Victor Franz Hess: A Short Biography

Victor Hess was 29 years old when he discovered cosmic rays and he devoted the rest of his research career, spanning almost half a century, to the study of this strange radiation and its effect on the human body.

Victor Franz Hess was born on June 24, 1883, at Waldstein Castle near Deutsch Feistritz, Austria, to Vinzens and Sarafine Hess. His father was the chief forester in the estate of Prince Oettingen-Wallerstein. Victor attended the Gymnasium in the nearby city of Graz and entered the University of Graz in 1901. He received his PhD at the age of 23.

A curious turn of events at this point of his life pushed Hess towards research on radiation and atmospheric electricity, ultimately culminating in the discovery of cosmic rays. Hess wanted to pursue postdoctoral work in optics and had made arrangements to study under Paul Drude in Berlin, a famous physicist working on optics at that time. (Incidentally, it was Drude who introduced the symbol 'c' for the speed of light in vacuum.) But unfortunately, Drude committed suicide just a few weeks before Hess was to join him. Hess therefore looked for a position in Austria and accepted an offer from Franz Exner in the University of Vienna, who was a pioneer in the study of radiation. Hess also lectured on physics at the university and at the Vienna Veterinary Academy.

In 1910, Hess was appointed as an assistant at the Institute for Radium Research of the Austrian Academy of Sciences. While working there, he became interested in the reports of detection of electrical charges in insulated containers. Hess wanted to determine whether the source of ionization could be in the sky rather than on the ground. He wanted to make measurements at a height above 500 meters where he estimated the ground radiation would ionize negligibly. For this purpose, he designed instruments that would not get damaged by temperature and pressure changes and made ten balloon flights (including five at night) between 1911 and 1913. He found that instead of decreasing, the ionization began to increase after a certain height and concluded that "a radiation of very high penetration power enters our atmosphere from above". He also made a balloon flight during an almost total eclipse on 12th April, 1912, and concluded that since the ionization did not decrease during the eclipse, the source of radiation could not reside in the sun. The American physicist Robert A Millikan – famous for the determination of electrical charge of electrons – named this radiation 'cosmic' in 1925 (although Millikan's idea that 'cosmic rays' were energetic forms of electromagnetic radiation and not charged particles was proved wrong later).

Hess moved from Vienna to the University of Graz in 1920 as an Associate Professor. In 1921, he visited the USA for two years, lecturing at several universities and helped build a research laboratory. He was promoted as a full professor after his return to Graz, and then he moved to the University of Innsbruck in 1931. There, he founded a station for cosmic ray observations on Hafelekar Mountain at a height of 2,300 meters. In 1936, he shared the Nobel Prize in physics with Carl D Anderson, the American physicist who had discovered positron.

When Hess returned to Graz in 1937, he was dismissed from his job after a year because of the changing atmosphere in Austria, and Germany under the Nazi rule. His wife was Jewish. Luckily, a sympathetic Gestapo officer cautioned the Hess family that they might be taken to a concentration camp if they stayed on in Austria, and they fled to Switzerland barely a month before the arrest orders actually arrived. In 1938, Hess accepted an offer from the Fordham University in New York and settled in USA; he became an American citizen in 1944. After the bombing on Hiroshima, Hess led an investigation on radioactive fallout, mostly conducted from the upper stories of the Empire State Building in New York. In 1947, he made measurements of radioactivity in the subway stations of New York. He also developed a method of detecting trace amount of radium in the human body with the help of gamma rays, thus making it possible to detect radium poisoning before its level reached a critical stage.

Hess continued to do research even after formally retiring from Fordham Professorship in 1958, on the toleration of radioactivity of the human body and became a strong opponent of nuclear weapon testing. He believed "we know too little about radioactivity at this time to state definitely that testing underground or above the atmosphere will have no effect on the human body". He also wrote that he intended to dedicate the rest of his working life to understand the effects of radiation on human beings better.

Hess died on December 7, 1964.

In 2004, an observatory was built in the deserts of Namibia with an array of Cerenkov detectors to observe gamma rays from astrophysical sources. High energy gamma rays (which are part of the cosmic ray phenomenon) produce Cerenkov radiation – blue streaks of light – when they penetrate the atmosphere. The observatory was named HESS (High Energy Stereoscopic System) Telescope to pay homage to the discoverer of cosmic rays.

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