CAMBRIDGE

Astronomy & Astrophysics

Highlights

TEXTBOOK

An Introduction to Star Formation

Derek Ward-Thompson
Cardiff University
and Anthony P. Whitworth
Cardiff University

Guiding the reader through all the stages that lead to the formation of a star such as our Sun, this advanced textbook provides students with a complete overview of star formation. This unique, self-contained text combines theory with observation, and is ideal for students and professional researchers alike.

'Star formation is one of the most active research fields in modern astronomy and is also the key to understanding problems as diverse as galaxy evolution and the origin of planets. This book, written by two highly-regarded experts, first poses the questions that define the field of star formation and then gives a remarkably comprehensive yet concise survey of the underlying physics. The book provides both an overview suitable for those new to the field and also a convenient handbook for established researchers. It emphasizes both basic principles and established results and will surely remain a standard work for years to come.'
David Williams, Emeritus Perren Professor of Astronomy, University College London

Contents: 1. Introduction; 2. Probing star formation; 3. The ISM: the beginnings of star formation; 4. Molecular clouds: the sites of star formation; 5. Fragmentation and collapse: the road to star formation; 6. Young stars, proto-stars and accretion: building a typical star; 7. The formation of high-mass stars, and their surroundings; 8. By-products and consequences of star formation; Index.

2011 247 x 174 mm 228pp 81 b/w illus.
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GRADUATE TEXTBOOK

High Energy Astrophysics

Third edition

Malcolm S. Longair
University of Cambridge

The third edition of this well-established textbook is ideal for advanced undergraduate and beginning graduate courses in high energy astrophysics. Now consolidated into a single-volume treatment, this textbook has been completely rewritten, providing a strong astronomical and astrophysical background for students to explore more advanced topics.

'The third edition of Malcolm Longair's *High Energy Astrophysics* is a remarkable gem. It is written in the clear, lucid style that characterizes Professor Longair's monographs and displays an admirable balance between breadth and depth. It is remarkably up to date and covers both high-energy phenomenology and physical processes with authority. It would serve equally well as a textbook for a graduate-level course or a reference work for the practising astrophysicist: a nicely written and sophisticated appendix on basic astronomy will make it equally useful for readers trained as physicists.'
Bradley M. Peterson, Professor and Chair of Astronomy, Ohio State University

Contents: **Part I.** Astronomical Background: 1. High energy astrophysics – an introduction; 2. The stars and stellar evolution; 3. The galaxies; 4. Clusters of galaxies; **Part II.** Physical Processes: 5. Ionisation losses; 6. Radiation of accelerated charged particles and bremsstrahlung of electrons; 7. The dynamics of charged particles in magnetic fields; 8. Synchrotron radiation; 9. Interactions of high energy photons; 10. Nuclear interactions; 11. Aspects of plasma physics and magnetohydrodynamics; **Part III.** High Energy Astrophysics in our Galaxy: 12. Interstellar gas and magnetic fields; 13. Dead stars; 14. Accretion power in astrophysics; 15. Cosmic rays; 16. The origin of cosmic rays in our galaxy; 17. The acceleration of high energy particles; **Part IV.** Extragalactic High Energy Astrophysics: 18. Active galaxies; 19. Black holes in the nuclei of galaxies; 20. The vicinity of the black hole; 21. Extragalactic radio sources; 22. Compact extragalactic sources and superluminal motions; 23. Cosmological aspects of high energy astrophysics; Appendix; References; Index.

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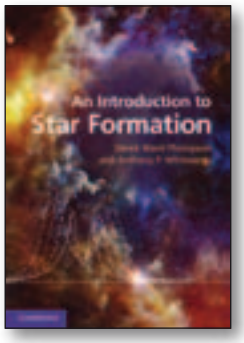

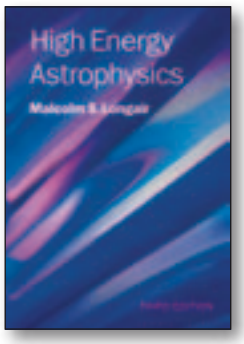

Contents

Highlights.....1
Astronomy and Astrophysics.....2
Cosmology and Relativity.....4
Solar and Space Physics.....5
Planetary Sciences and Astrobiology...6
Proceedings of the IAU.....9
Also of Interest.....10
Professional Development..... 10

