

tions require some changes in present conversion tables.

Aspects of resistance thermometry are described by eight papers in the second section. These include four papers on thermistors, whose applications and limitations are carefully detailed in the introductory paper to this sub-section. In particular, the difficulties in providing for the non-interchangeability of individual thermistors in designing thermistor bridges are discussed in some detail.

There are nineteen papers in the section on radiation thermometry. Several papers describe two-color radiation pyrometers, and a number of others are concerned with temperature measurements in radiating gases. Thermal properties of materials at high temperatures is the subject of two additional papers in this section.

Section four on dynamic temperature measurements contains seventeen papers, with a majority of them devoted to gas flow applications. Also discussed, however, are surface temperature measurements on solids. The importance of careful installation and interpretation of results is emphasized in this section. Included is a fine paper on the accuracy and response of thermocouples by Green and Hunt.

Automatic methods of temperature measurement and control is the subject of section five. The first paper is an interesting but unnecessary review of the papers presented at the 1939 symposium under this title. The remainder of the papers in the first sub-section discuss control system fundamentals. A second sub-section of seven papers is devoted to automatic measurement methods in radiation pyrometry.

Collected in section six are fourteen papers on miscellaneous methods. These include discussions of the intermittent thermometer, an ablating probe, infrared imaging techniques, and several other special applications. A number of the papers in this section describe techniques recently developed for particular applications but which may have a wider use in the future.

A final section contains seven papers dealing with high temperature sources and thermal imaging techniques. Many of the papers in this

section deal with the operational techniques used with arc-imaging furnaces. Difficulties in calibration and control are discussed in detail.

In a volume of this scope with contributions from so many different individuals, there is inevitably some duplication. Most of this is not objectionable, and in some cases it is even desirable. Nevertheless, while many exotic new methods are described adequately, this reviewer would have appreciated at least one paper on the liquid-in-glass thermometer which is still widely used and misused in science and industry. Taken as a whole, this latest edition of a long useful work contains significant new material, and the almost twelve-hundred references provide an additional valuable guide to current literature for all whose interests and assignments bring them to problems of temperature measurement and control.

An Introduction to Vacuum Technique. By A. H. Turnbull, R. S. Barton, J. C. Riviere. 190 pp. Wiley, New York, 1962. \$7.75

Reviewed by **R. A. Pasternak**, *Stanford Research Institute, Menlo Park, California.*

The uses of vacuum in research and in industry have shown a spectacular growth in recent years, particularly since the initiation of large-scale space programs. The great demand for information on vacuum techniques has resulted in quite a few monographs on this subject.

An Introduction to Vacuum Technique is based on a United Kingdom Atomic Energy Authority report directed to the beginner which has been expanded by adding engineering data. The result does not appear well balanced to this reviewer, particularly in view of the small size of the book.

Two of the seven chapters are devoted to the more theoretical aspects of vacuum. The treatment is elementary and easily understandable. The other chapters are mainly collections of short descriptions of vacuum components, instrumentation, and of engineering instructions. The data presented are quite extensive—the selection naturally is colored by the preferences of the authors; they are useful handbook references to vacuum tech-

niques, but their instructiveness for beginners in the field is somewhat questionable. For example, eighteen pages are devoted to vacuum seals and their design, and a table of O-ring dimension occupies two-and-one-half pages.

The style is simple and precise; the text is very adequate. Finally, both the drawings and the printed text are kind to the eye.

Interstellar Communication. A collection of Reprints and Original Contributions. A. G. W. Cameron, ed. 320 pp. Benjamin, New York, 1963. \$8.50.

Reviewed by **E. J. Öpik**, *Armagh Observatory and University of Maryland.*

Here, 10 original essays and 22 reprints are offered on a subject which, though of enormous philosophical and scientific interest, seemed to "lack respectability" until the publication of G. Cocconi and P. Morrison's pioneering paper in *Nature* (1959) (Paper No. 15 of the collection).

Communications within the solar system are now considered a commonplace matter. For the time being, communication with advanced civilizations on planets of other stars is, of course, a matter of speculation only. Its pursuit is justified as a stimulant, even if success cannot be guaranteed. A first effort has already been made at the Green Bank National Radio Astronomy Observatory (F. D. Drake, Papers 16 and 17).

Estimates are made of the probable number of contemporaneous advanced civilizations in the Galaxy, of their lifetimes, of the probability of receiving a reply before the other partner has vanished or lost interest. Existing knowledge is supplemented by more or less plausible guesswork. However, unnecessary guesses are also made where knowledge is at hand. Thus, Huang (Papers 6-9), Morrison (Paper 26), and Shklovsky (Paper 1) assume that the frequency of stellar planets is proportional to orbital area or volume; faint dwarf stars are therefore thought unlikely to carry many habitable planets. The assumption is contradicted by the statistics of binaries which show a logarithmic distribution of the distances of stellar companions (E. Öpik, *Tartu Observatory Publ.*, Vol. 25, No. 6, 1924). The