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Introductory Remarks

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Introductory remarks

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When Hess discovered the 'cosmic radiation' in 1912 he thought that it comprised some sort of ultra-gamma radiation. Later work showed that the so-called 'radiation' consisted in fact of particles rather than quanta, and for many decades the particles and their interactions occupied the stage. It was not until the balloon experiments of the 1960s and, more particularly, the satellite work of Kraushaar and colleagues in 1967 that a small but finite flux of γ-rays was definitely detected in the primary beam and the subject of γ-ray astronomy could be regarded as having started.

The first attempt at mapping the sky in γ-rays was made by Fichtel and coworkers in 1972 with the SAS-2 satellite, and more recently the European COS-B satellite has continued this programme. The latter vehicle with its very impressive spark chamber detector was launched in 1975 and is still in orbit.

The present time is for several reasons opportune for a Discussion Meeting on γ-ray astronomy. Starting at the lowest energies, γ-ray lines have definitely been detected and the hunt is on for an interpretation. The observation of the 0.51 MeV e^+e^- annihilation line from the general direction of the galactic centre, with an unexpectedly high flux, is particularly intriguing. At higher energies, the COS-B data are proving to be of great value with respect to the observation of discrete sources – mostly of unknown origin – and the identification of large cloud complexes as sources of γ-rays owing to their being irradiated by the ambient cosmic ray flux. The identification of these sources is one of the big puzzles in γ-ray astronomy at present and will no doubt occupy much of our time in this Discussion. Studies of cosmic ray irradiated molecular complexes hold out hope for use of γ-rays as a tool for determining the distribution of cosmic ray electrons and nuclei in the Galaxy; both the SAS-2 results with their low instrumental background counts and the COS-B data with its greater statistical precision are proving of great value in the search for cosmic ray gradients in the Galaxy and with it an answer to the cosmic ray origin problem. At even higher energies (above 10^{11} eV), where the optical Cherenkov radiation produced in the atmosphere by incident γ-rays can be used, there are signs that unambiguous signals have at last been detected.

Taken together with rather dramatic observations of γ-ray bursts, many of which seem to be from still unknown sources in the Galaxy, and quite certain observations of extragalactic objects at a variety of energies, the outlook for this, the ultimate field in high energy astronomy, looks very bright.