

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.

UGO FANO
University of Chicago

Nuclear and Particle Physics

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

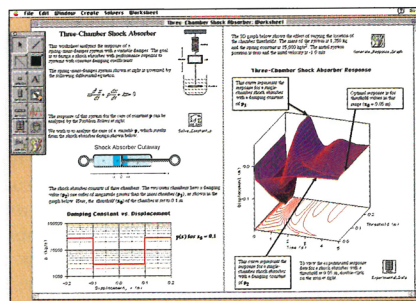
William E. Burcham and M. Jobes, two well-known British physicists, have produced a massive, 752-page treatise on nuclear and particle physics. Both fields are constantly developing as a consequence of new facilities, discoveries and insights. Thus an up-to-date book is always welcome. *Nuclear and Particle 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

From the makers of LabVIEW®

HiQ

Interactive Math for Macintosh and Power Macintosh



Interactively analyze and document in the HiQ environment – much more than a command-line interface.

Solve Math Problems Interactively

- Data Fitting
- Data Visualization
- Eigenvalue
- Expression Evaluation
- Linear Algebra
- Numerical Integration
- Nonlinear Systems
- Optimization
- Ordinary Differential Equations
- Probability and Statistics
- Root Solving
- Signal Processing and much more ...

Call today for Your
FREE HiQ Demo
(800) 433-3488

(Includes Interactive Data Fitter)
E-mail address: info@natinst.com



NATIONAL INSTRUMENTS™
The Software is the Instrument®
6504 Bridge Point Parkway
Austin, TX 78730-5039 USA
Tel: (512) 794-0100
Fax: (512) 794-8411

© Copyright 1995 National Instruments Corporation. All rights reserved. Product and company names listed are trademarks or trade names of their respective companies.

Circle number 40 on Reader Service Card

3K

the easy way

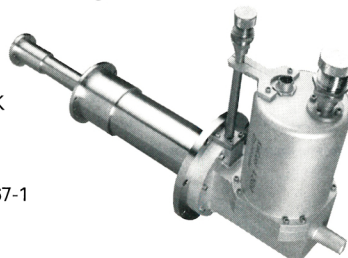
Leybold's KelCool® 4.2GM is the only two-stage Gifford-McMahon cryocooler that delivers 0.5W at 4.2K, and a remarkable no-load bottom temperature of <3K. Forget the hassle of liquid helium or the high cost and complexity of a third stage.

Superior Performance

- 0.5W capacity at 4.2K
- Tested and certified to less than 2.9K

Reliability

- Standard two-stage design
- Meets MIL-S-901D and MIL-STD-167-1 shock and vibration tests
- Smooth, quiet running



Get the cold facts on the Two-Stage KelCool. Call today!



balzers

Balzers & Leybold have merged!

Leybold Cryogenics
North America
8 Sagamore Park Road
Hudson NH 03051
Phone (603) 595-3205
Fax (603) 889-8573

See us at MRS Show, Boston, Booth #U-609

Circle number 41 on Reader Service Card

OPTICAL RAY TRACERS

for PC, Macintosh,
and PowerMac

BEAM TWO \$89

- + for students & educators
- + coaxial system
- + lens, mirrors, irises
- + exact 3-D monochromatic trace
- + 2-D on-screen layouts
- + diagnostic ray plots
- + least squares optimizer
- + Monte Carlo ray generator

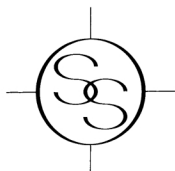
BEAM THREE \$289

- + for advanced applications
- + all BEAM TWO functions, plus:
- + 3-D optics placement
- + tilts and decenters
- + cylinders and torics
- + polynomial surfaces
- + 3-D layout views
- + glass tables

BEAM FOUR \$889

- + for professional applications
- + all BEAM THREE functions, plus:
- + big tables: 99 surfaces
- + full CAD support: output to DXF, plotter, PostScript
- + point spread function
- + modulation transfer function
- + wavefront display too

Every package includes
versions for coprocessor
and noncoprocessor machines
also manual and sample files.
Write, phone, or fax us
for further information.



STELLAR SOFTWARE

P.O. BOX 10183
BERKELEY, CA 94709 USA
PHONE (510) 845-8405
FAX (510) 845-2139

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 Jobs 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-Jobs 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.

ERNEST M. HENLEY

*University of Washington
Seattle, Washington*

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,