重力波と宇宙論
関係書ご案内 (May 2018)

　昨年のノーベル物理学賞にアメリカの三人の重力波研究者が選ばれました。これを頂点として、重力波研究は社会的にも注目を浴び、日本においても本格的な観測が始まっております。ここ数年に出版されました重力波と宇宙論に関係する研究書をご案内いたします。お見積りご依頼、見計らい希望などお気軽にお申込み下さい。

1. ## Advanced Interferometers and the Search for Gravitational Waves
Lectures from the First VESF School on Advanced Detectors for Gravitational Waves
(Series: Astrophysics and Space Science Library)
March 2014, 387 pages, Hardcover　(Springer)
ISBN 9783319037912　**¥23,630**

The search for gravitational radiation with optical interferometers is gaining momentum worldwide. Beside the VIRGO and GEO gravitational wave observatories in Europe and the two LIGOs in the United States, which have operated successfully during the past decade, further observatories are being completed (KAGRA in Japan) or planned (ILIGO in India). The sensitivity of the current observatories, although spectacular, has not allowed direct discovery of gravitational waves. The advanced detectors (Advanced LIGO and Advanced Virgo), at present in the development phase, will improve sensitivity by a factor of 10, probing the universe up to 200 Mpc for signal from inspiraling binary compact stars. This book covers all experimental aspects of the search for gravitational radiation with optical interferometers. Every facet of the technological development underlying the evolution of advanced interferometers is thoroughly described, from configuration to optics and coatings, and from thermal compensation to suspensions and controls. All key ingredients of an advanced detector are covered, including the solutions implemented in first-generation detectors, their limitations, and how to overcome them. Each issue is addressed with special reference to the solution adopted for Advanced VIRGO, but constant attention is also paid to other strategies, in particular those chosen for Advanced LIGO.

2. ## Astrophysics of Black Holes
From Fundamental Aspects to Latest Developments
(Astrophysics and Space Science Library, Vol 440)
Edited by Cosimo Bambi
July 2016, 207 pages, Hardcover　(Springer)
ISBN 9783662528570　**¥25,780**

This book discusses the state of the art of the basic theoretical and observational topics related to black hole astrophysics. It covers all the main topics in this wide field, from the theory of accretion disks and formation mechanisms of jet and outflows, to their observed electromagnetic spectrum, and attempts to measure the spin of these objects. Black holes are one of the most fascinating predictions of general relativity and are currently a very hot topic in both physics and astrophysics. In the last five years there have been significant advances in our understanding of these systems, and in the next five years it should become possible to use them to test fundamental physics, in particular to predict the general relativity in the strong field regime. The book is both a reference work for researchers and a textbook for graduate students.

3. ## The Black Hole-Neutron Star Binary Merger in Full General Relativity
Dependence on Neutron Star Equations of State
(Series: Springer Theses)
by Koutarou Kyutoku
June 2013,　178 pages, Hardcover　(Springer)
ISBN 9784431542001　**¥23,630**

This thesis presents a systematic study of the orbital evolution, gravitational wave radiation, and merger remnant of the black hole–neutron star binary merger in full general relativity for the first time. Numerical-relativity simulations are performed using an adaptive mesh refinement code, SimulAtor for Compact objects in Relativistic Astrophysics (SACRA), which adopts a wide variety of zero-temperature equations of state for the neutron star matter.

Gravitational waves provide us with quantitative information on the neutron star compactness and equation of state via the cutoff frequency in the spectra, if tidal disruption of the neutron star occurs before the binary merges. The cutoff frequency will be observed by next-generation laser interferometric ground-based gravitational wave detectors, such as Advanced LIGO, Advanced VIRGO, and KAGRA.

The author has also determined that the mass of remnant disks are sufficient for the remnant black hole accretion disk to become a progenitor of short-hard gamma ray bursts accompanied by tidal disruptions and suggests that overspinning black holes may not be formed after the merger of even an extremely spinning black hole and an irrotational neutron star.

4. ## Canonical Quantum Gravity
Fundamentals and Recent Developments
by Francesco Cianfrani, Orchidea Maria Lecian,

Matteo Lulli, & Giovanni Montani
July 2014, 200 pages, Hardcover (World Scientific)
ISBN 9789814556644   **¥23,470**

This book aims to present a pedagogical and self-consistent treatment of the canonical approach to Quantum Gravity, starting from its original formulation to the most recent developments in the field.

We start with a rapid and original introduction to the formalism and concepts on which General Relativity has been built up, giving all the information necessary in the later analysis. The Lagrangian approach to the Einsteinian Theory is then presented in some detail, underlining the parallelism with non-Abelian gauge theories. Then the basic concepts of the canonical approach to Quantum Mechanics are provided, focusing on all those formulations which are relevant for the Canonical Quantum Gravity problem. The Hamiltonian formulation of General Relativity and its constrained structure is then analyzed by comparing different formulations and the resulting quantum dynamics, described by the Wheeler DeWitt equation, is fully discussed in order to outline its merits and limits. Then, the reformulation of the Canonical Quantum Gravity in terms of the Ashtekar Barbero Immirzi variable is faced, by a detailed and complete discussion of the resulting Loop Quantum Gravity Theory. Finally, we provide a consistent picture of canonical Quantum Cosmology, by facing the main features of the Wheeler De Witt equation for the homogeneous Bianchi models and then by a detailed treatment of Loop Quantum Cosmology, including very recent developments.

5. Centennial of General Relativity
A Celebration

Edited by Cesar Augusto Zen Vasconcellos
Dec 2016, 300 pages, Hardcover, (World Scientific)
ISBN 9789814699655   **¥20,510**

It has been over 100 years since the presentation of the Theory of General Relativity by Albert Einstein, in its final formulation, to the Royal Prussian Academy of Sciences. To celebrate 100 years of general relativity, World Scientific publishes this volume with a dual goal: to assess the current status of the field of general relativity in broad terms, and discuss future directions. The volume thus consists of broad overviews summarizing major developments over the past decades and their perspective contributions.

Readership: Undergraduate and graduate students as well as researchers in the field of astrophysics and cosmology.

CONTENTS: General Relativity and Compact Stars (Norman K Glendenning). Non-Spherical Compact Stellar Objects in Einstein's Theory of General Relativity (Omair Zubairi and Fridolin Weber). Pseudo-Complex General Relativity: Theory and Observational Consequences (Peter O Hess and Walter Greiner). Strange Matter: A State before Black Hole (Renxin Xu and Yanjun Guo). Building Non-Spherical Cosmic Structures (Roberto A Sussman). Cosmology after Einstein (Marc Lachièze-Rey). Highlights of Standard Model Results from ATLAS and CMS (Cristina Biino). Beyond the Standard Model Searches at ATLAS and CMS (Géraldine Conti). Results from LHCb (Katharina Müller). TeV Astrophysics: Probing the Relativistic Universe (Ulisses Barres de Almeida). Observation of Gravitational Waves from a Binary Black Hole Merger (B P Abbott et al.)

