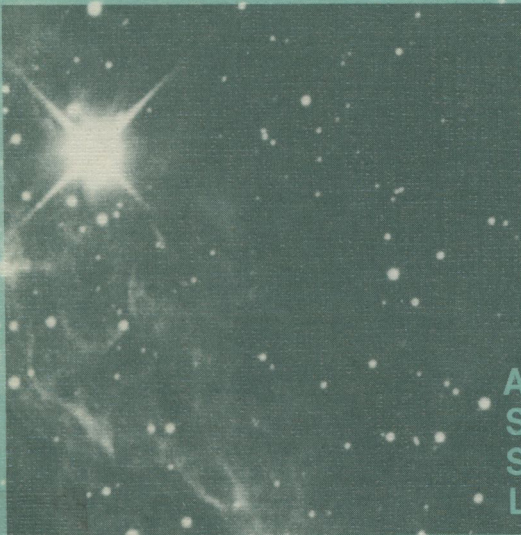


The Symbiotic Phenomenon

Joanna Mikolajewska
Michael Friedjung
Scott J. Kenyon
Roberto Viotti
(editors)



Astrophysics
Space
Science
Library

Kluwer Academic Publishers

THE SYMBIOTIC PHENOMENON

ASTROPHYSICS AND SPACE SCIENCE LIBRARY

A SERIES OF BOOKS ON THE RECENT DEVELOPMENTS
OF SPACE SCIENCE AND OF GENERAL GEOPHYSICS AND ASTROPHYSICS
PUBLISHED IN CONNECTION WITH THE JOURNAL
SPACE SCIENCE REVIEWS

Editorial Board

R.L.F. BOYD, *University College, London, England*

W. B. BURTON, *Sterrewacht, Leiden, The Netherlands*

L. GOLDBERG[†], *Kitt Peak National Observatory, Tucson, Ariz., U.S.A.*

C. DE JAGER, *University of Utrecht, The Netherlands*

J. KLECZEK, *Czechoslovak Academy of Sciences, Ondřejov, Czechoslovakia*

Z. KOPAL, *University of Manchester, England*

R. LÜST, *European Space Agency, Paris, France*

L. I. SEDOV, *Academy of Sciences of the U.S.S.R., Moscow, U.S.S.R.*

Z. ŠVESTKA, *Laboratory for Space Research, Utrecht, The Netherlands*

VOLUME 145
PROCEEDINGS

THE SYMBIOTIC PHENOMENON

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

Edited by

JOANNA MIKOLAJEWSKA

*Institute of Astronomy,
Nicolaus Copernicus University, Torun, Poland*

MICHAEL FRIEDJUNG

Institut d'Astrophysique (CNRS), Paris, France

SCOTT J. KENYON

*Harvard-Smithsonian Center for Astrophysics,
Cambridge, Massachusetts, U.S.A.*

and

ROBERTO VIOTTI

Istituto Astrofisica Spaziale (CNR), Frascati, Italy



KLUWER ACADEMIC PUBLISHERS

DORDRECHT / BOSTON / LONDON

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.

All Rights Reserved

© 1988 by Kluwer Academic Publishers

No part of the material protected by this copyright notice may be reproduced or
utilized in any form or by any means, electronic or mechanical
including photocopying, recording or by any information storage and
retrieval system, without written permission from the copyright owner.

Printed in The Netherlands

TABLE OF CONTENTS

Preface	xi
Group Photograph	xiii
List of Participants	xv
SESSION 1. THE BASIC DATA	1
A Perspective on the Symbiotic Stars D. Allen	3
Multifrequency Observations of Symbiotic Stars S.J. Kenyon	11
V 641 Cas - A Symbiotic Candidate? T. Tomov, M. Mikolajewski	23
Ultraviolet FeII Absorption Lines in HD 59643 J.E. Eaton	25
Orbital Radial Velocity Curves of Symbiotic Stars M.R. Garcia, S.J. Kenyon	27
Orbital Parameters of Three Symbiotic Stars E.M. Leibowitz, L. Formigini	33
Properties of Cool Stellar Components in S-Type Symbiotic Stars O.G. Taranova, B.F. Yudin	37
Absolute Energy Distributions for Selected Quiescent Symbiotic Stars M.H. Slovak, A.D. Code	43
Infrared Observations of Symbiotic Miras P.A. Whitelock	47
The Environments of Cool Stars R.E. Stencel	57

Dust Emission from Symbiotic Stars: Interpretation of IRAS Observations B.G. Anandarao, A.R. Taylor, S.R. Pottasch	65
Atmospheric Shocks in Mira Variables - MgII Emission E.W. Brugel, T.E. Beach, L.A. Willson, G.H. Bowen	67
The Radio Properties of Symbiotic Stars E.R. Seaquist	69
Radio Imaging of Symbiotic Stars A.R. Taylor	77
Observations of Bipolar Mass Flow from Symbiotic Stars J. Solf	85
Optical Polarimetry of Symbiotic Stars A.M. Magalhães	89
Polarimetry of Symbiotic Stars T.N. Khudyakova	101
The Present State of Symbiotic Polarimetry H.E. Schwarz, C. Aspin, A.M. Magalhães, R.E. Schulte - Ladbeck	103
SESSION 2. THE PHYSICS OF THE SYMBIOTIC PHENOMENON	105
Ionization Models of Symbiotic Stars H. Nussbaumer	107
Photoionization Models with Accretion Disks M. Vogel	119
Emission Line Ratio Classification of Symbiotic Stars H.E. Schwarz	123
Resonance Line Profiles from Radial Accretion Flows R. Tylenda	127
Colliding Winds in Symbiotic Systems S. Kwok	129
Accretion Disks in Symbiotic Stars W.J. Duschl	137
Accretion from Stellar Winds M. Livio	149

