

BOOKSHELF

Books received

Felix Berezin: Life and Death of the Mastermind of Supermathematics edited by M Shifman, World Scientific. Hardback ISBN 978-981-270-532-7, £41 (\$75). Paperback ISBN 9789812705334, £21 (\$39).

Felix Berezin was an outstanding Soviet mathematician who was the driving force behind the emergence in the 1960s and 1970s of the branch of mathematics, now known as supermathematics. The integral over the anti-commuting Grassmann variables that he introduced in the 1960s laid the foundation for the path integral formulation of quantum field theory with fermions, the heart of modern supersymmetric field theories and superstrings. This book features a masterfully written memoir by Berezin's widow, Elena Karpel, who narrates a remarkable account of his life and struggle for survival under the totalitarian Soviet regime. Supplemented with recollections by close friends and colleagues, Berezin's accomplishments in mathematics, his novel ideas and breakthrough works, are reviewed in two articles written by Andrei Losev and Robert Minlos.

Scale-free Networks: Complex Webs in Nature and Technology by Guido Caldarelli, Oxford University Press. Hardback ISBN 9780199211517, £49.95 (\$115).

This book presents the experimental evidence for scale-free networks and provides students and researchers with theoretical results and algorithms to analyse and understand these features. A variety of different social, natural and technological systems – from the Internet to food webs and boards of company directors – can be described by the same mathematical framework. In all these situations a graph of the elements of the system and their interconnections displays a universal feature: there are few elements with many connections, and many elements with few connections. The content and exposition make this a useful textbook for beginners, as well as a reference book for experts in a variety of disciplines.

Principles of Quantum Computation and Information: Volume II: Basic Tools and

Special Topics, by Giuliano Benenti, Giulio Casati and Giuliano Strini, World Scientific. Hardback ISBN 9789812563453 £33 (\$58). Paperback ISBN 9789812565280 £22 (\$38).

Quantum computation and information is a new, rapidly developing interdisciplinary field. Building on the basic concepts introduced in Volume I, this second volume deals with various important aspects, both theoretical and experimental, of quantum computation and information in depth. The areas include quantum data compression, accessible information, entanglement concentration, limits to quantum computation due to decoherence, quantum error-correction, and the first experimental implementations of quantum information protocols. This volume also includes a selection of special topics, including quantum trajectories, quantum computation and quantum chaos, and the Zeno effect.

Elements of String Cosmology by Maurizio Gasperini, Cambridge University Press. Hardback ISBN 9780521868754 £45. E-book format ISBN 9780511332296 \$68.

The standard cosmological picture of our universe emerging from a Big Bang leaves open many fundamental questions, which string theory, a unified theory of all forces of nature, should be able to answer. The first book dedicated to string cosmology, this contains a pedagogical introduction to the basic notions of the subject. It describes the new possible scenarios suggested by string theory for the primordial evolution of our universe and discusses the main phenomenological consequences of these scenarios, stressing their differences from each other, and comparing them to the more conventional models of inflation. It is self-contained, and so can be read by astrophysicists with no knowledge of string theory, and high-energy physicists with little understanding of cosmology. Detailed and explicit derivations of all the results presented provide a deeper appreciation of the subject.

Searching for the Superworld: A Volume in Honor of Antonino Zichichi on the Occasion of the Sixth Centenary Celebrations of the University of Turin, Italy, by Sergio Ferrara and Rudolf M Mössbauer, World Scientific Series in 20th

Century Physics, Volume 39. Hardback ISBN 9789812700186 £69 (\$128).

The “superworld” is a subject of formidable interest for the immediate future of subnuclear physics to which Antonino Zichichi has contributed with a series of important papers of phenomenological and theoretical nature. These papers represent a must-have collection, not only for their originality, but also for their complete analysis of expected scenarios on the basis of today's knowledge of physics. The contributions are divided into two parts. The first deals with the problem of the convergence of the three fundamental forces of nature measured by the gauge couplings, with the onset of the energy threshold for the production of the lightest supersymmetric particles and with the existence of a gap between the string scale and the GUT scale. The second deals with the study of a theoretical model capable of including supersymmetry with the minimum number of parameters (possibly one), and agreeing with all the conditions established by string theories – this turns out to be a “one-parameter no-scale supergravity” model whose experimental consequences are investigated for present and future facilities aimed at the discovery of the first example of the superparticle.

