

BOOKS

terial in too little space. On the other hand, the book is very thoroughly referenced; an interested reader can easily find the relevant literature.

In summary, I found this to be a well-written book that would be highly valuable to anyone working in laboratory or space plasmas. The book should not be considered a standard textbook, like the classical *Principles of Plasma Physics* (McGraw-Hill, 1973) by Nicholas Krall and Alvin Trivelpiece. For example, there are no problems in Biskamp's book. In spirit it is more like Eugene Parker's *Cosmical Magnetic Fields* (Clarendon, 1979), because it presents a clear description of current areas of research, with the emphasis always on the physics of the phenomenon.

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Principles of Symmetry, Dynamics and Spectroscopy

William G. Harter
Wiley, New York, 1993.
846 pp. \$125.00 hc
ISBN 0-471-05020-2

Group theory has come into its own. In contrast to the situation in the 1930s, when it was regarded by many as an unnecessarily complicated and almost perverse tool of theoretical physics, group theory is now seen as an essential component of graduate and even undergraduate education. Nothing could demonstrate this change of heart better than William Harter's *Principles of Symmetry, Dynamics and Spectroscopy*. In it, European esoterica have been supplanted by American practicalities.

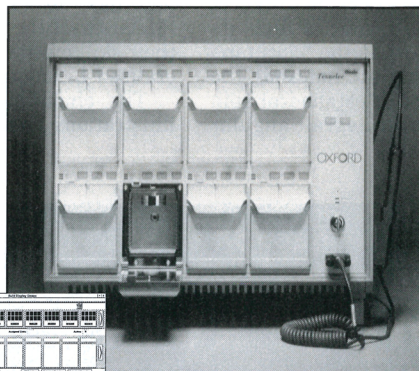
Harter senses that most physicists would be happy working under the hood of a car, and he has brought the vision of an intellectual auto mechanic to group theory. The formal theory that both senior undergraduates and graduate students can profitably absorb is interspersed with mechanical analogs. As someone who has tackled the vibrating fullerenes, Harter is particularly strong on normal modes. This topic leads into the calculus of angular momentum, level splittings (particularly for SF_6 , where Harter himself has made major contributions), spherical tensors and the Wigner-Eckart theorem for finite symmetries and $SO(3)$. The emphasis is on the representations of groups rather than the abstract groups them-

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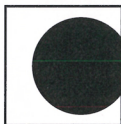
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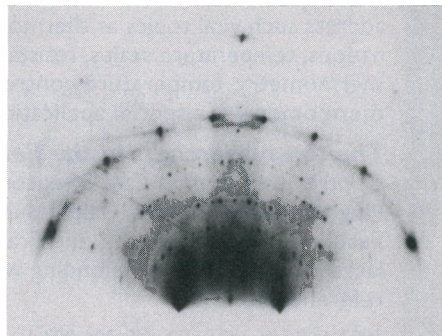
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selves. Lie groups and algebras do not go beyond $O(4)$ and $U(3)$. There are no applications to particle physics.

The large number of diagrams gives a flavor of the amazingly rich and varied course of lectures that must have formed the nucleus of the book. The wit one has come to expect from Harter's many articles finds its outlet in such items as the "clocktane molecule" (modestly not indexed), the mnemonic wheels for octahedral spin algebra with half-integral angular

momenta, and the many nomograms. Axes often have crank handles attached to aid the visualization of rotation and to encourage reader participation. Readers whose ocular decoupling has been honed by Philip Morse and Herman Feshbach's classic *Methods of Theoretical Physics* (McGraw-Hill, 1953) can exercise their skill on the stereograms for generalized Lissajous trajectories.

The abundance of examples and illustrations comes at a price: The

book is long. In 1932 B. L. Van der Waerden was able to derive a general expression for an $SO(3)$ Clebsch-Gordan coefficient in a couple of pages. Harter takes more than 100 pages to work his way through the dihedral and octahedral groups before moving on to some special cases of $SO(3)$ and ultimately to the general result.

The book's modern writing style, characteristic of today's ever fatter textbooks, is a reflection of the classroom, where the teacher explains while the audience passively listens. Harter has rethought and reworked his material, often in a brilliantly inventive way, but there is a risk that weak-willed readers may lose their sense of direction and be left dazed and groggy rather than inspired.

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Topics in Ergodic Theory

Ya. G. Sinai

*Princeton U. P., Princeton,
New Jersey, 1994. 216 pp.*

\$39.50 hc ISBN 0-691-03277-7

The first sentence of Yasha Sinai's *Topics in Ergodic Theory* states that "ergodic theory studies statistical properties of deterministic dynamical systems." The 18 lectures in this book cover that area in the broadest sense. Sinai, now at Princeton University, is the acknowledged leader in the field. His work on K systems began 35 years ago, and he continues to make important contributions. This is a mathematics book rather than a physics book, but because of its obvious relevance to the area called chaos science, it will interest many theoretical physicists.

On the whole, the author avoids abuse mathematics, so the book will be accessible to physicists. However, the use without comment of basic tools from mathematical probability theory (such as the Borel Cantelli lemma and Doob's theorem) will require many physicist readers to do some background work or else accept a fair amount on faith. The book is filled with clear and nontrivial examples that will be of use even to those who don't hold with the theorem-proof style of much of the book.

The book is divided into five parts. The first, which focuses on John von Neumann's celebrated theorem classifying ergodic systems having pure-point spectrum, will be of limited interest to physicists, because such spectra correspond to systems that