PYTHAGORAS (circa 580 to 500 BC)
exoterically the Greek Philosopher, Mathematician and Educator who founded the **Pythagorean School** and from which began **Pythagoreanism; and**
esoterically the **SCHOOL OF ON (ANNU)** Greek student **who undertook a 40 day VEGETARIAN fast to gain entrance**, who went on to found his **Pythagorean School** in Italy and promulgated his **ANNU CULTURE** education with theories on the **Celestial Music Harmony** and famous **Pythagorean Theory on the Hypotenuse of a Right Triangle** which was the prerequisite to building the **GREAT PYRAMIDS done two thousand years before his birth** and thus learned at the **SCHOOL OF ON (ANNU).**
See Appendix I-A; Appendix II-A; Pages 4, 43 & 75 and Multimedia 1.3.5 EB Pythagoras and Multimedia 1.3.5.1 Pythagoreanism.
Refer to **GREEK STUDENTS OF, SCHOOL OF ON, INNER CELESTIAL MUSIC and VEGETARIANISM.**

PYTHAGORAS
born c. 580 BC, , Samos, Ionia
died c. 500, , Metapontum, Lucania

Pythagoras, contorniate medallion engraved between AD 395 and 410; in the *Bibliothèque Nationale,* Paris France**.** Courtesy *Bibliotheque Nationale*.

Greek philosopher, mathematician, and founder of the **Pythagorean** brotherhood that, although religious in nature, formulated principles that influenced the thought of **Plato** and **Aristotle** and contributed to the development of mathematics and Western rational philosophy **(see Pythagoreanism).**

Pythagoras migrated to southern Italy about 532 BC, apparently to escape Samos' tyrannical rule, and established his ethico-political academy at Croton (now Crotona)**.**

It is difficult to distinguish **Pythagoras'** teachings from those of his disciples. None of his writings has survived, and **Pythagoreans** invariably supported their doctrines by indiscriminately citing their master's authority**. Pythagoras**, however, is generally credited with the ***theory of the functional significance of numbers in the objective world and in music.***

Other discoveries often attributed to him ***(e.g., the incommensurability of the side and diagonal of a square, and the Pythagorean theorem for right triangles***) were probably developed only later by the Pythagorean school**.** More probably the bulk of the intellectual tradition originating with **Pythagoras** himself belongs to **mystical wisdom** rather than to **scientific scholarship.**

NOTE: Pythagoras' training by the **School of On** of Ancient Egpy/Kemit is not mentioned**;** and his **theory of the Right Triangle Hypotenuse** that he learned at the **School of On** is not attributed to him in the 6 th Century BC but to his much later students.

PYTHAGOREANISM

philosophical school and **religious brotherhood**, believed to have been founded by **Pythagoras of Samos**, who settled in Croton in southern Italy about 525 BC.

General features of Pythagoreanism

The character of the original **Pythagoreanism** is controversial, and the conglomeration of disparate features that it displayed is intrinsically confusing. Its fame rests, however, on some very influential ideas, not always correctly understood, that have been ascribed to it since antiquity.

These ideas include those of **:**

(1) the **metaphysic of number** and the conception that reality, including music and astronomy, is, at its deepest level, mathematical in nature;

(2) the use of **philosophy** as a means of **spiritual purification**;

(3) the **heavenly destiny of the soul** and the **possibility of its rising to union with the divine**;

(4) the appeal to **certain symbols**, sometimes mystical, such as **the tetraktys**, the **golden section**, and the **harmony of the spheres** (to be discussed below);

(5) the **Pythagorean theorem**; and

(6) the demand that members of the order shall observe a **strict loyalty and secrecy**.

By laying stress on certain inner experiences and intuitive truths revealed only to the *initiated*, **Pythagoreanism** seems to have represented a soul-directed subjectivism alien to the mainstream of **Pre-Socratic Greek** thought centring on the Ionian coast of Asia Minor (Thales, Anaximander, Anaxagoras, and others), which was preoccupied with determining what the basic cosmic substance is.

