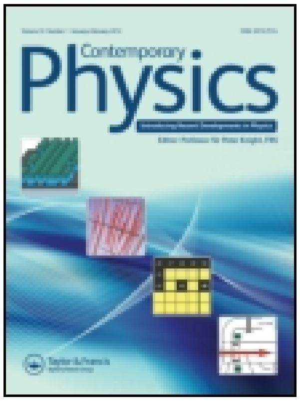

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The Thermodynamics of Quantum Yang-Mills Theory: Theory And Applications, by Ralf Hofmann

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the story. The concept of *shape invariance* is next introduced which enables one, for a limited class of potentials, to forego even this basic knowledge – of one spectrum. The text then goes on to discuss the breaking of supersymmetric quantum mechanics, and the associated algebra. This concludes the first part of the book, which is devoted to the fundamental theory of SUSYQM.

The second part of the volume discusses applications. The relation between SUSQYM and Hermite, Legendre and Laguerre polynomials is discussed, how some deformations of potentials leave the spectrum invariant, and how to generate shape invariant potentials. In an interesting chapter on the well-known WKB (Wentzel–Kramers–Brillouin) approximation method, the authors demonstrate that the supersymmetric variant of WKB (SWKB) in fact yields exact solutions for all of the known translational shape invariant polynomials. A class of potentials for which the Schrödinger equation reduces to that for the hypergeometric functions was discovered by Natanzon in 1979. Since this is also a property of all known shape invariant potentials, these must be a subclass of Natanzon potentials. This warrants a short final chapter.

There are two additional sections devoted to a summary and solutions to problems, of which there are 97 – all with solutions, making for an excellent self-teaching text. This book provides an extremely clear introduction to the topic of supersymmetric quantum mechanics, which will undoubtedly encourage many readers to further exploration of the subject.

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The Thermodynamics of Quantum Yang–Mills Theory: Theory And Applications, by Ralf Hofmann, Singapore, World Scientific, 2012, 480 pp., £79.00 (hardcover), ISBN 978-9814329040. Scope: review. Level: researchers.

This book's aim is to provide insight into physics application of quantum Yang–Mills Theory defined on a four dimensional flat space-time continuum. Part 1 of the book deals with the theoretical aspects. In Part 2, the focus is on applications, in particular application on low-temperature photon physics in astrophysical systems and in cosmology.

For understanding the content of the book better, the reader is expected to be familiar with the perturbative method four-dimensional Gauge theory including its perturbative renormalisability. Also, new developments presented rely on milestones like the Euclidean formulation of thermal quantum field theory, the small mass expansion in thermal field theory etc.

The presentations of this material in Chapters 2–4 is sketchy. To stimulate further study, appropriate reference of the literature is also provided at the end of each of these chapters.

In Chapters 5–10, recent results on Yang–Mills Thermodynamics and its potential application to low-temperature photon physics is discussed, the materials are extracted mostly from important research papers published in this area in between 2004 and 2010.

Thermalisation implies space–time symmetries that are utilised suitably in this book to identify and process fundamental saturated field configurations in their role to imply a useful a priori estimate for deconfining thermal ground state. The notion of the latter is the starting point for a treatment of the Yang–Mills partition function in effective variables.

If not stated otherwise, this book uses supernatural units and Einstein's summation convention for repeated indices throughout. This book will be useful mainly to active researchers in this area.

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Atoms in Intense Laser Fields, by C.J. Joachain, N.J. Kylstra and R.M. Potvliege, New York, Cambridge University Press, 2011, 580 pp., £80.00 (hardcover), ISBN 9780521793018. Scope: monograph. Level: postgraduate, researcher, scientist.

The construction of powerful lasers in the 1980s with coherent pulses of femtosecond duration over a wide frequency range has opened a full new area of nonlinear interaction processes with matter. The peak intensity of the laser pulse is so high that its associated electric field may compete with that due to the nucleus. Therefore, the very fast electromagnetic pulse is able to detach an electron from its parent atom and make it to oscillate rapidly, thus producing a short pulse that may be analysed in terms of harmonics. In this way, harmonics of the pump frequency have been produced up to some hundreds and attosecond pulses may be generated. The high density of pump field photons makes it also easy to obtain multiphoton ionisation – already predicted by