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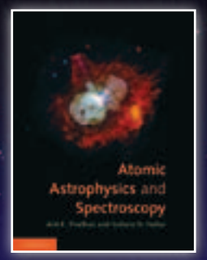

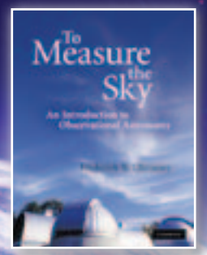

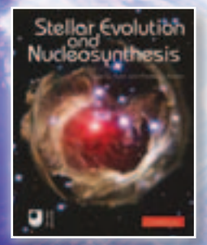

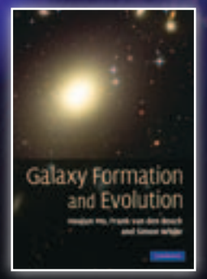

GRADUATE TEXTBOOK

Atomic Astrophysics and Spectroscopy

Anil K. Pradhan
Ohio State University
and Sultana N. Nahar
Ohio State University

Bridging the gap between physics and astronomy, this is the first integrated graduate-level textbook on atomic astrophysics. It covers the basics of atomic physics and astrophysics, and state-of-the-art research applications, methods and tools. A website hosted by the authors, containing updates, corrections, exercises and solutions, is available at ww.cambridge.org/9780521825368.

'This is a *very* important book that bridges the gap between modern atomic physics and modern astrophysics. It covers all the essential subjects, and is very well written. I think it will be of considerable value to research workers in both broad areas, to professors who wish to teach about the subjects, and to students. I expect that it will be very well received by both communities. I'm happy that Cambridge [University Press] will add this book to its distinguished series of books in physics and astrophysics.'
Dimitri Mihalas, G. C. McVittie Professor Emeritus, University of Illinois and Laboratory Fellow, Los Alamos National Laboratory

Contents: 1. Introduction; 2. Atomic structure; 3. Atomic processes; 4. Radiative transitions; 5. Electron-ion collisions; 6. Photoionization; 7. Electron-ion recombination; 8. Multi-wavelength emission spectra; 9. Absorption lines and radiative transfer; 10. Stellar properties and spectra; 11. Stellar opacity and radiative forces; 12. Gaseous nebulae and HII regions; 13. Active galactic nuclei and quasars; 14. Cosmology; Appendices; References; Index.

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Astronomy and Astrophysics

TEXTBOOK

To Measure the Sky

An Introduction to Observational Astronomy

Frederick R. Chromey
Vassar College, New York

With a lively yet rigorous and quantitative approach, this textbook introduces the fundamental topics in optical observational astronomy for undergraduates. It explains the theoretical foundations for observational practices and reviews essential physics to support students' mastery of the subject. Student understanding is strengthened through over 120 exercises and problems.

'I like this book a lot and think it is a valuable contribution to the education of undergraduates. It is a wide-ranging and thorough survey of the techniques common to astronomical observing in the optical and infrared wavelengths … The treatment throughout is both accurate and responsible. I know of no comparable book.'
Jay M. Pasachoff, Williams College

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187 b/w illus. 40 tables 121 exercises
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TEXTBOOK

Stellar Evolution and Nucleosynthesis

Sean G. Ryan
University of Hertfordshire
and Andrew J. Norton
The Open University, Milton Keynes

An ideal bridging text for astrophysics and physics majors looking to move on from the introductory texts.

***'Stellar Evolution and Nucleosynthesis* provides a fine, insightful, and remarkably complete introduction to modern astrophysics that is both well written and illustrated. A logical flow, attention to detail, worked examples, and end-of-chapter summaries are especially good in creating an effective learning environment.'**
Jim Kaler, Professor Emeritus of Astronomy, University of Illinois

Contents: 1. Main sequence stars; 2. Gravitational contraction; 3. Nuclear fusion; 4. From main-sequence to giant branch; 5. Helium-burning stars; 6. Late stages of stellar evolution; 7. Supernovae, neutron stars and black holes; 8. Star formation; Index.

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TEXTBOOK

Extreme Environment Astrophysics

Ulrich Kolb
The Open University, Milton Keynes

Covering host systems of accreting, relativistic bodies, and the high-energy phenomena associated with them, this self-contained astrophysics textbook is ideal for advanced undergraduates. Worked examples, exercises with complete solutions, full-colour figures and informative chapter summaries guide students through their studies, and boxed equations and key facts highlight important points.