In contrast with such **Ionian naturalism**, **Pythagoreanism** was akin to trends seen in **mystery religions** and **emotional movements**, such as ***Orphism***, which often claimed to achieve through intoxication a spiritual insight into the divine origin and nature of the soul.

Yet there are also aspects of it that appear to have owed much to the more sober, “Homeric” philosophy of the Ionians. The **Pythagoreans,** for example, displayed an interest in **metaphysics (the nature of Being),** as did their naturalistic predecessors, though they claimed to find its key in mathematical form rather than in any substance.
They accepted the essentially Ionian doctrines that the world is composed of opposites (wet-dry, hot-cold, etc.) and generated from something unlimited; **but they added** the idea of the imposition of limit upon the unlimited and the sense of a musical harmony in the universe. Again, like the Ionians, they devoted themselves to **astronomical** and **geometrical speculation.** Combining, as it does, a rationalistic theory of number with a mystic numerology and a speculative cosmology with a theory of the deeper, more enigmatic reaches of the soul, **Pythagoreanism interweaves Rationalism and irrationalism more inseparably than does any other movement in ancient Greek thought.**

Major concerns and teachings

The problem of describing **Pythagoreanism** is complicated by the fact that the surviving picture is far from complete, being based chiefly on a small number of fragments from the time before **Plato** and on various discussions in authors who wrote much later—most of whom were either **Aristotelians** or **Neoplatonists** (see below **History of Pythagoreanism**)**.** In spite of the historical uncertainties, however, that have plagued searching scholars, the contribution of **Pythagoreanism** to Western culture has been significant and therefore justifies the effort, however inadequate, to depict what its teachings may have been.

Moreover, the **heterogeneousness of Pythagorean doctrines** has been well documented ever since **Heracleitus**, a classic early 5th-century Greek philosopher who, scoffing at **Pythagoras'** wide-ranging knowledge, said that it "does not teach one to have intelligence." There probably never existed a strictly uniform system of **Pythagorean** philosophy and religious beliefs, even if the school did have a certain internal organization.

Pythagoras appears to have taught by **pregnant, cryptic akousmata ("something heard") or symbola.** His pupils handed these on, formed them partly into **Hieroi Logoi** ("Sacred Discourses"), of which different versions were current from the 4th century on, and interpreted them according to their convictions.

Major concerns and teachings
Religion and ethics

The belief in the **transmigration of souls** provided a basis for the **Pythagorean** way of life. Some **Pythagoreans** deduced from this belief the principle of "the kinship of all beings," the ethical implications of which were later stressed in 4th-century speculation. **Pythagoras** himself seems to have **claimed a semidivine status in close association with the superior god Apollo**; he believed that **he was able to remember his earlier incarnations** and, hence, to know more than others knew. Recent research has emphasized **shamanistic traits** deriving from the ecstatic cult practices of **Thracian medicine men** in the early **Pythagorean** outlook. The rules for the religious life that **Pythagoras** taught were largely ritualistic: refrain from speaking about the holy, wear white clothes, **observe sexual purity**, **do not touch beans**, and so forth. He **seems also to have taught purification of the soul by means of music and mental activity (later called philosophy) in order to reach higher incarnations**. **"To be like your Master"** and **so "to come nearer to the gods"** was the challenge that he imposed on his pupils. **Salvation**, and perhaps **ultimate union with the divine cosmos** through the study of the cosmic order, became one of the leading ideas in his school.

