

BOOK REVIEWS

Spectrum of Thorium from 9400 to 2000 Å. By J. Junkes, S. J., and E. W. Salpeter, S. J., 8 pp. + 16 plates. Specola Vaticana, Città del Vaticano, 1964. \$10.00.
Reviewed by C. C. Kiess, Georgetown College Observatory.

Today's spectroscopists, engaged in the measurement of the many-lined spectra of the heavier atoms and of molecules, have, for several years, felt the need for a comparison spectrum with more secondary standards more accurately determined than the system prescribed by the International Astronomical Union about a half-century ago. This need has now been met with wavelengths in the spectrum of thorium, excited in electrodeless lamps and measured by Meggers and Stanley at the National Bureau of Standards, and by Stanley and co-workers at Purdue University.

The original set of secondary standards, measured in the spectrum of the iron arc according to specifications by the IAU, served well for investigations of the spectra of the lighter metals excited by arcs-in-air, and of gases excited in Geissler tubes. These wavelengths were measured interferometrically relative to the red ray of cadmium, the then primary standard of wavelength, with orders of interference of 30 000 to 40 000 waves. The accuracy attained did not exceed a part in three or four million for lines in the violet region, and a part in six or seven million for lines in the near infrared. Furthermore, these standards are nonuniformly distributed in the spectrum, some successive ones being separated by 50 Å or more. Altogether, after more than a decade of laborious measuring and computing, about 250 of these secondary standards were set up in conformity with IAU requirements.

The standard lines now available in the spectrum of thorium number more than 500. Owing to the higher orders of interference with which they were measured, their accuracy is at least ten times greater than that of the iron standards, and they are distributed along the spectrum at much smaller intervals, very few being separated

by as much as 10 Å. However, to use these standards, "It is evident that for a quick and sure orientation in this highly complex spectrum, which is lacking in striking groups of lines, an appropriate map is needed. . . ." Such a map, prepared at the Specola Vaticana, shows all the lines measured by Zalubas, on grating spectrograms, with the identifying wavelengths marked in the margins above and below the thorium spectrum, those of standards being underscored. The complete map consists of sixteen charts, each with three sections of the spectrum. In the region 9400 to 4000 Å each section spans 200 Å, while between 4000 and 2300 Å the span is 100 Å, becoming 200 Å again between 2300 and 2000 Å. In addition to stronger and weaker exposures to thorium, each strip contains a juxtaposed exposure to the less complex and better known spectrum of the iron arc "for purposes of orientation". In form and make-up the map follows the style of Fr. Gatterer's *Grating Spectrum of Iron*, issued in 1951 by the same institution. This new set of maps will prove to be of tremendous value to all spectroscopists who use excited thorium as the source of a comparison spectrum.

Mathematical Theory of Probability and Statistics. By Richard von Mises. Hilda Geiringer, ed. 694 pp. Academic, New York, 1964. \$22.00.
Reviewed by J. Gillis, Weizmann Institute of Science, Rehovot, Israel.

The reviewer once noticed that omitting the first chapter of most books on probability had little effect on the pleasure, profit, or otherwise to be derived from reading the remainder; and he has since acted accordingly. However, those who translated and edited von Mises' work on the subject were at least one move ahead. Because what had to be omitted now was two chapters. In this book the definitions section is particularly long and complicated. The old notion of the Kollektiv is preserved, a useful idea 35 years ago but long superfluous. And

with the measure-theoretic approach somehow grafted on to it here and there, the whole makes a confusing mixture.

Those who get through (or around) this mixture to the rest of the book will be richly rewarded. The development begins with the most elementary considerations and includes some of the various derivations of the laws of large numbers. All of the standard distributions are discussed and the work is abundantly illustrated by interesting applications. Indeed this wealth of application is probably one of its strongest features.

Problems of inference and hypothesis testing occupy a particularly large place. The Bayes' approach; maximum likelihood; and the more modern sequential approach to errors of the two kinds; all of these are fully treated. Queuing theory is omitted, but there is nevertheless sufficient really good material in the book to make it a valuable handbook for those working in the field, either as theoreticians or practitioners.

The Statistical Analysis of Experimental Data. By John Mandel. 410 pp. Interscience, New York, 1964. \$12.00.
Reviewed by J. E. Mansfield, Harvard University.

Anyone who has tried to look up a point in one of the standard probability and statistics texts, which all seem to be oriented toward psychology and economics, will appreciate this effort. The stress is on analysis of data from chemistry and classical physics; the peculiar problems of nuclear and atomic physics receive short shrift. Still, there is little doubt that this book will be more useful than most.

Statistics is one of those things we all seem to know intuitively when we need to. But here, for instance, several important distinctions are made that may disturb crusty old intuitions—the difference, for instance, between precision and accuracy; or between a statistic and a population parameter. And a favorite device, the average deviation from the mean, is rudely unmasked. This last will no doubt disturb many physicists.

Some of the development is quite interesting. Confidence intervals are discussed in a very lucid fashion, using