

Biographical Encyclopedia of Astronomers

© 2007 Springer

Stokes, George Gabriel

Born Skreen, Co. Sligo, Ireland, 13 August 1819

Died Cambridge, England, 1 February 1903

George Stokes was one of the leading figures of 19th-century physics and is chiefly remembered for his theoretical work, especially in hydrodynamics. His name is attached to several physical laws - the Navier-Stokes equation governing fluid motion; Stokes's law of viscosity, relating the resistance experienced by a body moving in a fluid to viscosity; Stokes's law of fluorescence, which states that the wavelength of the light absorbed by fluorescent materials is always shorter than that emitted; Stokes's (curl) theorem, which applies to fluid dynamics and electromagnetic theory; and (better known to astronomers) the Stokes parameters of polarization for radiation.

Born into an Anglo-Irish family that included many academics and ministers of religion, Stokes received his early education at the Reverend R. H. Wall's school in Dublin. He moved to Bristol College, England, at the age of 16. Stokes then entered Pembroke College, Cambridge, in 1837 and graduated first in his class (senior wrangler) in mathematics (1841). Afterward, he became a fellow of the college and was appointed to the Lucasian Chair of Mathematics (1849), the post once occupied by Sir Isaac Newton. From his Cambridge days, Stokes became a close scientific colleague of William Thomson (Lord Kelvin).

Stokes was made a Fellow of the Royal Society of London (1851) and was awarded its Rumford Medal (1854) for his explanation of fluorescence. He was elected secretary of the society from 1854 until he became its president in 1885. In 1857, Stokes married Mary Susanna Robinson, daughter of the astronomer Romney Robinson of Armagh Observatory. The couple had three children. From 1887 to 1891, Stokes served as a Member of Parliament for Cambridge University. He received many medals and academic honors during his career and was made a baronet in 1889.

Stokes sought to explain many natural phenomena involving light waves, was deeply interested in contemporary astrophysical discoveries, and furthered the development of astronomical instrumentation. He discussed the optimization of achromatic lenses and arrived at an explanation of the criterion that Joseph von Fraunhofer had employed when designing telescope objectives. In 1852, Stokes employed fluorescence, one of his particular interests, as a means for detecting the ultraviolet spectrum of the Sun. He focused the solar spectrum onto a solution of quinine sulfate, which emitted a blue fluorescence except at the positions of particular absorption lines. Stokes anticipated to some extent Gustav Kirchhoff's discoveries concerning the Fraunhofer lines in the solar spectrum. Yet, because he never published his conclusions on that subject, he refused to claim any credit. In 1852, he introduced a set of four quantities now termed the Stokes parameters, which are widely used to characterize the polarization state of a light wave.

Stokes's prominence in the British physics community led to invitations to serve on many committees. Those relevant to astronomy included the Committee on Solar Physics and the Board of Visitors of the Royal Greenwich Observatory. He acted as an advisor to the telescope maker Sir Howard Grubb and was involved in the unsuccessful British efforts under W. V. Vernon Harcourt to improve the manufacturing of optical glass. As secretary of the Royal Society, he was closely involved in procuring a large telescope for the pioneer astrophysicist Sir William Huggins. Stokes was a member of the local committee set up to supervise Grubb's manufacture of a 27-inch telescope for the Imperial Observatory of Vienna and specified the curvatures for its objective lens.

Ian S. Glass

Selected References

Kelvin, Lord (1903). "The Scientific Work of Sir George Stokes." *Nature* 67: 337-338

Larmor, Joseph (1907). *Memoir and Scientific Correspondence of the Late Sir George Gabriel Stokes*. 2 vols. Cambridge: Cambridge University Press. (1920).

"Stokes, Sir George Gabriel." In *Dictionary of National Biography*, Supplement, January 1901–December 1911, edited by Sir Sidney Lee, pp. 421–424. London: Oxford University Press.

Parkinson, E. M. (1976). "Stokes, George Gabriel." In *Dictionary of Scientific Biography*, edited by Charles Coulston Gillispie. Vol. 14, pp. 74–79. New York: Charles Scribner's Sons

Rayleigh, Lord (1905). "Sir George Gabriel Stokes, Bart. 1819-1903." *Proceedings of the Royal Society of London* 75: 199-216. (Reprinted in *Rayleigh, Scientific Papers*. New York: Dover, Vol. 5, pp. 173-189.)