The advanced ethics and political theories sometimes ascribed to **Pythagoreanism** may to some extent reflect ideas later developed in the circle of **Archytas**, the leading 4th-century Pythagorean. But a picture current among the **Peripatetics (the school founded by Aristotle)** of **Pythagoras** as the educator of the Greeks, who publicly preached a **gospel of humanity**, is clearly anachronistic. Several of the **Peripatetic writers**, **Aristoxenus**, **Dicaearchus**, and **Timaeus**, seem to have interpreted some principles—properly laid down only for esoteric use in the brotherhood—as though these applied to all mankind**:** the internal loyalty, modesty, self-discipline, piety, and abstinence required by the secret doctrinal system; **the higher view of womanhood reflected in the admission of women to the school**; a certain community of property; and perhaps the drawing of a parallelism between the macrocosm (the universe) and the microcosm (man), in which (for instance) the **Pythagorean idea** that the cosmos is an organism was applied to the state, which should thus mix monarchy, oligarchy, and democracy into a harmonic whole—these were all universalized.

Metaphysics and number theory

According to **Aristotle**, **number speculation** is the most characteristic feature of **Pythagoreanism.** Things "are" number, or "resemble" number. To many **Pythagoreans** this concept meant that things are measurable and commensurable or proportional in terms of number—an idea of considerable significance for Western civilization. But there were also attempts to arrange a certain minimum number of pebbles so as to represent the shape of a thing—as, for instance, stars in a constellation that seem to represent an animal. For the **Pythagoreans** even abstracted things "have" their number: "justice" is associated with the number four and with a square, "marriage" with the number five, and so on. The psychological associations at work here have not been clarified.

Major concerns and teachings

Metaphysics and number theory

The harmony of the cosmos

Figure 1: The Tetraktys (see text).

The **sacred decad** in particular has a cosmic significance in Pythagoreanism: its mystical name, tetraktys (meaning approximately “fourness”), implies **1 + 2 + 3 + 4 = 10**; but it can also be thought of as a **“perfect triangle,”** as in **Figure 1.**

Speculation on number and proportion led to an intuitive feeling of the harmonia (“fitting together”) of the kosmos (“the beautiful order of things”); and the application of the tetraktys to the theory of music (see below Music) revealed a hidden order in the range of sound.

Pythagoras may have referred, vaguely, to **the “music of the heavens,” which he alone seemed able to hear;** and later **Pythagoreans** seem to have assumed that the distances of the heavenly bodies from the Earth somehow correspond to musical intervals—a theory that, under the influence of **Platonic conceptions**, resulted **in the famous idea of the “harmony of the spheres.”** Though number to the **early Pythagoreans** was still a kind of cosmic matter, like the water or air proposed by the Ionians, their stress upon numerical proportions, harmony, and order comprised a decisive step toward **a metaphysic** in which form is the basic reality.

The doctrine of opposites

From the Ionians, the **Pythagoreans** adopted the **idea of cosmic opposites**, which they—perhaps secondarily—applied to their number speculation. The principal pair of opposites is the limit and the unlimited; the limit (or limiting), represented by the odd (3,5,7, . . .), is an active force effecting order, harmony, “cosmos,” in the unlimited, represented by the even. All kinds of opposites somehow “fit together” within the cosmos, as they do, microcosmically, in an individual man and in the **Pythagorean** society. There was also a **Pythagorean “table of ten opposites,”** to which **Aristotle** has referred—limit–unlimited, odd–even, one–many, right–left, male–female, rest–motion, straight–curved, light–darkness, good–evil, and square–oblong. The arrangement of this table reflects a dualistic conception, which was apparently not original with the school, however, or accepted by all of its members.

The **Pythagorean** number metaphysic was also reflected in its cosmology. The unit (1), being the starting point of the number series and its principle of construction, is not itself strictly a number; for, to be a number is to be even or odd, whereas, in the **Pythagorean view**, “one” is seen as both even and odd. This ambivalence applies, similarly, to the total universe, conceived as the One. There was also a **cosmogonical theory (of cosmic origins)** that explained the generation of numbers and number-things from the limiting-odd and the unlimited-even—a theory that, by stages unknown to scholars, was ultimately incorporated into **Plato's philosophy** in his doctrine of the derivation of sensed realities from mathematical principles.

