

## FOREWORD

PROCEEDINGS OF THE INTERNATIONAL ASTRONOMICAL UNION COLLOQUIUM 142  
AT THE UNIVERSITY OF MARYLAND, 1993 JANUARY 11–15  
PARTICLE ACCELERATION PHENOMENA IN ASTROPHYSICAL PLASMAS

The energization of charged particles by nonthermal processes throughout the universe continues to be a major unsolved problem for astrophysics since the discovery of cosmic rays. The characteristics of the accelerated particles are determined from their direct detection and from the secondary radio waves, X-rays, gamma rays, and neutrons they produce. The observations indicate acceleration mechanisms operative at several astrophysical sites, such as solar and stellar coronae and planetary magnetospheres, interplanetary space, pulsars, accretion disks of binary systems, active galactic nuclei, supernovae and their remnants, radio galaxies, QSOs, SS 433, gamma-ray burst sources, the Galactic plane and halo, and black holes.

The energies of the accelerated particles range from as low as a few hundred to  $10^{20}$  eV. Within the solar system solar flares produce accelerated particles whose energies are above  $3 \times 10^{10}$  eV, rivaling the energies of some accelerated particles in the distant QSOs.

Exciting new observations bearing on this problem have recently become available from newly operational space missions such as the *Compton Gamma Ray Observatory (CGRO)*, *Granat*, the *Hubble Space Telescope (HST)*, *ROSAT*, *Yohkoh*, and ground-based observatories. It was, therefore, vital to synthesize the observations and their theoretical explanations in a colloquium concentrating on the particle acceleration problem. It is clear that the basic acceleration mechanisms which have been invented, discovered, or proposed are applicable throughout the universe and could be fruitfully discussed in the broadest context.

The present Colloquium was conceived to fulfill this need. It has been unique in that it concentrated solely on one topic—the physical processes resulting in accelerated particles regardless of the astronomical site or object. This required that all participants have a broad view of the universe and that the discussion be united around the common physical theme. Nearly 200 observers and theoreticians from the worldwide scientific community attended the five-day Colloquium, providing an opportunity for fruitful interaction among the attendees. The papers in this issue are presented in the order of presentation of topics at the Colloquium. The agenda for invited papers and contributed oral presentations follows this Foreword. Included in these proceedings are more than half the papers presented, along with several poster papers that relate to the particle acceleration theme.

Funding for the Colloquium was provided by the International Astronomical Union (IAU), the Committee on Space Research (COSPAR), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the Department of Energy (DOE), the University of New Hampshire, and the University of Maryland.

The Colloquium was endorsed by several IAU and COSPAR commissions, and we gratefully acknowledge the support of the following:

- ERIC PRIEST—IAU Commission 10 (Solar Activity)
- P. G. MEZGER—IAU Commission 40 (Radio Astronomy)
- E. B. JENKINS—IAU Commission 44 (Astronomy from Space)
- R. SUNYAEV—IAU Commission 48 (High Energy Astrophysics)
- L. F. BURLAGA—IAU Commission 49 (Interplanetary Plasma and Heliosphere)
- J. LENARD CULHANE—COSPAR Subcommittee E1 (Galactic and Extragalactic Astrophysics)

We are grateful to Mary M. Chupp for her tireless efforts in carrying out the many essential details, over a period of more than two years, which ensured the success of the Colloquium. We also wish to express our appreciation to Mukul Kundu, Chair of the Local Organizing Committee, and John D. Trasco of the University of Maryland Astronomy Department for the excellent local arrangements and enjoyable reception and banquet. Colin Norman and Reuven Ramaty effectively resolved last-minute program conflicts. We thank Markus Aschwanden, N. Gopalswamy, Ed Schmahl, and Steve White for their assistance at the University of Maryland.

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