

Bookshelf

Numerical Relativity. Solving Einstein's Equations on the Computer

By Thomas W Baumgarte and Stuart L Shapiro

Cambridge University Press

Hardback: £55 \$90

E-book: \$72

Symmetries are a powerful tool for solving specific problems in all areas of physics. However, there are situations where both exact and approximate symmetries are lacking and, therefore, it is necessary to employ numerical methods. This, in essence, is the main motivation invoked for the use of large-scale simulations in relativistic systems where gravity plays a key role, such as black-hole formation, rotating stars, binary neutron-star evolution and even binary black-hole evolution.

Numerical Relativity by Thomas Baumgarte and Stuart Shapiro is an interesting and valuable contribution to the literature on this subject. Both authors are well known in the field. Shapiro, together with Saul Teukolsky, wrote a monograph on a related subject – *Black Holes, White Dwarfs and Neutron Stars* (John Wiley & Sons 1983) – that is familiar to students and researchers. The careful reader will recognize various similarities in the overall style of the presentation, with systematic attention to the details of the mathematical apparatus. In *Numerical Relativity*, 18 chapters are supplemented by a rich appendix. The first part could be used by students and practitioners for tutorials on the so-called Adler-Deser-Misner formalism and, ultimately, on the correct formulation

of the Cauchy problem in general relativity.

It seems that the authors implicitly suggest that the future of numerical relativity is closely linked to our experimental ability to observe directly general relativistic effects at work. While astrophysics and gravitational waves have so far provided a rich arena for the applications, the intrinsic difficulties in detecting high-frequency gravitational waves with wide-band interferometers, such as LIGO and VIRGO, might suggest new cosmological applications of numerical techniques in the years to come. This book will take you into an exciting world populated by binary neutron stars and binary black holes.

Still, the achievements of numerical relativity (as well as those of all of the other areas of physics where large-scale computer simulations are extensively used) cannot be reduced simply to the quest for the most efficient algorithm. At the end of nearly 700 pages, the reader is led to reflect: is it wise to commit the research programme of young students and post-docs solely to the development of a complex code? After all, the lack of symmetry in a problem might just reflect the inability of physicists to see the right symmetries for the problem. A balanced perspective for potential readers can be summarized in the words of Vicky Weisskopf, when talking about the proliferation of numerical methods in all areas of physics: "[...] We should not be content with computer data. It is important to find more direct insights into what a theory says, even if such insights are insufficient to yield the numerical results obtained by computers" (*Joy of Insight: Passions of a Physicist*, Basic Books, 1991).

● Massimo Giovannini, CERN and INFN Milan-Bicocca.

Maîtriser le nucléaire : Que sait-on et que peut-on faire après Fukushima ?

par Jean Louis Basdevant

Editions Eyrolles

Broché: €17,50

Jean Louis Basdevant, ancien professeur à l'Ecole Polytechnique où il donna d'excellents cours, et auteur de nombreux livres pédagogiques, vient de réussir un tour de force en écrivant un livre sur les problèmes du nucléaire en moins d'un mois à la suite de la catastrophe de Fukushima. C'est un livre très pédagogique qui commence par un historique de la radioactivité, puis un exposé du b-a ba de la physique nucléaire, suivi d'une description des avantages et des dangers de

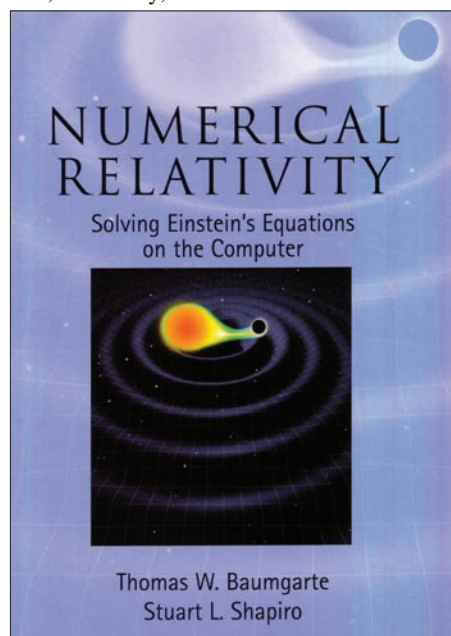


la radioactivité dont il quantifie les effets. Suit une description de la fission, puis de la production d'énergie nucléaire présente et future (si les hommes le veulent!), y compris la proposition de fission induite par accélérateur tel que celui proposé par Carlo Rubbia. Vient alors la description de accidents : Lucens (négligeable), Three Mile Island, Tchernobyl (y compris une mise au point sur les doses reçues en France, en fait faibles), et Fukushima, avec une analyse des erreurs et même des fautes qui ont conduit à ces catastrophes.