Major concerns and teachings

Mathematics and science

Pythagorean thought was scientific as well as metaphysical and included specific developments in arithmetic and geometry, in the science of musical tones and harmonies, and in astronomy.

Arithmetic

Early Pythagorean achievements in mathematics are unclear and largely disputable, and the following is, therefore, a compromise between the widely divergent views of modern scholars.

Figure 2: Gnomons of Pythagorean number theory (see text).

In the speculation on odd and even numbers, the early Pythagoreans used so-called gnomones (Greek: “carpenter's squares”). Judging from Aristotle's account, gnomon numbers, represented by dots or pebbles, were arranged in the manner shown in **Figure 2.**

If a series of odd numbers is put around the unit as gnomons, they always produce squares; thus, the members of the series 4, 9, 16, 25, . . . are “square” numbers. If even numbers are depicted in a similar way, the resulting figures (which offer infinite variations) represent “oblong” numbers, such as those of the series 2, 6, 12, 20 . . . . On the other hand, a triangle represented by three dots (as in the upper part of the tetraktys) can be extended by a series of natural numbers to form the “triangular” numbers 6, 10 (the tetraktys), 15, 21. . . . This procedure, which was, so far, **Pythagorean**, led later, perhaps in the **Platonic Academy**, to a speculation on “polygonal” numbers.

Figure 3: Gnomon for Pythagorean theorem. The marked off “carpenter's square.

Probably the square numbers of the gnomons were early associated with the **Pythagorean theorem (likely to have been used in practice in Greece, however, before Pythagoras),** which holds that for a right triangle a square drawn on the hypotenuse is equal in area to the sum of the squares drawn on its sides; in the gnomons it can easily be seen, in the case of a 3,4,5–triangle for example (see Figure 3), that the addition of a square gnomon number to a square makes a new square: 32 + 42 = 52, and this gives a method for finding two square numbers the sum of which is also a square.

Some 5th-century **Pythagoreans** seem to have been puzzled by apparent arithmetical anomalies: the mutual relationships of triangular and square numbers; the anomalous properties of the regular pentagon; the fact that the length of the diagonal of a square is incommensurable with its sides—i.e., that no fraction composed of integers can express this ratio exactly (the resulting decimal is thus defined as irrational); and the irrationality of the mathematical proportions in musical scales. The discovery of such irrationality was disquieting because it had fatal consequences for the naive view that the universe is expressible in whole numbers; the **Pythagorean Hippasus** is said to have been expelled from the brotherhood, according to some sources even drowned, because he made a point of the irrationality. In the 4th century, **Pythagorizing mathematicians** made a significant advance in the theory of irrational numbers, such as the-square-root-of-n (Ö), n being any rational number, when they developed a method for finding progressive approximations to Ö by forming sets of so-called diagonal numbers.

Major concerns and teachings

Metaphysics and number theory

The harmony of the cosmos

Mathematics and science Geometry

In **geometry**, the **Pythagoreans** cannot be credited with any proofs in the **Euclidean sense.** They were evidently concerned, however, with some speculation on geometrical figures, as in the case of the **Pythagorean theorem**, and the concept that the point, line, triangle, and tetrahedron correspond to the elements of the tetraktys, since they are determined by one, two, three, and four points, respectively. They possibly knew practical methods of constructing the five regular solids, but the theoretical basis for such constructions was given by non-**Pythagoreans** in the 4th century.

