

PREFACE

This volume contains the invited talks to the IAU colloquium 121 "Inside the Sun" held at Versailles, May 22-26, 1989. "Inside the Sun" aimed at increasing the knowledge on the solar interior and the underlying physics and hopefully contributed to the cross-fertilisation of ideas, theory and observations of all the groups. This conference was a first step to proceed to an assessment of all these current theoretical and experimental progress, in a global way. The 175 participants from 24 countries illustrate the existence of a lively community concerned by this subject. What site could be a better chance than Versailles, the city of Sun King Louis the XIVth, to hold exactly 200 years after the "Etats Generaux" a kind of "Etats Generaux" of what is happening in the heart of the Sun. At the end of this book, two texts are an illustration of this time-space conjunction! In spite of a wonderful weather during the whole week, the attendance was always very high.

As pointed out by Jean Audouze in his introductory talk, the interior of the Sun is a very interdisciplinary subject. These last decades, the solar neutrino problem raised by the Davis' experiment has led to the alternative of revising our view on the solar structure and stellar evolution theory or to explain it by fundamental properties of neutrinos, related themselves to the most achieved theories unifying all fundamental forces. At the same time, helioseismology developed greatly and was able to put very strong constraints on the structure of the Sun down to very near the centre. Many terrestrial and space experiments are under way or planned for the next years to obtain more accurate data. The magnetic field, the rotation and the large scale motions are also now observed in more details. We propose to call "heliophysicists" all these specialists from different fields which unite to understand fully the problem of the solar interior. To illustrate this, the organizing committee joined astrophysicists and particle physicists together.

The proceedings contain nearly all of the 30 invited papers, as well as 7 contributed papers presented during the Conference. We retain mostly for the proceedings, the plan adopted during the Conference. We thus begin by the solar modelling, including the Standard Solar Model - the related discussions were very active during the meeting - and the main inputs of physics (Equation of State, Opacities). The experimental results on solar neutrinos precede the recent theoretical ideas on neutrino masses. The subject of Helioseismology is presented both from a theoretical and experimental point of view, pointing out the recent results on the solar rotation and on the structure of the solar core. The problems of Solar Dynamo and of Transport processes are presented in connection with the Solar Cycles. The authors were asked to write their contribution from an educational stand-point. The final talk by D. Gough makes the inventory of questions that remain to be solved.

Three poster sessions were organized. The first was devoted to Solar Neutrinos and Solar Models (26 contributions), it was chaired by James Rich (Saclay), the second one (29 contributions), conducted by Eric Fossat (Nice) treated Helioseismology and Diffusion problems and the third one (36 contributions), co-chaired by Elisabeth Ribes (Meudon) and Françoise Bely-Dubau (Nice) covered the subjects of Convection, Dynamo and Transport. The posters were displayed during the whole Conference, and a brief presentation of the subject took place at the beginning of the session. The discussions were very active in front of the panels during all the breaks. Contributions presented during the poster sessions will be published in a special issue of Solar Physics. We want to thank the chairmen of these sessions who succeeded in the difficult task of allowing at the same time a short presentation of the subject, and of conducting an active discussion among the participants.

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The members of the International Scientific Committee, chaired by E.Schatzman (Meudon) were J.N.Bahcall (Princeton), R.M.Bonnet (ESA Paris), T.Brown (Boulder), R.Davis (Philadelphia), F.Deubner (Würzburg), W. Dziembowski (Warsaw), E.Fossat (Nice), D.O.Gough (Cambridge), H.Harari (Rehovot), T.Kirsten (Heidelberg), M.Koshiha (Tokyo), A.Maeder (Geneva), T.Montmerle (Saclay), A.Renzini (Bologna), P.Roberts (UCLA), M.Spiro (Saclay) and G.T.Zatsepin (Moscow). We are very grateful to them for suggestions and active participation in the elaboration of the program.

The Organizing Committee was composed of F.Bely-Dubau (Nice), G.Berthomieu (Nice), J.Boratav (Saclay), M.Cassé (Saclay), M.Cribier (Saclay), W.Däppen (Saclay), B.Foing (Verrières-le-Buisson), E.Fossat (Nice), P.O.Lagage (Saclay), Y.Lebreton (Meudon), T.Montmerle (Saclay), E.Ribes (Meudon), J.Rich (Saclay), E.Schatzman (Meudon) and D.Vignaud (Saclay). This Committee wishes to express special thanks to Mrs Jacqueline Boratav for her dedicated work before, during and after the Colloquium. He wishes to thank Mrs Simone Roussiez, Dominique Brou and Mireille Kalifa as well as Jean-Pierre Soirat, Jacques Mazeau and Henri de Lignières for their valuable technical support in the different parts of the Conference and of the edition of these Proceedings.

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