

Biographical Encyclopedia of Astronomers

© 2007 Springer

Cassini, Giovanni Domenico [Jean-Dominique]

Born Perinaldo near Imperia, (Liguria, Italy), 8 June 1625

Died Paris, France, 14 September 1712

Giovanni (or Gian) Cassini was the first in a dynasty of astronomers prominent in pre-revolutionary France. A skillful observer, but very conservative in theoretical matters, he did not totally accept the Copernican doctrine and vigorously opposed Newtonian gravitational theory. His best work was observational, not theoretical.

Cassini was the son of Jacopo Cassini, of Tuscany, and Julia Crovesi, but was raised by a maternal uncle. He was educated at Vallebene, the Jesuit College at Genoa, and the abbey of San Frauctuoso. As a boy, Gian showed great intellectual curiosity and expressed interest in poetry, mathematics, and astronomy

Paradoxically, Cassini's career began as the result of a brief flirtation with astrology that brought him to the attention of the Marquis Cornelio Malvasia, a wealthy astronomer and senator of Bologna who produced ephemerides for astrological purposes. Cassini accepted his invitation to work in Malvasia's observatory at Panzano, near Bologna. Here Cassini studied under the astronomer Giovanni Riccioli, then completing his great treatise, the *Almagestum novum* (1651), and the physicist Francesco Grimaldi, later distinguished for his discovery of diffraction

In 1650, the senate of Bologna appointed Cassini professor of astronomy at the university, where he wrote a treatise on comet C/1652 Y1 in which he expressed his anti-Copernican views. He also believed that the Moon has an atmosphere and that comets are located beyond Saturn, arising as the result of emanations from the Earth and planets. Later comparison with other observations obliged him to reject the latter hypothesis, and thereafter he considered comets analogous to planets but traveling in paths of greater eccentricity.

One of Cassini's first instruments at Bologna was a large sundial of his own design, mounted on top of the Church of San Petronio and substituted for one made unusable by modifications to the building (1653). With it he made observations of the apparent motion of the Sun, the obliquity of the ecliptic, and the exact positions of the solstices and equinoxes, data that formed the basis of new tables of the Sun he published in 1662. From other observations he also formulated the first major theory of atmospheric refraction

Using long-focal-length telescopes of excellent definition constructed by the Roman lens makers Giuseppe Campani and Eustachio Divini, Cassini, starting in 1664, made a series of observations of the planetary surfaces that led to important discoveries. He determined the rotation periods of Mars and Jupiter and obtained values very close to the presently accepted values. His Venus results were very ambiguous. He also reported on the polar flattening of Jupiter and accurately described its bands and spots.

Cassini successfully developed tables of the movements of Jupiter's satellites and in 1668 published *Ephemerides merides Bononienses mediceorem siderum*. These were used for decades by navigators and astronomers until Cassini published more precise tables in 1693. Ole Römer employed them in 1675 to demonstrate the finite nature of the speed of light.

Cassini was by now preoccupied with technical matters on behalf of the Bolognese authorities; In 1663 he became superintendent of fortifications and in 1665 inspector of Perugia. However, his tables of Jupiter's satellites and his growing number of planetary discoveries attracted the interest of the French, who, having recently founded the Académie royale des sciences, were enhancing its prestige by recruiting foreign scholars and scientists of distinction. Christiaan Huygens had been elected in 1667, and membership was now offered to Cassini. He accepted, and it was then suggested that he come to Paris for a limited period. The terms offered were highly attractive. After diplomatic discussions, the Bologna Senate and Pope Clement IX authorized his acceptance but insisted that the appointment be temporary. On February 25, 1669, Cassini set out for Paris. This was essentially the end of his Italian career; he never returned permanently to Italy and in 1673 became a naturalized Frenchman.

The following year, Cassini married Geneviève de Laistre, daughter of the lieutenant general of the Comté of Clermont, whose dowry included the Château of Thury in the Oise. They had two sons. The younger, Jacques Cassini, became an astronomer and geodesist and succeeded his father (who became blind in 1710) in the supervision and direction of the Paris Observatory.

Gian Cassini failed in his attempt to persuade Louis XIV and his architect Claude Perrault to modify the structure of the Paris Observatory to make it a practical observing site. Yet, soon after he arrived in Paris in 1669, Cassini continued the observational series begun in Italy, using lenses by Campani and Divini, and some lenses of French manufacture

Cassini found the Saturnian moons, Iapetus (1671), Rhea (1672), and Tethys and Dione (both on the same night, 21 March 1684). Variations in the brightness of Iapetus suggested to him that

the satellite always turned the same face toward Saturn. Although he abandoned this hypothesis in 1705, a century later William Herschel considered it entirely valid.

Cassini observed a band on the globe of the planet and in 1675 observed the division in Saturn's ring system that now bears his name. He described the system as being composed of swarms of tiny particles moving in two concentric rings of different densities.

Between 1671 and 1679, Cassini observed the Moon and drew up an atlas of sketches from which he formed a large map of its surface features. This he presented to the Académie des sciences (1679).

With Niccolò Fatio, he made the earliest continuous observations of the zodiacal light, a phenomenon Cassini considered to be of cosmic origin (1683). During the Mars opposition of 1672, Cassini planned simultaneous observations of the planet from Paris (by Jean Picard and himself) and Cayenne (by Jean Richer) to determine that planet's parallax. The result, which Cassini assumed to be 9.5 inches for the Sun, was sufficiently in error that a reasonably accurate estimation of the mean Earth-Sun distance was impossible. However, it was an improvement over earlier estimates.

In 1685, Cassini tried out a "parallactic machine," in effect an equatorial clockwork drive whereby the telescopic object was tracked by gradually shifting the ocular support. He claimed this greatly aided his observations.

In the late 17th century, a controversy arose over the shape and dimensions of the Earth. In 1669, Picard had measured an arc of the meridian with some accuracy, based on the widely held assumption that the Earth is a sphere. But all was thrown into doubt when Richer reported that the length of a pendulum with a frequency of once a second was shorter at Cayenne (near the Earth's equator) than at Paris. Richer attributed this to a flattening of the Earth. Huygens and

Isaac Newton had arrived at the same conclusion, but using different methods. Cassini disagreed. He believed in the sphericity of the globe and suggested temperature differences as the cause of Richer's observation. To resolve the issue, Cassini proposed a triangulation of the meridian between the northern and southern frontiers of France. The result led him to propose that the Earth was a prolate spheroid, a view favored by the Cartesians. This theory was defended first by Cassini's son, and then his grandson, but finally rejected by his great-grandson.

Judgments on Cassini's contributions are various. Jean Delambre charged him with having derived his best ideas from his predecessors and predisposing French astronomy in an authoritarian and retrograde manner. Whatever the truth, he was a gifted observer and indisputably his many discoveries outweigh his failings in theory.

Richard Baum

Alternate name

Cassini I

Selected Reference

Taton, René (1971). "Cassini, Gian Domenico (Jean-Dominique) (Cassini I)." In *Dictionary of Scientific Biography*, edited by Charles Coulston Gillispie, Vol. 3, pp. 100-104. New York: Charles Scribner's Sons