6. The Cosmological Singularity

(Series: Cambridge Monographs on Mathematical Physics)

By Vladimir Belinski & Marc Henneaux
Dec 2017, 278 pages, Hardcover   (Cambridge U.P.)
ISBN 9781107047471   **¥24,340**

Written for researchers focusing on general relativity, supergravity, and cosmology, this is a self-contained exposition of the structure of the cosmological singularity in generic solutions of the Einstein equations, and an up-to-date mathematical derivation of the theory underlying the Belinski–Khalatnikov–Lifshitz (BKL) conjecture on this field. Part I provides a comprehensive review of the theory underlying the BKL conjecture. The generic asymptotic behavior near the cosmological singularity of the gravitational field, and fields describing other kinds of matter, is explained in detail. Part II focuses on the billiard reformulation of the BKL behavior. Taking a general approach, this section does not assume any simplifying symmetry conditions and applies to theories involving a range of matter fields and space-time dimensions, including supergravities. Overall, this book will equip theoretical and mathematical physicists with the theoretical fundamentals of the Big Bang, Big Crunch, Black Hole singularities, the billiard description, and emergent mathematical structures.

7. Cosmology, Gravitational Waves and Particles

Proceedings of the Conference Conference on Cosmology, Gravitational Waves and Particles Nanyang Technological University, Singapore, 6 - 10 February 2017

Edited by Harald Fritzsch
Jan 2018, 350 pages, Hardcover   (World Scientific)
ISBN 9789813231795   **¥22,250**

In February 2016, physicists announced the breakthrough discovery of the gravitational waves, which were predicted by Albert Einstein in his century-old theory of General Relativity. These gravitational waves were emitted as a result of the collision of two massive black holes that happened about 1.3 billion years ago. They were discovered at the Laser Interferometer Gravitational-Wave Observatory (LIGO) in the United States and thus marked a new milestone for physics. However, it remains unclear to physicists how the gravitational interaction can be included in the Standard Theory of particle physics which describes the electroweak and the strong interactions in our universe.

In this volume are the lectures, given by the speakers at the conference on cosmology and particle physics. The discussed topics range from gravitational waves to cosmology, dark matter, dark energy and particle physics beyond the Standard Theory.

8. Einstein and Others: Unification

(Series: Contemporary Fundamental Physics)
Edited by Valeriy V. Dvoeglazov & Alberto Molgado
Dec 2018, 227 pages, Hardcover   (Nova Science)
ISBN 9781634632768   **¥35,640**

We continue the Book Series ``Contemporary Fundamental Physics". The thematic issue ¡°Einstein and Others: Unification¡± contains articles related to the problem of the unification of interactions and to other fundamental problems of the modern physics. The book includes an Editorial Introduction, and nine articles. This book may be considered as continuation of the books "Einstein and Poincare: The Physical Vacuum" and "Einstein and Hilbert: Dark Matter", published by us a few years ago. The authors are: S. Capozziello, M. De Laurentis, L. Fabbri and S. Vignolo, D. J. Cirilo Lombardo, S. I. Kruglov, V. V. Varlamov and M. V. Beloborodova, C. Pierre, W. A. Rodrigues Jr. and E. Capelas de Oliveira, A. Krasulin, and V. V. Dvoeglazov.

9. Experimental Search for Quantum Gravity

(FIAS Interdisciplinary Science Series)

Dec 2017, 120 pages, Hardcover (Springer)
ISBN 9783319645360 **¥17,190**

This book summarizes recent developments in the research area of quantum gravity phenomenology. A series of short and nontechnical essays lays out the prospects of various experimental possibilities and their current status. Finding observational evidence for the quantization of space-time was long thought impossible. In the last decade however, new experimental design and technological advances have changed the research landscape and opened new perspectives on quantum gravity. Formerly dominated by purely theoretical constructions, quantum gravity now has a lively phenomenology to offer. From high precision measurements using macroscopic quantum oscillators to new analysis methods of the cosmic microwave background, no stone is being left unturned in the experimental search for quantum gravity.

This book sheds new light on the connection of astroparticle physics with the quantum gravity problem. Gravitational waves and their detection are covered. It illustrates findings from the interconnection between general relativity, black holes and Planck stars. Finally, the return on investment in quantum-gravitation research is illuminated. The book is intended for graduate students and researchers entering the field.

10. Exploring the Early Universe with Gravitational Waves

(Series: Springer Theses)
by Laura Bianca Bethke
May 2015, 139 pages, Hardcover (Springer)
ISBN 9783319174488 **¥23,630**

This work investigates gravitational wave production in the early universe and identifies potentially observable features, thereby paving the way for future gravitational wave experiments. It focuses on gravitational wave production in two scenarios: inflation in a model inspired by loop quantum gravity, and preheating at the end of inflation. In the first part, it is demonstrated that gravitational waves' spectrum differs from the result obtained using ordinary general relativity, with potentially observable consequences that could yield insights into quantum gravity. In the second part, it is shown that the cosmic gravitational wave background is anisotropic at a level that could be detected by future experiments. Gravitational waves promise to be an rich source of information on the early universe. To them, the universe has been transparent from its earliest moments, so they can give us an unobstructed view of the Big Bang and a means to probe the fundamental laws of nature at very high energies.

11. Extracting Physics from Gravitational Waves

Testing the Strong-field Dynamics of General Relativity and Inferring the Large-scale Structure of the Universe

(Series: Springer Theses)
by Tjonnie G. F. Li
July 2015, 235 pages, Hardcover (Springer)
ISBN 9783319192727 **¥25,780**

Tjonnie Li's thesis covers two applications of Gravitational Wave astronomy: tests of General Relativity in the strong-field regime and cosmological measurements. The first part of the thesis focuses on the so-called TIGER, i.e. Test Infrastructure for General Relativity, an innovative Bayesian framework for performing hypothesis tests of modified gravity using ground-based GW data. After developing the framework, Li simulates a variety of General Relativity deviations and demonstrates the ability of the aforementioned TIGER to

measure them. The advantages of the method are nicely shown and compared to other, less generic methods. Given the extraordinary implications that would result from any measured deviation from General Relativity, it is extremely important that a rigorous statistical approach for supporting these results would be in place before the first Gravitational Wave detections begin. In developing TIGER, Tjonnie Li shows a large amount of creativity and originality, and his contribution is an important step in the direction of a possible discovery of a deviation (if any) from General Relativity.

In another section, Li's thesis deals with cosmology, describing an exploratory study where the possibility of cosmological parameters measurement through gravitational wave compact binary coalescence signals associated with electromagnetic counterparts is evaluated. In particular, the study explores the capabilities of the future Einstein Telescope observatory. Although of very long term-only applicability, this is again a thorough investigation, nicely put in the context of the current and the future observational cosmology.