It is notable that the properties of the circle seem not to have interested the early **Pythagoreans.** But perhaps the tradition that **Pythagoras** himself discovered that the sum of the three angles of any triangle is equal to two right angles may be trusted. The idea of geometric proportions is probably **Pythagorean** in origin; but the so-called golden section—which divides a line at a point such that the smaller part is to the greater as the greater is to the

whole—is hardly an early **Pythagorean** contribution. Some advance in geometry was made at a later date, by 4th-century **Pythagoreans**; e.g., **Archytas** offered an interesting solution to the problem of the duplication of the cube—in which a cube twice the volume of a given cube is constructed—by an essentially geometrical construction in three dimensions; and the conception of geometry as a “flow” of points into lines, of lines into surfaces, and so on, may have been contributed by Archytas; but on the whole the numerous achievements of non-**Pythagorean** mathematicians were in fact more conspicuous than those of the **Pythagoreans.**

Music

The achievements of the **early Pythagoreans** in musical theory are somewhat less controversial. The scientific approach to music, in which musical intervals are expressed as numerical proportions, originated with them, as did also the more specific idea of harmonic “means.” At an early date they discovered empirically that the basic intervals of Greek music include the elements of the tetraktys, since they have the proportions 1:2 (octave), 3:2 (fifth), and 4:3 (fourth). The discovery could have been made, for instance, in pipes or flutes or stringed instruments: the tone of a plucked string held at its middle is an octave higher than that of the whole string; the tone of a string held at the 2/3 point is a fifth higher; and that of one held at the 3/4 point is a fourth higher. Moreover, they noticed that the subtraction of intervals is accomplished by dividing these ratios by one another. In the course of the 5th century they calculated the intervals for the usual diatonic scale, the tone being represented by 9:8 (fifth minus fourth); i.e., 3/2 ¸ 4/3, and the semitone by 256:243 (fourth minus two tones); i.e., 4/3 ¸ (9/8 ´ 9/8). **Archytas** made some modification to this doctrine and also worked out the relationships of the notes in the chromatic (12-tone) scale and the enharmonic scale (involving such minute differences as that between A flat and G sharp, which on a piano are played by the same key).

Major concerns and teachings

Mathematics and science Astronomy

In their cosmological views the **earliest Pythagoreans** probably differed little from their Ionian predecessors. They made a point of studying the stellar heavens; but—with the possible exception of the theory of musical intervals in the cosmos—no new contributions to astronomy can be ascribed to them with any degree of probability. Late in the 5th century, or possibly in the 4th century, a **Pythagorean** boldly abandoned the geocentric view and posited a cosmological model in which the Earth, Sun, and stars circle about an (unseen) central fire—a view traditionally attributed to the 5th-century **Pythagorean** Philolaus of Croton.

History of Pythagoreanism

The **life of Pythagoras** and the **origins of Pythagoreanism** appear only dimly through a thick veil of legend and semihistorical tradition. The literary sources for the teachings of the **Pythagoreans** present extremely complicated problems. Special difficulties arise from the oral and esoteric transmission of the early doctrines, the profuse accumulation of **tendentious legends**, and the considerable amount of confusion that was caused by the **split in the school in the 5th century BC**.

In the 4th century, **Plato's** inclination toward **Pythagoreanism** created a tendency—manifest already in the middle of the century in the works of his pupils—**to interpret Platonic concepts as originally Pythagorean**. But the radical skepticism as to the reliability of the sources shown by some modern scholars has on the whole been abandoned in recent research. It now seems possible to extract bits of reliable evidence from a wide range of ancient authors, such as **Porphyry** and **Iamblichus** (see below **Neo-Pythagoreanism**).Most of these literary sources hark back ultimately to the environment of **Plato** and **Aristotle**; and here the importance of one of Aristotle's students has become obvious, viz., the musicologist and philosopher **Aristoxenus,** who in spite of his bias possessed firsthand information independent of the point of view of **Plato's Academy.**

The role played by **Dicaearchus**, another of Aristotle's pupils, and by the Sicilian historian **Timaeus**, of the early 3rd century BC, is less clear. Recently, the reliability of **Aristotle's** account of **Pythagoreanism** has also been emphasized against the doubts that had been expressed by some modern scholars; but **Aristotle's sources**, in turn, hardly lead farther back than to the late 5th century (perhaps to Philolaus; see below Two Pythagorean sects). In addition, there are scattered hints in various early authors and in some not very substantial remains of 4th-century Pythagorean literature. **The mosaic of reconstruction thus has to be to some extent subjective.**