'This is a very readable, well-written and beautifully illustrated account of some of the most exciting and energetic phenomena in the Universe. The treatment is aimed at the senior undergraduate level but the clarity of the text and the carefully worked examples and exercises make it accessible and interesting to a much wider audience. This book will be appreciated by everyone wishing to know about accreting binaries, active galactic nuclei and gamma-ray bursts, from astronomy and physics undergraduates to research astrophysicists.'
Juhan Frank, Louisiana State University

Contents: 1. Accretion power; 2. Formation and evolution of accretion-powered compact binaries; 3. Steady-state accretion; 4. Accretion disc outbursts; 5. Indirect imaging of accreting systems; 6. High-energy emission from compact accretors; 7. Relativistic outflows; 8. Gamma-ray bursts; Index.

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GRADUATE TEXTBOOK

Galaxy Formation and Evolution

Houjun Mo
University of Massachusetts, Amherst
Frank van den Bosch
Yale University, Connecticut
and Simon White
MPI fur Astrophysik, Munchen

Covering diverse topics from astronomy, particle physics, and cosmology, this book is ideal for researchers entering the field. Emphasizing both observational and theoretical aspects, the book provides a coherent introduction to the broad range of science underlying the formation and evolution of galaxies.

'Mo, van den Bosch, and White have written a comprehensive text on the modern subject of galaxy formation and evolution. The book is fully self-contained, covering the basic theory in depth, and including the essential background material on observations and the relevant theory from extragalactic astronomy, stellar astrophysics, and cosmology. It will serve as an indispensable reference for students and researchers alike, and is destined to become a classic in this field.'
Robert C. Kennicutt, Jr, Plumian Professor of Astronomy and Experimental Philosophy, and Director, Institute of Astronomy, University of Cambridge

2010 247 x 174 mm 840pp
160 b/w illus.
978-0-521-85793-2 Hardback £50.00 / US$85.00
eBook available
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The High Energy Universe

Ultra-High Energy Events in Astrophysics and Cosmology

Péter Mészáros
Pennsylvania State University

Written in a concise and accessible language, this book provides an overview of high energy, particle and gravitational astrophysics. It will be suitable for undergraduate and graduate students, as well as other readers interested in the subject. Colour versions of a selection of the figures are available at ww.cambridge.org/9780521517003.

2010 247 x 174 mm 222pp
73 b/w illus. 4 tables
978-0-521-51700-3 Hardback £35.00 / US$59.00
eBook available
www.cambridge.org/9780521517003

TEXTBOOK

Introduction to High-Energy Astrophysics

Stephan Rosswog
Jacobs University Bremen
and Marcus Brüggen
Jacobs University Bremen

High-energy astrophysics covers cosmic phenomena that occur under the most extreme physical conditions. This 2007 textbook is a self-contained, relevant exploration of this exciting field. Written for undergraduate students studying high-energy astrophysics, each chapter ends with exercises.

'… it makes an easy transition to the applications of physics to astrophysics … The book is well constructed and develops derivations and explanations that are presented in logical sequences of thought with an ease characteristic of few books of its kind …This is an excellent choice for the bookshelves of current and aspiring astrophysicists … Summing Up: Highly recommended.'
Choice Reviews Online

2011 244 x 170 mm 366pp
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www.cambridge.org/9780521674423

Stars and their Spectra

An Introduction to the Spectral Sequence

Second edition

James B. Kaler
University of Illinois, Urbana-Champaign

Revised and expanded, the second edition of this popular book provides a thorough introduction to stellar spectra. Each chapter explores a different star type, including new classes L and T. With modern digital spectra and updates from two decades of astronomical discoveries, it is invaluable for amateur astronomers and students.

2011 247 x 174 mm 422pp
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978-0-521-89954-3 Hardback
c. £30.00 / US$50.00
Publication August 2011
www.cambridge.org/9780521899543

Exploring the X-ray Universe

Second edition

Frederick D. Seward
Harvard-Smithsonian Center for Astrophysics
and Philip A. Charles
South African Astronomical Observatory, Sutherland

Capturing the excitement and accomplishments of X-ray astronomy, this second edition now includes a broader range of astronomical phenomena and dramatic new results from the most powerful X-ray telescopes. Ideal for undergraduate students, it is supported by over 300 figures, and more specialized technical points separated in boxes.

