areas with which I am familiar, most of the authors are at the forefront of research in their fields and are articulate and clear.

One irritating feature, however, is the number of typographical mistakes. This may be expected in a first edition, and many are obvious errors that even a novice would probably catch. Some errors, however, are important and not easy to catch unless you already know the concept or fact being introduced. For example, in a discussion of rare-earth ions and the electronic angular momentum, the relation between J, L and S is wrong: Rather than being $J = L + S$ for the light rare earths, as the text states, it is in fact $J = |L - S|$ (page 2208). Annoying typos include the "bracket" notation for an electronic state "$| \rangle$" as "$1 \rangle$" (page 2216), the mass magnetic susceptibility referred to as the "massic" magnetic susceptibility (page 1668) and Nb_3Sn written as NB_3Sn, which would be a completely different compound if it existed. Depending on how familiar you are with a topic, it is possible to be misled by such typos. I hope that a mechanism to catch most of the typos will be instituted for the second edition.

In spite of these errors, the encyclopedia is well worth having in your library reference section, although the suggested retail price is probably too much for the average personal collection. David Bloor, Richard Brook, Merton Flemings and Subhash Mahajan, who undertook the enormous task of compiling important topics and finding suitable advisory editors (18 of them), not to mention the hundreds of topical authors, have done a superb job.

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Physics Experiments Using PCs: A Guide for Instructors and Students

Edited by H. M. Staudenmaier
Springer-Verlag, New York, 1995. 312 pp. $39.95 pb ISBN 3-540-58801-9

In his introduction to *Physics Experiments Using PCs*, H. M. Staudenmaier points out that despite the increasing importance of computers in both academic and industrial laboratories, the standard undergraduate physics curriculum fails to provide formal instruction or extensive experience in using them. The experiments described in this volume use computers to collect and analyze data in a variety of physics subfields at various levels of difficulty. As the US physics community mobilizes to better prepare its students for today's competitive job markets, a new emphasis on practical skills and flexible training is appearing in American colleges and universities. Faculty will need resources such as these experiments to broaden the physics curriculum and increase the emphasis on practical applications.

As in any multiauthor collection, the quality of the contributions varies. The material on introductory mechanics using a form of video capture lags considerably behind state-of-the-art educational software available in the US. Similarly the material on converting a personal computer to a multichannel analyzer for use in nuclear physics concentrates on programming details that are not particularly useful in a climate where technology changes quickly. However, the experiments on thermal physics contain very nice discussions of measurement and control theory suitable for upper-level undergraduates, and the experiments on optical transfer functions and parity violation in weak interactions will provide a stimulating challenge to such students. The scheme for collecting and analyzing data from an orbiting satellite will appeal to almost any inventive undergraduate, and the experiment is inexpensive for a relatively glamorous undertaking.

The descriptions of the experiments contain sufficient detail to allow either a student or a faculty member to set them up from scratch. The specific pieces of equipment described may be a bit dated, but the text gives enough information to allow substitutions or reconstructions. The sections on theory generally provide adequate background for the experiments.

Unfortunately, none of the authors addresses the conduct of the lab from an instructional point of view. Students need to learn experimental design—selecting measuring devices, interfacing them to a computer, programming the computer or adapting existing software for a particular problem. They must figure out how to calibrate their systems and estimate their experimental errors. But if the instructor simply provides students with the texts of the experiments in *Physics Experiments Using PCs*, or sets up and tests the equipment for a class, the students may well grow accustomed to working with the computer as a useful black box, but they will have little chance to develop vital skills in experimental design, construction and analysis.

To prepare for industrial careers, students need to practice working in design groups. They must hone their communication skills by both working out a design with a team and presenting experimental results to their peers. In an ideal world, advanced lab courses provide an opportunity for students to explain their results to nonscience audiences, perhaps by writing press releases on results.

By supplying ideas for sophisticated new experiments, this volume makes a useful contribution to the ongoing revision of the undergraduate physics curriculum. Had it dealt with the changes needed in instructional strategies as well, it would have been outstanding.

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Geophysical Inverse Theory

Robert L. Parker
Princeton U. P., Princeton, N.J., 1994. 386 pp. $39.50 hc ISBN 0-691-03634-9

Our knowledge of the physical properties of the Earth's interior—except for the few kilometers at the top—depends on our ability to infer their values at depth from functionals measured at the surface. This is called the inverse problem; a specific example would be the determination from an anomalous gravity field of the shape of an ore body causing it. In this case there is an infinity of possible models; such an inverse problem is called nonunique. The direct problem consists of evaluating the functionals for a specific model; in general there is no difficulty in solving those.

The geophysical inverse problems were brought to the attention of the geophysical community in the 1960s, largely as a result of the accumulation of vast amounts of new seismological data that could not be satisfactorily explained by a manual adjustment of the model parameters. For example, the eigenfrequencies of the normal modes of the Earth were first measured from the records of the great Chilean earthquake of 1960. These eigenfrequencies are nonlinear functionals of the distribution of the shear and bulk elastic moduli and density throughout the Earth's volume, and their observed values disagreed by 1–2% with the predictions of the existing models of the Earth's interior.

In this context George Backus and Freeman Gilbert published a series of