the same velocity, produce seven different sounds – a number that is the key of almost everything (Campbell 1964: 326).

Finally, at the top of the image the cosmic lesson written on the scroll above Apollo reads: "*Mentis Apollineae vis has movet undique Musas"* – "The energy of the Apollinian Mind sets these Muses everywhere in motion" (Campbell 1968: 105). This would include silent Thalia below, as rests are necessary to melody (Wind 1958: 267).

III. Conclusion

While the ability to calculate Pythagorean ratios, illustrated in "The Music of the Spheres," may have been improved upon with the introduction of irrational numbers, his discovery of the mathematical relationship between tones laid the foundation for much of Western music theory. While the later astronomical discoveries of Copernicus, Galileo and others, that the sun is the center of our solar system, may have modified how we calculate the distances between the celestial bodies from one another, this image continues to fascinate modern day alchemists with the sheer beauty of this sublime illumination of the relationship between the Muses, their musical notes and modes, and that of the corresponding heavenly bodies, gods, and metals attributed to them.

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