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once-over-lightly treatment of many areas and the "block and gap" method, which gives the reader a somewhat distorted picture of the field. It is much less encyclopedic than R. C. Haymes's *Introduction to Space Science* and would serve well as a text for a senior-level course.

The book is fairly well written, though weak in spots. Papagiannis is at his best in describing the fields with which he is most experienced: solar physics and solar-terrestrial relations. He is an excellent guide to the confusing nomenclature and the vast quantities of data that the field's rapid advance has produced. The accounts of typical geomagnetic atoms and solar flares enable one to put into perspective the literature on x-ray bursts, radio bursts, plagues, and sudden ionospheric disturbances. The book is close enough to the current literature (the latest references are from 1971) that the reader can feel the excitement of current work in the field. It is very satisfying that one can now combine observations from many unrelated fields—radio astronomy, particle physics, geomagnetism, and solar physics, among others—into a broad picture that can successfully explain much of the data.

The main weakness of the book is in the treatment of the necessary plasma physics background. While Papagiannis assumes that his readers have only an introductory knowledge of electromagnetism, his derivations are sufficiently confusing that a second course in e-and-m or a plasma physics book at the reader's elbow are somewhat useful. Fortunately these derivations are fairly infrequent. His treatment of space astronomy is adequate, but does not convey the flavor of the field as well as his descriptions of space physics.

In spite of these minor weaknesses, *Space Physics and Space Astronomy* is an excellent textbook for an advanced undergraduate or graduate course in the field. Furthermore, anyone who wants to see how the space program has opened up exciting new disciplines should buy it, as it is the best book of its kind.

HENRY L. SHIPMAN
University of Missouri
St. Louis

Thermocouple Temperature Measurement

P. A. Kinzie
278 pp., Wiley, New York, 1973. \$14.95

Although it is difficult to quantify the relative importance of thermocouple thermometry accurately within the

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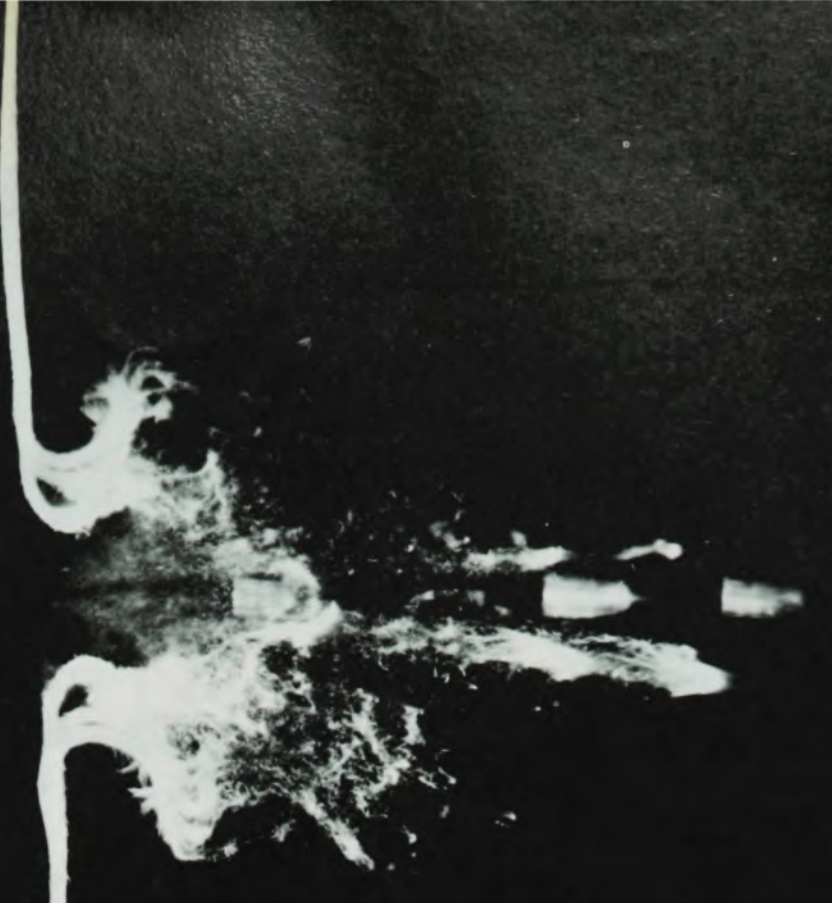
overall field of temperature measurement, few would argue that there are a sufficiently large number of practitioners of this particular thermoelectric art to provide a potentially wide audience for a book on the subject.