12. Extreme Regimes in Quantum Gravity

(Series: Physics Research and Technology)
by Emmanuele Battista
Aug 2017, 332 pages, Hardcover (Nova Science)
ISBN 9781536123364 **¥33,900**

In the first part, by applying the effective field theory point of view to the quantization of general relativity, detectable, though tiny, quantum effects in the position of Newtonian Lagrangian points of the Earth-Moon system are found. In order to make more realistic the quantum corrected model proposed, the full three-body problem where the Earth and the Moon interact with a generic massive body as well as the restricted four-body problem involving the perturbative effects produced by the gravitational presence of the Sun in the Earth-Moon system are also studied. After that, a new quantum theory having general relativity as its classical counterpart is analysed. By exploiting this framework, an innovative interesting prediction involving the position of Lagrangian points within the context of general relativity is described. Furthermore, the new pattern provides quantum corrections to the relativistic coordinates of Earth-Moon libration points of a few millimetres.

The second part of the book deals with the Riemannian curvature characterizing the boosted form assumed by the Schwarzschild-de Sitter metric. The analysis of the Kretschmann invariant and the geodesic equation shows that the spacetime possesses a "scalar curvature singularity" within a 3-sphere and that it is possible to define what the authors refer to as a "boosted horizon", which is a sort of elastic wall where all particles are surprisingly pushed away, suggesting that such "boosted geometries" are ruled by a sort of "antigravity effect". Eventually, the equivalence with the coordinate shift method is invoked in order to demonstrate that all ä2 terms appearing in the Riemann curvature tensor give a vanishing contribution in the distributional sense.

12. First-stage LISA Data Processing and Gravitational Wave Data Analysis

Ultraprecise Inter-satellite Laser Ranging, Clock Synchronization and Novel Gravitational Wave Data Analysis Algorithms

(Series: Springer Theses)
by Yan Wang
Dec 2015, 228 pages, Hardcover (Springer)
ISBN 9783319263885 **¥25,780**

This thesis covers a diverse set of topics related to

space-based gravitational wave detectors such as the Laser Interferometer Space Antenna (LISA). The core of the thesis is devoted to the preprocessing of the interferometric link data for a LISA constellation, specifically developing optimal Kalman filters to reduce arm length noise due to clock noise. The approach is to apply Kalman filters of increasing complexity to make optimal estimates of relevant quantities such as constellation arm length, relative clock drift, and Doppler frequencies based on the available measurement data. Depending on the complexity of the filter and the simulated data, these Kalman filter estimates can provide up to a few orders of magnitude improvement over simpler estimators. While the basic concept of the LISA measurement (Time Delay Interferometry) was worked out some time ago, this work brings a level of rigor to the processing of the constellation-level data products.

The thesis concludes with some topics related to the eLISA such as a new class of phenomenological waveforms for extreme mass-ratio inspiral sources (EMRIs, one of the main source for eLISA), an octahedral space-based GW detector that does not require drag-free test masses, and some efficient template-search algorithms for the case of relatively high SNR signals.

14. The Fourteenth Marcel Grossmann Meeting

On Recent Developments in Theoretical and Experimental General Relativity, Astrophysics, and Relativistic Field Theories
Proceedings of the MG14 Meeting on General Relativity, University of Rome "La Sapienza", Italy, 12 – 18 July 2015 (In 4 Volumes)
Edited by: Massimo Bianchi, Università degli Studi di Roma "Tor Vergata", Italy, Robert T Jantzen, Villanova University, USA, and Remo Ruffini, International Center for Relativistic Astrophysics Network (ICRANet), Italy & University of Rome "La Sapienza", Italy
Oct 2017, 4 Vols/4200pages, (World Scientific)
ISBN: 9789813226593   **¥189,180**
The four volumes of the proceedings of MG14 give a broad view of all aspects of gravitational physics and astrophysics, from mathematical issues to recent observations and experiments. The scientific program of the meeting included 35 morning plenary talks over 6 days, 6 evening popular talks and 100 parallel sessions on 84 topics over 4 afternoons.
Volume A contains plenary and review talks ranging from the mathematical foundations of classical and quantum gravitational theories including recent developments in string theory, to precision tests of general relativity including progress towards the detection of gravitational waves, and from supernova cosmology to relativistic astrophysics, including topics such as gamma ray bursts, black hole physics both in our galaxy and in active galactic nuclei in other galaxies, and neutron star, pulsar and white dwarf astrophysics.
The remaining volumes include parallel sessions which touch on dark matter, neutrinos, X-ray sources, astrophysical black holes, neutron stars, white dwarfs, binary systems, radiative transfer, accretion disks, quasars, gamma ray bursts, supernovas, alternative gravitational theories, perturbations of collapsed objects, analog models, black hole thermodynamics, numerical relativity, gravitational lensing, large scale structure, observational cosmology, early universe models and cosmic microwave background anisotropies, inhomogeneous cosmology, inflation, global structure, singularities, chaos, Einstein-Maxwell systems, wormholes, exact solutions of Einstein's equations, gravitational waves, gravitational wave detectors and data analysis, precision gravitational measurements, quantum gravity and loop quantum gravity,

quantum cosmology, strings and branes, self-gravitating systems, gamma ray astronomy, cosmic rays and the history of general relativity.

15. Fundamentals of Interferometric Gravitational Wave Detectors, 2nd Edition

by Peter R Saulson
April 2017, 336 pages, Hardcover (World Scientific)
ISBN 9789813143074   **¥17,560**
LIGO's recent discovery of gravitational waves was headline news around the world. Many people will want to understand more about what a gravitational wave is, how LIGO works, and how LIGO functions as a detector of gravitational waves.This book aims to communicate the basic logic of interferometric gravitational wave detectors to students who are new to the field. It assumes that the reader has a basic knowledge of physics, but no special familiarity with gravitational waves, with general relativity, or with the special techniques of experimental physics. All of the necessary ideas are developed in the book.The first edition was published in 1994. Since the book is aimed at explaining the physical ideas behind the design of LIGO, it stands the test of time. For the second edition, an Epilogue has been added; it brings the treatment of technical details up to date, and provides references that would allow a student to become proficient with today's designs.

16. General Relativity: The most beautiful of theories

(Series: de Gruyter Studies in Mathematical Physics, Vol 28)
by Carlo Rovelli
Jan 2015, 208 pages, Hardcover (De Gruyter)
ISBN 9783110340426   **¥26,770**
Generalising Newton's law of gravitation, general relativity is one of the pillars of modern physics. While applications in the beginning were restricted to isolated effects such as a proper understanding of Mercury's orbit, the second half of the twentieth century saw a massive development of applications. These include cosmology, gravitational waves, and even very practical results for satellite based positioning systems as well as different approaches to unite general relativity with another very successful branch of physics - quantum theory.
On the occassion of general relativity's centennial, leading scientists in the different branches of gravitational research review the history and recent advances in the main fields of applications of the theory, which was referred to by Lev Landau as "the most beautiful of the existing physical theories."

