

# The Realm of Interacting Binary Stars

J. Sahade, G. E. McCluskey, Jr.  
and Y. Kondo (eds.)



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# Realm Of Interacting Binary Stars

**Tomokazu Kogure, Kam-Ching Leung**



## **Realm Of Interacting Binary Stars:**

*The Realm of Interacting Binary Stars* J. Sahade, G.E. McCluskey, Y. Kondo, 2012-12-06 More than two centuries have elapsed since the story of the interacting binary stars began with the rediscovery of the variability of Algol by John Goodricke and the interpretation he proposed for explaining the regular periodic brightness variations which he found Over this long span of time our knowledge about these systems has been growing and we have now reached a fairly good understanding of the structure and behavior of this interesting group of objects This book contains a timely summary of our present knowledge of interacting binary stars The chapters have been written by distinguished scientists who have done relevant research in the field of interacting binary stars

**An Introduction to Close Binary Stars** R. W. Hilditch, 2001-03-12 Binary systems of stars are as common as single stars They are of fundamental importance because they allow stellar masses radii and luminosities to be measured directly and explain a host of diverse and energetic phenomena including X ray binaries cataclysmic variables novae symbiotic stars and some types of supernovae This 2001 book was the first to provide a pedagogical and comprehensive introduction to binary stars It combines theory and observations at all wavelengths to develop a unified understanding of binaries of all categories It comprehensively reviews methods for calculating orbits the Roche model ideas about mass exchange and loss methods for analysing light curves the masses and dimensions of different binary systems and imaging the surfaces of stars and accretion structures This book provides a thorough introduction to the subject for advanced undergraduate and graduate students Researchers will also find this to be an authoritative reference

**Evolutionary Processes in Interacting Binary Stars** Y. Kondo, R.F. Sisteró, R.S. Polidan, 1992-06-30 This book contains the proceedings of IAU Symposium No 151 Evolutionary Processes in Interacting Binary Stars which was held from 5 to 9 August 1991 in Cordoba Argentina The primary aim of this conference was to review and evaluate our current understanding of the evolutionary processes in wide variety of interacting binary stars from their births to their deaths Subjects included the formation of binaries mass flow and transfer accretion processes and binaries with collapsed components such as novae X ray binaries and binary pulsars As the field covered is both broad and diverse there were in all thirty seven invited talks sixty two contributed papers were also presented In addition these proceedings contain comments from a panel discussion of the major unsolved problems of interacting binary stars

Binary Stars: Selected Topics on Observations and Physical Processes F. C. Lazaro, M.J. Arevalo, 2008-01-11 More than half of all stars in the universe formed and evolved as binary systems and their study is essential for understanding stellar and galactic evolution The six lectures in this book give both a readable introduction and an up to date review of nearly all aspects of research into binary stars including the range from common binaries to more exotic systems composed of white dwarfs neutron stars and black holes

**Binary Stars as Critical Tools and Tests in Contemporary Astrophysics (IAU S240)** International Astronomical Union.

Symposium, 2007-08-27 IAU Symposium 240 held in conjunction with the 26th General Assembly of the International

Astronomical Union highlights the latest advances in the field of binary and multiple stars and was the first major meeting in recent years bringing together members of both the wide and close binary communities. Topics discussed ranged from common proper motion pairs and other fragile binaries to contact binaries and star brown dwarf planet systems exploring the numerous interests common to all binary star researchers. Highlights included talks on observing binaries using high angular and spectral resolution techniques, the impacts of new and planned large scale surveys, recent models for binary evolution, new methods for analyzing cataclysmic pairs and disentangling spectra, surveys of extragalactic eclipsing binaries, Doppler tomography and imaging and binaries as probes of the Galaxy's chemical and dynamical evolution. This volume will be an important reference source for binary star researchers for many years to come.

