This time span includes the heroic period of the quantum theory and the atomic models with Planck, Einstein, Bohr, Sommerfeld, Lorentz, Boltzmann and others as the principal figures in theoretical physics. Paul Ehrenfest differed from these men because he had never acquired the skill to carry through any extensive calculation and emotionally he was possibly not suited to do so. His strength was directed towards critical analysis, asking the pertinent question, clearing up obscurities, getting to the bottom of a problem. This was often done with the aid of the "Socratic dialogue", verbal or in letters, with many of the outstanding theoreticians of the time. There is nothing novel in this as a method of research in theoretical physics, but the intensity and determination which Ehrenfest applied and the enthusiasm he was able to stimulate in his participants were unusual. This side of Ehrenfest's character was also the reason that he became famous as an inspiring teacher and lecturer. An impressive example can be found in his biographer's account of the inaugural lecture given by Ehrenfest when appointed professor at the University of Leyden in 1912.

A third of this volume is devoted to Paul Ehrenfest's personal biography: his youth in Vienna, the years of study at its university where L. Boltzmann's influence first directed him to statistical mechanics, the highly important stay of eighteen months in Göttingen and the five years' period in Russia. During these "Wanderjahre", Ehrenfest became acquainted with the European physicists of eminence and their problems. Being married to a Russian mathematician and the father of two girls, it became urgent for him to find an academic position with a steady income. After a disappointing search, help came from an unexpected side: Lorentz chose him as his successor.

It is characteristic of Ehrenfest's seriousness of mind and of his self discipline that he kept extensive notes not only on personal matters but of discussions, scientific questions and ideas occurring to him so as to make sure to reflect further on them at a later date. These notebooks and diaries provided his biographer with a mine of information, permitting him to create a true image of Paul Ehrenfest (pp. 90–91, a programme for little Tatyana's future intellectual development, is most typical).

The principal section of the volume is concerned with the history of atomic physics and the contribution Ehrenfest has made to it. There are the following chapters arranged chronologically: the critic of statistical mechanics, theoretical miscellany, the essential nature of the quantum hypothesis and the adiabatic principle.

The volume finishes with a chapter "Einstein und Ehrenfest". It gives the volume a charming ending full of glimpses into the bonds between the two friends and shows the human side of the awe-inspiring phenomenon of Einstein.

On reading this book, one cannot help admiring the erudition of the author, the agreeable style of his language and his ability to present physics in clear terms with didactic skill. This volume can be warmly recommended and I am looking forward to the second volume.

E. Bretscher

COSMIC RADIATION

Proceedings of the Eleventh International Conference on Cosmic Rays

Budapest, August 25 September 4, 1969. Vol. 1: Origin and Galactic Phenomena. Edited by A. Somogyi. (*Acta Physica* Supplement, Vol. 29.) Pp. 571. (Akadémiai Kiadó: Budapest, 1970.) 220*s*.

If in no other way, this book is remarkable both for the speed with which it has been produced (it is only a year since the conference which it reports took place) and for the high quality of its appearance, which does not seem to have suffered at all from the speed of its preparation. These factors must owe much to the production of the volume as a supplement to a journal (*Acta Physica*) where both the editors and publishers are familiar with producing the printed word from manuscripts quickly and accurately—perhaps there is a lesson here for those contemplating the publication of other conference reports.

This volume is the first of four to be published covering the Proceedings of the Eleventh Conference on Cosmic Rays, and is restricted to those papers dealing with the origin of cosmic radiation and galactic phenomena. The full texts of all the relevant original contributions are included, and although in several cases these contributions deal with work which has also been reported elsewhere, this completeness has resulted in a most valuable review book and source from which other relevant papers can be found. It is impossible to do justice to a book of this kind in a limited review; all that can be said is that this volume comprehensively covers the field which it is reporting, and if the other three volumes cover their fields in a similar detailed manner, then the set will become an essential and much used part of every astrophysics library. Although the price of these volumes will probably be far too high for the individual astronomer to buy them, they are good value when compared with the cost of similar volumes produced by some other publishers, and this sort of comprehensive review is in any case much more suited to the libraries of academic institutions than to the individual's private collection.

John Gribbin

PROBLEMS OF EPISTEMOLOGY

Studies in History and Philosophy of Science

Edited by Gerd Buchdahl and L. L. Laudan. Vol. 1, Nos. 1 and 2. Quarterly. (Macmillan (Journals): London, May and August 1970.) 100*s* per annum; 30*s* per issue.

This new quarterly, according to the editors' manifesto, intends to promote studies leading to "an understanding of the scientific enterprise", which (as they rightly emphasize) demands an approach that "must be simultaneously historical and philosophical". They are sorry for the "gap that has grown between the two disciplines" of history and philosophy of science, and which they somehow hope to bridge by providing a meeting place for philosophically minded historians and historically minded philosophers.

In entertaining such optimistic expectations, they do not seem to realize that the place of philosophical thinking in science has undergone a radical change since the beginning of the nineteenth century. In the preceding period of formation of modern science, philosophical reflexion was—for good reasons—an inherent part of the scientific activity of the great pioneers; by the end of this period, when science had acquired its own method and put it on a solid foundation, and at the same time, under the pressure of accumulated experience and increasing refinement of the techniques of investigation, had divided into a number of specialized disciplines, makers of philosophical systems—again for obvious reasons—were left irrevocably behind. What scientists still need is a continued analysis of the basic assumptions underlying their activity, but this epistemological analysis requires such an intimate knowledge of the most technical aspects of scientific investigation that it can only be carried out usefully by the scientists themselves. This situation has not, of course, prevented people from talking glibly about the foundations and the meaning of science without taking the precaution of acquiring the necessary experience; but their self-styled description as philosophers of science should not deceive any but themselves about the true status of their verbal exercises.