

# Biographical Encyclopedia of Astronomers

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Klein, Oskar Benjamin

Born Morby, Sweden, 15 September 1894

Died Stockholm, Sweden, 5 February 1977

Swedish theoretical physicist Oskar Klein developed a useful extension of Theodor Kaluza's five-dimensional version of general relativity; Klein's work anticipates the existence of dark matter in the universe. The son of Austrian immigrants Gottlieb Klein (the chief rabbi of Stockholm) and Toni Levy, Klein worked in the laboratory of Svante Arrhenius while still a teenager and earned a Ph.D. at Stockholm in 1921 with a study of suspensions and solutions. Klein worked briefly with Niels Bohr in Copenhagen and then with Svein Rosseland, using the initial ideas of quantum mechanics and the Bohr model of the atom to elucidate the process of collisional de-excitation (which is what prevents coronal lines from being observed in laboratory studies).

While at the University of Michigan from 1923 to 1935, Klein attempted to formulate a five-dimensional extension of general relativity that would incorporate electromagnetism as well as gravity. Theodore Kaluza attempted a similar unification at about the same time. The five-dimensional Kaluza-Klein spacetime has Applications in modern theoretical cosmology include the possibility of a lowest-mass particle that preserves Kaluza-Klein symmetry and could be a dark matter candidate.

After returning to Europe, Klein was at Lund from 1925 to 1930 and professor at Stockholm from 1930 until his retirement in 1962. He contributed to a great many topics in quantum mechanics, but the next topic of importance for astronomy was his work with Yoshio Nishima of Japan, using the Dirac equation to study the scattering of light by electrons. The Klein-Nishina cross-section replaces the Thompson cross-section at high energies and is smaller. Toward the end of his life, Klein, together with Hannes Alfvén, proposed a cosmology that would be completely symmetric in matter and antimatter. He continued to take an active interest in cosmological issues well into the 1970s, corresponding with younger workers in the field like John Wheeler. Klein was awarded honorary degrees by the universities of Oslo and Copenhagen.

*Virginia Trimble*

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