Reports on Astronomy Jacqueline Bergeron, 2012-12-06. IAU Transactions are published as a volume corresponding to each General Assembly. Volume A is produced prior to the Assembly and contains Reports on Astronomy prepared by each Commission President. The intention is to summarize the astronomical results that have affected the work of the Commission since the production of the previous Reports up to a time which is about one year prior to the General Assembly. Volume B is produced after the Assembly and contains accounts of Commission Meetings which were held together with other material. The reports included in the present volume range from outline summaries to lengthy compilations and references. Most reports are in English.

**Frontiers Of Space And Ground-Based Astronomy** Willem Wamsteker, Malcolm S. Longair, Y. Kondo, 2012-12-06. ROSAT Observations. G HASINGER. Max Planck Institut für extraterrestrische Physik D 85740 Garching Germany. Abstract: This review describes the most recent advances in the study of the extragalactic soft X-ray background and what we can learn about its constituents. The deepest pointed observations with the ROSAT PSPC are discussed. The  $\log N$   $\log S$  relation is presented which reaches to the faintest X-ray fluxes and to the highest AGN surface densities ever achieved. The  $N$   $S$  relation shows a 2 density in excess of 400 deg at the faintest fluxes and a flattening below the Einstein Deep Survey limit. About 60% of the extragalactic background has been resolved in the deepest field. Detailed source spectra and first optical and radio identifications will be discussed. The results are put into perspective of the higher energy X-ray background. Key words: X-rays background, radiations, active galactic nuclei.

1 Introduction. The extragalactic X-ray background (XRB) discovered about 30 years ago has been studied extensively with many X-ray experiments in particular with the satellites HEAO I and II (see e.g. Boldt 1987) and with ROSAT (e.g. Hasinger et al. 1993). Figure 1 shows a compilation of some of the most recent spectral measurements for the X-ray background. Over the energy range from 3 to about 100 keV its spectrum can be well approximated by an optically thin thermal bremsstrahlung model with  $kT \approx 40$  keV while at lower X-ray energies a steepening into a new component has been observed (e.g. ...).

*A Guide to Close Binary Systems* Edwin Budding, Osman Demircan, 2022-05-12. Introduction to Close Binary Systems provides a comprehensive survey and guide to the fast moving field of multiple specifically binary stars with an up to date account of research around close i.e. interacting pairs. Such interactions allow direct quantification of

stellar properties opening up factual insights into basic building blocks of the Universe The book provides a much needed update for the seminal Close Binary Systems of Zdeněk Kopal Following a comparable plan it presents relevant subject matter with an emphasis on building a framework of understanding to serve as a supporting resource for students and researchers The text starts from a general historical background and progresses into the main theoretical ideas supporting our *prima facie* interpretation of observations The central chapters explore further into these observational methods arranged according to the classic subdivisions of astrometry spectroscopy and photometry Optimal inversion of observational data into model parametrization is a theme through these chapters Significant here is the problem of how non uniqueness in modelling affects interpretation The underlying issues of stellar evolution bearing on observational evidence become paramount in the last four chapters The book proceeds step by step from directly understandable examples of unevolved pairs to the challenging cases where stars are found in more and more extreme conditions leading up to the mergers of massive black hole pairs seen in the new field of gravitational wave astronomy This is a valuable reference for postgraduate and advanced undergraduate students working in mainstream areas of stellar astrophysics with applications also to exoplanet research which shares some methodological features Course designers for stellar astrophysics will find a useful selection of topics within this book Key features Provides a well explained and backgrounded up to date account of close binary systems in a fast moving field of research that is growing in scientific importance Surveys a wide range of case studies within the context of binary and multiple star systems Fills an acknowledged gap in current literature Cover Image A public memorial to Zdeněk Kopal in his home town birthplace of Litomysl in Czechia

