William E. Wilson and his contemporaries

Ian Elliott
Pinecroft, Kilternan, Dublin 18 (formerly of Dunsink Observatory)

Although he never attended school or university, William E. Wilson FRS, of Daramona, County Westmeath, made pioneering contributions to solar physics, celestial photography and stellar photometry. His well-equipped observatory attracted collaborators who included George Francis FitzGerald of Trinity College Dublin and Arthur Rambaut of Dunsink Observatory.

William Edward Wilson was born on 19 July 1851 at Greenisland, just north of Belfast. He was the only son of John and Frances Wilson of Daramona House, Streete, County Westmeath. John Wilson and his three younger brothers, James, George and Robert, had each been given large estates in Leinster by their father, also named William, who had made his fortune in the shipping industry in Belfast, in particular by exporting pork to feed the British Army. All four brothers were educated at Trinity College Dublin, the two eldest becoming barristers.

On account of his delicate health, the young William was educated at home. His aptitude for mathematics was attributed to his mother, who belonged to the Nangle family of Belfast, who were said to possess 'considerable mathematical ability'. In 1870, when William was nineteen, he had the opportunity of joining a expedition to Algeria to observe a total solar eclipse. The expedition was led by William Huggins and included John Tyndall. Although the eclipse was clouded out, Wilson was inspired to take up astronomy, and the following year he took delivery of a 12-inch (300-mm) reflector from Grubb's of Dublin and installed it in the garden of Daramona House. His other equipment included a small transit instrument, made by himself, for timekeeping. Over the course of the next few years he experimented with wet-plate photography of the Moon and measured solar radiation with thermopiles.

In 1881 Wilson replaced his first telescope with a 24-inch (600-mm) Grubb Cassegrain reflector and dome erected on a new site adjoining the house, and he fitted out a physical laboratory, a darkroom and a workshop. Initially the original telescope mount was used for the 24-inch, but in 1892 he bought a new Grubb mount with an electrically controlled clock drive which led to a very fruitful period of observation and research. The precision drive allowed Wilson to make long exposures of celestial objects, and his photographs compared favourably with any taken elsewhere at that time.

From 1888 onwards Wilson measured the solar photospheric limb darkening with high accuracy, and he attempted to detect variations in the sunspot cycle. He collaborated with Arthur A. Rambaut, who was then director of Dunsink Observatory, and a joint paper entitled 'On the heat of the solar atmosphere' was published in the *Proceedings of the Royal Irish Academy* in 1892.

Figure 1. Photograph of William Wilson about 35 years old

In 1893 and 1894 Wilson investigated the centre-to-limb variation of sunspot umbrae. He showed that the umbrae of sunspots do not exhibit a limb darkening effect, thus contradicting similar observations by Samuel P. Langley made twenty years earlier.

In 1894 Wilson started a programme to estimate the temperature of the solar photosphere – the visible surface of the Sun seen in white light. He used a 15-inch (375-mm) Grubb heliostat on loan from the Royal Society and was assisted by P.L. Gray of Mason College in Birmingham. The sensitive detector was a differential radiomicrometer designed by C.V. Boys and made by Yeates & Son in Dublin. The detector was used as a null device to balance the heat from a small portion of the photosphere by the heat given off by an electrically heated platinum wire. The final value for the photospheric temperature of 6590°C compares well with modern estimates and was an important step forward in understanding the physical nature of the Sun and other stars.

Wilson photographed sunspots regularly with a 4-inch (100-mm) Grubb photoheliograph. In August 1898 he took a series of 400 photographs of a sunspot in almost four hours. This was probably the first application of cinematography to astronomy. Wilson sent his photographs and the cine camera to George Ellery Hale at Mount Wilson.

Another pioneering achievement at Daramona was the measurement of stellar brightness using photovoltaic detectors. The first measurements of the brightness of planets was carried out from a

Paper submitted October 2003, accepted November 2003

Figure 2. The Great Nebula in Orion taken 1897 Jan 23, 40min. exposure

Dublin back garden in 1892 by William H.S. Monck and Stephen M. Dixon using selenium cells prepared by George M. Minchin of Coopers Hill College in London. In 1895/96 Minchin brought some improved cells to Daramona and, with the help of Wilson and G.F. FitzGerald, measured the brightnesses of ten stars, the brightest being Betelgeuse. These were the first ever photoelectric measurements of stars.

