Biographical Encyclopedia of Astronomers

Airy, George Biddell

Born Alnwick, Northumberland, England, 27 July 1801

Died Greenwich, England, 2 January 1892

George Airy was the seventh Astronomer Royal; he made major and lasting contributions to many branches of astronomical and physical science and engineering, and his procedures for the mathematical treatment of observations remained the standard for more than a century. His name is associated (Airy diffraction pattern) with the appearance of light that has passed through a small circular aperture.

The son of farmer William Airy and Ann Biddell, Airy was schooled locally at Colchester. At age 12, he asked his uncle, Arthur Biddell, to take him in; his uncle raised him from that point. At school, Airy excelled in classics, history, and mathematics. He taught himself a wide range of other subjects, including astronomy, chemistry, and navigation. Airy entered Trinity College, Cambridge, in 1819, and graduated as a senior wrangler in 1823. He contributed several papers, mainly on optical subjects, to the Cambridge Philosophical Society. A noteworthy example was "On a peculiar defect in the eye, and a mode of correcting it." Airy was myopic and wore the usual concave spectacles for this, but his left eye remained almost useless; he discovered by experiment that the eye was seriously astigmatic and designed a concave-cylindrical lens to correct it. His solution is routinely prescribed today.

Airy became a fellow of Trinity College in 1824, and Lucasian Professor of Mathematics in 1826. Two years later he was appointed Plumian Professor of Astronomy, which included superintendency of the newly created Cambridge University Observatory. Airy devised a new system for reducing positional observations and was also responsible for the design and erection of the Northumberland 11%-in refractor, in a double-yoke equatorial mounting that he developed from a form previously used only for small instruments. Still in use today, the mounting proved to be extremely successful and was the forerunner of those used for large telescopes at the Mount Wilson Observatory and Palomar Observatory

Meanwhile, Airy continued his research into the wave theory of light and many other topics. His contributions in such diverse fields as optical diffraction and engineering metrology, for instance, are remembered by the continued use of the terms Airy disk and Airy points. At the second meeting of the British Association for the Advancement of Science in 1832, Airy was invited to present a report on the Progress of Astronomy, which was to prove to be of seminal importance. He arranged for the reduction and publication of Stephen Groombridge's Catalogue of Circumpolar Stars when Groombridge himself was incapacitated by a stroke, thus salvaging an invaluable reference source. Having directed the Cambridge Observatory so successfully, it was inevitable that Airy should succeed Astronomer Royal John Pond when the latter retired in 1835.

Airy directed the Royal Observatory for 46 years and reorganized the establishment so effectively that it continued to be run on the pattern he formulated for more than 120 years. He introduced full reduction and annual publication of all the observations, and also organized the reduction and publication into three massive volumes of all the positional observations of the Sun, the Moon, and the planets that had been made at Greenwich between 1750 and 1830. In addition to maintaining and developing its traditional role in positional astronomy and time determination, Airy introduced regular photography of the Sun's surface, stellar radial-velocity measurements, and systematic monitoring of the Earth's magnetism. He also designed the great

equatorial telescope, a 12%-inch refractor in a mounting developed from his design for the Northumberland telescope.

Arguably, Airy's greatest achievement at Greenwich was the design of a new suite of instruments to meet the increasing standards of accuracy required for positional astronomy: the altazimuth, the reflex zenith tube, the barrel chronograph, and, most notably, the transit circle. These instruments, introduced between 1847 and 1854, were to prove the best in the world at the time and to have a combined working life of 313 years; they also provided the design basis for major positional instruments for generations to come. Airy retired on 15 August 1881 and moved to a house nearby

Airy's transit circle – described by Simon Newcomb as "the most commenced serviceable meridian instrument ever constructed" – was first used in 1851; its last observations were made in 1954, and were reduced using Airy's procedures. At the Washington Conference of 1884, the longitude of the Airy transit circle had been adopted as the prime meridian and the reference for the world's time zones

Airy undertook many nonastronomical tasks: He served on the Board of Longitude and more than 30 Royal Commissions and government Select Committees, and was the de facto chief scientific advisor to the governments of his day. Airy chaired the committee to restore the national standards of length and weight following their destruction in a fire at the Houses of Parliament, and played a leading role in the introduction of the electric telegraph and the distribution of time signals, the standardization of railway gauges, and the correction of magnetic compass disturbances in iron ships. He also participated in numerous international collaborations, including the Greenwich-Paris and the Pulkovo-Greenwich-Valencia longitude determinations, and organized expeditions to observe several solar eclipses and two transits of Venus. Airy was asked to draw up detailed instructions for the determination of the Canada-United States boundary, and trained the officers concerned for several weeks at Greenwich. He gave similar assistance to the establishment of the Oregon state boundary

Airy published a dozen books, mainly in the fields of mathematics, optics, and astronomy, and wrote over 500 scientific papers. He also wrote essays on topics ranging from early Hebrew scriptures to Roman military history. One of his most successful books was Six Lectures on Astronomy (London, 1849), based on a course of public lectures given on the occasion of the opening of the Ipswich Museum. Twelve further editions of this work, later retitled Popular Astronomy, appeared for over 40 years

Airy served as president of the Royal Society of London from 1871 to 1873 and was awarded both its Copley Medal and its Royal Medal (twice). He was a member of the Council of the Royal Astronomical Society continuously from 1830 to 1886, during which time he served as president for four terms. Airy received a knighthood in 1872 and in 1875 became the first scientist to be appointed a freeman of the City of London. He was also honored by several universities and numerous overseas academies

Airy was a highly industrious and energetic man with total self-confidence and a strong sense of duty and moral rectitude. He was famously meticulous and carefully preserved all documents and correspondence, even inventing a filing system for this purpose. His sense of order has proven of great benefit to posterity, establishing an archive that is remarkable in its value and completeness. Airy's own high standards led him to expect much of others, but although demanding of his staff, he was also very fair. For much of the 20th century, however, it was fashionable to denigrate him as a tyrannical employer, but these criticisms

were greatly exaggerated. They largely arose from the statements of a young assistant who served under Airy only briefly and later wrote disparagingly of Airy's management style in a program that had been completed some three decades before his own birth! Recent research has shown such criticisms to be totally undeserved.

Airy has been unjustly criticized in connection with the prediction and discovery of the planet Neptune, and consequent loss of priority for the young Cambridge student John Adams. Searching for a hypothetical planet was not within the remit of the Royal Observatory with its extensive programs and limited resources, and Airy quite properly suggested that it could be more appropriately sought with the Northumberland refractor at Cambridge Observatory. If James Challis, Adams' professor at Cambridge, had not been dila-tory, Neptune might well have been found there. Archival evidence shows that Airy behaved entirely correctly.

Airy was a devoted family man: In 1830 he married Richarda Smith, eldest daughter of the Chaplain to the Duke of Devonshire. They had nine children; the three eldest all died young. Airy was sparing of his friendships, but remained very close to his lifelong friends, notably Sir John Herschel.

Gilbert E. Satterthwaite

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