

The history of cosmic ray studies after Hess

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Cosmic rays after Hess is the birthplace of elementary particle physics. The 1936 Nobel prize was shared between Victor Hess and Carl Anderson. Anderson discovered the positron in a cloud chamber. The positron was predicted by Dirac several years earlier, but Anderson was not aware of it. In his subsequent cloud chamber investigations Anderson found - together with Neddermeyer - the muon, which for some time was considered to be a candidate for the Yukawa particle responsible for nuclear binding. Only emulsion measurements by Perkins, Powell, Occhialini and Muirhead clarified the situation by the discovery of the charged pions in cosmic rays. The cloud chamber continued to be a powerful instrument in cosmic ray studies. Rochester and Butler using the cloud chamber of the Blackett group in Manchester found V_s , which turned out to be shortlived neutral kaons decaying into a pair of charged pions. Also s were found in cosmic rays. But after that the period of accelerators and storage rings took over. The unexpected renaissance of cosmic rays started with the search for solar neutrinos and the observation of the supernova 1987A. With the observation of neutrino oscillations one began to look beyond the standard model of elementary particles. Interesting results from X-ray and gamma-ray astronomy and the detailed observations of the cosmological background radiation disclosed that we are living in a universe dominated by dark matter and dark energy. After 100 years of cosmic ray research we are at the beginning of a new era, and we still aim "To understand what holds the core of the world together".

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