

Bookshelf

From the Web to the Grid and Beyond: Computing Paradigms Driven by High-Energy Physics

By René Brun, Federico Carminati and Giuliana Galli Carminati (eds.)

Springer

Hardback: £62.99 €74.85 \$99.00

E-book: £49.99 €59.49 \$69.95

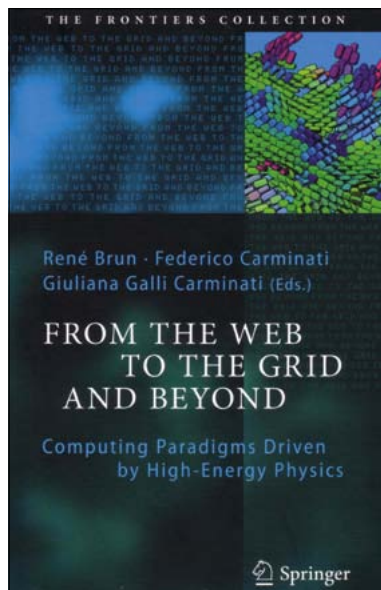
To tell the story behind the title, the editors of this book have brought together chapters written by many well-known people in the field of computing in high-energy physics.

It starts with enlightening accounts by René Brun and Ben Segal of how things that I have been familiar with since being a postdoc came to be. I was intrigued to discover how we alighted on so much of what we now take for granted, such as C++, TCP/IP, Unix, code-management systems and ROOT. There is a nice – and at times frightening – account of the environment in which the World Wide Web was born, describing the conditions that needed to be present for it to happen as it did, and which nearly might not have been the case. The reader is reminded that ground-breaking developments in high-energy physics do not, in general, come about from hierarchical management plans, but from giving space to visionaries.

There are several chapters on the Grid (Les Robertson, Patricia Méndez Lorenzo and Jamie Shiers) and the evolution from grids to clouds (Pedrag Buncic and Federico Carminati). These will be of interest to those who, like me, were involved in a series of EU Grid projects that absorbed many of us completely during the era of “e-science”. The Worldwide LHC Computing Grid was built and is of course now taken for granted by all of us. The discussion of virtualization and the evolution from grids to clouds presents an interesting take on what is a change of name and what is a change of technology.

In another chapter, Carminati gives his candid take on software development – and I found myself smiling and agreeing. Many of us will remember when some sort of religion sprang up around OO design methods, UML, OMT, software reviews and so on. He gives his view of where this helped and where it hindered in our environment, where requirements change, users are developers, and forward motion is made by common consent not by top-down design.

Distributed data and its access is discussed in depth by Fabrizio Furano and Andrew Hanushevsky, who remind us that this is one of the most demanding sectors in computing for high-energy physics. A history of parallel computing by Fons



Rademakers is interesting because this has become topical recently, as we struggle to deal with many-core devices. Lawrence Pinsky's chapter on software legal issues delves into how instruments such as copyright and patents are applied in an area for which they were never designed. It makes for engrossing reading, in the same way that technical issues become captivating when watching legal drama on television.

It is not clear – to me at least – whether Giuliana Galli Carminati's final chapter on “the planetary brain” is a speculation too far and should be politely passed over, as the author invites the reader to do, or whether there is something significant there that the reader should be concerned about. The speculation is whether the web and grid form something that could be considered as a brain on a planetary scale. I leave you to judge.

It is a highly interesting book, and I plan to read many of the chapters again.

● Peter Clarke, University of Edinburgh.

Gottes unsichtbare Würfel: Die Physik an den Grenzen des Erforschbaren

By Helmut Satz

CH Beck

Hardback: €19.95

Also available as an e-book

Also published as:

Ultimate Horizons: Probing the Limits of the Universe



Springer

Hardback: £44.99 €53.49

E-book: £35.99 €41.65

This book is one of the most interesting introductions to today's problems and advances in the fields of cosmology, particle and nuclear physics that I have seen. The author's talent in explaining complex problems with “simple” language is certainly the fruit of his life-long teaching experience at the University of Bielefeld and other places. There are numerous examples where the reader is given easy “visualizations” of scientific findings. For instance, if our eyes were sensitive to photons with a wavelength of about 7 cm, then we would see the sky illuminated even at night, thanks to the cosmic microwave background – the afterglow of the Big Bang. Another example is the Casimir effect – a curious demonstration that “the vacuum is not empty” – while Paul Dirac's sea is revisited to define empty space as a “sea of unborn particles”.

