

The science of color

COLOR SCIENCE: CONCEPTS AND METHODS, QUANTITATIVE DATA AND FORMULAS. By Günter Wyszecki, V. S. Stiles. 628 pp. Wiley, New York, 1967. \$27.50

by Kenneth L. Kelly

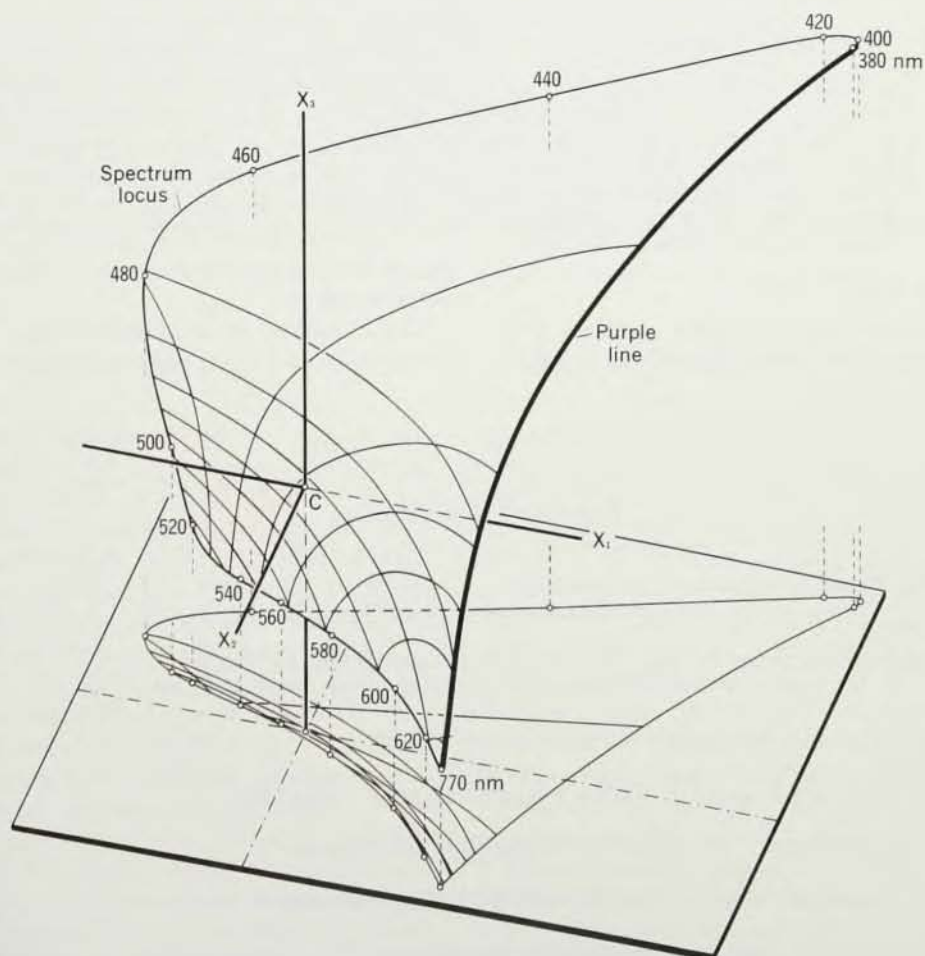
This is truly a remarkable book! To use the author's words, "This collection of concepts and methods, quantitative data and formulas bearing on color science is directed to the colorimetrist, to those concerned with color problems in industry, and to the research worker in color—physicist, physiologist, or psychologist." The authors have set themselves the task of assembling in one book the basic knowledge on the science of color explained in straightforward terms and in the universal language of science, mathematics. Here the nonmathematically trained reader will have trouble, but then this book was written for the trained research or industrial worker. The language is concise, the mathematics are rigorous, and all equations are derived relying on the reader only for the textbook part of the mathematics. This is not a book that one would read for pleasure, but it is one that will save many hours hunting for a certain equation or table of values. It is a splendid reference and workbook, and one that will bring credit to these two well known colorimetrists.

Logically, and it is a joy to witness, the authors start each new section with a short statement on the section to follow, stating what will be covered and how it relates to the material discussed. Relative to other books on this subject, there is a minimum of text and a larger number of pages of formulas and tables. I have heard some criticism that parts of the tables were unnecessarily long and that some of the newer references are missing. In answer to the first, I would say that it is better to have a little too much than to have to chase around for that last elusive table that these authors have seen fit to include. To the second, those who are interested only in a small part of this book, I would remind them that the authors have attempted as much as is humanly pos-

sible to keep up to date all parts of this book. To such critics I have asked the simple question, "Have you read the whole book?" I have. Anyone who has honestly completed this task will have a much greater appreciation of the tremendous contribution to the field of color research contained in *Color Science*.