17. Globular Cluster Binaries and Gravitational Wave Parameter Estimation

Challenges and Efficient Solutions
(Springer Theses)
by Carl-Johan Haster
July 2017, 92 pages, Hardcover (Springer)
ISBN 9783319634401   **¥23,630**
This thesis presents valuable contributions to several aspects of the rapidly growing field of gravitational wave astrophysics. The potential sources of gravitational waves in globular clusters are analyzed using sophisticated dynamics simulations involving intermediate mass black holes and including, for the first time, high-order post-Newtonian

corrections to the equations of motion. The thesis further demonstrates our ability to accurately measure the parameters of the sources involved in intermediate-mass-ratio inspirals of stellar-mass compact objects into hundred-solar-mass black holes. Lastly, it proposes new techniques for the computationally efficient inference on gravitational waves.

On 14 September 2015, the LIGO observatory reported the first direct detection of gravitational waves from the merger of a pair of black holes. For a brief fraction of a second, the power emitted by this merger exceeded the combined output of all stars in the visible universe. This has since been followed by another confirmed detection and a third candidate binary black hole merger. These detections heralded the birth of an exciting new field: gravitational-wave astrophysics.

18. Gravitational Lensing
By **Scott Dodelson,** Fermi National Accelerator Laboratory, Batavia, Illinois
July 2017, 234 pages, Hardcover, (Cambridge U.P.)
ISBN 9781107129764   **¥8,690**
Gravitational lensing is a consequence of general relativity, where the gravitational force due to a massive object bends the paths of light originating from distant objects lying behind it. Using very little general relativity and no higher level mathematics, this text presents the basics of gravitational lensing, focusing on the equations needed to understand the phenomena. It then applies them to a diverse set of topics, including multiply imaged objects, time delays, extrasolar planets, microlensing, cluster masses, galaxy shape measurements, cosmic shear, and lensing of the cosmic microwave background. This approach allows undergraduate students and others to get quickly up to speed on the basics and the important issues. The text will be especially relevant as large surveys such as LSST and Euclid begin to dominate the astronomical landscape. Designed for a one semester course, it is accessible to anyone with two years of undergraduate physics background.

19. Gravitational Waves. (2 Vols Set)
Volume 1: Theory and Experiment,
Volume 2: Astrophysics and Cosmology
by Michele Maggiore
April 2018, 1325 pages, Hardcover   (Oxford U.P.)
ISBN 9780198755289   **¥24,620**
The two-volume book Gravitational Waves provides a comprehensive and detailed account of the physics of gravitational waves. While Volume 1 is devoted to the theory and experiments, Volume 2 discusses what can be learned from gravitational waves in astrophysics and in cosmology, by systematizing a large body of theoretical developments that have taken place over the last decades. The second volume also includes a detailed discussion of the first direct detections of gravitational waves. In the author's typical style, the theoretical results are generally derived afresh, clarifying or streamlining the existing derivations whenever possible, and providing a coherent and consistent picture of the field.

The first volume of Gravitational Waves, which appeared in 2007, has established itself as the standard reference in the field. The scientific community has eagerly awaited this second volume. The recent direct detection of gravitational waves makes the topics in this book particularly timely.

20. Gravitational Wave Astrophysics
Proceedings of the Third Session of the Sant Cugat Forum on Astrophysics
(Series: Astrophysics and Space Science Proceedings、Vol 40)

Edited by Carlos F. Sopuerta
Dec 2014, 309 pages, Hardcover   (Springer)
ISBN 9783319104874   **¥42,980**
This book offers review chapters written by invited speakers of the 3rd Session of the Sant Cugat Forum on Astrophysics - Gravitational Waves Astrophysics. All chapters have been peer reviewed. The book goes beyond normal conference proceedings in that it provides a wide panorama of the astrophysics of gravitational waves and serves as a reference work for researchers in the field.

21. Gravitational Wave Astrophysics with Pulsar Timing Arrays
(Series: Springer Theses)
by Chiara M. F. Mingarelli
Nov 2015, 119 pages, Paperback   (Springer)
ISBN 9783319184005   **¥19,340**
This Ph.D. thesis from the University of Birmingham UK opens new research avenues in the use of Pulsar Timing Arrays (PTAs) to study populations of super-massive black hole binaries through gravitational-wave observations. Chiara Mingarelli's work has shown for the first time that PTAs can yield information about the non-linear dynamics of the gravitational field. This is possible because PTAs capture, at the same time, radiation from the same source emitted at stages of its binary evolution that are separated by thousands of years. Dr. Mingarelli, who is the recipient of a Marie Curie International Outgoing Fellowship, has also been amongst the pioneers of the technique that will allow us to probe the level of anisotropy of the diffuse gravitational-wave background radiation from the whole population of super-massive black hole binaries in the Universe. Indeed, future observations will provide us with hints about the distribution of galaxies harboring massive black holes and insights into end products of hierarchical mergers of galaxies.

22. Gravitational Wave Detection and Data Analysis for Pulsar Timing Arrays
(Series: Springer Theses)
by Rutger van Haasteren
Sept 2013, 139 pages, Hardcover   (Springer)
ISBN 9783642395987   **¥21,480**
Pulsar timing is a promising method for detecting gravitational waves in the nano-Hertz band.

In his prize winning Ph.D. thesis Rutger van Haasteren deals with how one takes thousands of seemingly random timing residuals which are measured by pulsar observers, and extracts information about the presence and character of the gravitational waves in the nano-Hertz band that are washing over our Galaxy. The author presents a sophisticated mathematical algorithm that deals with this issue. His algorithm is probably the most well-developed of those that are currently in use in the Pulsar Timing Array community.

In chapter 3, the gravitational-wave memory effect is described. This is one of the first descriptions of this interesting effect in relation with pulsar timing, which may become observable in future Pulsar Timing Array projects.

The last part of the work is dedicated to an effort to combine the European pulsar timing data sets in order to search for gravitational waves. This study has placed the most stringent limit to date on the intensity of gravitational waves that are produced by pairs of supermassive black holes dancing around each other in distant galaxies, as well as those that may be produced by vibrating cosmic strings.

23. Gravitational-Wave Physics and Astronomy

An Introduction to Theory, Experiment and Data Analysis

by Jolien D. E. Creighton & Warren G. Anderson
Oct 2017, 381 pages, Hardcover   (Wiley-VCH)
ISBN 9783527408863   **¥33,380**

This most up-to-date, one-stop reference combines coverage of both theory and observational techniques, with introductory sections to bring all readers up to the same level. Written by outstanding researchers directly involved with the scientific program of the Laser Interferometer Gravitational-Wave Observatory (LIGO), the book begins with a brief review of general relativity before going on to describe the physics of gravitational waves and the astrophysical sources of gravitational radiation. Further sections cover gravitational wave detectors, data analysis, and the outlook of gravitational wave astronomy and astrophysics.

