

Biographical Encyclopedia of Astronomers

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Helmholtz, Hermann Ludwig Ferdinand von

Born Potsdam, (Germany), 31 August 1821

Died Berlin, Germany, 8 September 1894

Hermann von Helmholtz, German mathematical physicist, is commemorated by the Helmholtz free energy (thermodynamics), Helmholtz coils (electromagnetism), and other eponyms. However, he is important within astronomy primarily for his association with the idea that the sun and stars derive their energy from gravitational contraction and with the time scale associated with that energy source, the Kelvin-Helmholtz time scale. (See William Thompson, Lord Kelvin.) The idea had its roots in the work of Julius Mayer (1841) and John Waterston (1843), in the papers rejected for publication by the Paris Academy and by the Royal Society of London, who suggested two ways of converting gravitational energy into heat—either the infall of meteoric material or contraction Kelvin initially adopted the infall view and Helmholtz the contraction view. The discussions by Kelvin and Helmholtz were the ones that persuaded the scientific community of the importance of the ideas, partly because of their more careful calculations, partly because they tied the results more closely to the nebular hypothesis for the origin of stars with planetary systems, and partly because of their more established positions in science. A gravitational origin for solar and stellar energy was generally accepted from about 1854 to the end of the 19th century. There is also a Kelvin-Helmholtz instability, which makes ripples at the interface between fluids flowing past each other and occurs in a variety of astrophysical contexts

Helmholtz had broad-based interests and expertise and made significant contributions to various disciplines. He was trained as a physician. He held the chair in physiology at the University of Königsberg through 1855, the chair in anatomy and physiology at the University of Bonn through 1858, and the chair in physiology at the University of Heidelberg through 1871. Then, following his growing reputation in physics and mathematics, he accepted the chair in physics at the University of Berlin.

In addition to his work in the sciences, Helmholtz was deeply interested in philosophy, music, and the arts. He criticized the theory of inherent knowledge (*a priori*) proposed by Immanuel Kant and stressed reliance on empirical evidence. He is best known for his formulation of the law of the conservation of energy, *Über die Erhaltung der Kraft* (On the Conservation of Force). He also did fundamental work in mathematics, optics, electrodynamics, meteorology, thermodynamics, and physiology

Helmholtz was elevated to the nobility in 1882 by the authority of Emperor William I. As a sign of the elevation, the title "von" was added to his name. In 1877, he was elected to the post of rector of the University of Berlin, a post that he held until 1878. In 1888, Helmholtz was appointed director of the newly formed Physico-Technical Institute of Berlin.

Helmholtz died before evidence began to accumulate that the sun and Earth were much older than the associated Kelvin-Helmholtz time of 30,000,000 years. Shortly after his death, a statue was commissioned from the artist Ernst Herter. The statue, sculpted from Tyrolean marble, was placed at the entrance of the university and dedicated in 1899. The statue may be seen today in front of the Humboldt University of Berlin facing the street, Unter den Linden.

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