derstand the most familiar approach to the cooling of matter in gas phase.

Macroscopically, such cooling actions amount to quenching the thermal motions along translational degrees of freedom. Attaining lower and lower temperatures implies analogous quenching of smaller energy transfers characteristic of optical spectra and of their fine-and hyperfine-structures.

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Nuclear and Particle Physics

W. E. Burcham and M. Jobes
Wiley, New York, 1995. 752 pp.
$59.95 pb ISBN 0-582-45088-8

William E. Burcham and M. Jobes, two well-known British physicists, have produced a massive, 752-page treatise on nuclear and particle physics. Both fields are constantly developing as a consequence of new facilities, discoveries and insights. Thus an up-to-date book is always welcome. *Nuclear and Particle Physics* is no exception, even though it has some shortcomings in its nuclear physics coverage. The authors state that the book is written "at two levels." Part I (220 pages) is a "brief summary of the main topics normally appearing in an undergraduate course in nuclear structure physics." Part II, on particle physics, should be useful for graduate students and researchers interested in this field.

The problem with Part I is that there are too many inaccuracies and too few explanations. For instance, the authors state that central forces do not mix states of different angular momenta. But noncentral forces do not do so either; the authors undoubtedly meant to restrict this statement to orbital angular momenta. Further, the basis given for the shell model makes little sense. And is it really true that "direct evidence for the existence of shell structure has come from nuclear reactions"? They are certainly not the source of the best evidence. Also in Part I, formulas appear without bases—for example, the formulas for form factor (3.11), the nuclear g factor (3.21) and total cross section (6.9). The Mössbauer effect is described but not explained. Perhaps the reader is supposed to have seen all this material (with appropriate explanations) earlier, but I believe it does not help the reader to present facts without clues to their origins. Also, there is little differentiation between older and newer physics. There

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,