

Dyson, Frank Watson

Born Measham, near Ashby-de-la Zouch, Leicestershire, England, 8 January 1868

Died at sea near Cape Town, South Africa, 25 May 1939

Frank Dyson, a highly successful director of the Royal Observatory at Greenwich, contributed significantly to the study of proper motions of stars, and inaugurated the transmission of time via radio, but he is best known for helping to organize the 1919 solar eclipse expedition which provided the first detection of gravitational deflection of starlight.

The oldest of seven children of a Baptist minister, Dyson won a national mathematics contest at 13. This led eventually to scholarships to the University of Cambridge, where he was an honors student in mathematics and astronomy. He continued at Cambridge University as a fellow, achieving some renown for calculating the gravitational potential of an anchor ring. Dyson was appointed Chief Assistant to Astronomer Royal **William Christie** at the Royal Observatory, Greenwich, in 1894.

Although he knew nothing of instruments or observation when appointed, Dyson successfully supervised the compilation of the Greenwich portion of the *Carte du Ciel* and Astrographic Catalogue. Many *Carte du Ciel* plates had already been made by his predecessor, **Herbert Turner**. Dyson improved the reduction of the measurements, instituting new determinations of the locations of the reference stars on the plates.

Dyson rereduced visual measurements of circumpolar stars made by English amateur **Stephen Groombridge** some 80 years earlier, greatly increasing the precision of the stars' positions. Then, with **William Thackeray**, Dyson determined the proper motions of 4,239 stars near the North Celestial Pole. Analysis of these motions led to improved values for the rate of the Earth's precession and for the solar motion. Dyson and Thackeray found that the motions of the stars were related to their magnitudes and galactic latitudes. They found that the fastest-moving stars moved in two streams, confirming a discovery of **Jacobus Kapteyn**, but their measurements lent more support to **Karl Schwarzschild's** ellipsoidal model for stellar motions.

After viewing six eclipses, with good weather every time, Dyson called himself "a hundred percent eclipse observer." In Sumatra in 1901 he obtained spectra of the solar chromosphere and corona, including the first detection of the element europium in the Sun. In 1905, Dyson published wavelengths and intensities of 1,200 emission lines he had photographed in the spectrum of the chromosphere on three expeditions.

Dyson served as Astronomer Royal for Scotland from 1905 to 1910. Having been the first to complete his observatory's portion of the *Carte du Ciel* at Greenwich, he now agreed to measure and reduce plates made at Perth, Australia. Dyson also began a study of double stars too close to the North Celestial Pole to be reached by the Greenwich refractor, a project that continued long after he left Edinburgh. Dyson became a popular professor at the University of Edinburgh; his lectures on introductory astronomy became his first book.

In 1910, on returning from the meeting of the International Solar Union in Pasadena, Dyson was appointed the ninth Astronomer Royal, a position that then included the directorship of the Royal Observatory at Greenwich.

The Royal Observatory had been providing time service by telegraph since the 19th century. In 1924, Dyson began sending time signals directly to the British Broadcasting Company for broadcast throughout the country. The famous "six pips" were broadcast at 1 s intervals, with the last one on the hour. Dyson adopted the new, precise "master-slave" clock invented by William Hamilton Shortt and first demonstrated at the observatory in Edinburgh in 1921.

During World War I, Dyson lost 36 members of his staff to the armed forces, and data reduction fell behind, even though he hired retirees, conscientious objectors, Belgian refugees, and women in their place.

In the middle of the war, in the capital of Britain's enemy, **Albert Einstein** published the general theory of relativity. Einstein predicted, among other things, that starlight passing the limb of the Sun would be deflected by about 1.75", an effect that might be measurable on photographs of star fields surrounding the Sun during a total eclipse. **Arthur Eddington**, Dyson's former chief assistant at Greenwich and now a Cambridge professor, received the journals via neutral Holland and publicized the new theory in England. Meanwhile, Eddington's colleagues were anxious to get him a deferment from the military draft, as the Quaker professor wanted to declare himself a conscientious objector, and they believed such a declaration would embarrass the university. Dyson pointed out that the solar eclipse of 29 May 1919 would occur when the Sun was in the midst of the Hyades, offering no fewer than 13 stars close enough to the Sun's limb and bright enough to photograph. It would be the best eclipse in 1,000 years for measuring the Einstein effect.

Dyson persuaded the Admiralty to let him plan one expedition and to defer Eddington to plan another. As **James Jeans** described it:

In 1918, in the darkest days of the war, two expeditions were planned, one by Greenwich Observatory and one by Cambridge, to observe, if the state of civilization should permit when the time came, the eclipse of May 1919 with a view to a crucial test of Einstein's generalized relativity. The Armistice was signed in November 1918; the expeditions went and returned, bringing back news which changed, and that irrevocably, the astronomer's conception of the nature of gravitation and the ordinary man's conception of the nature of the universe in which he lives.

Dyson was awarded the Catherine Wolfe Bruce Gold Medal of the Astronomical Society of the Pacific in 1922 and the Gold Medal of the Royal Astronomical Society and the Royal Medal of the Royal Society, both in 1925. He held every office in the Royal Astronomical Society, and served as president of the International Astronomical Union from 1928 to 1932. Dyson retired at 65 and spent his last years advising scientific organizations, coauthoring a book on eclipses, and visiting his eight children and numerous grandchildren.

Dyson's papers are in the Royal Greenwich Observatory archives at Cambridge University.

Joseph S. Tenn

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Keywords

Carte du Ciel and Astrographic Catalogue; Christie, William Henry Mahoney; Eddington, Arthur Stanley; Einstein, Albert; general relativity; Gold Medal, Bruce; Gold Medal, RAS; Gold Medal, RS; Groombridge, Stephen; Jackson, John; Jeans, James Hopwood; Kapteyn, Jacobus Cornelius; Observatory, Cambridge; Observatory, Edinburgh; Observatory, Greenwich; Schwarzschild, Karl; Shortt, William Hamilton; solar eclipse, chromospheric spectrum; solar eclipse, coronal spectrum; solar eclipse, light deflection; Thackeray, William Grasett; time signals, radio, World War I; Turner, Herbert Hall

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