

Bookshelf

Ken Wilson Memorial Volume: Renormalization, Lattice Gauge Theory, the Operator Product Expansion and Quantum Fields

By Belal E Baaquie et al. (eds)

World Scientific

Hardback: £57

Paperback: £29

As the title of this collection of essays on the work of Kenneth Wilson (1936–2013) indicates, his impact on physics was enormous, transforming both high-energy and condensed-matter physics. He also foresaw much of the modern impact of computers and networking, and I can feel that influence even as I type this review.

This is a long book, comprising 385 pages with 21 essays by many of today's most influential physicists. It should be made clear that while it includes plenty of biographical material, this is, for the most part, a combination of personal reminiscences and highly technical articles. A non-physicist, or even a physicist without a fairly deep understanding of modern quantum field theory, would probably find much of it almost completely impenetrable, with equations and figures that are really only accessible to the cognoscenti.

That said, a reading of selected parts sheds interesting light on a variety of complex topics in ways that are perhaps not so easily found in modern textbooks. I would not hesitate to suggest such a strategy to a philosopher or historian of science, or an undergraduate or graduate student in physics. The chapters are all well written, and whatever fraction is understood will prove valuable.

Some of the most interesting parts are quotations from Wilson himself. A particularly striking example is from Paul Ginsparg's essay: "I go to graduate school in physics, and I take the first course in quantum field theory, and I'm totally disgusted with the way it's related. They're discussing something called renormalization group, and it's a set of recipes, and I'm supposed to accept that these recipes work – no way. I made a resolution, I would learn to do the problems that they assigned, I would learn how to turn in answers that they would expect, holding my nose all the time, and some day I was going to understand what was really going on."

He did, and now thanks to him, we do too. This represents just a fraction of the impact that Wilson has had on our field. The book is long, and not an easy read, but well worth the



effort and I highly recommend it.

● John Swain, Northeastern University.

Books received

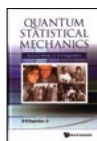
Quantum Statistical Mechanics: Selected Works of N N Bogolubov

By N N Bogolubov, Jr (ed.)

World Scientific

Hardback: £57

E-book: £43



Nicolai Bogolubov (1909–1992) was well known in the world of high-energy physics as one of the founders of JINR, Dubna, and the first director of the Laboratory Theoretical Physics, now named after him. He was also well known in the wider community for his many contributions to quantum field theory and to statistical mechanics. Part I of this book, which is edited by his son, contains some of the elder Bogolubov's papers on quantum statistical mechanics, a field in which he obtained a number of fundamental results, in particular in relation to superfluidity and superconductivity. Superfluidity was discovered in Russia in 1938 by Kapitza, and in 1947 Bogolubov published his theory of the phenomenon based on the correlated interaction of pairs of particles. This later led him to a microscopic theory for superconductivity, which helped to set

the Bardeen–Cooper–Schrieffer theory on firm ground. Part II is devoted to methods for studying model Hamiltonians for problems in quantum statistical mechanics, and is based on seminars and lectures that Bogolubov gave at Moscow State University.

Beyond the Standard Model of Elementary Particle Physics

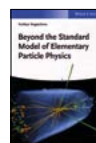
By Yorikiyo Nagashima

Wiley

Hardback: £105 €131.30

E-book: £94.99 €118.80

Also available at the CERN bookshop



This comprehensive presentation of modern particle physics provides a store of background knowledge of the big open questions that go beyond the Standard Model, concerning, for example, the existence of the Higgs boson or the nature of dark matter and dark energy. For each topic, the author introduces key ideas and derives basic formulas needed to understand the phenomenological outcomes. Experimental techniques used in detection are also explained. Finally, the most recent data and future prospects are reviewed. The book can be used to provide a quick look at specialized topics, both to high-energy and theoretical physicists and to astronomers and graduate students.

Lie Groups and Lie Algebras for Physicists

By Ashok Das and Susumo Okubo

World Scientific

Hardback: £63

E-book: £24



Ashok Das and Susumo Okubo, colleagues at the University of Rochester, are theoretical high-energy particle physicists from different generations. Okubo's name is probably best known for the mass formula for mesons and baryons that he and Murray Gell-Mann derived independently through the application of the SU(3) Lie group in the quark model, while Das works on questions related to symmetry. Their book is intended for graduate students of theoretical physics (with a background in quantum mechanics) as well as researchers interested in applications of Lie group theory and Lie algebras in physics. The emphasis is on the inter-relations of representation theories of Lie groups and the corresponding Lie algebras.