To attract some substantial fraction of this audience P. A. Kinzie set himself a task "to present a summary of data and literature references for both well known and *little used* thermocouples [and] to provide a *convenient* source of information for the study of *unconventional* requirements and their solutions" [italics mine]. In this he has succeeded admirably. There is a truly comprehensive collection of data for approximately 300 thermocouple types, supplemented by a bibliography of over 500 references. Most of the latter are the original source papers for the data, but there are also a number of significant review and general articles. The bibliography is particularly valuable because it is very much up-to-date.

It is apparent from the author's judicious approach to chapter groups, intrachapter arrangements, useful appendices and a comprehensive index that he recognized the difficulties inherent in trying to order and classify a large amount of data in a field known for its problems with standardization. As a result, the reader should be able to locate practically any thermocouple by (1) general type (noble metal with or without platinum, base metal with or without copper, nonmetallic, etc.); (2) elemental composition; (3) ISA-ANSI type designation (E, J, K, T, etc.); (4) manufacturer's or generic name (Chromel P, constantan, Platinel, Geminol, etc.). Perhaps even more important, the searching for a particular—usually conventional—thermocouple type will often lead to the discovery of a less well known or unfamiliar type that might do a better job.

A large variety of thermocouples are described for each of the temperature regimes—high, moderate and low. There is a surprising amount of data on environmental effects such as nuclear irradiation, intense magnetic fields, high and low pressures, and exotic atmospheres. And lest it be overlooked, it is a pleasure to acknowledge the outstanding quality of the book's editing and typography—no small task.

It is important to potential readers to point out what this book is not and does not claim to be. In the author's own words, "a complete treatment of fundamental principles is not attempted, because the reader will either have some general background in this subject, or can consult an appropriate textbook or review article." While sympathizing with the author's plight in establishing a limit to the book's



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coverage, I believe he could have very profitably added about 20-30 pages. The added text could have included material now lacking on reference-junction techniques and devices; the details of special thermocouple circuits such as thermopiles, averaging (parallel) thermocouples, and differential thermocouples; and interfacing problems with signal-processing instrumentation, as well as some information on the instrumentation itself. Perhaps in a second edition?

LAWRENCE G. RUBIN
National Magnet Lab, MIT
Cambridge, Massachusetts

Nuclear Structure Theory

J. M. Irvine
478 pp. Pergamon Press, New York,
1973. \$27.00

Nuclear-structure theory has developed into two almost completely separate groups. One group has been attempting to understand the properties of nuclei from nuclear matter calculations, while the other has been using less fundamental models, such as the shell model, to predict detailed features of nuclei. There are many experts in either of these fields, but there seem to be remarkably few who understand both fields well. Both theorist and experimentalist would welcome a book that covers in a consistent notation the nuclear-structure theory between such diverse topics as the Brueckner ladder sum and Nilsson wave functions. John Maxwell Irvine's book is partially successful in this task.

A principal characteristic that distinguishes this book from others is the considerable attention paid to detail. There are numerous useful tables and formulas that are usually not included, or only referenced, in other books. There are tables of two-body matrix elements, tables of Nilsson wave functions, rules for the use of Goldstone graphs, and recursion formulas for calculating coefficients of fractional parentage. By including these details in the text, the author has created a "guide-book," which should help the physicist who is not expert in a particular aspect of nuclear structure theory not only by quickly acquainting him with the principles involved in a calculation, but also by providing him with many of the detailed ingredients used in such calculations.

The book does have a number of weaknesses. One is that the space available in a single volume could have been used to better advantage. For example, the first of the book's four sections is devoted to nuclear phenomenology, and included here are

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