

Brownian Motion [nl63]

Early experimental evidence for atomic structure of matter. Historically important in dispute between 'atomicists' and 'energeticists' in late 19th century.

Brown 1828:

Observation of perpetual, irregular motion of pollen grains suspended in water. The particles visible under a microscope (pollen) are small enough to be manifestly knocked around by even smaller particles that are not directly visible (molecules).

Einstein, Smoluchowski 1905:

Correct interpretation of Brownian motion as caused by collisions with the molecules of a liquid. Theoretical framework of thermal fluctuations grounded in the assumption that matter has a molecular structure and with aspects that are experimentally testable.

Perrin 1908:

Systematic observations of Brownian motion combined with quantitative analysis. Confirmation of Einstein's predictions. Experimental determination of Avogadro's number.

Langevin 1908:

Confirmation of Einstein's results via different approach. Langevin's approach provided more detailed (less contracted) description of Brownian motion. Langevin equation proven to be generalizable. Foundation of general theory of fluctuations rooted in microscopic dynamics.