

Preface

The International School on Physics and Astrophysics of Ultra High Energy Cosmic Rays (UHECR2000) was held at the Observatoire de Paris–Meudon on June 26-29, 2000. This was the first international school specifically dedicated to ultra high energy cosmic rays. Its aim was to familiarize with and attract students, physicists and astronomers into this quickly developing new research field.

The mysterious and currently unknown origin of the most energetic particles observed in Nature has triggered in recent years theoretical speculations ranging from electromagnetic acceleration to as yet undiscovered physics beyond the Standard Model. It has also lead to the development of several new detection concepts and experimental projects, some of which are currently under construction. By its nature, the field of ultra high energy cosmic rays is therefore highly interdisciplinary and borrows from astrophysics and cosmology, via particle physics, to experimental physics and observational astronomy. One main aspect of the school was to emphasize and take advantage of this interdisciplinarity. The lectures were grouped into subtopics and are reproduced in this volume in the following order: After a general introductory lecture on cosmic rays follow two contributions on experimental detection techniques, followed by three lectures on acceleration in astrophysical objects. The next four contributions cover all major aspects of propagation and interactions of ultra high energy radiation, including speculative issues such as new interactions. The last lecture discusses “top-down” scenarios where cosmic rays are produced by decay from higher energies close to Grand Unification scale instead of being accelerated. The volume is rounded off by a critical summary of the topics covered. We hope that this topical book will be useful to a broad range of people interested in ultra high energy cosmic rays, from beginning students looking for interesting research projects to senior researchers.

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