24. Gravitational Waves: Explorations, Insights and Detection

(Series: Physics Research and Technology)
Edited by Isaac Carson
July 2017, 152 pages, Paperback   (Nova Science)
ISBN 9781536122466   **¥14,250**

The search for fast growing infinitesimal perturbations in the Friedmann-Lemaître-Robertson-Walker universe within Einstein's General Relativity is regarded as very important for explanation of observational inhomogeneities such as nebulae and clusters of galaxies. Chapter One reports on numerical solutions of Hawking's equations for gravitational waves in evolutionary universe, which includes wave-matter interaction. Chapter Two presents an overview of various options of direct including of SQUID into a system for registering effects of super weak elongation or very little force. Chapter Three reviews previous work on constraining gravitational radiation from elliptically deformed pulsars with terrestrial nuclear laboratory data in light of the recent gravitational wave detection, and estimates the maximum gravitational wave strain amplitude, using an optimistic value for the breaking strain of the neutron star crust. Chapter Four explores the LIGO signal GW150914 within the braneworld scenario. Future space flight propelled by artificially-generated Gravitational Wave (GW) beam is discussed within the framework of the General Relativity theory in the final chapter of this book.

25. Gravitational Waves in Decaying Vacuum Cosmologies

by David Alejandro Tamayo Ramírez
March 2017, 208 pages, Paperback (Nova Science)
ISBN 9783330763333   **¥14,250**

In the present work we study in detail the primordial gravitational waves in cosmologies with a decaying vacuum. The cosmological framework is the FLRW Universe in General Relativity. The decaying vacuum models are an alternative to solve the cosmological constant problem attributing a dynamic to the vacuum energy of the type Lambda(H). The evolution equation of the linear tensor perturbations was derived and the time-dependent part decoupled from the spatial one. The resulting equation has the form of a damped harmonic oscillator which depends on the scale factor, which carries all the cosmological and decaying vacuum characteristics. The gravitational wave equation is established and its time-dependent part has analytically been solved for different cosmological eras. The main result is that unlike the standard cosmology, there is gravitational wave amplification during the radiation era. The physical gravitational wave quantities like the modulus of the mode function, power and gravitational wave energy density spectra generated at different cosmological eras are also explicitly evaluated.

26. Gravity, a Geometrical Course

Volume 1: Development of the Theory and Basic Physical Applications

by Pietro Giuseppe Frè
Oct 2012, 338 pages, Hardcover   (Springer)
ISBN 9789400753600   **¥23,630**

Volume One is dedicated to the development of the theory and basic physical applications. It guides the reader from the foundation of special relativity to Einstein field equations, illustrating some basic applications in astrophysics. A detailed account of the historical and conceptual development of the theory is combined with the presentation of its mathematical foundations. Differentiable manifolds, fibre-bundles, differential forms, and the theory of connections are covered, with a sketchy introduction to homology and cohomology. (Pseudo)-Riemannian geometry is presented both in the metric and in the vielbein approach. Physical applications include the motions in a Schwarzschild field leading to the classical tests of GR (light-ray bending and periastron advance) discussion of relativistic stellar equilibrium, white dwarfs, Chandrasekhar mass limit and polytropes. An entire chapter is devoted to tests of GR and to the indirect evidence of gravitational wave emission. The formal structure of gravitational theory is at all stages compared with that of non gravitational gauge theories, as a preparation to its modern extension, namely supergravity, discussed in the second volume.

27. Gravity, a Geometrical Course

Volume 2: Black Holes, Cosmology and Introduction to Supergravity

by Pietro Giuseppe Frè
Oct 2012, 452 pages, Hardcover (Springer)
ISBN 9789400754423   **¥23,630**

Volume Two is covers black holes, cosmology and an introduction to supergravity. The aim of this volume is two-fold. It completes the presentation of GR and it introduces the reader to theory of gravitation beyond GR, which is supergravity. Starting with a short history of the black hole concept, the book covers the Kruskal extension of the Schwarzschild metric, the causal structures of Lorentzian manifolds, Penrose diagrams and a detailed analysis of the Kerr-Newman metric. An extensive historical account of the development of modern cosmology is followed by a detailed presentation of its mathematical structure, including non-isotropic cosmologies and billiards, de Sitter space and inflationary scenarios, perturbation theory and anisotropies of the Cosmic Microwave Background. The last three chapters deal with the mathematical and conceptual foundations of supergravity in the frame of free differential algebras. Branes are presented both as classical solutions of the bulk theory and as world-volume gauge theories with particular emphasis on the geometrical interpretation of kappa-supersymmetry. The rich bestiary of special geometries underlying supergravity lagrangians is presented, followed by a chapter providing glances on the equally rich collection of special solutions of supergravity.

28. Handbook of Supernovae

Edited by Athem W. Alsabti & Paul Murdin
Nov 2017, 2689 pages, Hardcover   (Springer)

ISBN 9783319218458　**¥279,390**
This reference work gathers all of the latest research in the supernova field areas to create a definitive source book on supernovae, their remnants and related topics. It includes each distinct subdiscipline, including stellar types, progenitors, stellar evolution, nucleosynthesis of elements, supernova types, neutron stars and pulsars, black holes, swept up interstellar matter, cosmic rays, neutrinos from supernovae, supernova observations in different wavelengths, interstellar molecules and dust. While there is a great deal of primary and specialist literature on supernovae, with a great many scientific groups around the world focusing on the phenomenon and related subdisciplines, nothing else presents an overall survey. This handbook closes that gap at last. As a comprehensive and balanced collection that presents the current state of knowledge in the broad field of supernovae, this is to be used as a basis for further work and study by graduate students, astronomers and astrophysicists working in close/related disciplines, and established groups.

29. Introduction to General Relativity, Black Holes and Cosmology
by Yvonne Choquet-Bruhat
Jan 2015, 320 pages, Hardcover　(Oxford U.P.)
ISBN 9780199666454　**¥16,000**
General Relativity is a beautiful geometric theory, simple in its mathematical formulation but leading to numerous consequences with striking physical interpretations: gravitational waves, black holes, cosmological models, and so on. This introductory textbook is written for mathematics students interested in physics and physics students interested in exact mathematical formulations (or for anyone with a scientific mind who is curious to know more of the world we live in), recent remarkable experimental and observational results which confirm the theory are clearly described and no specialised physics knowledge is required. The mathematical level of Part A is aimed at undergraduate students and could be the basis for a course on General Relativity. Part B is more advanced, but still does not require sophisticated mathematics. Based on Yvonne Choquet-Bruhat's more advanced text, General Relativity and the Einstein Equations, the aim of this book is to give with precision, but as simply as possible, the foundations and main consequences of General Relativity. The first five chapters from General Relativity and the Einstein Equations have been updated with new sections and chapters on black holes, gravitational waves, singularities, and the Reissner-Nordstrom and interior Schwarzchild solutions.
The rigour behind this book will provide readers with the perfect preparation to follow the great mathematical progress in the actual development, as well as the ability to model, the latest astrophysical and cosmological observations. The book presents basic General Relativity and provides a basis for understanding and using the fundamental theory.