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The Multiwavelength Atlas of Galaxies

Glen Mackie
Swinburne University of Technology, Victoria

Unveiling the secrets of some of the best-observed galaxies, this atlas contains over 250 full-color images spanning the whole electromagnetic spectrum. It explains why we see stars, gas and dust through different radiation processes, and describes the instruments used. An accompanying website contains slide shows of the galaxies.

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AGN Feedback in Galaxy Formation

Edited by Vincenzo Antonuccio-Delogu
Istituto Nazionale di Astrofisica (INAF), Catania, Italy
and Joseph Silk
University of Oxford

Featuring contributions from well-respected researchers in the field, and bringing together work by specialists in both galaxy formation and AGN, this volume addresses a number of key questions about AGN feedback in the context of galaxy formation. It is intended for use by both researchers and graduate students in astrophysics.

Cambridge Contemporary Astrophysics

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Black Holes

Edited by Mario Livio
Space Telescope Science Institute, Baltimore
and Anton M. Koekemoer
Space Telescope Science Institute, Baltimore

Written by leading experts, these review papers explore the many aspects of black hole astrophysics. Topics range from black hole entropy, the fate of information, and supermassive black holes, to collider experiments and the measurements of black hole spins. This is an invaluable resource for researchers and graduate students.

Space Telescope Science Institute Symposium Series, 21

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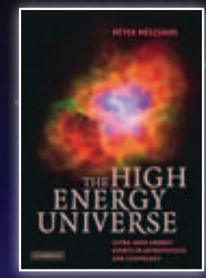
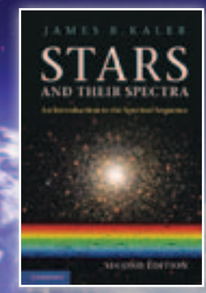
Advancing Variable Star Astronomy

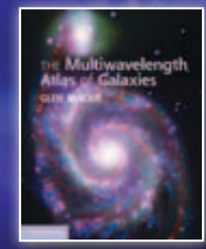
The Centennial History of the American Association of Variable Star Observers

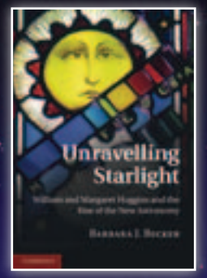
Thomas R. Williams
American Association of Variable Star Observers
and Michael Saladyga
American Association of Variable Star Observers

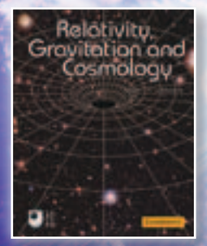
Marking the AAVSO's centennial year, this timely book presents an authoritative and accurate history of this important association. Moving chronologically through five eras of variable star astronomy, the authors discuss the evolution of the AAVSO's

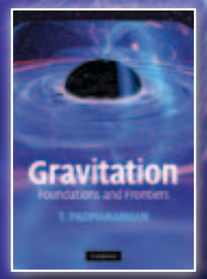












structure and purpose, focusing on the thousands of individuals who have made its progress possible.

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A Photographic Atlas of Selected Regions of the Milky Way

Edward Emerson Barnard
Yerkes Observatory, Wisconsin
Foreword by Gerald Orin Dobek
Northwestern Michigan College

Reproduced in print for the first time, this book combines both volumes of Barnard's *Photographic Atlas of Selected Regions of the Milky Way*. It directly replicates Barnard's text, with high resolution images of the original photographic plates, and a pull-out of the 50 plates combined in a panorama.

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'… a must for anyone interested in the history of deep sky observing.'
Astronomy Now

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Unravelling Starlight

William and Margaret Huggins and the Rise of the New Astronomy
Barbara J. Becker
University of California, Irvine

Challenging traditional accounts of the origins of astrophysics, this book re-examines the life and career of nineteenth-century English amateur astronomer William Huggins and his wife, Margaret Huggins. Written in an engaging style, this book will be valuable to scientists, students and anyone interested in the history of astronomy.

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Cosmology and Relativity

TEXTBOOK

Observational Cosmology

Stephen Serjeant
The Open University, Milton Keynes

A comprehensive and up-to-date treatment of observational cosmology, this advanced undergraduate textbook enables students to use quantitative physical methods to understand the Universe. It contains full-colour figures, worked examples, exercises with solutions, and clearly identifiable key facts and equations. Suggestions for further reading provide jumping-off points for further study.