On passe alors à la fusion, par confinement magnétique et aussi inertielle. Le diagnostic n'est pas très optimiste. Le calendrier d'ITER est sans cesse repoussé et ITER ne produira pas d'énergie électrique. Tout ceci suivi de quelques données sur l'énergie.

On passe aux armes nucléaires et thermonucléaires et leur fonctionnement ou encore les affreuses bombes à neutrons, la lutte contre la prolifération, les dangers du terrorisme, avec la facilité de construire des bombes artisanales, et aussi les bombes classiques contenant des matériaux radioactifs.

Finalement le dernier chapitre est intitulé : « que penser et que faire après Fukushima ». L'auteur se contente de donner des éléments de réponse, sans prendre explicitement parti. Les décideurs devraient certainement lire ce livre pour se faire une opinion sérieuse au lieu de se laisser aller à des réactions



Bookshelf

émotionnelles incontrôlées. Je recommande vivement la lecture de ce livre.

Bien qu'il soit en Français, je recommande également ce livre aux anglophones : le Français est simple et compréhensible.

● *André Martin, CERN.*

Books received

Perspectives on Supersymmetry II

By Gordon L Kane (ed.)

World Scientific

Hardback: £97 \$141

Paperback: £45 \$65

Being an update of *Perspectives on Supersymmetry* published in 1998, which was also edited by Gordon Kane, this volume begins with an excellent pedagogical introduction to the physics and methods and formalism of supersymmetry. It is accessible to anyone with a basic knowledge of the Standard Model of particle physics. Next comes an overview of open questions, followed by chapters such as how to detect superpartners and tools for studying them, the current limits of superpartner masses on entering the LHC era, the lightest superpartner as a dark-matter candidate in thermal and non-thermal cosmological histories, and associated Z' physics. Most chapters have been extended and updated from the earlier edition, while some are new.

Nuclear Collective Motion: Models and Theory

By David J Rowe

World Scientific

Hardback: £55 \$89

Paperback: £28 \$42

E-book: \$116

Two of the most important developments in nuclear physics have been the shell model and the collective model. A third, based on variational and mean-field methods, brings these two approaches together in the so-called unified models. These three approaches provide the foundations on which nuclear physics is based. They need to be understood by everyone practicing or teaching nuclear physics. This book provides a simple presentation of the models and the theory of nuclear collective structure, with an emphasis on the physical content and the ways they are used to interpret data.

Electromagnetic Analysis Using Transmission Line Variables (2nd edition)

By Maurice Weiner

World Scientific

Hardback: £89 \$130

E-book: \$169

In this book, the author employs a relatively

new method for solving electromagnetic problems, making use of a transmission line matrix. Mathematically, the procedures are identical to traditional numerical methods; however, the matrix becomes a launch pad for many improvements in the analysis, using more modern notions of electromagnetic waves. In this second edition, major revisions occur in chapters IV and VII, which now present an up-to-date treatment of plane-wave correlations and decorrelations, as well as provide a revised formulation of simulation to solve transient electromagnetic problems.

Introduction to the Theory of Critical Phenomena: Mean Field, Fluctuations and Renormalization (2nd edition)

By Dimo I Uzunov

World Scientific

Hardback: £88 \$142

Paperback: £48 \$78

This introduction to the theory of phase transitions and critical phenomena covers a period of more than 100 years of theoretical research, providing a clear interrelationship with experimental problems. Starting from a basic university-level knowledge of thermodynamics, statistical physics and quantum mechanics, it explains various types of phase transition and (multi)critical points. The classic aspects of the theory are naturally related with modern developments. This new edition contains a more detailed presentation of the renormalization group method and its applications to particular systems.

The Light Fantastic: A Modern Introduction to Classical and Quantum Optics (2nd edition)

By Ian R Kenyon

Oxford University Press

Hardback: £70 \$126

Paperback: £35 \$62.95

Kenyon's thorough introduction to modern classical and quantum optics is appropriate for advanced undergraduates or beginning graduates. Digital cameras, LCD screens, laser welding and the optical fibre-based internet illustrate the penetration of optics in 21st century life, many such applications being presented from first principles. This thoroughly revised and updated edition includes new coverage of photonic crystals and Bloch waves, as well as quantum dots and microcavities.

