

Preface

These are the Proceedings of Symposium No. 195 of the International Astronomical Union (IAU), held in Bozeman, Montana, U.S.A., during 6–10 July 1999, and hosted by Montana State University (MSU).

Recent years have seen much progress in the study of the basic mechanisms responsible for high-energy emission from astrophysical plasmas. From the wealth of data from observatories such as *Einstein*, *Exosat*, *Ginga*, IUE, ROSAT, EUVE, GRO, ASCA, SAX, RXTE, and *Yohkoh*, it is now clear that many common physical processes are at work in different astrophysical systems. Magnetohydrodynamic processes, for example, play key dynamical roles in the solar corona and in accreting systems in active galactic nuclei (AGN) and Galactic compact objects. Magnetic reconnection processes, thought to be involved in the heating of the solar corona, are expected to occur in accretion disks and neutron star magnetospheres. The physics of emission from highly relativistic plasmas is critical to understanding jets from AGN, supernovae, and the relativistic fireballs now thought responsible for cosmic gamma-ray bursts. Plasma processes were also of crucial importance in the early universe and affected the development of the primordial magnetic field and of structure. Though similar physical processes are encountered by researchers studying compact objects, accreting sources, supernovae, the Sun, and the early universe, researchers from these different subfields interact surprisingly little. *The purpose of this symposium was to bring together experts from different subfields of high-energy astrophysics who encounter common questions in their research. Our goal was to create a forum in which the participants could benefit from the expertise of others who have worked on similar problems in different astrophysical contexts.*

With the successful launch of the *Chandra Observatory* and XMM, and the launch of HESSI imminent, this conference formed an ideal environment in which to discuss these exciting problems. The meeting focused on high-energy processes taking place in astrophysical plasmas, and included discussion of the mechanisms of high-energy emission from various magnetized and thermal plasmas. Particular emphasis was given to accreting systems, jets, neutron stars, black holes, the Sun, supernovae, gamma-ray bursts, soft gamma repeaters, and the early universe. Both theoretical and observational issues were covered, and future directions discussed.

The symposium started with reviews on past, current, and future satellite observations in high-energy and solar astrophysics, followed by theoretical papers which were more directly related to these observations, on high-energy phenomena in, and emission from, astrophysical plasmas. The meeting proceeded to cover more theory-oriented, basic physical problems, such as the effects of magnetic fields, particle acceleration, and physical processes in relativistic astrophysical plasmas. The afternoon of the last day was reserved for a panel discussion and conference summary. This symposium included invited review and specialty papers, a panel discussion, a conference summary, and contributed papers (mostly posters but some oral). Here, we present these papers.

The spirit of the meeting was to bring together researchers from different subfields of high-energy astrophysics to share their expertise in studying emission processes of common interest in astrophysical plasmas. It was also to

bring together observers and theorists for mutual interaction. In this sense, this symposium was to be unique in its scope and emphasis. As C.R. Canizares emphasized in the panel discussion, this symposium succeeded, at least to a certain degree, in accomplishing this ambitious though difficult goal, and we hope that this will be the beginning of more such meetings in the future.

Acknowledgments. The Scientific Organizing Committee consisted of Drs. G. Ai, R. Blandford, T. Courvoisier, L. Culhane (Co-chair), G.G. Fazio, K. Nomoto, A. Nordlund, F. Pacini, M.J. Rees, R. Romani, G. Srinivasan, J. Trümper, S. Tsuruta (Co-chair), and L. Woltjer. We express deep gratitude to these colleagues and others, such as L. Acton, R. Canfield, A. Fabian, A. Gruzinov, D. Longcope, and W. Wamsteker, for very useful suggestions and input towards making the program of the meeting scientifically more interesting. The Local Organizing Committee consisted of L. Acton (Co-chair), R. Canfield, W. Hiscock, M. Larson, B. Link, D. Longcope, S. Tsuruta (Co-chair), and M. Wills-Davey. J. Halvorson (Director), A. Fox, and other members of MSU Conference Services dealt with practical matters. We are grateful to these colleagues for their efficient efforts in organizing the meeting, together with the assistance of junior staff and graduate students A. Burnette, A. Davey, K. Fukumura, C. Kankelborg, A. LeRoux, D. McKenzie, E. Noonan, D. Rilett, M. Teter, and B. Welsch.

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