Biographical Encyclopedia of Astronomers

Sitter, Willem de

Born Sneek, the Netherlands, 6 May 1872

Died Leiden, the Netherlands, 20 November 1934

Dutch mathematical astronomer Willem de Sitter gave his name to one of the first solutions to Albert Einstein's equations of general relativity, which showed that a universe containing very little matter would, in some sense, expand, and so prepared the way for Edwin Hubble's discovery of that expansion (though a different solution in fact applies). De Sitter was the son of a judge, Lamoraal U. de Sitter, and Catharine Th. W. Bertling. He received his early education at Arnhem, the Netherlands, where his father was President of the Court. De Sitter studied at the University of Groningen, primarily in mathematics, under Jacobus Kapteyn, with whom he maintained a lifelong friendship and scientific collaboration, receiving a Ph.D. in 1901 for work involving observations of the satellites of Jupiter, made in Cape Town, South Africa (1897–1899). In Cape Town, de Sitter also met and married Eleonore Suermondt. They had three sons and two daughters

From his position as a staff member at Groningen, de Sitter was appointed to a professorship of astronomy at Leiden University in 1908, where he became director of the observatory in 1919, holding both positions until his death. He reorganized the Department of Astronomy at Leiden, adding a department for astrophysics, and observational facilities at the Union Observatory in Johannesburg, South Africa.

De Sitter has become best known for his work on cosmology, but the earliest part of his career and much of his later life were devoted to celestial mechanics and astrometry. In his 1901 thesis, he discussed heliometer observations of Jupiter's inner moons made at the Cape Observatory, leading to an improved determination of the masses of these satellites In a subsequent work (*New Mathematical Theory of Jupiter's Satellites*), de Sitter presented a comprehensive analysis of observations of the satellites made since 1668. His extensive knowledge of celestial mechanics also allowed him to present comprehensive discussions of the complex interrelations among the phenomena from which the major astronomical constants are derived, in particular the combination of results from geodetic and gravity measurements with those from astronomical observations. In 1927, he published *The Most Probable Values of Some Astronomical Constants*. A second paper, *On the System of Astronomical Constants*, edited by de Sitter's pupil Dirk Brouwer, was published posthumously in 1938. These constants include the shape of the Earth, the length of the astronomical unit, and the masses of the planets.

In order to arrive at a system of fundamental declinations, free from the systematic errors due to atmospheric refraction and telescope flexure that have always plagued meridian observations, de Sitter initiated a pilot expedition to Kenya in 1930. There, right on the equator, declinations were made by measuring the distance along the horizon between the rising and setting points of a star, which gives an angle that is twice the complement of the declination.

De Sitter was among the very first to realize the importance of Einstein's work on relativity for astronomy, and he contributed much to the introduction of Einstein's work into English-speaking countries during World War I. He first discussed, in 1911, the small deviations in the motions of the Moon and the planets still left in the context of classical dynamics. In 1916 and 1917, de Sitter presented to the Royal Astronomical Society a series of three papers on "Einstein's Theory of Gravitation and its Astronomical Consequences." Because there was almost no communication between Germany and England during World War I, these papers were instrumental in introducing general relativity to the English scientific community, and they played an important part in the decision made by Arthur Eddington and others to send expeditions to observe the solar eclipse of 1919 in order to look for the small shifts in the positions of stars predicted by Einstein's theory. In the context of his cosmological work, de Sitter introduced a solution to the fundamental equations that define the properties of the Universe.

It soon became known as the de Sitter universe (or de Sitter space), an alternative to Einstein's solution, provided the density of matter in the Universe could be considered negligible and the Universe allowed to expand. De Sitter's solution predicted systematic redshifts in the spectra of distant objects (though a quadratic relationship rather than a linear one, which was sought by several colleagues).

De Sitter was elected president of the International Astronomical Union for 1925–1928. One of his major concerns (shared by Eddington and others) was to reintegrate the international community, and he succeeded in extending invitations to the 1928 General Assembly in Leiden to astronomers from Germany and other Central Powers, though some of these nations were not admitted to the union until after World War II. De Sitter was the author of a booklet on the history of the Leiden Observatory (1633–1933) and a founder (in 1921) of the journal *Bulletin of the Astronomical Institutes of the Netherlands*. It, in turn, was merged in 1969 with journals from France and Germany to form a single European journal, *Astronomy and Astrophysics.*

De Sitter received medals from the Royal Astronomical Society (London) and the Astronomical Society of the Pacific, as well as a number of honorary degrees

The archives of Leiden Observatory have a collection of de Sitter's notes and letters.

Adriaan Blaauw

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