Elements of Phase Transitions and Critical Phenomena

By Hidetoshi Nishimori and Gerardo Ortiz

Oxford University Press

Hardback: £49.95 \$89.95

This introductory account of the theory of phase transitions and critical phenomena reflects lectures given by the authors to graduate students and is thus classroom-tested to help beginners enter the field. Most parts are written as self-contained units and every new concept or calculation is explained in detail without assuming prior knowledge of the subject. The book enhances and revises one that is a bestseller in the Japanese market and considered a standard textbook in the field. It contains new pedagogical presentations of field theory methods, including a chapter on conformal field theory.

Muon Spin Rotation, Relaxation and Resonance: Applications to Condensed Matter

By Alain Yaouanc and Pierre Dalmas de Réotier

Oxford University Press

Hardback: £75 \$135

Primarily intended for postgraduate students and researchers of condensed-matter science, chemical physics and material science, who plan to use the muon-spin rotation, relaxation and resonance (μ SR) techniques, this book combines for the first time a detailed discussion of the physical information contained in the measured polarization functions with real examples. The first part presents typical results of the application of μ SR and explains the basic principles involved. The second part, the core of the book, provides a comprehensive discussion of the measured polarization functions. In the third part, the authors analyse examples from the following fields: diffusion properties of muon and muonium, magnetism, superconductivity and muonium centres in materials.

Elementary Scattering Theory: For X-ray and Neutron Users

By D S Sivia

Oxford University Press

Hardback: £39.95 \$71.95

Paperback: £19.95 \$35.95

The opportunities for doing scattering experiments at synchrotron and neutron facilities have grown rapidly in recent years and are set to continue to do so. This text provides a basic understanding of how these techniques enable the structure and dynamics of materials to be studied at the atomic and molecular level. Although mathematics cannot be avoided in a theoretical discussion, the aim has been to write a book that most scientists will still find approachable. To this end, the first two chapters are devoted to providing a tutorial background in the mathematics and physics that are implicitly assumed in other texts.

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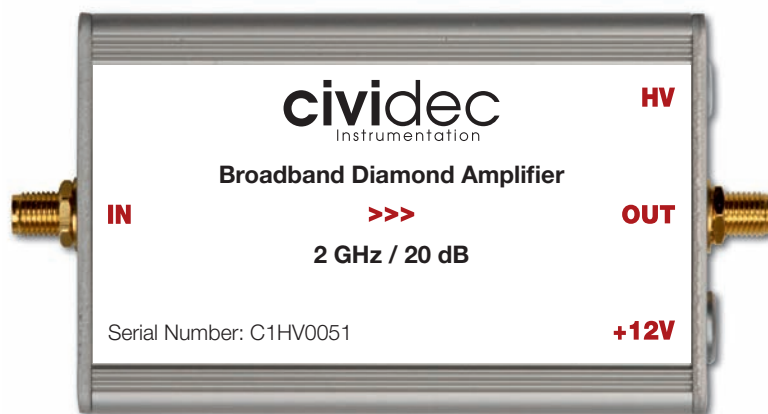
- **Charge Amplifier for single-particle detection**

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SNR for MIP particles: 15
Peaking time: 4 ns

APPLICATION EXAMPLE:

CERN LHC – Diamond Beam Loss Monitor

DBLM are installed complementary to the ionization chambers of the base machine | **radiation-hard pre-amplifier** | <1 ns time resolution | single MIP resolution | high dynamic range



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Emission Detectors

By Alexander I Bolozdynya

World Scientific

Hardback: £37 \$60

E-book: \$78

After decades of research and development, emission detectors have recently become the most successful instrumentation used in modern fundamental experiments searching for cold dark matter, and are also considered for neutrino coherent scattering. This book is the first monograph exclusively dedicated to emission detectors. It reviews the properties of two-phase working media based on noble gases, saturated hydrocarbon, ion crystals and semiconductors. It should interest detector physicists and experimentalists, nuclear engineers, materials scientists, and advanced graduate students in physics and medical imaging.

Six Quantum Pieces: A First Course in Quantum Physics

By Valerio Scarani with Chua Lynn and Liu Shi Yang

World Scientific

Hardback: £30 \$48

Paperback: £15 \$24

This original approach to quantum physics combines the competence of a well known researcher in quantum information science and the freshness in style of two high-school students. Quantum physics is challenging because it describes counter-intuitive phenomena and employs rather advanced mathematics. The description of "traditional" quantum phenomena (such as the structure of atoms and molecules) does indeed involve the whole formalism. However, other striking phenomena – the most "typically quantum" ones – can be described using only high-school mathematics. This course exploits this fact, making it possible for a beginner to tackle mind-boggling experiments such as teleportation and the violation of Bell's inequalities.