30. Introduction to Particle and Astroparticle Physics
Multimessenger Astronomy and its Particle Physics Foundations, 2nd Edition
(Series: Undergraduate Lecture Notes in Physics)
by Alessandro De Angelis & Mário Pimenta
June 2018, 733 pages, Paperback　(Springer)
ISBN 9783319781808　**¥12,890**
This book introduces particle physics, astrophysics and cosmology. Starting from an experimental perspective, it provides a unified view of these fields that reflects the very rapid advances being made. This new edition has a number of improvements and has been updated to include material on the Higgs particle and to describe the recently discovered gravitational waves. Astroparticle and particle physics share a common problem: we still don't have a description of the main ingredients of the Universe from the point of view of its energy budget. Addressing these fascinating issues, and offering a balanced introduction to particle and astroparticle physics that requires only a basic understanding of quantum and classical physics, this book is a valuable resource, particularly for advanced undergraduate students and for those embarking on graduate courses. It includes exercises that offer readers practical insights. It can be used equally well as a self-study book, a reference and a textbook.

31. Joint Search for Gravitational Waves and High-energy Neutrinos
ANTARES, VIRGO and LIGO detectors
by Boutayeb Bouhou
Sept 2017, 188 pages,　188 pages, Paperback
(Éditions universitaires européennes)
ISBN 9783841614315　**¥13,800**
The aim of this work is the joint detection of gravitational waves and high energy neutrinos in a multi-messengers context. The neutrino and gravitational waves astronomies are expected to play a fundamental role in the future. In fact, these messengers can travel big distances because of their weak interaction with matter (contrary to photons that at high energy are rapidly absorbed) without being affected by magnetic fields (contrary to charged cosmic rays). They can also escape dense media and provide informations on the processes taking place in the heart of astrophysics sources. Particularly, GW+HEN multi-messenger astronomy may open a new observational window on the Universe. ANTARES collaboration has built a telescope of area 0.1 km² in the Mediterranean Sea for the detection of high energy neutrinos. This is the most sensitive telescope for the observed part of the sky. LIGO and Virgo interferometers are ground-based detectors for direct observation of gravitational waves, instaled in Europe and the USA respectively. Instruments ANTARES, Virgo and LIGO offer unrivaled sensitivity in the area of joint observation.

32. Lectures on General Relativity, Cosmology and Quantum Black Holes
by Badis Dr Ydri
Sept 2017, 351 pages, Hardcover　(IOP Pub)
ISBN 9780750314763　**ca. ¥28,500**
Whilst general relativity is not complex in its formulation, the physical interpretation of its mathematical descriptions gives rise to a range of exciting consequences in cosmology. A detailed understanding of general relativity is therefore a prerequisite for students wishing to pursue further courses or commence research projects in cosmology and its various captivating subfields including black holes and gravitational waves.This is not a book on general relativity per se and the author's treatment of this fundamental topic is concise, with the required differential geometry summarized in an appendix. Instead, the primary goal of this book is to allow students to understand in a critical way two pillars of modern theoretical physics: inflationary theory, and quantum black holes and the information-loss problem. Accordingly, the book extensively introduces black holes and cosmology before proceeding to the important issues found in inflation and the information-loss problem. Other important topics discussed in detail include the cosmological constant and its relation to dark energy and an introduction to quantum field theory on curved backgrounds. Including numerous exercise problems, the material provides a single rigorous text for advanced students in theoretical physics and mathematics requiring an introduction to the implications and interpretation of general relativity in areas of

cosmology. Readers of this text will be well prepared to follow the theoretical developments in the field and undertake research projects as part of an MSc or PhD programme.

33. Lorentzian Geometry and Related Topics

GeLoMa 2016, Málaga, Spain, September 20–23
(Series: Springer Proceedings in Mathematics & Statistics, Vol 211)
Edited by Maria A. Cañadas-Pinedo, José Luis Flores, & Francisco J. Palomo
Nov 2017, 271 pages, Hardcover   (Springer)
ISBN 9783319662893   **¥30,080**
This volume contains a collection of research papers and useful surveys by experts in the field which provide a representative picture of the current status of this fascinating area. Based on contributions from the VIII International Meeting on Lorentzian Geometry, held at the University of Málaga, Spain, this volume covers topics such as distinguished (maximal, trapped, null, spacelike, constant mean curvature, umbilical...) submanifolds, causal completion of spacetimes, stationary regions and horizons in spacetimes, solitons in semi-Riemannian manifolds, relation between Lorentzian and Finslerian geometries and the oscillator spacetime.
In the last decades Lorentzian geometry has experienced a significant impulse, which has transformed it from just a mathematical tool for general relativity to a consolidated branch of differential geometry, interesting in and of itself. Nowadays, this field provides a framework where many different mathematical techniques arise with applications to multiple parts of mathematics and physics. This book is addressed to differential geometers, mathematical physicists and relativists, and graduate students interested in the field.

34. Multiple Messengers and Challenges in Astroparticle Physics

Edited by Roberto Aloisio, Eugenio Coccia & Francesco Vissani
Nov 2017, 530 pages, Hardcover   (Springer)
ISBN 9783319654232   **¥40,830**
This book, designed as a tool for young researchers and graduate students, reviews the main open problems and research lines in various fields of astroparticle physics: cosmic rays, gamma rays, neutrinos, cosmology, and gravitational physics. The opening section discusses cosmic rays of both galactic and extragalactic origin, examining experimental results, theoretical models, and possible future developments. The basics of gamma-ray astronomy are then described, including the detection methods and techniques. Galactic and extragalactic aspects of the field are addressed in the light of recent discoveries with space-borne and ground-based detectors. The review of neutrinos outlines the status of the investigations of neutrino radiation and brings together relevant formulae, estimations, and background information. Three complementary issues in cosmology are examined: observable predictions of inflation in the early universe, effects of dark energy/modified gravity in the large-scale structure of the universe, and neutrinos in cosmology and large-scale structures. The closing section on gravitational physics reviews issues relating to quantum gravity, atomic precision tests, space-based experiments, the strong field regime, gravitational waves, multi-messengers, and alternative theories of gravity.

35. Multi-Wavelength Studies of Pulsars and Their Companions

(Series: Springer Theses)
by John Antoniadis
Sept 2014, 83 pages, Hardcover   (Springer)
ISBN 9783319098968   **¥23,630**
The focus of his prize-winning thesis is on observations and modeling of binary millisecond pulsars. But in addition, John Antoniadis covers a wide range of observational measurements of binary compact stars systems and tests of General Relativity, like indirect measurements of gravitational wave emission and posing the most stringent constraints on Scalar-Tensor gravity theories. Among others, he presents a system that hosts the most massive neutron star known to date, which has important ramifications for strong-field gravity and nuclear physics. This impressive work was awarded the Otto-Hahn Medal of the Max-Planck Society and the Best PhD in Gravity, Particle and Atomic physics award by the German Physics Society (DPG).

