SOLID STATE ASTROPHYSICS

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SOLID STATE ASTROPHYSICS

PROCEEDINGS OF A SYMPOSIUM
HELD AT THE UNIVERSITY COLLEGE,
CARDIFF, WALES, 9–12 JULY 1974

Edited by

N. C. WICKRAMASINGHE and D. J. MORGAN
University College, Cardiff

With a Preface by Sir Fred Hoyle, F.R.S.

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PREFACE

Over the past decade the study of the formation and properties of interstellar grains has assumed a growing importance, going much beyond what might have been guessed only a few years ago. It has come to be understood that grains play a role in processes other than the simple absorption and scattering of starlight, which was all that the astronomers of a generation ago considered to be their relevance. Grains indeed play a critical role in controlling the temperature, composition, and states of aggregation of the whole interstellar medium. Among the still mysterious problems is the origin of the vast clouds of obscuring material that is observed in radiogalaxies like NGC 5128 and M 82, which may well be associated with the explosions of very massive objects.

It is safe to say that from this growing field of study much still remains to be discovered. The topics discussed in this volume will make clear to the reader the range and versatility of the subjects.

F. HOYLE

FOREWORD

by

THE PRINCIPAL

The Symposium on Solid State Astrophysics held in July 1974 brought to University College Cardiff a large and very distinguished gathering of astronomers. It was the first time that such a collection of scholars, absorbed with the problem of the systems of outer space, had collected together in Wales, and so provided a splendid springboard for the researches of the newly founded group of astronomers in the Department of Applied Mathematics and Astronomy at University College.

I know that Professor Wickramasinghe and his colleagues care deeply that the University of Wales, and, in particular, the Cardiff group, should be one of the world centres for the study of Theoretical Astronomy, and I believe that this volume will make an important contribution to the achievement of that hope.

C. W. L. BEVAN

INTRODUCTION

An International Symposium on Solid State Astrophysics was held at University College, Cardiff, during the period 9–12th July 1974. The symposium was sponsored by the European Physical Society and was financed in part by a grant from the Royal Society.

The recognition of the importance of solid state physics in several branches of astrophysical research has been relatively recent. Solid state physics is relevant to problems associated with the behaviour of interstellar solid particles, the physics of the Moon and inner planets and the crystallization of neutron stars. On account of the strong interest in problems relating to interstellar dust in the Department of Applied Mathematics and Astronomy at Cardiff, it was considered appropriate to concentrate on this topic and to restrict the subject matter of the symposium to interstellar dust and neutron stars. The main aim of the symposium was to bring together astronomers, solid state theorists and laboratory physicists working on problems relating to these two major areas of contemporary astrophysics.

Part I of the proceedings published here contains invited papers and contributions in the general field of interstellar dust and related laboratory astrophysics. Questions relating to the chemical composition and optical properties of interstellar dust have been debated by astronomers for over 40 years. A resurgence of interest in these subjects has taken place in recent years, mainly due to advances in infrared and ultraviolet astronomy which are providing vital clues regarding the composition of these grains. Although the existence of silicates and graphite particles in both circumstellar shells and interstellar space appears to be fairly well established, the question of what other materials, if any, condense on these grains in the interstellar medium remained an open question at the end of the symposium. It was generally accepted that interstellar dust grains play a crucial role in several astrophysical processes – e.g. molecule formation in interstellar space, star formation and infrared radiation from nebulae and galaxies.

Part II of the proceedings contains invited papers and contributions relating to applications of solid state physics to the theory of neutron stars. Important questions relating to the equation of state of neutron star matter, including that of the conditions for crystallization, were discussed by invited speakers and contributors.

In the case of papers which have been published elsewhere than in *Astrophysics and Space Science*, only abstracts are presented here.

The Organizing Committee gratefully acknowledges financial assistance received from the Royal Society and wishes to express its gratitude to University College, Cardiff, for the facilities provided during the period of the symposium.

N. C. WICKRAMASINGHE
D. J. MORGAN

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