Color Science contains a detailed table of contents and a well cross-referenced index both of which make the book quite usable. There is also an author index and 18 pages of references including three in 1966. As the title implies, the authors have devoted themselves to bringing together all the tools necessary for the practice of colorimetry and also the fundamen-

tal information necessary for further research in color vision. One may be concerned with the brief coverage given to color-order systems and the almost passing reference to color names and color communication that is becoming of such importance in industry. Again, one must consider the title and size of this book and look for a complete coverage of this material in Judd's books. It would have been helpful to have a diagram of the DIN-Color System explaining the three variables similar to Fig. 6.10 showing the organization of a Munsell constant-hue chart. On the other hand, if one wants, as David MacAdam says, the first serious discussion since 1920 of line elements based on color discrimi-



UNIFORM-CHROMATICITY-SCALE SURFACE derived from Stiles's line element.

nation data, he will find it in *Color Science*.

The typography and illustrations are excellent, and the diction is such that not only the expert but also the beginner in this field can use the book as a basic reference; really almost as a reference shelf. Only one error has been brought to this reviewer's notice and that is on page 461, where the quantities Δx , Δy and Δz should each be multiplied by 100 to make them consistent with figures 6.45 through 6.47. *Color Science* is highly recommended to everyone interested in the measurement and specification of color and in the basic field of research on color vision. I heartily recommend a thorough reading of *Color Science*.

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A mixed bag of beams

METHODS OF EXPERIMENTAL PHYSICS, Vol. 4: ATOMIC AND ELECTRON PHYSICS, Part A: Atomic Sources and Detectors. Vernon W. Hughes, Howard L. Schultz, eds. 515 pp. Academic Press, New York, 1967. \$21.50

by John T. Scott

It has been said that a camel is a horse that was designed by a commit-

tee. If books were horses this one would have a bigger hump than most. The committee in this case is the group of 21 authors who have contributed to this volume, 4A in the series "Methods of Experimental Physics," under the general direction of Ladislaus Marton. Volumes 1, 2, 3, 5 and 6 have already appeared but volume 4 has been held up because the material for the planned book on atomic and electron physics outgrew the bounds of a single volume during the gestation period. There is now to be a volume 7 on the interactions between atomic particles; volume 4B, on the single-particle properties of electrons, atoms and ions has also been published recently. The book now under review deals with the production and detection of these particles.

With so many contributors it has been impossible for the editors to preserve a uniform treatment of the different parts of this book. There are two ways in which a review article can be written and we can find examples of both of them here. The first provides a miniature text on a highly specialized subject; no previous knowledge is assumed and considerable information is presented, with references added for the serious reader who wants to follow his study further. The second way consists of a collection, or rag bag, of references loosely held together by a text that is meaningless if read by itself, in which each reference is introduced by one or two uncritical sentences in repetitive fashion.

The 21 authors share 31 sections between them and I can pick out only a

few of these for special mention. The articles on thermionic emission of electrons, by G. A. Haas, and secondary electron emission, by F. M. Charbonnier, L. W. Swanson and W. P. Dyke, are excellent; they can be read with profit without the references, although plenty are given. Tables of data and details of experimental methods are included.

The production and detection of atomic beams are covered in two articles, both by Hin Lew, that provide as good a review of these subjects as any available today. Everything you would need to know to start an atomic-beam experiment is there. A useful table of references to the production of atomic beams of nearly all the elements is included; it appears to be complete up to the year 1961. Elsewhere in the book references as recent as 1966 are given. The evidence is that sections of the volume were completed at widely different times, which makes such expressions as "recently" and "at the present time" misleading.

The articles on photon production (Wilhelm Raith, Robert Christensen and I. Ames) and photon detection (M. Posner and Raith) are also excellent. They include both theoretical and experimental material that I have not seen gathered into any other single volume. Numerical data and critical comparisons of commercially available equipment are especially useful; so often authors of scientific texts appear to find direct identification of a commercial product unseemly or immoral and give us only oblique references such as "Commercial versions of the mass filter have recently become available" (Francis Pichanik on quadrupole mass filters in this book).

Some overlap between sections can be found, such as the treatment of noise in detector systems that occurs twice, and two descriptions of field ionization, both inadequate, one strangely included with electron emission and the other with the section on ion sources where it is erroneously referred to as "field emission."

The sections that are the most disappointing are those that show uneven treatment, presumably reflecting their authors' interests. For example, Carl Anderson on the production of ions is curt and out of date when writing on photoionization (there is no mention of either Vernon Dibeler or Joseph Berkowitz, for example) and electron bombardment sources (his figure 2 on page 261 is not relevant to the text

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