is almost no mention of meson reactions, even though mesons are the basis of the long-range nuclear forces, and there is little coverage of current topics of interest in nuclear physics, such as the interacting boson model or nuclei at high excitation energies, densities and temperatures.

Burcham and Jobes obviously feel more at home in particle physics. Their coverage of it is much more complete and thorough; explanations (and derivations) are given for newly introduced concepts and formulas; the progression of new topics is sensible and easy to follow; the physics is up-to-date and even includes, as an addendum, the discovery of the top quark. The quark model and the standard model symmetries, including gauge symmetry, are covered thoroughly and clearly, and both theory and experiments are presented.

Nevertheless, Part II also contains a few inaccurate statements. For example: Zweig did not call his partons "quarks," but rather "aces," and there are more than "precisely" 9 mesons with spin–parity 0^-. Some explanations are also missing—why three colors are needed, for instance. And there are some odd combinations, such as the nonrelativistic Schrödinger equation following immediately after the introduction of relativistic kinematics in chapter 9. There is also no coverage of quantum chromodynamics on a lattice.

Aside from these shortcomings, I found the second part of the book to be a well-written and lucid presentation of the theoretical and experimental basis of our present understanding of particle physics and the standard model. The book ends with a description of grand unified theories and attempts to include gravity.

Each chapter contains references and about a dozen problems, with solutions given at the end of the text. These features should be particularly helpful to graduate students and researchers who wish to be brought up-to-date.

There are of course quite a few other books, such as Kurt Gottfried and Victor Weisskopf's *Concepts of Particle Physics* (Oxford University, 1984), which cover the same subject but are almost a decade older. Both the Burcham–Jobes and Gottfried–Weisskopf texts offer the reader insights and an understanding of particle physics. I prefer the latter, because it does not suffer from some of the shortcomings of the present work.

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Computer Simulations with Mathematica: Explorations in Complex Physical and Biological Systems

Richard J. Gaylord
and Paul R. Wellin
Springer-Verlag, New York, 1995.
297 pp. $54.95 hc
ISBN 0-387-94274-2

Mathematica Graphics: Techniques and Applications

Tom Wickham-Jones
Springer-Verlag, New York, 1994.
720 pp. $49.95 hc
ISBN 0-387-94047-2

Software systems such as Mathematica, capable of both numerical and symbolic computation, have been gaining rapidly in popularity over the last several years. Indeed, if the explosion in the number of books describing or exploiting their features is any indication, these systems will soon become virtually indispensable in research and teaching. *Computer Simulations with Mathematica* by Richard Gaylord and Paul Wellin and *Mathematica Graphics: Techniques and Applications* by Tom Wickham-Jones represent two steps towards this indispensability. Both books make extensive use of Mathematica's graphics capabilities—the first as a computational tool, the other in a detailed exposition and reference.

Computer Simulations is a fine introduction to the computer modeling of natural phenomena, an approach the authors call "algorithmic physics." This name is a bit misleading, as the applications are hardly confined to physics; the book also contains material relevant to chemistry, biology, computer science and operations research. Part I consists of chapters devoted to probabilistic systems, including percolation clustering and the Ising model. To my mind, though, the work truly excels in Part II with its presentation, discussion and applications of cellular automata. Mathematica seems particularly well suited to cellular automata, and the accompanying graphics are excellent in their quality, ease of generation and pedagogical effect. (As a resident of Los Angeles, I took particular interest in the chapter on traffic flow.)

The book is well written, and the chapters are organized in a clear, straightforward fashion. In fact the individual chapters could be considered as largely self-contained entities: Each begins with a description of the problem and an introduction to the abstract solution, followed by a clear, methodical outline of the algorithm. The level of presentation is suitable for readers possessing some familiarity with programming and algorithmic methods, although I can imagine a complete novice benefiting from this book. To gain full benefit from the book however, it is necessary to be Mathematica-literate, and to this end the authors devote an appendix—a brief but useful primer on the rudiments of Mathematica forms and constructions.

An integral component of *Computer Simulations* is the accompanying CD-ROM. On the disk are images and animations resulting from simulations described in the book, as well as graphics files containing extensions to concepts presented in the text. Also included is a version of each chapter in Mathematica notebook form, which allows the book to be read interactively. For those without Mathematica, a copy of the program MathReader is provided, which will enable them to run the animations and view the notebooks. Taken together, the book and CD should serve as an excellent foundation for a course on algorithmic methods.

Whereas Gaylord and Wellin provide an introduction to applied programming and graphical techniques, Wickham-Jones has called upon his experience as the main developer of graphics at Wolfram Research to produce an invaluable reference on the general use of graphics in Mathematica. Written in the spirit of Mathematica originator Stephen Wolfram's *Mathematica: A System for Doing Mathematics by Computer* (Addison-Wesley, 1991), and identical in layout, *Mathematica Graphics* covers a wealth of material on the conceptualization, generation and manipulation of graphics objects. The book is divided into four parts, beginning with a fairly basic and accessible presentation of Mathematica's built-in graphics functions. Part II is more advanced, showing how to construct new graphics functions using Mathematica programming techniques. Included in this is a discussion of two- and three-dimensional graphics, as well as an entire chapter on the use of color. Several examples of graphics problems are presented, accompanied by detailed solutions. Part III is devoted to applications, such as the visualization of numerical data and the construction of vector field lines. The final section provides a thorough reference to the different types of graphics objects used by Mathematica.

Mathematica Graphics comes with a diskette containing a large number of the packages described and used in the text. Of particular merit are the ExtendGraphics packages, which expand upon Mathematica's built-in capabilities. Included are useful tools with which to construct sophisticated tick marks and labels on plots; a package to generate vector field lines; packages for implementing various triangulation techniques; and functions for the manipulation of graphics objects in two and three dimensions.

Mathematica Graphics requires more background in Mathematica than does *Computer Simulations*, and many readers may find it helpful to have a supplementary source close at hand. In particular, much of the book requires at least a passing familiarity with Mathematica programming methods; a more detailed description of these techniques (as in for example, Roman Maeder's *Programming in Mathematica*, Addison-Wesley, 1990) may prove invaluable.

Despite Wickham-Jones's somewhat stiff writing style and a few minor typographical errors, those who read *Mathematica Graphics* in its entirety will be richly rewarded. Indeed, for anyone interested in learning more about the implementation and breadth of Mathematica's graphics abilities and applications, this book is an excellent resource.

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The Encyclopedia of Advanced Materials

David Bloor, Richard J. Brook, Merton C. Flemings and Subhash Mahajan
Pergamon, New York, 1994. 4 Vol., 3152 pp. $1600.00 hc
ISBN 0-08-040606-8

As a solid-state scientist with an interest in materials synthesis, characterization and utilization, I found this four-volume, 3000-page *Encyclopedia of Advanced Materials* well organized. It covered every topic that my group and I could think to search for, as well as many more that we discovered on browsing through the text. Each topic is covered at a level appropriate to an intelligent scientist who wants to know something about an unfamiliar topic. At least in the