History of Pythagoreanism

Early Pythagoreanism

Within the **ancient Pythagorean movement four chief periods** can be distinguished: **early Pythagoreanism**, dating from the late 6th century BC and extending to about 400 BC; **4th-century Pythagoreanism**; the **Hellenistic trends**; and **Neo-Pythagoreanism**, a revival that occurred in the mid-1st century AD and lasted for two and a half centuries.

Background

The background of Pythagoreanism is complex, but two main groups of sources can be distinguished.

The **Ionian philosophers** (Thales, Anaximander, Anaximenes, and others) provided **Pythagoras** with the problem of **a single cosmic principle**, the **doctrine of opposites**, and whatever reflections of **Oriental mathematics** there are in **Pythagoreanism**; and from the **technicians of his birthplace**, the **Isle of Samos**, he learned to **understand the importance of number, measurements, and proportions.**

Popular cults and beliefs current in the 6th century and reflected in the **tenets of Orphism** introduced him to the **notions of occultism and ritualism** and to the **doctrine of individual immortality.** In view of the **shamanistic traits of Pythagoreanism**, reminiscent of **Thracian cults, it is** interesting to note that **Pythagoras seems to have had a Thracian slave**.

NOTE: NO mention of his training in the Ancient Egyptian Mystery School of On (Annu).

History of Pythagoreanism

Early Pythagoreanism

Pythagorean communities

The school apparently founded by **Pythagoras at Croton** in southern Italy seems to have been primarily **a religious brotherhood** centred around **Pythagoras** and the **cults of Apollo and of the Muses**, **ancient patron goddesses of poetry and culture.** It became perhaps successively institutionalized and received different classes of **esoteric members** and **exoteric sympathizers. The rigorism of the ritual and ethical observances demanded of the members is unparalleled** in early Greece; in addition to the rules of life mentioned above, **it is fairly well attested that secrecy and a long silence during the novitiate were required.** The exoteric associates, however, were politically active and established a Crotonian hegemony in southern Italy. About 500 BC a coup by a rival party caused **Pythagoras** to take refuge in Metapontum, where he died.

During the early 5th century, **Pythagorean communities**, **inspired by the original school at Croton,** existed in many southern Italian cities, a fact that led to some doctrinal differentiation and diffusion. In the course of time the politics of the **Pythagorean** parties became decidedly **antidemocratic.** About the middle of the century a **violent democratic revolution** swept over southern Italy; in its wake, many **Pythagoreans** were killed, and only a few escaped, among them **Lysis of Tarentum** and **Philolaus of Croton**, who went to Greece and formed small **Pythagorean** circles in Thebes and Phlious.

Two Pythagorean sects

Little is known about **Pythagorean** activity during the latter part of the 5th century. The differentiation of the school into **two main sects**, later called **akousmatikoi (Greek: akousma, "something heard," viz., the esoteric teachings)** and **mathematikoi (Greek: mathematikos, "scientific"),** may have occurred at that time.

The **acousmatics** devoted themselves to the observance of rituals and rules and to the interpretation of the **sayings of the master**; the "**mathematics"** were concerned with the scientific aspects of **Pythagoreanism.**

Philolaus, who was rather a mathematic, probably published a summary of Pythagorean philosophy and science in the late 5th century.

History of Pythagoreanism

4th-century Pythagoreanism

In the first half of the 4th century, **Tarentum**, in southern Italy, rose into considerable significance. Under the political and spiritual leadership of the **mathematic** Archytas, a friend of Plato, **Tarentum** became a new centre of **Pythagoreanism**, from which **acousmatics**—so-called **Pythagorists** who did not sympathize with **Archytas**—went out travelling as **mendicant ascetics** all around the Greek-speaking world.