Thermonuclear Runaway Models for Symbiotic Novae S.J. Kenyon	161
On the Outburst of Symbiotic Stars H. Nussbaumer, M. Vogel	169
Thermonuclear Runaways on Accreting Hot White Dwarfs D. Prialnik, O. Regev	171
The Decay Time after a Thermonuclear Flash M. Orio	173
General Discussion on the Physics of Symbiotic Stars S.J. Kenyon	177
 SESSION 3. PHYSICS OF INDIVIDUAL OBJECTS	 179
Z Andromedae: Quiescence and Activity A. Cassatella, T. Fernandez-Castro, N. Oliverson	181
CI Cygni - The Well Understood Symbiotic Binary? J. Mikolajewska, M. Mikolajewski	187
A P Cygni Profile for the He 10830 A Line of CI Cyg in Eclipse S. Bensammar, M. Friedjung, N. Letourneur, J.P. Maillard	193
Symbiotic Eclipsing Binary Star CI Cyg. The Cold Component Variability T.S. Belyakina	197
AG Dra a Symbiotic Star with an Uncommon Cool Component M. Friedjung	199
Spectral Variations of AG Dra between 1981 and 1985 C.C. Huang, Y.F. Chen, L. Chen	205
CH Cyg: Ten Years of Activity P.L. Selvelli	209
CH Cygni Half a Century Ago - Changing Activity of the Cool Component W. Dziewulski, M. Muciek, M. Mikolajewski	219

Spectroscopic Orbit of the Eclipsing Symbiotic Star CH Cyg M. Mikolajewski, R. Szczerba, T. Tomov	221
Slow and Rapid Changes of the Radial Velocities in the Symbiotic Binary CH Cygni A. Skopal	223
Radial Velocities of CH Cyg Just as the Jets Appeared E. Janaszak, M. Mikolajewski	225
The Spectrum of CH Cygni - A Search for Rapid Line Variations T. Tomov, D. Raikova	227
Polarization in CH Cygni during Quiet and Active Phases M.H. Rodriguez	229
Continued Radio Activity from CH Cygni A.R. Taylor, E.R. Seaquist, S.J. Kenyon	231
An "Accretor-Propeller" Model of CH Cygni M. Mikolajewski, J. Mikolajewska	233
A Review of the R Aquarii System A.G. Michalitsianos, M. Kafatos	235
The Ultraviolet Spectrum of RX Puppis M. Kafatos, A.G. Michalitsianos	245
A Model for RX Puppis D.A. Allen, A.E. Wright	249
Symbiotic Star AG Pegasi - Retrospect and Prospects D. Chochol	251
The Observations of AG Peg during 1985-1987 A.A. Boyarchuk, T.S. Belyakina, A.E. Tarasov, T. Tomov	257
The Photometric Period of AG Pegasi R. Luthardt	259
The Causes of the Light Variations in AG Peg B.F. Yudin	261
Ultraviolet Variability of the Symbiotic Star AG Peg D. Chochol, Z. Komarek, A. Vittone	263

A New Absorption-Line Orbit for the Symbiotic Nova AG Pegasi M.H. Slovak, D.L. Lambert	265
The Symbiotic Novae R. Viotti	269
The Symbiotic Nova PU Vul (Kuwano-Honda Object): Some Results of Coordinated Investigations R.E. Gershberg, N.M. Shakhovskoj	279
The Spectroscopic Variations of the Symbiotic Nova PU Vul L. Hric, D. Chochol, B. Kovachev	283
Emission Line Analyses of HBV 475, V1016 Cyg and HM Sge S. Tamura	285
 SESSION 4. CONTRIBUTIONS FOR OTHER INDIVIDUAL OBJECTS	 287
 Photometric and Spectroscopic Variations of the Symbiotic Star EG Andromedae A. Skopal, D. Chochol, A. Vitone, A. Mammano	 289
The Search for the Elusive Companion of EG Andromedae J.E. Pesce, R.E. Stencel, N.A. Oliverson	291
The Symbiotic Star UV Aurigae P. Seal	293
The Third Galactic Carbon Symbiotic R.E. Schulte-Ladbeck, D.J. MacConnell, N. Zarate	295
BI Crucis A. Altamore, C. Rossi, R. Viotti	297
Effects of Eccentric Orbit of BF Cygni on IUE and Optical Spectra J. Mikolajewska, M. Mikolajewski	299
Ultraviolet to Near Infrared Observations of BF Cyg A. Cassatella, R. Gonzalez-Riestra, T. Fernandez-Castro, J. Fuensalida, A. Gimenez	301

Ultraviolet Variability of AX Persei J. Mikolajewska	303
IUE and Optical Observations of He 2-104 J.H. Lutz	305
Summary of Discussion on Individual Objects D. Allen	307
SESSION 5. SYMBIOTIC PHENOMENA AND STELLAR EVOLUTION. CONCLUSIONS.	309
The Formation and Evolution of Symbiotic Stars R.F. Webbink	311
Recurrent Novae M. Livio	323
Unravelling the Multiple Component Radio Emission of RS Oph in Outburst A.R. Taylor, M.F. Bode, R.J. Davis, R.W. Porcas	335
The 1987 Outburst of the Recurrent Nova U Sco K. Sekiguchi, M.W. Feast, P.A. Whitelock, M.D. Overbeek, W. Wargau, J. Spencer Jones	337
What Can We Learn from ζ Aur Binary Systems? K.P. Schröder	339
Summary of Final Discussion R.E. Stencel	347
Concluding Remarks M. Friedjung	349
Overheard in Torun	355
Subject Index	357
Object Index	363