36. New Frontiers in Black Hole Astrophysics

(Series: Proceedings of the International Astronomical Union Symposia and Colloquia, 324)
Edited by Andreja Gomboc
September 2017, Hardcover (Cambridge U.P.)
ISBN 9781107169944   **¥21,730**
Black holes lie at the heart of some of the most fascinating astrophysical phenomena. IAU Symposium 324 marked the 100th anniversary of Schwarzschild's solution of Einstein's field equations predicting the existence of black holes. Our understanding of black holes has come an impressively long way since then, with the last major discovery being coalescing black holes producing gravitational waves, also predicted in 1916. In this volume, observational and theoretical experts discuss the current state-of-the-art in the astrophysics of black-hole systems and their exploitation in testing fundamental theories of physics. Topics span a wide range and include a historical review, the similarity and diversity of black hole systems, gamma ray bursts, tidal disruption events, active galactic nuclei, black hole systems as multi-messenger sources, and the opening of new observational horizons. This fresh review is especially useful to researchers and graduate students engaged in these exciting fields.

37. One Hundred Years of General Relativity

From Genesis and Empirical Foundations to Gravitational Waves, Cosmology and Quantum Gravity
(In 2 Volumes)
Edited by: Wei-Tou Ni
National Tsing Hua University, Hsinchu, Taiwan
July 2017, 2 Vols/1356 pages, (World Scientific)
ISBN 9789814635127   **¥43,120**
The aim of this two-volume title is to give a comprehensive review of one hundred years of development of general relativity and its scientific influences. This unique title provides a broad introduction and review to the fascinating and profound subject of general relativity, its historical development, its important theoretical consequences, gravitational wave detection and applications to astrophysics and cosmology. The series focuses on five aspects of the theory:
Genesis, Solutions and Energy
Empirical Foundations

Gravitational Waves
Cosmology
Quantum Gravity
The first three topics are covered in Volume 1 and the remaining two are covered in Volume 2. While this is a two-volume title, it is designed so that each volume can be a standalone reference volume for the related topic.

38. An Overview of Gravitational Waves
Theory, Sources and Detection
Edited by Gerard Auger & Eric Plagnol
May 2017, 250 pages, Hardcover (World Scientific)
ISBN 9789813141759 **¥22,250**

This book describes detection techniques used to search and analyse gravitational waves (GW). It covers the whole domain of GW detection, starting from the theory and ending with the experimental techniques (both present and future) used to detect them. The theoretical sections of the book address the theory of GW in the general relativity followed by the theory of GW detection. The different sources of GW are described as well as the methods used to analyse them and to extract the physical parameters of the sources. With the recent announcement of gravitational wave detection and the first results from LISA Pathfinder, this book will allow non-specialists to understand the present status of the field and the future of gravitational wave detection.

39. Precision Cosmology
The First Half Million Years
By **Bernard J. T. Jones,** Rijksuniversiteit Groningen, The Netherlands
May 2017, 774 pages, Hardcover (Cambridge U.P.)
ISBN 9780521554336 **¥16,510**

Cosmology seeks to characterise our Universe in terms of models based on well-understood and tested physics. Today we know our Universe with a precision that once would have been unthinkable. This book develops the entire mathematical, physical and statistical framework within which this has been achieved. It tells the story of how we arrive at our profound conclusions, starting from the early twentieth century and following developments up to the latest data analysis of big astronomical datasets. It provides an enlightening description of the mathematical, physical and statistical basis for understanding and interpreting the results of key space- and ground-based data. Subjects covered include general relativity, cosmological models, the inhomogeneous Universe, physics of the cosmic background radiation, and methods and results of data analysis. Extensive online supplementary notes, exercises, teaching materials, and exercises in Python make this the perfect companion for researchers, teachers and students in physics, mathematics, and astrophysics.

40. Precision Interferometry in a New Shape
Higher-order Laguerre-Gauss Modes for Gravitational Wave Detection
(Series: Springer Theses)
by Paul Fulda
Sept 2013, 154 pages, Hardcover (Springer)
ISBN 9783319013749 **¥23,630**

With his Ph.D. thesis, presented here in the format of a "Springer Theses", Paul Fulda won the 2012 GWIC thesis prize awarded by the Gravitational Wave International Committee. The impact of thermal noise on future gravitational wave detectors depends on the size and shape of the interrogating laser beam. It had been known since 2006 that, in theory, higher-order Laguerre-Gauss modes could reduce thermal noise. Paul Fulda's research brings Laguerre-Gauss modes an enormous step forward. His work includes analytical, numerical and experimental work on table-top setups as well as experiments at the Glasgow 10m prototype interferometer. Using numerical simulations the LG33 mode was selected as the optical mode to be tested. Further research by Paul and his colleagues since then concentrated on this mode. Paul has developed and demonstrated simple and effective methods to create this mode with diffractive optics and successfully demonstrated its compatibility with the essential building blocks of gravitational wave detectors, namely, optical cavities, Michelson interferometers and opto-electronic sensing and control systems. Through this work, Laguerre-Gauss modes for interferometers have been transformed from an essentially unknown entity to a well understood option with an experimental basis.

41. Quantum Enhancement of a 4 km Laser Interferometer Gravitational-Wave Detector
(Series: Springer Theses)
by Sheon S. Y. Chua
May 2015, 220 pages, Hardcover (Springer)
ISBN 9783319176857 **¥25,780**

The work in this thesis was a part of the experiment of squeezed light injection into the LIGO interferometer. The work first discusses the detailed design of the squeezed light source which would be used for the experiment. The specific design is the doubly-resonant, traveling-wave bow-tie cavity squeezed light source with a new modified coherent sideband locking technique. The thesis describes the properties affecting the squeezing magnitudes and offers solutions which improve the gain. The first part also includes the detailed modeling of the back-scattering noise of a traveling Optical Parametric Oscillator (OPO). In the second part, the thesis discusses the LIGO Squeezed Light Injection Experiment, undertaken to test squeezed light injection into a 4km interferometric gravitational wave detector. The results show the first ever measurement of squeezing enhancement in a full-scale suspended gravitational wave interferometer with Fabry-Perot arms. Further, it showed that the presence of a squeezed-light source added no additional noise in the low frequency band. The result was the best sensitivity achieved by any gravitational wave detector. The thesis is very well organized with the adequate theoretical background including basics of Quantum Optics, Quantum noise pertaining to gravitational wave detectors in various configurations, along with extensive referencing necessary for the experimental set-up. For any non-experimental scientist, this introduction is a very useful and enjoyable reading. The author is the winner of the 2013 GWIC Theses Prize.

42. Supernova Explosions
(Series: Astronomy and Astrophysics Library)
by David Branch & J. Craig Wheeler
Aug 2017, 721 pages, Hardcover (Springer)
ISBN 9783662550526 **¥23,420**

Targeting advanced students of astronomy and physics, as well as astronomers and physicists contemplating research on supernovae or related fields, David Branch and J. Craig Wheeler offer a modern account of the nature, causes and consequences of supernovae, as well as of issues that remain to be resolved.
Owing especially to (1) the appearance of supernova 1987A in the nearby Large Magellanic Cloud, (2) the spectacularly successful use of supernovae as distance indicators for cosmology, (3) the association of some supernovae with the enigmatic cosmic gamma-ray bursts, and (4) the discovery of

a class of superluminous supernovae, the pace of supernova research has been increasing sharply. This monograph serves as a broad survey of modern supernova research and a guide to the current literature.