Introductory Quantum Physics and Relativity

By Jacob Dunningham and Vlatko Vedral

Imperial College Press

Hardback: £50 \$80

Paperback: £26 \$42

The authors have based this introduction to the two pillars of modern physics on the lecture courses that they taught at the University of Leeds. It contains all of the necessary material for quantum physics and relativity in the first two years of a typical physics degree course. The choice of topics complies fully with the Institute of Physics guidelines but the coverage also

includes more interesting and up-to-date applications, such as Bose condensation and quantum teleportation.

Modern Aspects of Superconductivity: Theory of Superconductivity

By Sergei Kruchinin, Hidemi Nagao and Shigeyuki Aono

World Scientific

Hardback: £62 \$90

E-book: \$117

Written for students and researchers of superconductivity, this book discusses aspects of the experiment and theory surrounding superconductivity. New experimental investigations of magnetic and thermodynamic superconducting properties of mesoscopic samples are explored, and the results are predicted based on theoretical models in nanoscale superconducting systems. Topics include high- T_c superconductivity, two-gap superconductivity in magnesium diborades, room-temperature superconductivity and the mechanism of superconductivity.

Supersymmetric Quantum Mechanics : An Introduction

By Asim Gangopadhyaya, Jeffry V Mallow and Constantin Rasinariu

World Scientific

Hardback: £50 \$80

Paperback: £25 \$40

The aim of this book is to provide a single compact source for those who want to understand the essentials of supersymmetric quantum mechanics (SUSYQM). The text contains a large selection of examples, problems and solutions that illustrate the fundamentals and its applications. It is richly illustrated and contains an attractive and relevant list of topics.

Fundamentals of Quantum Information

By Hiroyuki Sagawa and Nobuaki Yoshida

World Scientific

Hardback: £36 \$58

This introduction to the basic concepts of quantum computation and information seeks to provide intuitive and transparent ideas of the subjects, in a way that is not strictly mathematical. Aimed at undergraduate and graduate students, it is self-contained and unified in its description of the cross-disciplinary nature of this field. It starts with the quantum bits and the entangled states, which turn out to bring revolutionary ideas in information theory. Quantum mechanics and mathematical tools are explained with many examples and illustrations. There are exercises at the end of each chapter, with detailed solutions provided at the end of the book.



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Model ⁽¹⁾	Form Factor	N. of ch. ⁽⁴⁾	Max. Sampling Frequency (MS/s)	N. of Bits	Input Dynamic Range (Vpp) ⁽⁴⁾	Single Ended / Differential Input	Bandwidth (MHz)	Memory (MS/ch) ⁽⁴⁾	DPP firmware ⁽⁵⁾
x724	VME	8	100	14	0.5 / 2.25 / 10	SE / D	40	0.5 / 4	PHA
	Desktop/NIM	4 / 2				SE			
x720	VME	8	250	12	2	SE / D	125	1.25 / 10	CI, PSD
	Desktop/NIM	4 / 2				SE			
x721	VME	8	500	8	1	SE / D	250	2	no
x731	VME	8 - 4	500 - 1000	8	1	SE / D	250 / 500	2 / 4	no
x730 COMING SOON	VME	8	500	12	2	SE / D	250	1.25 / 10	PSD
	Desktop/NIM	4 / 2				SE			
x751	VME	8 - 4	1000 - 2000	10	1	SE / D	500	1.8 / 14.4 - 3.6 / 28.8	PSD
	Desktop/NIM	4 - 2				SE			
x761	VME	2	4000	10	1	SE / D	TBD	7.2 / 57.6	no
	Desktop/NIM	1				SE			
x740	VME	64	62.5	12	2 / 10	SE	30	0.19 / 1.5	no
	Desktop/NIM	32							
x742	VME	32+2	5000 ⁽²⁾	12	1	SE	600	0.128 / 1 ⁽³⁾	no
	Desktop/NIM	16+1							

(1) The x in the model name is V1 for VME, VX1 for VME64X, DT5 for Desktop and N6 for NIM

(2) Sampling frequency of the analog memory (switched capacitor array); A/D conversion takes place at lower speed (dead-time)

(3) The memory size for the x742 is 128/1024 events of 1024 samples each

(4) The indication "size 1/size 2" denotes different options

(5) Digital Pulse Processing (DPP) firmware:

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PAV11 - Parity Violation to Hadronic Structure and more...

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FUNFI - Fusion for Neutrons and Sub-critical Nuclear Fission

September 12 - 15, 2011

XCVII Congresso Nazionale Società Italiana di Fisica

September 19 - 23, 2011

TWEPP-11 Topical Workshop on Electronics for Particle Physics 2011

September 26 - 30, 2011