The Symbiotic Phenomenon

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Astrophysics
Space
Science
Library

Kluwer Academic Publishers

THE SYMBIOTIC PHENOMENON

PROCEEDINGS OF THE 103RD COLLOQUIUM OF THE INTERNATIONAL ASTRONOMICAL UNION, HELD IN TORUN, POLAND, AUGUST 18-20, 1987

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KLUWER ACADEMIC PUBLISHERS
DORDRECHT / BOSTON / LONDON

Library of Congress Cataloging in Publication Data

CIP

International Astronomical Union. Colloquium (103rd : 1987 : Toruń, Poland)
The symbiotic phenomenon : proceedings of the 103rd Colloquium of the International Astronomical Union, held in Toruń, Poland, August 18-20, 1987 / edited by Joanna Mikolajewska ... [et al.].
p. cm. -- (Astrophysics and space science library ; v. 145)
Includes index.
ISBN 9027727236
1. Stars, Symbiotic--Congresses. I. Mikolajewska, Joanna.
II. Title. III. Series.
QB843.S96I58 1987
523.8'41--dc19 88-4392
CIP

ISBN 90-277-2723-6

Published by Kluwer Academic Publishers,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

Kluwer Academic Publishers incorporates
the publishing programmes of
D. Reidel, Martinus Nijhoff, Dr W. Junk and MTP Press.

Sold and distributed in the U.S.A. and Canada
by Kluwer Academic Publishers,
101 Philip Drive, Norwell, MA 02061, U.S.A.

In all other countries, sold and distributed
by Kluwer Academic Publishers Group,
P.O. Box 322, 3300 AH Dordrecht, The Netherlands.

Printed in The Netherlands

PREFACE

Symbiotic stars were identified spectroscopically as M giants with a very strong He II 4686 emission line. After five decades of study by many astronomers, the first internatioinal meetings devoted to symbiotics were held at the University of Colorado (Boulder) and at the Haute Provence Observatory during the Summer of 1981. These conferences emphasized exciting new results obtained by modern satellite (EINSTEIN, IUE) and ground-based observatories. Although the vast majority of the participants were already fairly sure that symbiotics are almost certainly interacting binary systems, and not extremely peculiar single stars, it was not clear exactly which types of physical processes were needed to be invoked to explain their observed behaviour. Many were even worried that it might not be possible to clearly define a class of "symbiotic stars", and thus establish a unique model applicable to any system.

Since the publication of the Haute-Provence proceedings, our understanding of the physical processes occuring in symbiotic stars (and in related objects such as cataclysmic variables and compact planetary nebulae) has greatly improved. We now speak confidently of a "symbiotic phenomenon", in which an evolved red giant and a hot companion object (usually thought to be an accreting main sequence star or a luminous white dwarf star) happily coexist. Given this basic advance in our field, it seemed appropriate to bring together symbiotic afficianados from around the world to summarize our basic understanding of these binaries, to delineate the physical problems we have yet to solve, and thus to plan new observational and theoretical attacks on this important group of interacting binary system.

Our apparently improved understanding of symbiotic objects motivated a presentation that was significantly different from those of Boulder and Haute Provence. Rather than describe observations in distinct wavelength regions or discuss physical peculiarities of individual objects, the organization of this colloquium emphasized a multifrequency approach to our study of symbiotic stars and a description of the basic physical components (and their interaction). Thus, the meeting began with introduction to the observations and the working models constructed for symbiotic stars, continued with discussions of techniques designed to probe the physical structure of a symbiotic binary (e.g., orbital solutions, IR photometry and spectroscopy of the cool mass-losing component, radio/optical imagery, and polarization), and then turned to a description of physical models developed to interpret the multifrequency observations. With this physical background in mind, we then confronted cherished ideas with observational reality to

test our grasp of the symbiotic phenomenon. We hoped that this interaction would lead to a better understanding of our successes and failures, which could be used on the final day of the conference to place our field in the context of binary stellar evolution, to identify aspects of the symbiotic phenomenon in other stellar objects, and to discuss projects that remain to be accomplished.

