Contributions of Great Scientists to Aerosol Research (By Charles F. Clement)

Many great scientists, who are better known for their contributions to other scientific fields, have made major contributions to Aerosol Science. A list of such scientists is given below together with very brief descriptions of their contribution. A much fuller account of their contributions and those of others is given in the book, History of Aerosol Science, Proceedings of the Symposium on the History of Aerosol Science, eds. Othmar Preining and E. James Davis, Verlag der Österreichischen Akademie der Wissenschaften, Vienna 2000.

Brown, R. (1773-1858) Robert Brown was a botanist who observed random motion of small particles within pollen grains, but established that this movement, now known as Brownian motion, was general and not just biological in origin.

Cunningham, E. (1881-1977) Ebenezer Cunningham was a Cambridge mathematician who derived the correction factor, now named after him, to Stokes' drag on spherical particles whose size is comparable to the mean free path in a gas.

Einstein, A. (1879-1955) The great originator of the theory of relativity also made a great contribution to classical dynamics in 1905 by explaining diffusion and the Brownian motion of small particles in a gas or liquid. He obtained the basic relation between a particle's mobility and its diffusivity.

Faraday, M. (1791-1867). In addition to his well known major contributions to research on magnetism and electricity, Michael Faraday described in 1857 how a beam of light could detect small particles.

Kelvin, Lord (Thompson, William)(1824-1907) Included in his important contributions to thermodynamics is the formula giving the increase in vapour pressure over a curved surface which is crucial in specifying the nucleation and growth of liquid droplets.

Maxwell, J. C. (1831-1879) In addition to his seminal formulation of the basic equations of electromagnetism and his work on the kinetic theory of gases, James Clerk Maxwell made several contributions to Aerosol Science. They include a description of collisions and accommodation of molecules with surfaces and the solution of the diffusion equation for molecules condensing on a small sphere.

Mie, G. (1868-1957) Although Mie theory was anticipated by Lorenz, Gustav Mie solved the problem of light scattering by small spherical objects in terms of a power series expansion (1908), a technique which has been widely used in more general scattering theories ever since.

Millikan, R. A. (1868-1953) By levitating charged liquid aerosol droplets in a d.c electric field, Robert Millikan made accurate measurements of the charge on an electron, research for which he received a Nobel Prize in 1923.

Perrin, J. B. (1870-1942) The French physicist, Jean Perrin, worked in many areas of physics, especially on colloids where he verified experimentally Einstein's theory of Brownian motion. He was awarded a Nobel Prize in 1926.

Rayleigh, Lord (Strutt, John William)(1842-1919) The prodigious scientific output of this great Victorian polymath, 450 papers, included several relevant to aerosols. He described the light scattering from particles smaller than the light wavelength (1871), and the limiting electrical charge (Rayleigh limit) on a droplet at which it would break up (1878).

Stokes, G. G. (1819-1903) The experimental and theoretical work of George Stokes covered many areas of physics including hydrodynamics and elasticity. His major contribution to Aerosol Science in 1850 was to describe the motion of a small sphere moving through a viscous medium, a theory which, with modifications for particles with size of the order or less of the molecular mean free path in a gas, is used to this day.

Tyndall, J. (1820-1893) John Tyndall rediscovered and greatly expanded Faraday's idea of using light scattering to detect particles. He particularly applied this to disease organisms in air, and also found the relation between particle size and wave length of light in scattering.