

PREFACE

The research on cosmic rays proceeds in close cooperation with many fields of the natural sciences. When we refer to the historical development of cosmic ray research, it becomes clear that the research on cosmic rays has made progress with those of many other fields in sciences from the discovery of cosmic rays, via its great contribution to particle physics and its relation to high energy phenomena in cosmic space.

At present, it is well recognized that the nature of “primary” cosmic rays should be fully understood in the investigation of the so-called “secondary” cosmic rays which are produced by primary particles entering the terrestrial atmosphere due to their interaction with the atmospheric gases. In the past, therefore, there was some anxiety that two specialist groups had possibly been formed in cosmic ray research. In this country, such a situation was unfortunately found until recently in the history of cosmic ray research, and it still seems that this anxiety has never fully disappeared from those who are interested in cosmic ray physics.

Now, it can be said that the intrinsic nature of cosmic rays was uncovered in some detail through the mutual interaction between cosmic ray research and various other fields of science, as cited above, while cosmic ray particles themselves have become an important means of studying the high-energy phenomena in this Universe. Truly speaking, it may be said that, at the present moment, the cosmic ray research can not be done independently of the progress in astrophysics, in particular, high-energy astrophysics. In some way, cosmic ray physics has gradually begun to play an important role as a “tool” in the research of astrophysics. In view of this, it may be concluded that the research on cosmic rays is now called “Cosmic Ray Astrophysics”, since the most interesting and developing field in this research is now closely related to astrophysics.

Taking the above situation on cosmic ray research into consideration, we have compiled this book with an aim to review the current state of research in cosmic ray physics. In consequence, the contents of this book have been specially selected. The editors, therefore, hope that, while studying this book, the readers may find many important fields in cosmic ray research such as their essential role in high-energy astrophysical phenomena and the current topics of cosmic ray astrophysics.

If we had planned to compile a book dealing with the ultra-high energy phenomena related to Cosmo-Genesis and the unified theory in particle physics currently in rapid progress, the contents of the present book would have been completely different from the present edition, since the main objective of this book is cosmic ray astrophysics.

Finally, it should be noted that this book is an English edition for that which was originally published in 1983 in Japanese, and that one of the Editors (K. S.) is solely responsible for making this English edition.

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The Editors