The **acousmatics** seem to have preserved some early **Pythagorean Hieroi Logoi** and ritual practices. **Archytas** himself, on the other hand, concentrated on scientific problems, and the organization of his **Pythagorean brotherhood** was evidently less rigorous than that of the early school. After the 380's there was a give-and-take between the **school of Archytas** and the **Academy of Plato**, a relationship that makes it almost impossible to disentangle the original achievements of Archytas from joint involvements (but see above, Geometry and Music).

The Hellenistic Age

Whereas the **school of Archytas** apparently sank into inactivity after the death of its founder (probably after 350 BC), the **Academics** of the next generation continued "**Pythagorizing" Platonic doctrines,** such as that of the supreme One, the indefinite dyad (a metaphysical principle), and the tripartite soul.

At the same time, various **Peripatetics** of the **school of Aristotle**, including Aristoxenus, **collected Pythagorean legends** and applied contemporary ethical notions to them.

In the **Hellenistic Age**, **the Academic** and **Peripatetic views** gave rise to a rather fanciful antiquarian literature on **Pythagoreanism.** There also appeared a large and yet more heterogeneous mass of **apocryphal writings falsely attributed** to different **Pythagoreans**, as if attempts were being made to revive the school.

The texts fathered on Archytas display Academic and Peripatetic philosophies mixed with some notions that were originally Pythagorean. Other texts were fathered on **Pythagoras** himself or on his immediate pupils, imagined or real. Some show, for instance, that **Pythagoreanism** had become confused with **Orphism**; others suggest that **Pythagoras** was considered a magician and an astrologist; there are also indications of **Pythagoras** "the athlete" and "the Dorian nationalist."

But the anonymous authors of this **pseudo-Pythagorean literature** did not succeed in reestablishing the school, and the "**Pythagorean" congregations** formed in **early imperial Rome** seem to have had little in common with the **original school of Pythagoreanism** established in the late 6th century BC; **they were ritualistic sects that adopted, eclectically, various occult practices.**

History of Pythagoreanism

Neo-Pythagoreanism

With the ascetic sage **Apollonius of Tyana**, about the middle of the 1st century AD, a distinct **Neo-Pythagorean** trend appeared**. Apollonius** studied the **Pythagorean legends** of the previous centuries, **created and propagated the ideal of a Pythagorean life—of occult wisdom, purity, universal tolerance, and approximation to the divine—and felt himself to be a reincarnation of Pythagoras.**

Through the activities of **Neo-Pythagorean Platonists,** such as **Moderatus of Gades**, a pagan trinitarian, and the arithmetician **Nicomachus of Gerasa**, both of the 1st century AD, and, in the 2nd or 3rd century, **Numenius of Apamea,** forerunner of **Plotinus (an epoch-making elaborator of Platonism**), **Neo-Pythagoreanism gradually became a part of the expression of Platonism known as Neoplatonism**; and it did so without having achieved a scholastic system of its own.

The founder of a **Syrian school of Neoplatonism**, **Iamblichus**, a pupil of **Porphyry** (who in turn had been a **pupil of Plotinus**), thought of himself as a **Pythagorean sage** and about AD 300 wrote the **last great synthesis of Pythagoreanism**, in which most of the disparate post-classical traditions are reflected.

It is characteristic of the **Neo-Pythagoreans** that they were chiefly interested in the **Pythagorean way of life** and in the **pseudoscience of number mysticism.** On a more popular level, **Pythagoras and Archytas were remembered as magicians.**

Moreover, it has been suggested that **Pythagorean legends** were also influential in guiding the **Christian monastic tradition.**Medieval and modern trends In the Middle Ages the popular conception of **Pythagoras the magician** was combined with that of **Pythagoras "the father of the quadrivium";** i.e., of the more specialized liberal arts of the curriculum. From the Italian Renaissance onward, some "Pythagorean" ideas, such as the tetrad, the golden section, and harmonic proportions, became applied to aesthetics.