It is worth emphasizing that this book does not simply present a collection of facts. The author deliberately discusses implications of certain findings and manages to connect ideas and concepts from different branches of physics extremely well. For example, the term “horizon” is transported from general relativity to the field of particle physics, in the context of quark confinement, in introducing the concept of the “colour horizon” – the

Bookshelf

distance beyond which the quarks no longer interact with each other.

Each of the different topics is introduced properly from a historical perspective, always quoting the originator of the idea carefully, which sometimes goes back to the Ancient Greeks. It is interesting to depict the historical evolution of the concept of elementary particles as the “Matryoshka doll” of physics: atoms, thought at first to be indivisible, are actually composed of electrons and nuclei, the latter being themselves composed of protons and neutrons, which are composed of quarks.

A part of the book is dedicated to the studies of quark–gluon plasma, an area where the author has done pioneering work, including a seminal paper that is currently one of the most cited publications in particle physics. Also of interest is the collection of carefully inserted historical anecdotes. Even writers and poets, such as Michael Ende, Lewis Carroll, Edgar Allan Poe and Italo Calvino, find their words in the book.

From reading the book it transpires that, often, formulating a new problem is even more important than solving it. Scientific progress is mostly made through abstract thinking. Helmut is interested in understanding old and new problems of physics and, building on many years of studies and deep reflection, successfully transmits this enthusiasm to the reader. It certainly triggers further thinking.

● *Hermine K Wöhri, CERN.*

Books received

Handbook of Accelerator Physics and Engineering (2nd edition)

By Alexander Wu Chao, Karl Hubert Mess, Maury Tigner and Frank Zimmermann (eds.)

World Scientific

Hardback: £91

Paperback: £51

E-book: £38



Edited by internationally recognized authorities in the field, this expanded and updated second edition contains more than 100 new articles. With more than 2000 equations, 300 illustrations and 500 graphs and tables, it is intended as a *vade mecum* for professional engineers and physicists engaged in the design and operation of modern accelerators. In addition to the common formulae of previous compilations, it includes hard-to-find, specialized formulae, as well as material pooled from the lifetime experience of many of the world's experts. The eight chapters include both theoretical and practical matters, as well as an extensive

glossary of accelerator types. A detailed name and subject index is provided, with reliable references to the literature where the most detailed information available on all of the topics can be found.

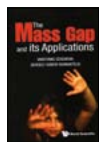
The Mass Gap and its Applications

By Vakhtang Gogokhia and Gergely Gabor Barnaföldi

World Scientific

Hardback: £65

E-book: £49



QCD is the most up-to-date theory of strong interactions. However, standard perturbative procedures fail if applied to low-energy QCD. Even the discovery of a Higgs boson will not solve the problem of masses originating from the non-perturbative behaviour of QCD. This book presents a new method – the introduction of the “mass gap” – first suggested by Arthur Jaffe and Edward Witten at the turn of the millennium. As the energy difference between the lowest order and the vacuum state in Yang–Mills quantum-field theory, the mass gap is – in principle – responsible for the large-scale structure of the QCD ground state, and therefore for its non-perturbative phenomena at low energies. The book also presents the applications and outlook of the mass-gap method and includes problems for students.

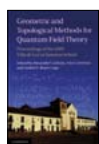
Geometric and Topological Methods for Quantum Field Theory: Proceedings of the 2009 Villa de Leyva Summer School

By Alexander Cardona, Iván Contreras and Andrés F Reyes-Lega (eds.)

Cambridge University Press

Hardback: £75 \$125

Also available as an e-book



Based on lectures given at the Villa de Leyva Summer School, this book presents modern geometric methods in quantum field theory.

Covering areas in geometry, topology, algebra, number-theory methods and their applications to quantum field theory, the book covers topics such as Dirac structures, holomorphic bundles and stability, Feynman integrals, geometric aspects of quantum field theory and the Standard Model, spectral and Riemannian geometry and index theory. It is a valuable guide for graduate students and researchers in physics and mathematics wanting to enter this interesting research field at the border between mathematics and physics.