The book's emphasis is on the explosive phases of supernovae. Part 1 is devoted to a survey of the kinds of observations that inform us about supernovae, some basic interpretations of such data, and an overview of the evolution of stars that brings them to an explosive endpoint. Part 2 goes into more detail on core-collapse and superluminous events: which kinds of stars produce them, and how do they do it? Part 3 is concerned with the stellar progenitors and explosion mechanisms of thermonuclear (Type Ia) supernovae. Part 4 is about consequences of supernovae and some applications to astrophysics and cosmology. References are provided in sufficient number to help the reader enter the literature.

43. Supernova 1987A

30 Years Later (IAU S331): Cosmic Rays and Nuclei from Supernovae and their Aftermaths

(Series: Proceedings of the International Astronomical Union Symposia and Colloquia)
Edited by Alexandre Marcowith, Matthieu Renaud, Gloria Dubner, Alak Ray, & Andreï Bykov
Nov 2017, 350 pages, Hardcover (Cambridge U.P.)
ISBN 9781107192553   **¥21,730**

The cataclysmic stellar explosion SN 1987A, visible to naked eye, was the nearest and brightest supernova witnessed since the invention of the telescope four centuries ago. This volume deals with supernovae and their remnants, in terms of exceptional phenomena that produce and release high-energy nuclei and particles. Marking the thirtieth anniversary of SN 1987A, the proceedings of IAU Symposium 331 introduce our accumulating knowledge on these central sources in many active fields of investigation: stellar evolution and the diversity of supernova progenitors and their properties, explosive nucleosynthesis and particle acceleration in the most extreme environments known to physics, and the long-standing issues about the origins of heavy nuclei in the Universe and of cosmic rays. Through its interdisciplinary approach, this volume also sheds light on the open issues related to these topics and emphasizes topics of future interest with upcoming multi-wavelength and multi-messenger facilities.

44. Supersymmetric Gravity and Black Holes

Proceedings of the INFN-Laboratori Nazionali di Frascati School on the Attractor Mechanism 2009
(Springer Proceedings in Physics, Vol 142)
Edited by Stefano Bellucci
June 2013, 204 pages, Hardcover (Springer)
ISBN 9783642313790   **¥38,680**

This book is based upon lectures presented in the summer of 2009 at the INFN-Laboratori Nazionali di Frascati School on Attractor Mechanism, directed by Stefano Bellucci. The symposium included such prestigious lecturers as S. Ferrara, G. Dall'Agata, J.F. Morales, J. Simón and M. Trigiante. All lectures were given at a pedagogical, introductory level, which is reflected in the specific "flavor" of this volume. The book also benefits from extensive discussions about, and the related reworking of, the various contributions.

It is the fifth volume in a series of books on the general topics of supersymmetry, supergravity, black holes and the attractor mechanism.

45. Tensors, Relativity, and Cosmology, 2nd Edition

July 2015, 276 pages, Paperback   (Academic Pr.)
ISBN 9780128033975   **¥21,730**

Tensors, Relativity, and Cosmology, Second Edition, combines relativity, astrophysics, and cosmology in a single volume, providing a simplified introduction to each subject that is followed by detailed mathematical derivations.

The book includes a section on general relativity that gives the case for a curved space-time, presents the mathematical background (tensor calculus, Riemannian geometry), discusses the Einstein equation and its solutions (including black holes and Penrose processes), and considers the energy-momentum tensor for various solutions. In addition, a section on relativistic astrophysics discusses stellar contraction and collapse, neutron stars and their equations of state, black holes, and accretion onto collapsed objects, with a final section on cosmology discussing cosmological models, observational tests, and scenarios for the early universe.

This fully revised and updated second edition includes new material on relativistic effects, such as the behavior of clocks and measuring rods in motion, relativistic addition of velocities, and the twin paradox, as well as new material on gravitational waves, amongst other topics.

46. Theory of Gravitational Interactions, 2nd Edition

(Series: UNITEXT for Physics)
by Maurizio Gasperini
Nov 2016, 373 pages, Hardcover   (Springer)
ISBN 9783319496818   **¥12,240**

This is the second edition of a well-received book that is a modern, self-contained introduction to the theory of gravitational interactions. The new edition includes more details on gravitational waves of cosmological origin, the so-called brane world scenario, and gravitational time-delay effects.

The first part of the book follows the traditional presentation of general relativity as a geometric theory of the macroscopic gravitational field, while the second, more advanced part discusses the deep analogies (and differences) between a geometric theory of gravity and the gauge theories of the other fundamental interactions. This fills a gap within the traditional approach to general relativity which usually leaves students puzzled about the role of gravity. The required notions of differential geometry are reduced to the minimum, allowing room for aspects of gravitational physics of current phenomenological and theoretical interest, such as the properties of gravitational waves, the gravitational interactions of spinors, and the supersymmetric and higher-dimensional generalization of the Einstein equations.

This textbook is primarily intended for students pursuing a theoretical or astroparticle curriculum but is also relevant for PhD students and young researchers.
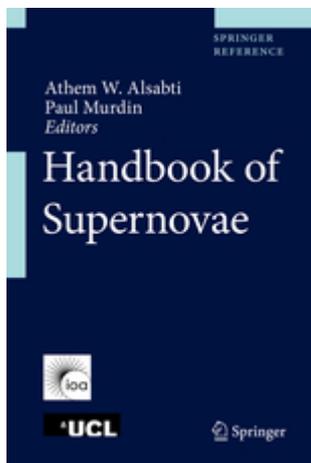
超新星ハンドブック・全 3 巻
Handbook of Supernovae
In 3 volumes

Edited by **A. W. Alsabti,** *University College London, London, UK;*
and **P. Murdin,** *University of Cambridge, Cambridge, UK*

2017 年 11 月出版　　全 3 巻／2689 ページ　　ハードカバー　　**¥279,390**

(Springer)　ISBN 9783319218458

◇　超新星の幅の広い領域における最新知識を包括的かつ構造的に提供します。
◇　超新星に関する最新研究を多くの関連分野から照らし出します。
◇　超新星に関心を持つすべての科学者にとっての出発点として必備のハンドブック。
◇　天文学、天体物理学、宇宙論、核化学関係者に広くお薦めいたします。

This reference work gathers all of the latest research in the supernova field areas to create a definitive source book on supernovae, their remnants and related topics. It includes each distinct subdiscipline, including stellar types, progenitors, stellar evolution, nucleosynthesis of elements, supernova types, neutron stars and pulsars, black holes, swept up interstellar matter, cosmic rays, neutrinos from supernovae, supernova observations in different wavelengths, interstellar molecules and dust. While there is a great deal of primary and specialist literature on supernovae, with a great many scientific groups around the world focusing on the phenomenon and related subdisciplines, nothing else presents an overall survey. This handbook closes that gap at last. As a comprehensive and balanced collection that presents the current state of knowledge in the broad field of supernovae, this is to be used as a basis for further work and study by graduate students, astronomers and astrophysicists working in close/related disciplines, and established groups.

Table of contents (109 chapters)