To many Humanists, moreover**, Pythagoras** was the father of the exact sciences. In the early 16th century, **Nicolaus Copernicus**, who developed the view that the Earth revolves around the Sun, considered his system to be essentially **Pythagorean or "Philolaic,"** and **Galileo** was called a **Pythagorean.**

The 17th-century Rationalist **G.W. Leibniz** appears to have been the last great philosopher and scientist who felt himself to be in the Pythagorean tradition.

It is doubtful whether **advanced modern philosophy** has ever drawn from sources thought to be distinctly **Pythagorean**. Yet **Platonic–Neoplatonic notions**, such as the **mathematical conception of reality** or the **philosopher's union with the universe** and various mystical beliefs are still likely to be stamped as Pythagorean in origin. **Even today a relatively uncritical admiration of Pythagoreanism is common.**

Evaluation

The history of the projection of **Pythagoreanism** into subsequent thought indicates how fertile some of its core concepts were. **Plato** is here the great catalyst; but it is possible to perceive behind him, however dimly, a series of **Pythagorean ideas** of paramount potential significance: the combination of religious esoterism (or exclusivism) with the germs of a new philosophy of mind, **present in the belief in the progress of the soul toward the actualization of its divine nature and toward knowledge**; **stress upon harmony and order**, and **upon limit as the good**; **the primacy of form, proportion, and numerical expression**; and in ethics, and emphasis upon such virtues as **friendship and modesty**.

The fact that Pythagoras, to later ages, also became alternatively conceived of as a Dorian nationalist, a sportsman, an educator of the people, or a great magician is a more curious consequence of the productivity of his teaching.

Holger Thesleff

Additional reading

The **collection of the fragments** in Hermann Diels and Walther Kranz, *Die Fragmente der Vorsokratiker,* 6th ed., vol. 1 (1951), is insufficient; additions are given in Maria Timpanaro Cardini (ed.), *Pitagorici: Testimonianze e frammenti*, 3 vol. (1958–64); and in Cornelia J. de Vogel, *Pythagoras and Early Pythagoreanism* (1966).

For the **pseudo-Pythagoreans,** see Holger Thesleff (ed.), *The Pythagorean Texts of the Hellenistic Period* (1965).The best comprehensive introduction to Pythagoreanism is the long chapter "*Pythagoras and the Pythagoreans*," in W.K.C. Guthrie, *A History of Greek Philosophy*, vol. 1, pp. 146–340 (1962).

Somewhat different approaches have been taken by de Vogel (op. cit.); and James A. Philip, *Pythagoras and Early Pythagoreanism* (1966), works that demand more active criticism by the reader.

Fairly full references to the discussion of Pythagoreanism up to 1960 are in Walter Burkert, *Weisheit und Wissenschaft: Studien zu Pythagoras, Philolaos, und Platon* (1962; Eng. trans., Lore and Science in Ancient Pythagoreanism, 1972), a highly technical and at times rather overcritical work.

Among later technical discussions are the articles *"Pythagoras" and "Pythagoreer"* in Pauly-Wissowa Realencyclopädie, vol. 47, (1963), and suppl. vol. 10 (1965)—of the contributors, Kurt von Fritz and H. Dorrie arrive at less controversial conclusions than B.L. van der Waerden.

Hellenistic Pythagoreanism is treated in Holger Thesleff, *An Introduction to the Pythagorean Writings of the Hellenistic Period* (1961); additions and corrections in *Entretiens Fondation Hardt,* vol. 18 (1972).

Neo-Pythagoreanism is treated in Philip Merlan, *From Platonism to Neoplatonism* (1953).

For up-to-date bibliographical accession, see *L'Année philologique (annual),* under the subject heading "Pythagorica" and the various Pythagoreans.