

Introductory Remarks

G. D. Rochester and A. W. Wolfendale

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Introductory remarks

BY G. D. ROCHESTER, F.R.S. AND A. W. WOLFENDALE

Department of Physics, University of Durham

The intriguing problem of the identification of the source of the cosmic radiation has presented a challenge since its discovery some 60 years ago. Measurement of the energy and isotropy of the radiation showed conclusively that one obvious source, the Sun, was not the main source. Even in 1938 it was clear from the discovery of extensive air showers that the cosmic-ray spectrum extended to at least 10^{16} eV and continuously running monitors indicated that the departure from isotropy was no greater than the statistical uncertainty of the measurements (i.e. about 1%).

Recent results have raised the maximum observed primary particle energy to higher than 10^{20} eV and the departure from isotropy for particulate radiation, to less than 0.01% at 5×10^{11} eV and 1% at 10^{17} eV. To these striking facts must now be added the great wealth of detailed knowledge which has come from the immense advances in technology in the past 30 years. On the cosmic-ray side these advances range from the flying of detectors and sophisticated equipment on great balloons near the top of the atmosphere to the imaginative flights of spacecraft far out into the Solar System, well away from the confusing effects of the Earth's atmosphere and the magnetosphere. Such experiments have given the relative abundances and the energy spectra of a variety of atomic nuclei and of electrons and positrons, and the intensity, energy and spatial distribution of X-rays and γ -rays.

On the astronomical side results of great significance have come from new astronomical techniques, especially from the science of radioastronomy which has led to the identification of new astronomical objects of key importance for cosmic rays and the identification of what are probably the major accelerating mechanisms.

In view of these great advances it seemed to the organizers that the present time might be opportune to review the present state of knowledge in this field and attempt a synthesis. The present volume, in which are presented the invited talks and some of the lively discussion which ensued, is the result. Professor Ginzburg was unfortunately not able to present his paper in person but he kindly sent his MS; this was edited and presented by Dr Osborne. To the invited papers we have added an interesting paper from Sir Bernard Lovell, F.R.S. in part stimulated by this discussion meeting.

We are grateful to the Royal Society and its Officers for making this meeting possible and for the excellent support in its organization.

Finally may we express the hope that the papers presented here will not only indicate the progress that has been made in studying the problem of the origin of the cosmic radiation but also stimulate interest in the many problems which remain.