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Claus Grupen

Neutrinos, Dark Matter and Co.

From the Discovery of Cosmic
Radiation to the Latest Results
in Astroparticle Physics



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What You Can Find in This *essential*

The birth of astroparticle physics is the historic balloon flight of Victor Hess in 1912, when he discovered cosmic radiation with an ionization chamber. This cosmic radiation was studied in many facets on the ground, under the earth, and in the atmosphere. It was soon discovered that cosmic rays were one way of studying elementary particle processes. In order to understand the whole variety of phenomena in cosmic rays, one had to include many subareas of physics: Thermodynamics, nuclear physics, plasma physics, stellar physics, astronomy, and elementary particle processes, to name a few. Astroparticle physics is therefore multidisciplinary in every respect. Today, astroparticle physics is an active, interdisciplinary field of research that includes and combines astronomy, cosmic rays, and elementary particle physics. In this *essential*, you will find a short historical outline of astroparticle physics and a description of the latest results without going into mathematical detail. This *essential should be* seen as an introduction to this new field of research. But you will get an overview of what is happening in the sky, between the stars and between the galaxies. By now, many things are quite well understood, but with every solution found, new questions arise. This range of questions with some answers can be found in this *essential*. A very detailed description of astroparticle physics, including a mathematical description of the relationships, especially in cosmology, can be found in the book “Entry into astroparticle physics” (“Einstieg in die Astroteilchenphysik”) by C. Grupen, published by Springer in 2018.