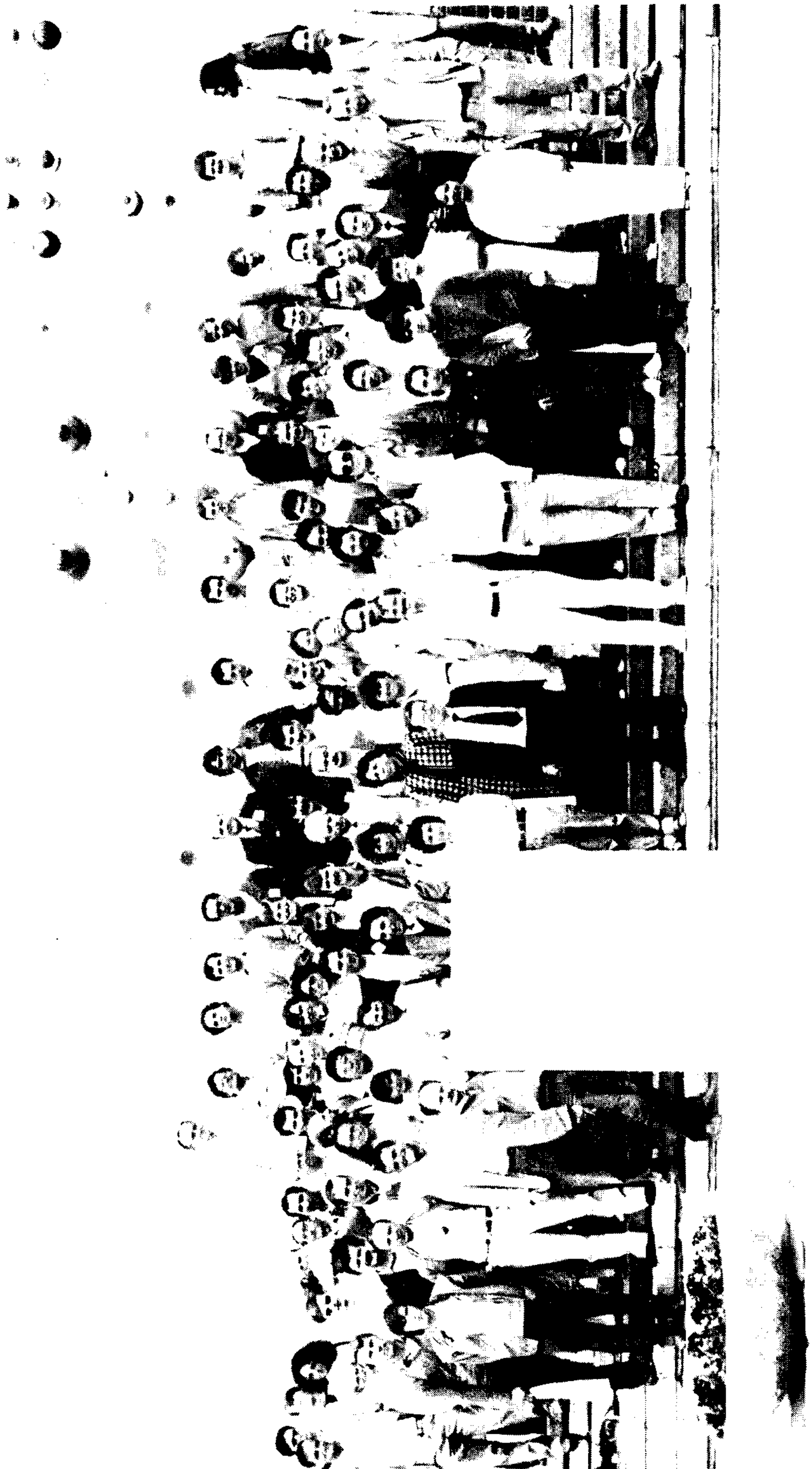
The large attendance of this colloquium (91 participants from 23 countries) speaks highly of the growth of our field since Haute Provence. For this reason alone, we may consider the meeting successful, because many researchers entered the lively discussions and exchanged ideas. It was not possible to reproduce the full discussion in this volume, but summaries of the three general discussions are included. We are happy to see that many young scientists have begun to study the symbiotic phenomenon, so we can expect an exciting crop of new results and revolutionary ideas for the next symbiotic colloquium !