In 1900 Wilson took part in the joint Royal Irish Academy/Royal Dublin Society eclipse expedition to Plasencia in Spain. Other members of the expedition included Arthur Rambaut, Charles Joly, Howard Grubb and Grubb's son Rudolph. The expedition was successful, and Wilson took some high-quality photographs of the corona through a specially made green filter.

One of Wilson's closest collaborators was George Francis FitzGerald, his junior by two weeks, who is probably best remembered for the effect that bears his name – the FitzGerald–Lorentz contraction in special relativity. FitzGerald visited Daramona regularly to carry out experiments in Wilson's laboratory, and there can be little doubt that Wilson benefited greatly from his advice and discussions. Some of their joint investigations included the effects of high pressures on an electric arc and on radioactive substances. FitzGerald's tragically early death in 1901 at the age of forty-nine must have been a sad blow.

Wilson collected his major papers and published them privately in 1900 as *Astronomical and Physical Researches made at Mr. Wilson's Observatory, Daramona, Westmeath*. His other astronomical activities included the observation of the transit of Venus in 1882, a search for a trans-Neptunian planet in 1901 and observations of Nova Persei in 1902. Wilson invented a 'radio-integrator' for recording sunshine which was adopted by the weather stations at Kew, Falmouth, Aberdeen and Valentia (Ireland). In 1903 he wrote a short letter to *Nature* suggesting that the source of the Sun's energy might be the disintegration of radium.

Wilson was a skilled observer in the laboratory as well as at the telescope. In 1896 he X-rayed a man's arm to assist in a diagnosis, and in 1898 he used X-rays to examine a portrait. He also experimented with wireless telegraphy. He was fortunate in having the means to obtain the best equipment available and in having access to good advice through a network of friends and acquaintances. He travelled regularly to scientific meetings in London and kept in close contact with Irish colleagues through the meetings of the Royal Dublin Society and the Royal Irish Academy.

One regular visitor to Daramona was Wilson's nephew, Kenneth E. Edgeworth, who was introduced to astronomy by his uncle. After a military career in the Royal Engineers, Edgeworth turned his attention to the origin of the solar system. In 1943 he suggested the existence of a reservoir of cometary material beyond the orbit of Neptune. This was seven years before Jan Oort made a similar suggestion, and eight years before Gerald Kuiper presented his ideas on this topic. The reservoir of cometary material is now known as the Edgeworth–Kuiper Belt.

Wilson died in March 1908 at the age of fifty-six and was survived by his widow, one son and two daughters. In 1922 the family moved to England, and in 1925 his 24-inch telescope was offered to the University of London. The Mill Hill Observatory of UCL was officially opened in 1929, and the Wilson telescope served the needs of research and tuition there until 1974, when it was presented to Merseyside County Museum in Liverpool (see http://www.liverpoolmuseums.org.uk).

Despite his lack of formal qualifications, Wilson was elected a Fellow of the Royal Society in 1896, having been a Member of the Royal Irish Academy since 1888. He was awarded an honorary D.Sc. by the University of Dublin in 1901.

Bibliography

Butler, C.J. and Elliott, I., 'Biographical and historical notes on the pioneers of photometry in Ireland', in *Stellar Photometry – Current Techniques and Future Developments*, IAU Colloquium No. 136 (Cambridge Universiity Press, 1993), pp. 3–12.

Edgeworth, K.E., *Jack of All Trades – The Story of My Life* (Dublin, Allen Figgis, 1965).

McNally, D. and Hoskin, M., 'William E. Wilson's observatory at Daramona House', *Journal for the History of Astronomy*, **19**, 146–153 (1988).

Warner, B., 'W.E. Wilson and the Daramona Observatory', *Sky & Telescope*, **53**, 108–110 (1977).

Wilson, W.E., *Astronomical and Physical Researches made at Mr Wilson's Observatory, Daramona* (Published privately, 1900).