**Allen's Astrophysical Quantities** Clabon Walter Allen, Arthur N. Cox, 2000 This new fourth edition of Allen's classic *Astrophysical Quantities* belongs on every astronomer's bookshelf It has been thoroughly revised and brought up to date by a team of more than ninety internationally renowned astronomers and astrophysicists While it follows the basic format of the original this indispensable reference has grown to more than twice the size of the earlier editions to accommodate the great strides made in astronomy and astrophysics It includes detailed tables of the most recent data on General constants and units Atoms molecules and spectra Observational astronomy at all wavelengths from radio to gamma rays and neutrinos Planetary astronomy Earth planets and satellites and solar system small bodies The Sun normal stars and stars with special characteristics Stellar populations Cataclysmic and symbiotic variables supernovae Theoretical stellar evolution Circumstellar and interstellar material Star clusters galaxies quasars and active galactic nuclei Clusters and groups of galaxies Cosmology As well as much explanatory material and extensive and up to date bibliographies

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strides made in astronomy and astrophysics It includes detailed tables of the most recent data on General constants and units Atoms molecules and spectra Observational astronomy at all wavelengths from radio to gamma rays and neutrinos Planetary astronomy Earth planets and satellites and solar system small bodies The Sun normal stars and stars with special characteristics Stellar populations Cataclysmic and symbiotic variables supernovae Theoretical stellar evolution Circumstellar and interstellar material Star clusters galaxies quasars and active galactic nuclei Clusters and groups of galaxies Cosmology As well as much explanatory material and extensive and up to date bibliographies

*Cataclysmic Variables* A. Bianchini, M. Della Valle, M. Orio, 2012-12-06 Cataclysmic Variables CVs are well furnished laboratories in which one can investigate a number of important physical processes These processes include thermonuclear reactions nebular physics winds mass accretion phenomena on compact objects magnetohydrodynamics plasmas thermal and non thermal radiative processes relativistic phenomena dust formation etc In the recent year the most exciting development in our opinion was that the small cold and invisible secondary components of CVs were found to be the prime motors for the evolution of close binary systems disclosing new scenarios for research All branches of astronomy and astrophysics often take advantage of the new ideas brought by the study of CVs It is for this reason we believe that meetings on CVs are important for most of the astronomical community The idea of a Congress on CVs in Padova has been fluttering in the air for a few years After all we thought a large part of the scientific heritage of Padova and Asiago Observatories is represented by the study of variable stars and in particular of CVs as Prof L Rosino reminded us at the very beginning of the Congress We finally chose Abano Terme as the site of the Conference not merely because Abano is one of the most famous centers in Europe for mud therapy and astronomers easily suffer from rheumatism but also because we knew that a very hearty welcome from the Abano Municipality and touristic associations awaited us

The Astrophysics of Emission-Line Stars Tomokazu Kogure, Kam-Ching Leung, 2010-05-05 Many types of stars show conspicuous emission lines in their optical spectra These stars are broadly referred to as emission line stars Emission line stars are attractive to many people because of their spectacular phenomena and their amazing varieties and variability This book offers general information on emission line stars starting from a brief introduction to stellar astrophysics and then moving to a broad overview of emission line stars including early and late type stars as well as pre main sequence stars Detailed references and index are prepared for further reading Tomokazu Kogure's email address tkogure pa2 so net ne jp

**Variables Stars and the Astrophysical Returns of the Microlensing Surveys** Roger Ferlet, Jean Pierre Maillard, Brigitte Raban, 1997

**Multiple Stars across the H-R Diagram** Svetlana Hubrig, Monika Petr-Gotzens, Andrei Tokovinin, 2007-10-13 The ESO workshop Multiple Stars across the H R Diagram was held in Garching on 12-15 July 2005 The topics included observations of multiple stars from ground and space dynamical and stellar evolution in multiple systems effects of the environment on multiplicity formation and early evolution of multiple stars and special components of multiple stars chemically peculiar stars blue stragglers brown dwarfs etc Stars