Quantum Field Theory of Non-equilibrium States by Jørgen Rammer, Cambridge University Press. Hardback ISBN 9780521874991 £45 (\$85). E-book format ISBN 9780511292620, \$68.

This textbook presents quantum field theoretical applications to systems out of equilibrium. It introduces the real-time approach to non-equilibrium statistical mechanics and the quantum field theory of non-equilibrium states in general. It offers two ways of learning how to study non-equilibrium states of many-body systems: the mathematical canonical way and an intuitive way using Feynman diagrams. The latter provides an easy introduction to the powerful functional methods of field theory, and the use of Feynman diagrams to study classical stochastic dynamics is considered in detail. The developed real-time technique is applied to study numerous phenomena in many-body systems, and there are numerous exercises to aid self-study.

Physics of Semiconductors in High Magnetic Fields by Noboru Miura, Oxford University Press. Hardback ISBN 9780198517566 £65 (\$150).

This book describes the basic concepts of various physical phenomena in semiconductors and their modulated structures under high magnetic fields. The topics cover magneto-transport phenomena, cyclotron resonance, far-infrared spectroscopy, magneto-optical spectroscopy, diluted magnetic semiconductors in high magnetic fields, as well as the recent advances in the experimental techniques needed for high field experiments. Starting from the introductory part describing the basic theoretical background, each chapter introduces typical experimental data, obtained in very high magnetic fields mostly in the pulsed field range at 20–100 T. The book will serve as a useful guide for researchers and students with an interest in semiconductor physics or in high magnetic fields.

Introduction to 3+1 Numerical Relativity by Miguel Alcubierre, Oxford University Press Series: International Series of Monographs on Physics, Volume 140. Hardback ISBN 9780199205677 £55 (\$110).

An introduction to the modern field of 3+1 numerical relativity, this book has been written so as to be as self-contained as possible, assuming only a basic knowledge of special relativity. Starting from a brief introduction to general relativity, it discusses the different concepts and tools necessary for the fully consistent numerical simulation of relativistic astrophysical systems, with strong and dynamical gravitational fields. The topics discussed in detail include: hyperbolic reductions of the field equations, gauge conditions, the evolution of black hole space-times, relativistic hydrodynamics, gravitational wave extraction and numerical methods. There is also a final chapter with examples of some simple numerical space-times. The book is for graduates and researchers in physics and astrophysics.

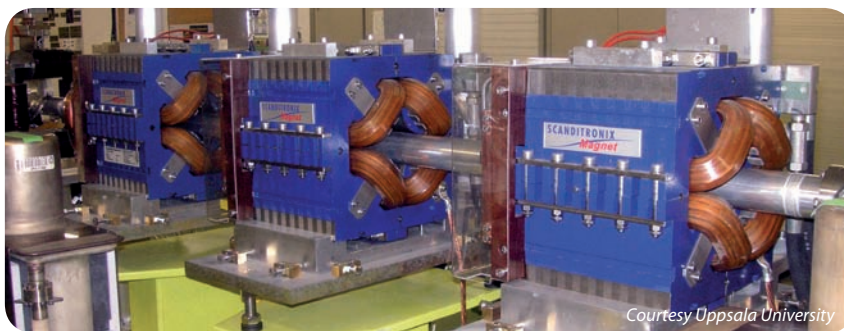
Zero to Infinity: The Foundations of Physics by Peter Rowlands, World Scientific Series of Knots and Everything, Volume 41. Hardback ISBN 9789812709141 £48 (\$88).

This book uses a methodology that is entirely new, creating the simplest and most abstract foundations for physics to date. The author proposes a fundamental description of process in a universal computational rewrite system, leading to an irreducible form of relativistic quantum mechanics from a single operator. This seems to be simpler, more fundamental, and also more powerful than any other quantum mechanics formalism available. The methodology finds immediate applications in particle physics, theoretical physics and theoretical computing. In addition, taking the rewrite structure more generally as a description of process, the book shows how it can be applied to large-scale structures beyond the realm of fundamental physics.