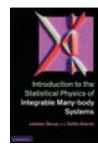
Introduction to the Statistical Physics of Integrable Many-body Systems

By Ladislav Šamaj and Zoltán Bajnok

Cambridge University Press

Hardback: £80 \$130

Also available as an e-book



Beginning with a treatise of non-relativistic 1D continuum Fermi and Bose quantum gases of identical spinless particles, this book describes the quantum inverse-scattering method

and analysis of the related Yang–Baxter equation and integrable quantum Heisenberg models. It also discusses systems within condensed-matter physics, the complete solution of the sine-Gordon model and modern trends in the thermodynamic Bethe ansatz. Each chapter concludes with problems and solutions to help consolidate the reader's understanding of the theory and its applications.

On the Topology and Future Stability of the Universe

By Hans Ringström

Oxford University Press

Hardback: £80 \$125

Also available as an e-book



This volume in the series of Oxford Mathematical Monographs contains a general introduction to the Cauchy problem for the Einstein–Vlasov system, a proof of future stability spatially of locally homogeneous solutions, and a demonstration that there are models of the universe that are consistent with the observations but have arbitrary compact spatial topology. It includes a general description of results in the area, relevant to mathematicians and physicists with knowledge of general relativity.

Advanced General Relativity: Gravity Waves, Spinning Particles, and Black Holes

By Claude Barrabès and Peter A Hogan

Oxford University Press

Hardback: £55 \$89.95

Also available as an e-book



This book is aimed at students making the transition from a first course on general relativity to a specialized subfield. It presents a variety of topics under the general headings of gravitational waves *in vacuo* and in a cosmological setting, equations of motion, and black holes, all having clear physical relevance and a strong emphasis on space–time geometry. Each chapter could be used as the basis for an early postgraduate project for those who are exploring avenues into research in general relativity, and who have already accumulated the technical knowledge required.



Mineral Insulated Cable

Reliable, Highly accurate cabling capable of operating in extreme environments.

- MgO and SiO₂ Cables.
- RF Coaxial Cables.
- Multiconductor Transmission Cables.
- Welded and hermetically sealed connections.
- Capable of operating in and measuring temperatures of up to 1,260°C.
- Capable of operating in the following atmospheres - oxidising, reducing, neutral and vacuum.

Innovation at Okazaki: Cabling, Temperature Sensors & Heaters | okazaki-mfg.com

Research Grade Ultra High Vacuum

Electron Guns

A Menagerie of Models and Sizes

1 eV to 100 keV fA's to 100's of mA's



- High Brightness Sources
- Ultra Stable Energies and Beam Currents
- Source Alignment During Full Operation
- Computer Control; Precision Metering
- Customer Replaceable Firing Units
- Custom Projects and Unique Applications

KIMBALL PHYSICS 

info@kimphys.com Wilton, NH USA 603-878-1616

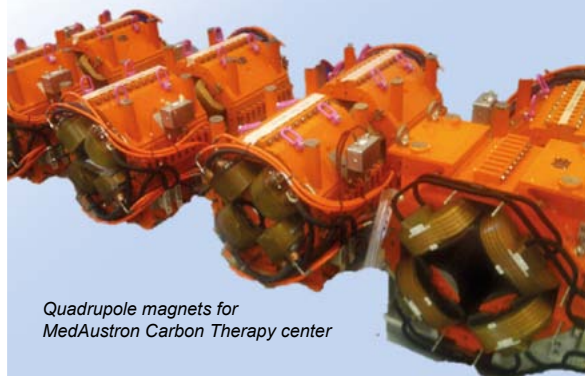
www.KimballPhysics.com



MAGNETS
BEAM TRANSPORT
POWER CONVERTERS
RF AMPLIFIERS

CUSTOMIZED SOLUTIONS FOR:

**HADRONTHERAPY,
LIGHT SOURCES
AND RESEARCH ACCELERATORS**



Quadrupole magnets for
MedAustron Carbon Therapy center

www.sigmaphi.fr