show a marked tendency to be in systems of different multiplicity ranging from simple binaries and triples to globular clusters with  $N \geq 10$ . Modern observations give a frequency of binary and multiple stars in the Galactic field of up to 70% and between 5% and 20% of these systems are at least triple. There is evidence that the degree of multiplicity increases with primary mass. Many known multiple systems are too wide to have significant physical interaction between their components. However, tidal and  $N$ -body dynamical interactions are important even in relatively wide systems and probably lead to the shrinkage of inner orbits. This sets the stage for spectacular evolutionary processes such as Roche lobe overflow, mergers, supernovae formation of special components, etc. Only recently did we realize that some of these processes require at least three stars. The formation of multiple systems remains a difficult and challenging part of astrophysics, although it has been addressed at the Workshop only briefly.

**Reports on Astronomy** Immo Appenzeller, 2012-12-06 IAU Transactions are published as a volume corresponding to each General Assembly. Volume A is produced prior to the Assembly and contains Reports on Astronomy prepared by each Commission. The intention is to summarize the astronomical results that have affected the work of the Commission since the production of the previous Reports up to a time which is about one year prior to the General Assembly. Volume B is produced after the Assembly and contains accounts of Commission Meetings which were held together with other material. The reports included in the present volume range from outline summaries to lengthy compilations and references. Most reports are in English.

**Interacting Binary Stars** Jorge Sahade, Frank Bradshaw Wood, 2015-11-24 Interacting Binary Stars deals with the development, ideas and problems in the study of interacting binary stars. The book consolidates the information that is scattered over many publications and papers and gives an account of important discoveries with relevant historical background. Chapters are devoted to the presentation and discussion of the different facets of the field such as historical account of the development in the field of study of binary stars, the Roche equipotential surfaces, methods and techniques in space astronomy and enumeration of binary star systems that are studied meticulously by scientists. Astronomers, astrophysicists, physicists, researchers and students in related fields will find the book interesting.

**Astrophysics at Very High Energies** Felix Aharonian, Lars Bergström, Charles Dermer, 2013-04-04 With the success of Cherenkov Astronomy and more recently with the launch of NASA's Fermi mission, very high energy astrophysics has undergone a revolution in the last years. This book provides three comprehensive and up-to-date reviews of the recent advances in gamma-ray astrophysics and of multi-messenger astronomy. Felix Aharonian and Charles Dermer address our current knowledge on the sources of GeV and TeV photons gleaned from the precise measurements made by the new instrumentation. Lars Bergström presents the challenges and prospects of astroparticle physics with a particular emphasis on the detection of dark matter candidates. The topics covered by the 40th Saas-Fee Course present the capabilities of current instrumentation and the physics at play in sources of very high energy radiation to students and researchers alike. This book will encourage and prepare readers for using space and ground-based gamma-ray observatories as well as neutrino and other

multi messenger detectors      **Astrophysics in the Extreme Ultraviolet** Stuart Bowyer, Roger F. Malina, 2012-12-06 From the beginning of Space Astronomy the Extreme Ultraviolet band of the spectrum roughly defined as the decade in energy from 90 900 was deemed to be the unobservable ultraviolet Pioneering results from an EUV telescope on the Apollo Soyuz Mission in 1975 forcibly demonstrated that this view was incorrect but it required the all sky surveys of the English Wide Field Camera and the Extreme Ultraviolet Explorer to demonstrate the broad potential of this field Over 700 EUV sources have now been detected Over 150 researchers from 16 countries gathered to share results in this new field at the International Astronomical Union Colloquium No 152 Papers were presented on a wide variety of topics including cool star coronae white dwarf atmospheres and evolution neutron stars the Io torus cataclysmic variable stars active galactic nuclei the interstellar medium winds and atmospheres of early type stars and EUV plasma diagnostics Selected manuscripts from this meeting are provided in these Conference Proceedings      **Chromospherically Active Binary Stars** Alvaro Giménez, 1994      Cataclysmic Variable Stars Brian Warner, 2003-09-18 This timely volume provides the first comprehensive survey of cataclysmic variable stars integrating theory and observation into a single synthesised text



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