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Viktor F. Hess: From Atmospheric Electricity to Cosmic Rays

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V. F. Hess (1883-1964), after receiving his Ph.D. in physics with highest honours at University of Graz, began his investigations of the electrical conductivity of the atmosphere at the University of Vienna and the newly founded Radium Institute of the Imperial Academy of Sciences, since it was then believed that this property was the result of ionizing radiations from radioactive decay of surface materials. V. F. Hess an ardent balloonist, decided to measure its altitude profile up to the peak of his balloon flights of about 5 km. When he noticed that after the expected initial decrease up to a few km, the conductivity started to increase again, he made the daring proposal for the existence of an ionizing radiation coming from space but not from the sun. This was the birth of cosmic rays, which he originally considered to be energetic gamma-rays, but later were shown to consist primarily of energetic protons and electrons, whose source is now considered to be supernovae remnants in our galaxy. Hess continued his research into cosmic rays at research stations in the Austrian Alps, while holding appointments as professor at the University of Graz and Innsbruck. In 1936, two dozen years after his ‘‘discovery”, he was awarded the Nobel Prize in Physics. In 1938 upon Austria’s inclusions in Hitler’s ‘‘Third Reich” Hess lost his last university position at the University of Graz because of his critical stance of the new regime. He emigrated to the USA where he became a professor at Fordham University, NY. There he concentrated on the effects of ionizing radiation on biological systems leaving the exploitation of his discovery to others. Cosmic rays play an important role in geophysics. Their interaction with the atmosphere not only produce the C-14 isotope used in archeological age determination but also serves as a proxy of solar activity because of the solar modulation effect (anticorrelation between cosmic ray intensity and solar activity). The search for the ‘‘cosmic ray gradient” on the first US Explorer

satellites also led to the discovery by J. van Allen of the radiation belts, that are ‘‘fed” by the interaction of cosmic rays with atmosphere.