FOREWORD

Traditionally, solar and stellar physics have been two separate branches of astronomy, which independently of each other have developed their own scientific goals and methods. During the last decade, however, we have witnessed a gradual convergence of these two areas: The solar physicists realize more and more that the sun has to be seen as a special case in a large family of stars of various properties. A more complete understanding of the sun can only be achieved by considering it in this broader context. The stellar physicists on the other hand have become aware that the detailed knowledge of the physical processes that the solar physicists have reached has a more general significance and can be applied to a variety of other astrophysical objects. Observational techniques developed in solar work can frequently be adapted for other stars as well. This unified approach to solar and stellar physics is often called the "solar–stellar connection".

One main goal of this approach has been to understand the general nature and causes of stellar activity. The pioneering and visionary program to search for activity cycles on other stars started by Olin Wilson at the Mount Wilson Observatory 16 years ago has born fruit: in his sample of 91 stars, cyclic behaviour similar to that of the sun is found to be quite common, but many stars also show irregular activity fluctuations of large amplitude. For some stars, no activity is seen. It has thus become feasible to search for empirical "scaling laws" for stellar activity, to find how the activity depends on, for instance, stellar mass, age, and rotation. In particular, differential rotation may now be observed on other stars as an extension of Olin Wilson's original program.

On the theoretical side, a new class of unified theories have emerged, which seek to explain the origin of all cosmic magnetic fields, like that of the Earth, the Sun, or the Galaxy. The solar magnetic cycle has been a well used testing ground for these dynamo theories, but too many free or unknown parameters have prevented these theories to be sufficiently constrained. As the unified theories can now be applied to a wide variety of stars of various properties, we may achieve a much deeper understanding of stellar activity and magnetism.

The central role played by magnetic fields in the activity of a star has been investigated in great detail on the sun. Using the Zeeman effect, the magnetic field in the solar photosphere can be mapped with high spatial resolution. One unexpected discovery made a decade ago was the extreme fine structure of the solar magnetic field: most of the magnetic flux in the photosphere occurs in strong-field, kG form, in isolated flux fragments or fluxtubes occupying a fraction of a percent of the surface area. This discovery has had important implications for the attempts to understand the origins of stellar magnetism and its influence on the outer atmospheres of the stars. Recent observations have demonstrated that this intermittent nature of the magnetic field occurs on other stars as well.

The magnetic fields not only cause stellar activity, but also have a decisive influence on the dynamics and energy balance of the outer stellar atmospheres, in particular their coronae. It is in fact being debated whether the very existence of a corona is a consequence of stellar magnetism. This question can now be penetrated in depth using the wealth of

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observations from the Einstein satellite, which records the X-ray emission arising in the hot stellar coronae. Coronal expansion leads to stellar winds, which transport angular momentum away from the stars. The evolution of stellar rotation — the spindown problem — is directly linked to stellar magnetic fields and coronae.

The title of the symposium, "Solar and Stellar Magnetic Fields: Origins and Coronal Effects", tries to express these interconnections in our synergistic approach to solar and stellar physics: the central and unifying role played by the magnetic field, and the link between the problem of magnetic-field origin in the stellar interiors and the problem of the structure and dynamics of the outer stellar atmospheres.

The symposium was held at the Swiss Federal Institute of Technology Zurich (ETHZ), August 2–6, 1982. It was attended by about 170 scientists from 21 countries. 110 papers were presented: 17 invited reviews, 36 orally presented contributed papers, and 56 poster papers. Due to lack of space, we list the poster papers by title only in the present volume.

The Scientific Organization Committee consisted of: J.O. Stenflo (Chairman), D. Mihalas, R.W. Noyes, A.B. Severny, M. Stix, Y. Uchida, G. Vaiana, N.O. Weiss, O.C. Wilson, C. Zwaan The members of the Local Organizing Committee were: M.C.E. Huber (Chairman), A.O. Benz, C.V.H. Huber, H. Nussbaumer, U. Pauls, H. Rüf, D.S. Spicer, J.O. Stenflo, A.-M. Thalmann, S. Weber. Using his extraordinary organizational talent and experience, the chairman Martin Huber elevated his task to a "fine art". He thereby greatly contributed to the smooth operation and the pleasant atmosphere of the symposium. As Session Chairmen during the meeting served: A.B. Severny and R.G. Giovanelli (Session I), E.A. Müller and D.J. Mullan (Session II), N.O. Weiss and M. Stix (Session III), R.M. Bonnet and Y. Uchida (Session IV), A.K. Dupree (Session V), and J.O. Stenflo (Session VI).

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The proceedings have been prepared from camera-ready typescripts, but it was often necessary to retype portions of the manuscripts to bring them as close as possible to a standard format. The printed text of the discussions was edited. It is based on a combination of written questions and comments, handed in by those who participated in the discussions, and a tape recording of the proceedings. Unfortunately the review on Solar Magnetic Fields is missing in this volume, since no manuscript was available in February 1983, when the proceedings had to be sent to the Publisher. The interested reader is referred to four relatively recent and still relevant reviews on this topic: by J.W. Harvey (1977, *Highlights of Astronomy* **4**, pp. 223–239), and by J.O. Stenflo (1976, *IAU Symp.* **71**, pp. 69–99; 1977, *IAU Coll.* **36**, pp. 143–188; 1978, *Rep. Prog. Phys.* **41**, pp. 865–907).

The secretary of the Institute of Astronomy at ETH, Mrs. S. Weber, has with her efficiency, skill, and dedication played a central role in all phases of the organization of the symposium and in the preparation of the proceedings. To her and all the other members of the Institute of Astronomy who have so greatly contributed to the success of this undertaking, I express my sincere thanks.

Zurich, February 1983 Jan Olof Stenflo