It was a happy circumstance that the Colloquium was held in the beautiful old town of Torun which actually was the birthplace of Nicolas Copernicus the founder of Modern Astronomy. The first director of the Torun Astronomical Observatory at Piwnice, the late W. Dziewulski was very active in the field of variable stars, and a postumus work is included in these proceedings.

We are grateful to the other members of the scientific organizing committee, D. Allen, A. Boyarchuk, E. Brandi, M. Hack, S. Kwok, B. Paczynski, R. Stencel, and A. Woszczyk, for their assistance in preparing the scientific program. We especially acknowledge D. Allen, H. Nussbaumer and R. Stencel for their extra efforts, particularly in planning the conference agenda. Light curves supplied by J. Mattei of the AAVSO highlighted the long-term behaviour of symbiotic stars, and emphasized the vital role that amateur astronomers play in our attempts to understand these objects. We finally thank the presidents of IAU Commissions 27, 29, 42 and 44 for sponsoring the Colloquium.

We extend our heartfelt thanks to the local organizing committee, R. Biernikowicz, C. Iwaniszewska, M. Mikolajewski, B. Ridak, A. Woszczyk, and J. Ziolkowski. We are especially grateful to the chairman of this committee, Prof . A. Woszczyk, fot his careful attention to the many fine details and extracurricular activities that made this meeting so enjoyable. Additional thanks are due to many anonymous people for taking care of the day activities of a scientific meeting.

The Editors



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"Symbiotic stars are like platypus"

David Allen

A PERSPECTIVE ON THE SYMBIOTIC STARS

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ABSTRACT. I give a very brief summary of the state of our knowledge of the symbiotic stars, together with some of my hopes for how the field will develop.

1. PREAMBLE

The task of the introductory speaker at a conference is a challenging one. The more so since the words one might choose for the verbal presentation differ from what the reader will seek in the final publication. So, I have decided to cheat: the text you are now considering reading is not what you would have heard if you attended the conference ...well, only partly so. I have taken the liberty of using different titles for the two presentations, to reflect their distinct emphases. But in one important way I have not cheated. This paper was written before the conference, and has not subsequently been modified. It may contain errors that are corrected by later papers; that is the risk I take. On the other hand, it is as fair a summary as I can give, as useful an introduction as I can conceive, to the view of symbiotic stars prevalent early in August 1987. I sincerely hope that the papers which follow will so overthrow the contents of this introduction that you will have no interest in reading it twice.

What I will present in the limited space available here cannot be regarded as a review, but only as a perspective. I eschew references (subsequent papers surely contain ample) save to draw attention to the proceedings of the 1981 conferences on the subject (Stencel 1981; Friedjung & Viotti 1982), and the only book published to date on these stars (Kenyon 1986).

Although not a review, it is appropriate to illustrate this paper with one optical spectrum of a classical symbiotic star, to show just what it is that characterises these objects. Because it is in the optical that they were first recognised, and still are classified, I have not broadened the waveband. Features to note in the spectrum, reproduced on the next page, include the TiO bands of the cool giant in the red; the Balmer jump in emission that shows the blue continuum to be gaseous rather than stellar; the high-excitation emission lines (λ4686 of He II; λ6087 of [Fe VII]); and the unidentified bands at 6830, 7088 Å, which are markedly broader than atomic emission lines of comparable intensity.

J. Mikolajewska et al. (eds.), The Symbiotic Phenomenon, 3–9.