

PREFACE

This Symposium, the first devoted entirely to the measurement and the role of magnetic fields in the non-solar Universe, was held in Heidelberg, on June 19-23, 1989.

The meeting began with review talks on magnetic phenomena near the solar photosphere, corona, and in stellar winds, since these nearby "laboratories", studied for many years, provide much of the prior knowledge of magnetic effects in astrophysical plasmas. The Symposium contained presentations of considerable new work concerning the role of magnetic fields in accretion disks, bipolar outflows, and related magnetic phenomena in molecular clouds and star forming regions. Both observations and related theory of the large-scale magnetic fields in the Milky Way were covered, in addition to a session on the more general theme of magnetohydrodynamics of galactic magnetic fields. Dynamo mechanisms were discussed in considerable detail. It was apparent that recent observational data on polarized emission from external galaxies are now of sufficiently high quality that meaningful tests of large-scale field amplification, and of ideas on the origin of galactic magnetic fields, can be undertaken.

Both new observations and numerical simulation work were described in the context of active galaxy nuclei, supernova remnants, radio source jets and extended lobes, and also in the environment of galaxy clusters. Recent large-scale computer simulations incorporating magnetic fields in star formation, radio source jets, and many other phenomena were presented, and much of this was very new. Evidence for magnetic fields in systems at large redshifts was reviewed, along with a discussion of the role of magnetic fields in the early Universe and at the galaxy formation epoch.

In all of these areas, a wealth of new observations were presented - either of magnetic field strengths, or closely related to magnetic effects.

Interest in IAU Symposium 140 was very high, and worldwide. The capacity audience of 200 participants came from 26 countries. Virtually every part of the world where there is research activity in the study of cosmic magnetic fields was represented. A number of papers had to be declined because of the large response - a total of 172 contributions.

Members of the Scientific Organizing Committee were G.V. Bicknell (Australia), C. Cesarsky (France), M. Fujimoto (Japan), C. Heiles (USA), F. Krause (GDR), P.P. Kronberg (Chairman) (Canada), J. Miller (USA), E.N. Parker (USA), E.R. Priest (UK), A.A. Ruzmaikin (USSR), and R. Wielebinski (FRG).

We are indebted to the SOC members and many other individuals who made their contribution to the success of Symposium No. 140. Most prominent in this regard is Gabi Breuer of the MPIfR Bonn, whose many efforts and organizational skills were outstanding in all respects – pre-organization, during the meeting, and in the preparation of this book. Others at Bonn and Heidelberg we would like to thank for their tireless work are Marita Krause, Thomas Schmutzler, Dieter Breitschwerdt, Elke Schwarzenbacher, Heinz Völk, Günter Hutschenreiter, and Walter Fußhöller. At Toronto we thank Laura Carriere, and Ernest Seaquist for their important contributions. During the conference we had much assistance from Ulrich Achatz, Michael Dahlem, Christian Fendt, Götz Golla, Cathy Horellou, Horst Meyerdierks, Nikolaus Neininger, Martin Pohl, Patricia Reich, Rainer Riemann, Jürgen Steinacker, and Axel Weichert. Reinhard Schlickeiser and Dirk Fiebig are acknowledged for critical reading of some manuscripts.

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We hope this book will serve as a useful reference for many areas of astrophysical research.

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