

Biographical Encyclopedia of Astronomers

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FitzGerald, George Francis

Born Dublin, Ireland, 3 August 1851

Died Dublin, Ireland, 22 February 1901

George FitzGerald was an eminent physicist noted for developing James Maxwell's electromagnetic theory of radiation and for his explanation of the null result of the Michelson-Morley experiment

George was the second of three sons of William FitzGerald, a clergyman in the (Anglican) Church of Ireland and professor of moral philosophy and ecclesiastical history at Trinity College, Dublin, and of Anne Francis, sister of the physicist George Stoney. William later became Bishop of Cork and then of Killaloe, County Clare. When George was eight and living in Cork, his mother died. He and his siblings were educated by Charles Harper and the family governess, Mary Anne Boole, sister of mathematician George Boole, in a home where metaphysics, science, and mathematics were highly regarded

FitzGerald graduated from Trinity College in 1871, at the top of his class in both mathematics and experimental physics. He spent the next six years preparing for the fellowship examination and was successful in 1877, on his second attempt. In 1881, FitzGerald was appointed Erasmus Smith Professor of Natural and Experimental Philosophy, holding the chair until his death. In 1885, he married Harriette Mary, second daughter of John Hewitt Jellett, provost of Trinity College

Electromagnetic theory, as formulated by Maxwell in his 1873 *Treatise on Electricity and Magnetism*, was in a crude and rudimentary form, but FitzGerald recognized its potential. In 1876, FitzGerald heard that the Glasgow physicist, John Kerr, had discovered that the polarization of light was altered by reflection from the poles of a magnet, and he sent a short paper to the Royal Society, which was refereed by Maxwell. Two years later, FitzGerald combined James MacCullagh's wave theory of light with Maxwell's theory to explain the Kerr effect. His two papers on "The Electromagnetic Theory of the Reflection and Refraction of Light" established him as a theoretical physicist. With Oliver Lodge, Oliver Heaviside, Joseph Larmor, and Heinrich Hertz, FitzGerald developed Maxwell's equations into the form we know today

In 1882, FitzGerald suggested a means for producing electromagnetic waves but failed to make them himself. When Hertz succeeded in 1888, FitzGerald brought this discovery to the attention of the British Association for the Advancement of Science, thereby ensuring its significance was appreciated

In spring 1889, FitzGerald, on a periodic visit to Lodge, discussed the failure of the 1881 experiment by Albert Michelson and Edward Morley to detect the ether. As they sat talking, FitzGerald had the brilliant idea that the motion of bodies through the ether might cause them

to change in size by just the amount needed to account for Michelson and Morley's null result; he soon sent a letter to *Science* under the title "The Ether and the Earth's Atmosphere." FitzGerald was unaware that the letter was published, and it remained forgotten until 1967. Hendrik Lorentz hit upon the same idea late in 1892, and he developed it fully in conjunction with his theory of electrons. The effect is now known as the FitzGerald-Lorentz contraction and is one of the consequences of Albert Einstein's theory of relativity, which led to the concept of the ether being abandoned

In astronomy, FitzGerald advised William E. Wilson on solar research that he carried out at Daramona House, County West-meath, in the 1880s and 1890s. Wilson produced the first reliable estimate of the temperature of the solar photosphere. (His final value of 6,863 K compares favorably with modern estimates.)

In 1892, FitzGerald assisted amateur astronomer William Monck to make the first photoelectric measurements of starlight. The detector was a photovoltaic cell of selenium made by George M. Minchin, and the charge was measured with an electrometer loaned by FitzGerald. The actual measurements of the brightness of Jupiter and Venus were made by Monck and Stephen M. Dixon with Monck's telescope in Dublin on 28 August 1892. This was followed by a series of stellar measurements made with Wilson's 24-inch Grubb reflector at Daramona in April 1895 and January 1896. Wilson and Minchin operated the telescope, and FitzGerald attended to the electrometer

In 1893, FitzGerald suggested that geomagnetic storms might be due to electrified particles emitted by the Sun. In 1900, he speculated that the Earth might have "a minute tail like that of a comet directed away from the Sun," which is now called the magnetosphere. He also suggested that comets' tails, aurorae, the solar corona, and cathode rays were closely related phenomena. In a letter to the *Astrophysical Journal* in 1898, FitzGerald urged American astronomers to measure the velocities of meteors by placing a rotating toothed wheel in front of a camera.

FitzGerald was a keen athlete and gymnast. He played a leading role in the Dublin University Experimental Science Association (DUESA), founded in 1878, which held monthly meetings with short presentations and demonstrations. In 1895 he bought a Lilienthal glider, and his attempt to fly in College Park earned him the sobriquet "Flightless FitzGerald."

FitzGerald was elected a Fellow of the Royal Society in 1883 and was its Royal Medallist in 1889 for his work in theoretical physics. He was made an honorary Fellow of the Royal Society of Edinburgh in 1900. He acted as honorary secretary of the Royal Dublin Society from 1881 to 1889 and introduced many of his ideas at its regular scientific meetings. He was also active in the British Association for the Advancement of Science. A 110-km-diameter lunar crater at 27°.5' N, 171° W is named for him

Both as tutor and professor, FitzGerald strove to improve the teaching of experimental physics at Trinity College but was hampered by a lack of funds. He obtained a disused chemical laboratory and introduced practical work into the curriculum. He was always ready to advise and encourage, and in particular three of his students went on to distinguish themselves in science: John Joly, Frederick Trouton, and Thomas Preston. From 1898, FitzGerald took an

active part in educational affairs in Ireland, serving on boards for national, intermediate, and technical education. Overwork eventually took its toll on his health. A recurrent digestive problem became more serious in autumn 1900, and he died after an operation for a perforated ulcer, leaving a young family of three sons and five daughters.

Ian Elliott

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