

Biographical Encyclopedia of Astronomers

© 2007 Springer

Plato

Born Athens, (Greece), circa 428 BCE

Died Athens, (Greece), 348/347 BCE

Plato's astronomy, though never systematized like that of Eudoxus or Aristotle, continued to influence readers for millennia, through the beauty and coherence of his images and myths

Plato was born Aristocles to Ariston and Perictionê, into one of the wealthiest Athenian families, descended from Solon's brother through his mother. He had two older brothers, Glaucon and Adeimantus, a sister Potone, and a younger half-brother Antiphon. Well-educated, Plato in his early twenties came under the influence of Socrates, upon whose execution he left Athens, traveling especially to southern Italy and Syracuse. He returned to Athens around 390 or 385 BCE and founded his school in the grove sacred to the hero Akademos. In the 360s BCE, Plato again visited Syracuse twice, vainly attempting to teach philosophy to its tyrant Dionysius II. He was unmarried but well loved by his students

The pervasive dramatic irony of his dialogues, his own express preference for probable accounts, plus millennia-deep scholarship continue to challenge Plato's readers. Certain ideas recur and may rather confidently be attributed to Plato (not just to characters in the dialogues), but many details may simply be decorative.

Plato discusses astronomy in six dialogues: *Phaedo*, *Republic* (books 7 and 10), *Politicus*, *Timaeus*, *Laws* (books 7 and 12), and *Epinomis*, composed in about that order over a generation. The first three weave astronomy into myth, and all six show a steadily growing appreciation of astronomy. Plato always sought to reveal cosmic design, penetrate phenomena to hidden mathematical reality, and inspire students to contemplate higher truths. Thus, and also because contemporary celestial observations eluded any coherent account, Plato preferred theory over observation

The 6th-century commentator Simplicius reported that Sosigenes in the 2nd century quoted Eudemos (in the generation after Plato) as saying that Plato's astronomical program was to find regular circular motions of the planets to explain their apparent irregular motions. Geminus attributed that program to the Pythagoreans, who said that even in human affairs, noble men do not alter speed or course, so one must hypothesize celestial uniformity, while Plutarch claimed that Plato saved astronomy from reproach by subordinating natural laws to divine principles.

In the *Phaedo*, equilibrium holds the spherical Earth centered in the spherical heaven. Earth is very large, with dimples filled by water, mist, and air, in which people gather like ants around frog ponds; atop the highest peaks lies Earth's true surface exposed to the surrounding bright, clear aether, through which the stars move.

In the *Republic*, Plato first insists on the utility of astronomy, then its importance in education: The proper goal of astronomical study is to direct the mind via theoretical exercise away from the mutable world to the eternal world of truth, just as number and geometry do, and music should. A mythic celestial mechanism completes the *Republic*, in which the entire cosmos is a spindle (hung from a rainbow-hued pillar of light), its whorl formed of eight nested whorls, representing the fixed stars and the seven "wanderers" (*planetai*). The outermost whorl, broad and "spangled" with stars, rotates the same way as the spindle itself; the seven inner whorls revolve gently in the opposite direction. The eighth (innermost) lunar whorl moves the fastest, illuminated by the next (seventh) and brightest solar whorl. That and the next two (the sixth Venus and fifth Mercury) all move together, with the next greatest swiftness, and so on in descending order out to the second (Saturn). The third (Jupiter) is the whitest; Venus is almost as white; and the fourth (Mars) is ruddy and "recycling" (probably because, although Jupiter and Saturn retrograde about once per year, and Venus and Mercury follow the Sun, Mars traverses more than a full circuit of the zodiac between retrogrades). This planetary order—Moon, Sun, Venus, Mercury, Mars, Jupiter, and Saturn outermost—persists in later works. Each whorl has upon it a Seirên singing a single tone, all eight in harmony. The spindle lies in the lap of the goddess Necessity, around whom sit the three Fates: Clotho turning the outer whorl, Atropos turning the seven inner whorls, and Lachesis playing with both. (Plato omits planetary names and the well-known zodiacal inclination; no one has convincingly explained the whorl widths: outermost widest, then Venus, Mars, Moon, Sun, Mercury, Jupiter, and Saturn narrowest.)

The myth in the *Politicus* tells that the revolution of the whole Universe affects the course of earthly events and alters its direction at great intervals. Plato proposed that time is created by the rotation of the cosmos, and that when the cosmos reverses, so too does time reverse its course.

The *Timaeus* gives a different model, not physical but fundamentally mathematical and deeply religious. The whole divinely ordered cosmos is a living, spinning spherical creature pervaded by a soul. The world-soul contributes to a band, half the length of which, called the "Same," forms the celestial equator moving all the fixed stars with the same motion, while the other half, called the "Other," being divided lengthwise into seven parts, corresponds in a way never completely described to a pair of interleaved geometric series 1, 2, 3, 4, 8, 9, 27, and to the seven planets. Venus and Mercury remain close to the Sun, due to an otherwise unspecified "contrary power." Each planet has its own soul, the cause of its unique motion, and is thereby an "instrument of time." Mere mortals do not understand their motions and periods, but all planets together completing their cycles marks a "perfect" year of the *kosmos*, whose value scholars have spilled much ink vainly computing. Each fixed star is spherical, with a soul whose motion is axial rotation. The Earth itself is wound around the cosmic pole, and by resisting the rotation of the whole (unlike the planets) remains the unmoved "guardian of day and night." The *Timaeus*, with its theory of matter founded on the Platonic solids, provided a geometric cosmological model that carried an enormous influence through the time of the Renaissance.

In the *Laws*, astronomy is considered useful (for better regulation of the civic calendar), just as arithmetic and surveying are otherwise useful, as well as for mental exercise and training. But

the members of the all-powerful Nocturnal Council must study astronomy to learn the primacy in time of the soul and the order and divinity of the stars, for only such men are fit for such high rank. True astronomical education will inculcate deep faith, rather than the disbelief caused by the soulless astronomy of mere bodies of stone. (Plato here alluded to Anaxagoras and Democritus.) Indeed, it is only by asserting that the planets do not truly wander that the wise and devout man may validly study astronomy without committing blasphemy, because the Sun and all stars are ensouled and self-moved

All ancient philosophers accepted the deeply Platonic *Epinomis*, but some modern scholars have denied his authorship. It argues that astronomy provides the best education for statesmen, and that the celestial bodies are worship-worthy beings through whom we learned number. The stars are fiery-bodied living beings, proven to be very large, and the Sun "leads" Mercury and Venus.

Plato's world-soul in harmony with all parts of the Universe offered a benign and humanocentric *kosmos*, whose appeal only Epicureans sought to resist before the modern period. Plato's approval of the musical harmony of the stars (which he may have intended as decoration, not definition), and his belief that the planets were divinities worthy of worship, ensured that astrology would be hard to resist, but his insistence that astronomy, with mathematics and music, were the highest studies of which the human mind is capable ensured their survival across centuries when little else did.

Paul Keyser

Selected References

Gregory, Andrew (2000). *Plato's Philosophy of Science*. London: Duckworth.

Kalfas, Vasilis (1996). "Plato's 'Real Astronomy' and the Myth of Er." *Elenchos* 17:5-20.