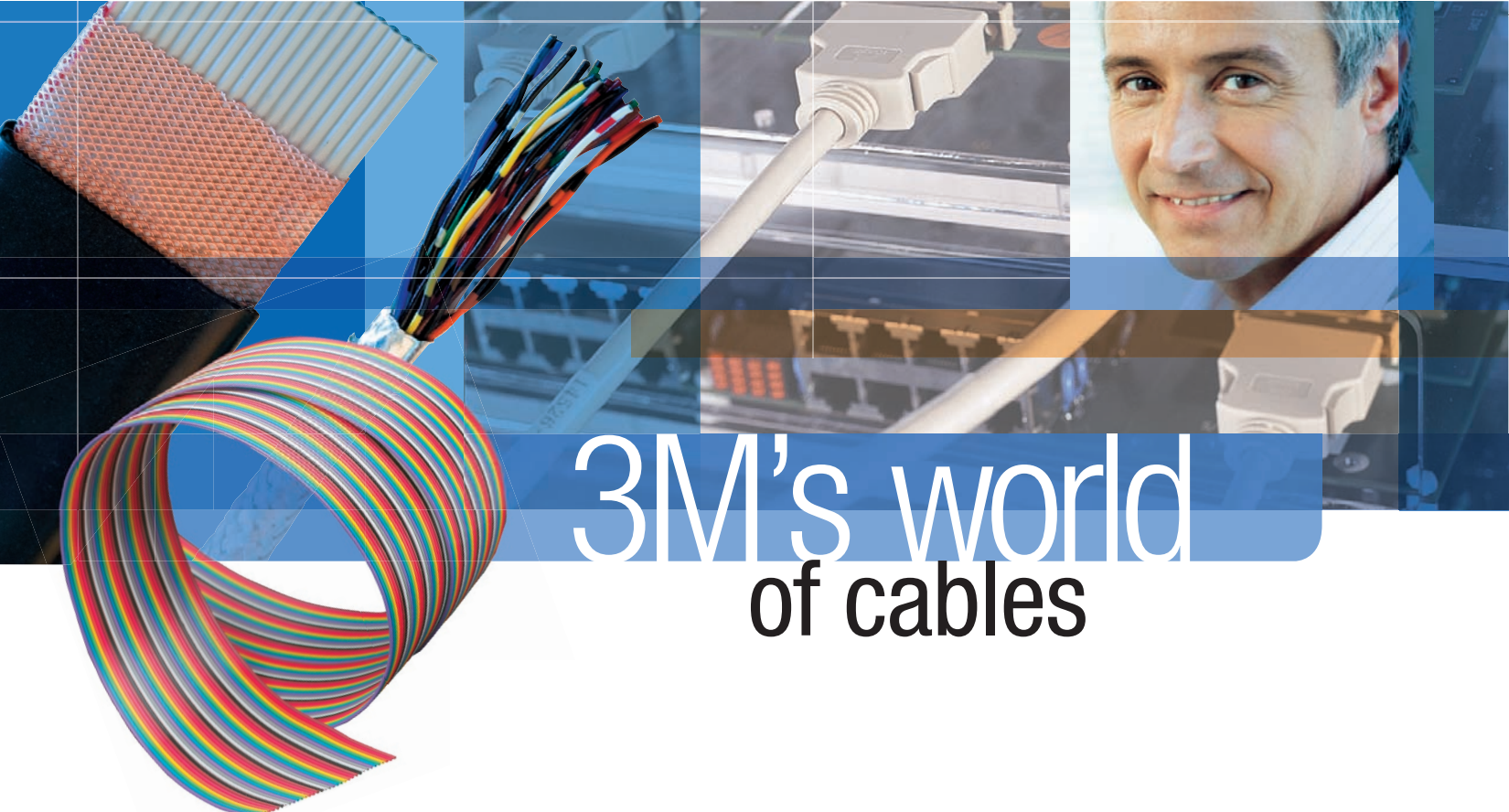
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