

**On meteorites and the history  
of stellar systems, [1889]**

**Circa 1889**

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## Summary Information

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<b>Abstract</b>	This essay formed the basis of lectures George Howard Darwin delivered before the Royal Institution of Great Britain on January 25, 1889. It was a popular account of a paper he read before the Royal Society the previous November ("On the Mechanical Conditions of a Swarm of Meteorites, and on Theories of Cosmogony," Proc. 45:3-16).

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## Background note

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George Howard Darwin (1845-1912, APS, 1898) was an astronomer and mathematician, who produced eighty papers collected in four volumes of his Scientific Works. He devoted himself to problems of mathematical cosmogony, and subsequent investigators have favored his methods over the merely qualitative arguments that prevailed before him. His most monumental work was a paper "On the Secular Changes in the Elements of the Orbit of a Satellite Revolving About a Tidally Distorted Planet" [1880]. Darwin was the fifth child of Charles Robert Darwin (1809-1882, APS 1869) and Emma Wedgwood. He began his education in the private school of Reverend Charles Pritchard, later Savillian professor of astronomy at Oxford. Darwin matriculated in Trinity College, Cambridge, and graduated second wrangler, winning Smith's prize in 1868. He was elected a fellow of Trinity College in October 1868, but did not return there until October 1873. In the meantime, he studied law for six years, and was admitted to the bar in 1874, although he never practiced.

In 1875 Darwin began a series of mathematical papers that would eventually form the corpus of his Scientific Papers in four volumes. In 1883 he was elected Plumian professor of astronomy and experimental philosophy at Cambridge, succeeding James Challis. He held this position for the remainder of his life. His work in this chair had no necessary connection with the observatory or practical astronomy. His lectures were poorly attended, although Ernest W. Brown and Sir James Jeans were among his students. Darwin was inspired by the physicist Sir William Thomson, Lord Kelvin (1824-1907, APS 1873), who probably set the young man's career path toward the sciences. His influence is evident in Darwin's early paper "On the Influence of Geological Changes on the Earth's Axis of Rotation," published in 1876, but a later group of papers, concerning the tides in viscous spheroids show the influence of Kelvin and Laplace. In one of these papers, entitled "On the Precession of a Viscous Spheroid and the Remote History of Earth" (1879), Darwin proposed the "resonance theory" of the origin of the moon, asserting that it might have originated from the fission of a parent earth as the result of instability produced by resonant solar tides. His greatest paper in this series was "On the Secular Changes in the Elements of the Orbit of a Satellite Revolving About a Tidally Distorted Planet," published in 1880.

After becoming Plumian professor of astronomy, Darwin focused more intensely on the problems of the origin and development of the solar system, conducting numerous studies of the figures of equilibrium of rotating masses of fluid and later investigations of periodic orbits in the restricted problem of three bodies with special reference to cases obtaining for the values of the mass ratio of the two finite bodies of 1:10 and 1:1048 (the latter ratio approximating the mass of Jupiter compared to the sun).

Darwin's greatest contribution to science was his pioneering work of applying detailed dynamical analysis to cosmological and geological problems. The major service that he rendered to cosmogony was to put various hypotheses to the actual test of calculations. His method provided a methodological milestone in cosmogony, and is still favored by investigators over merely qualitative arguments. Basically, he was an applied mathematician of the school of Lord Kelvin, who was content to study physical phenomena by the mathematical methods that best fit the purpose. In a speech to the Fifth International Congress of Mathematicians at Cambridge in 1912 Darwin compared his method to that of

Henri Poincaré, saying that "I appeal ... for mercy to the applied mathematician, and would ask you to consider in a kindly spirit the difficulties under which he labours."

During his career, Darwin received several honors. In 1879 he was elected a fellow of the Royal Society of London, and in 1898 he was elected a foreign member of the American Philosophical Society. In 1905 he was knighted, commander of the Bath through the influence of his friend Arthur Balfour, Prime Minister from 1902-1905. Finally, in 1912 Darwin served as president of the International Congress of Mathematicians at Cambridge. Shortly afterward, he died of cancer, and was buried in Trumpington Cemetery near Cambridge.

Darwin married in 1884 Maud DuPuy of Philadelphia. They had four children, the eldest of whom was the physicist Charles Galton Darwin (1887-1962, APS 1952).

## **Administrative Information**

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