'An impressively complete and beautifully illustrated overview of our current understanding of cosmology. Serjeant achieves a nice balance between the excitement of results from the forefront of research and a clear presentation of the basic tools needed to understand them.'
Professor John Peacock FRS, University of Edinburgh

Contents: 1. Space and time; 2. The cosmic microwave background; 3. The local Universe; 4. The distant optical Universe; 5. The distant multiwavelength Universe; 6. Black holes; 7. Gravitational lensing; 8. The intervening Universe; Epilogue; Appendices; Solutions; Index.

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TEXTBOOK

Relativity, Gravitation and Cosmology

Robert J. A. Lambourne
The Open University, Milton Keynes

Aimed at advanced undergraduates, this self-contained textbook covers the key ideas of special and general relativity and their applications. In full colour, it contains numerous worked examples and exercises with solutions. Key points and equations are highlighted, and each chapter ends with a summary list of important concepts and results.

'The author has done a great job of producing a text suitable for upper level undergrads and even first year graduate students. The graphics are very good and I particularly appreciate the concise chapter summaries and the exercises with solutions. Students will love this text. I will definitely use it in my upper division classes.'
John Huchra, Harvard University

Contents: 1. Special relativity and spacetime; 2. Special relativity and physical laws; 3. Geometry and curved spacetime; 4. General relativity; 5. The Schwarzschild solution and black holes; 6. Testing general relativity; 7. Cosmological solutions; 8. Our Universe; Index.

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GRADUATE TEXTBOOK

Gravitation

Foundations and Frontiers
T. Padmanabhan
Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India

Covering all aspects of gravitation in a contemporary style, this advanced textbook is ideal for graduate students and researchers. Its modular structure allows different sections to be combined to suit a variety of courses. There are more than 200 exercises and over 30 in-depth projects.

'This book is immensely impressive. It is full of insights and derivations that do not appear in other books. The serious student will appreciate the extensive coverage of advanced topics, notably of actions. One might say, the book is action-packed.'
Andrew J. S. Hamilton, Professor of Astrophysics, University of Colorado, Boulder

Contents: 1. Special relativity; 2. Scalar and electromagnetic fields in special relativity; 3. Gravity and spacetime geometry: the inescapable connection; 4. Metric tensor, geodesics and covariant derivative; 5. Curvature of spacetime; 6. Einstein's field equations and gravitational dynamics; 7. Spherically symmetric geometry; 8. Black holes; 9. Gravitational waves; 10. Relativistic cosmology; 11. Differential forms and exterior calculus; 12. Hamiltonian structure of general relativity; 13. Evolution of cosmological perturbations; 14. Quantum field theory in curved spacetime; 15. Gravity in higher and lower dimensions; 16. Gravity as an emergent phenomenon; Notes; Index.

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Numerical Relativity

Solving Einstein's Equations on the Computer
Thomas W. Baumgarte
Bowdoin College, Maine
and Stuart L. Shapiro
University of Illinois, Urbana-Champaign

Aimed at students and researchers entering the field, this pedagogical introduction to numerical relativity will also interest scientists seeking a broad survey of its challenges and achievements. The book contains 300 exercises, numerous illustrations (many in color), summary boxes, and applications to help readers master the subject.

'Over the last five years, there have been impressive advances in numerical relativity. It has now become a central area in the fast growing field of gravitational wave physics. These tools have played an important role also in the theory of critical phenomena associated with gravitational collapse, loop quantum cosmology and the discussion of quantum black holes and black branes. The book by Baumgarte and Shapiro provides an excellent introduction to the subject covering both, mathematical aspects and numerical techniques. The authors are world leaders in numerical relativity and their contributions have shaped neutron star simulations, the new frontier of this field. This book will soon become the standard advanced text for younger researchers entering the field and will also serve as the authoritative reference for senior researchers in numerical relativity and neighboring fields.'
Abhay Ashtekhar, Director, Institute for Gravitation and the Cosmos, Pennsylvania State University

2010 246 x 189 mm 720pp
97 b/w illus. 68 colour illus. 300 exercises
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eBook available
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An Illustrated Guide to Relativity

Tatsu Takeuchi
Virginia Polytechnic Institute and State University

This unique book explains Einstein's special theory of relativity pictorially, using diagrams rather than equations. It maintains the logic and rigor necessary for physics students, yet is simple enough to be understood by non-scientists. The book also contains entertaining problems which challenge the reader's understanding of the materials covered.

