Biographical Encyclopedia of Astronomers

Magini, Giovanni Antonio

Born Padua, (Italy), 13 June 1555

Died Bologna, (Italy), 11 February 1617

Working at the cusp of Ptolemaic and Copernican astronomy, Giovanni Antonio Magini attempted to combine the best elements of both. Although Magini's theories have traditionally been identified as opposing Galileo Galilei's, there is recent evidence that Magini supported certain aspects of Galileo's work. Magini's contributions to mathematics and geography were also noteworthy.

Magini completed his early studies in Padua and then attended the University of Bologna, graduating in June 1579 with a degree in philosophy, although he had shown great interest in mathematics since childhood. After Egnatio Danti was transferred to Rome in 1587, the Bologna Senate called a competition for the chair of mathematics, which was assigned to Magini in August 1588. The Paduan scientist was chosen over the young Galileo, who had also applied for the chair, not only because of Magini's greater experience and notoriety at the time, but also because he had already published volumes of ephemerides and astronomical tables

In addition to teaching Euclid, Magini also focused in particular on astrological and astronomical subjects, such as the theory of the planets, and on commentaries to John of Holywood's *Sphaera Mundi* and Ptolemy's astronomy. In 1597 he was given a lifetime teaching position and also received permission to go to Mantua. At the Gonzaga court, in 1599, Magini tutored the children of Duke Vincenzo, for whom he also wrote several astrological opinions. The sterling reputation he had earned among his peers was also due in part to his extensive correspondence with all the illustrious scholars of his time, including Galileo, Tycho Brahe, and Johannes Kepler. Magini established an excellent rapport with Kepler, who in 1610 asked him to come to Prague to work with him on the new astronomical ephemerides Magini did not accept Kepler's invitation, not only because he and the German astronomer had different viewpoints, but also because he did not want to leave the prestigious chair at Bologna.

According to 19th-century historian Antonio Favaro (editor of the complete edition of Galileo's works), Magini was one of Galileo's most dogged opponents. However, based on recent studies by G. Betti, this view of Magini as Galileo's "enemy" seems exaggerated, particularly since Magini was probably the true author—or at least the direct inspiration—of the 1611 *Epistola Apologetica* against Martin Horky, written in Galileo's defense. Moreover, Magini's two best disciples, Cesare Marsili and Giovanni Antonio Roffeni, were Galileo's most ardent supporters in 17th-century Bologna.

Magini's attitude toward the Copernican system is intriguing. Although convinced that the Earth did not move, in some of his works he accepted Nicolaus Copernicus' theory as a working hypothesis. He justified this because it simplified calculations and yielded results that better matched observations, even though, in Magini's opinion, the theories were improbable.

Nonetheless, he never agreed with the concept of the Copernican system from a philosophical standpoint, replacing it with his own planetary model that combined the ideas of Copernicus and Ptolemy and even added several new hypotheses. Magini claimed there was a need for a theory of planets that abandoned the model of the Alphonsine Tables in order to comply with recent observations, but rejected Copernicus's absurd hypotheses. Magini completely changed the Ptolemaic theories of the Sun and the Moon but adhered to the Ptolemaic system for the other five planets, albeit eliminating the equants. Furthermore, he accepted the idea that the stars and planets were pulled by their orbits or spheres and that they could not move independently. He also asserted that there had to be a ninth and tenth sphere between those of the fixed stars and the prime mover. Regarding his theory of the Moon, Magini agreed with Copernicus in affirming that Ptolemaic theory did not comply with observation and experience. He later adopted the cosmological system of Brahe, with whom he established a relationship of both friendship and scientific collaboration. However, he modified the Tychonic system with elements from Kepler's astronomy. Magini elaborated on his new theory in the *Tabulae novae iuxta Tychonis rationes*, but the work was unfinished when he died and was published posthumously in 1619. However, in 1623, six years after Magini's death, the Tribunal of the Holy Office ordered his entire astrological library confiscated.

Magini was far more skilled at calculation than at theory, and the ephemerides he calculated for the years 1581 to 1630 are proof of this. He was a very talented instrument maker. He also wrote *Breve istruzione sopra le apparenze et mirabili effetti dello specchio concavo sferico* on concave mirrors. In 1592, Magini published *Tabula tetragonica sui quadrati dei numeri naturali*, which made it possible to determine the product of two factors, such as the difference between two squares. In 1609, he drew up accurate trigonometric tables in which he introduced new terms for the functions now known as cosine, cotangent, and cosecant. The nomenclature used by Magini attracted several followers and was adopted by Bonaventura Cavalieri. Magini also contributed to practical geometry with treatises on the sphere and on the application of trigonometry He described the use of the quadrant and the astronomical square. Magini was the first person to suggest the use of the decimal point to separate the whole number from the decimals.

Magini was also active in medical astrology. He wrote a commentary on Galen's treatise, confirming that the stars govern the world of nature, and he recommended studying the annual recurrences of nativities and elections, essential for observing when the patient became ill, the critical days in the course of the illness, and the best times to administer medicine.

Magini's importance as a geographer and cartographer is undisputed. His edition of Ptolemy's *Guide to Geography*, which first appeared in Venice in 1596, is extremely important, not so much for Magini's careful descriptive comments but because he added 37 new maps to the 27 Ptolemaic maps, forming a true modern atlas. However, the work to which Magini devoted most of the latter part of his life was an atlas of Italy, for which he prepared his own maps. Most of them were original and based on official surveys conducted by various Italian governments. Because of this work, which Magini funded out of his own pocket, he was perennially in financial difficulty. The definitive compilation of the entire atlas, dedicated to Ferdinando Gonzaga, was published posthumously by Magini's son Fabio in 1620 under the

title *Italia di Gio. Ant. Magini data in luce da Fabio suo figliolo*. The work, which contained 61 tables and a brief commentary, enjoyed widespread and lasting fame.

Magini was buried in the Church of the Dominicans, with an epitaph dictated by his disciple Roffeni. His chair was offered to Kepler who, in a letter dated 15 May 1617 addressed to the rector of the University of Bologna, regretfully turned down the offer, fearful that as a Protestant he would feel ill at ease in a Catholic environment.

Fabrizio Bonoli

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