cers who can be relied on to obey the command to launch nuclear weapons. Yet Dougherty shows that he is not convinced that discipline will triumph, stressing the need to communicate any order to fire verbally, as "it is vital that they know that the nation's security is . . . in their hands." Throughout the article he appears not yet to have understood the difference in psychological attitudes toward nuclear and conventional war. In a famous case involving a decorated and mature officer wrestling with the problem of launching nuclear weapons, Dougherty stated that "this officer was not qualified for missile duty in SAC and, in fact, should not be retained in the Air Force." The logic of removing the officer from the Air Force and not just from nuclear weapons responsibility shows how little the difference between conventional and nuclear warfare is even now appreciated.

One of the book's most important chapters is "Sources of Error and Uncertainty" by Ashton Carter. The physicist reader will applaud its inclusion, for this is a subject we live with continually, but which is usually given less attention in the "outside world." Some of Carter's conclusions are neither well supported nor explained. For example, he examines the possibility that increasing redundancy in sensors that warn of attack may in fact reduce response reliability. Nowhere does he let the reader know whether enough reliable sensing devices are deployed at present to provide a reliable evaluation of an attack—clearly a crucial question. Instead, he stresses that we "should improve the ability . . . to assess attack, rather than add new sensors based on new physical principles." The physicist, used to the idea that more information can only help, will not understand this "rather than" argument. Compared with the unequivocal image each of us see when we watch a televised launch at Cape Canaveral, the information that present satellite or radar sensors can provide is primitive. Yet Carter doesn't discuss this first-order effect. Also, in his careful analysis of the reliability of attack assessment in connection with the strategy of launch-on-warning, Carter reviews the conventional wisdom of prior decades. I would have appreciated a more topical treatment.

The editors asked the authors to "provide information and analysis without interjecting personal views." This is a strength, but it also introduces a weakness: namely, a lack of even modest suggestions of new approaches, which would have enhanced the book's ability to stimulate discussion.

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Detectors for Particle Radiation

Konrad Kleinknecht
Cambridge U. P., New York, 1986. 206 pp.
$44.50 hc ISBN 0-521-30424-5; $19.95 pb ISBN 0-521-35852-3

Introduction to Experimental Particle Physics

Richard C. Fernow
Cambridge U. P., New York, 1986. 421 pp.
$44.50 hc ISBN 0-521-30170-X

Techniques for Nuclear and Particle Physics Experiments: A How-to Approach

William R. Leo
Springer-Verlag, New York, 1987. 368 pp.
$49.50 pb ISBN 0-387-17386-2

Over the last 30 years, graduate students have usually learned about particle detectors by working in the laboratory. So we have postdocs with a quilt of knowledge full of holes and only a cookbook understanding of the detectors that they build and service. Now that the field has matured, the time is ripe for books for graduate-school courses. The three books reviewed here, taken together, could serve as an excellent resource for students, postdocs and more senior physicists alike. The overlap in content is quite high among the three, but each book stresses different aspects of the field and each has its special areas of concentration. All three authors have actively used their expertise in instrumentation to produce results in physics research.

Konrad Kleinknecht's rather slim volume covers the whole field of radiation detectors from ionization detectors to transition radiation. Naturally, accomplishing this goal required highly selective contents: Kleinknecht discusses only the latest versions of detectors and condenses the physics principles on which they are based. By itself, the book is quite difficult for beginning students because of its concentrated nature. It could, however, serve as a reference to accompany the other two books. Most important physics principles are included, as well as the relevant mathematical expressions. This is especially true in the first chapter, on the interaction of charged and neutral particles in matter and on the drift of ions and electrons in gases.

Richard C. Fernow's longer book goes beyond Kleinknecht's coverage to include topics such as strong and weak interactions, beam transport, targets, fast electronics and triggers. Of the three, this book alone provides a set of problems at the end of each chapter. The problems are well chosen and give the student a taste of the problems one encounters in the laboratory. The book is aimed at the first-year graduate student, and the knowledge it imparts would make such a reader immediately useful in the laboratory as an experimenter.

The third book, by William R. Leo, is in some senses a cross between the other two. It goes into great but clear detail on subjects such as detector–electronics coupling. It has sections on coaxial cables (a topic usually neglected), preamplifiers, linear and digital systems, NIM and CAMAC standards and so on. This book also has the largest and best section on semiconductor detectors. On the other hand, some topics are given scant treatment. Almost completely left out are Čerenkov counters and sampling calorimeters. Statistics, however, is best covered in Leo's book.

Looking at the three books, I find that no single one delves deeply into the full range of potential subjects. Together they cover the field quite well. Although no topic is unique to Kleinknecht's book, if one tried to save money by getting only the other two, one would save little and miss Kleinknecht's insights to boot.

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BOOK NOTES

New Directions in Physics: The Los Alamos 40th Anniversary Volume

Edited by Nicholas Metropolis, Donald M. Kerr and Gian-Carlo Rota
Academic, San Diego, Calif., 1987. 292 pp. $34.95 hc
ISBN 0-12-492155-8

The 40th anniversary in 1983 of the founding of Los Alamos Laboratory and Project Y of the Manhattan Project was the occasion for a remarkable group of pioneers to reassemble to talk about that period and its aftermath—both for science as a whole and for themselves as participants. The 20 contributions in this volume, based on material presented on that occasion, are wide-ranging. Donald Kerr, who was the lab's director in 1983, offers a current perspective on Los Alamos, while Edwin McMillan gives a well-illustrated account of the Lawrence Laboratory in the 1930s. Richard Feynman and Eldred Nelson write about computers; fission and fusion are the topics for contributions by Arthur Wahl and Donald W. Kerst.

Experimental techniques and instrumentation rate several contributions: Felix Bloch on nmr, Robert R. Wilson on particle accelerators, Norman Ramsey on parity and time-reversal symmetry experiments, Owen Chamberlain on new particle detectors and, briefly, Robert Serber on the future of particle physics. Edward Teller discusses a lunar laboratory and Cyril Smith materials science. J. H. Manley, Rudolf Peierls, Emilio Segrè and I. I. Rabi ponder the doing of science and its implications within and without the context of science. Luis Alvarez and Hans Bethe write about cataclysms of extraterrestrial origin: asteroid impacts and supernova explosions. Anthony Turkevich discusses three paths to helium synthesis: the early universe, nucleosynthesis in stars and thermonuclear fusion initiated on Earth.

From work on the big bang that helped end a war to understanding the Big Bang, that brilliant band in Los Alamos helped to write the science of both the immediate future and the remote past.

—Per H. Andersen

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Edited by Sybil P. Parker
McGraw–Hill, New York, 1988.

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