2010 228 x 152 mm 266pp 137 colour illus. 69 exercises
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978-0-521-76394-3 Hardback £45.00 / US$75.00
eBook available
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Dark Energy

Theory and Observations
Luca Amendola
Osservatorio Astronomico di Roma, Monte Porzio
and Shinji Tsujikawa
Tokyo University of Science

Introducing the theoretical ideas, observational methods and results, this textbook is a thorough introduction to the exciting field of dark energy. Ideally suited to graduate courses on dark energy it contains problems with full solutions. Any calculations are worked through step-by-step.

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63 b/w illus. 44 exercises
978-0-521-51600-6 Hardback £45.00 / US$75.00
eBook available
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Dark Energy

Observational and Theoretical Approaches
Edited by Pilar Ruiz-Lapuente
Universitat de Barcelona

Covering the topic from its origin, through recent developments to its future perspectives, this book is a complete and comprehensive introduction to dark energy. It is ideal for physics graduate students who have just entered the field and researchers seeking an authoritative reference on the topic.

2010 247 x 174 mm 338pp 70 b/w illus.
978-0-521-51888-8 Hardback £40.00 / US$70.00
eBook available
www.cambridge.org/9780521518888

Canonical Gravity and Applications

Cosmology, Black Holes, and Quantum Gravity
Martin Bojowald
Pennsylvania State University

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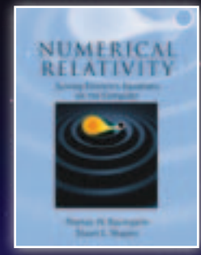

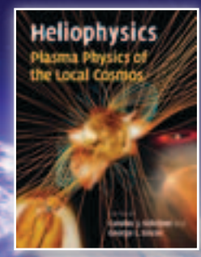

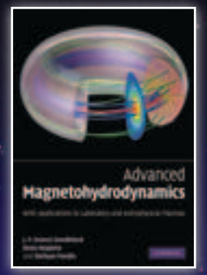

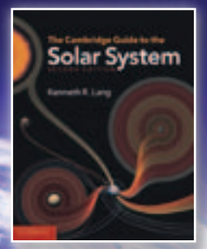

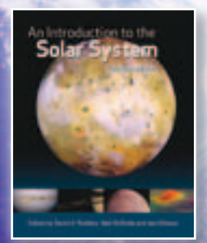

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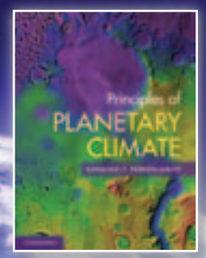

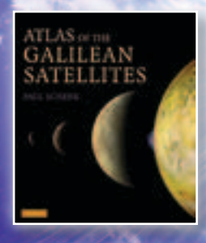

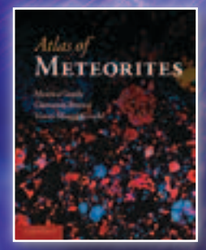

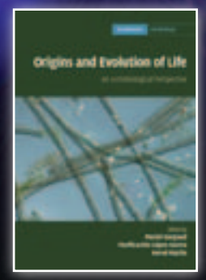

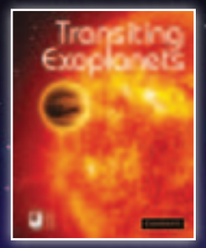

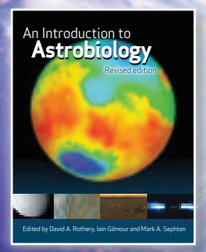

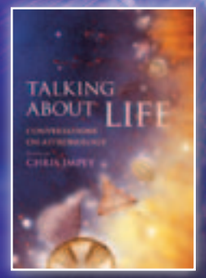

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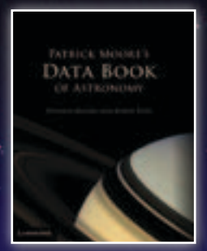

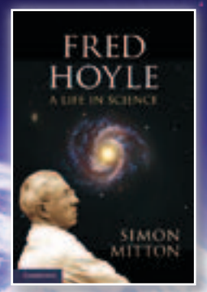

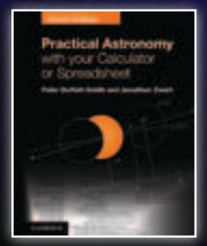

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