

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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and the caption is in error) but he spreads himself over 13 pages of experimental detail on plasma sources.

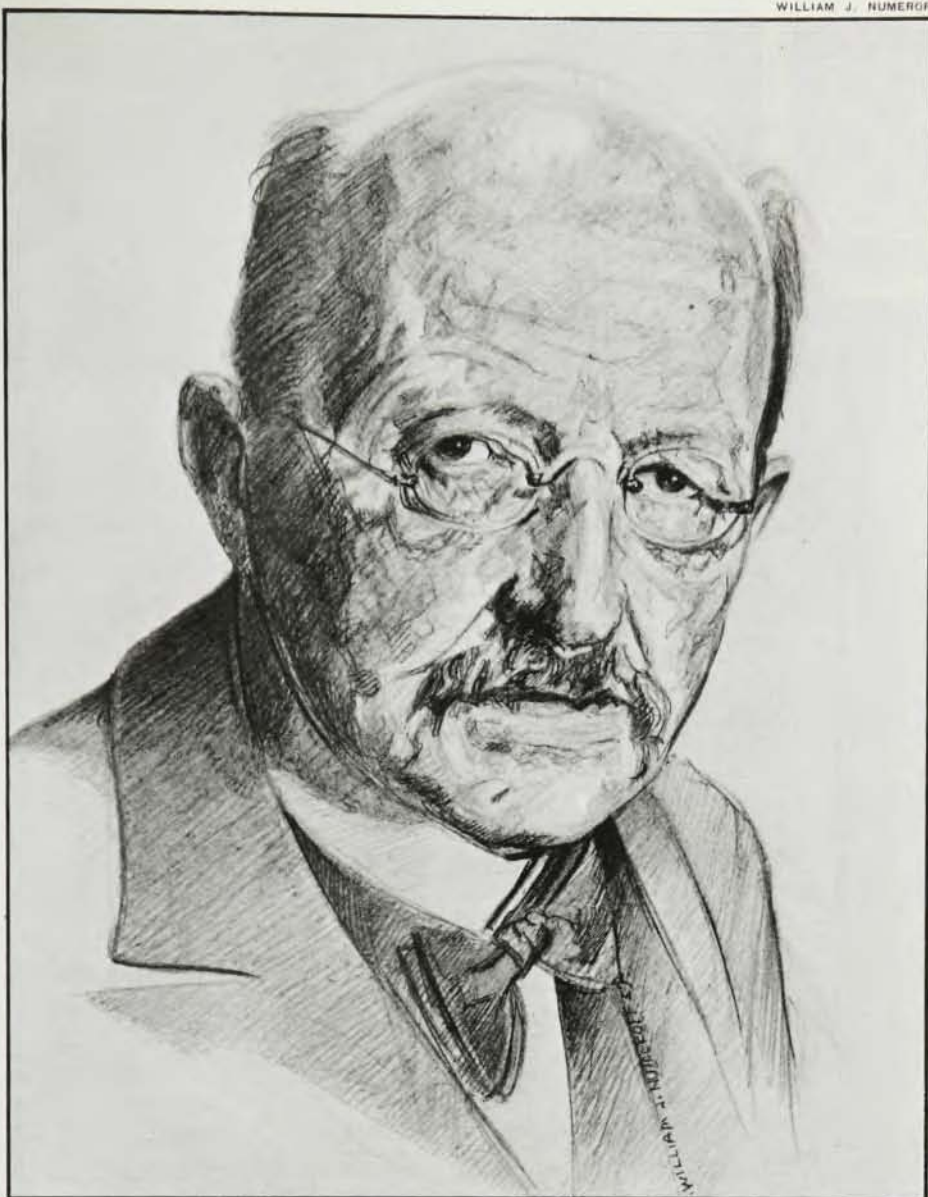
The section on electron optics is useless except as a collection of references (to 1965), which is a pity as there is a need for a modern monograph on this subject now that Otto Klemperer's fine Cambridge University Press book is out of print.

The production of this book is up to Academic Press's usual standards with a very small (but finite) number of typographical errors. An exception is the author index, which has been carelessly put together. I counted 39 cases of misspellings or confusion over initials that result in one man being indexed as two.

Is this book for you? If you are interested in the production and detection of atoms or photons, yes; go out and buy it. Otherwise, browse in it at the bookstore, copy down some of the references, and put it back.

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MAX PLANCK: "Experiments are the only means of knowledge at our disposal. . ."

Mainly historical

IMAGINATION AND THE GROWTH OF SCIENCE. By A. M. Taylor. 110 pp. Schocken Books, New York, 1966. \$3.95

by L. Marton

The contents of this book constituted originally the Tallman lectures at Bowdoin College, Brunswick, Maine and were devoted to the important role imagination plays in scientific creation. There are some lovely quotations in the book, and I cannot resist the temptation of reproducing at least a few of them. Ralph Waldo Emerson: "Science does not know its debt to imagination." Leon Brillouin: "An artist's inspiration or a scientist's theory reveal the unpredictable power of human imagination." Max Planck: "Experiments are the only means of knowledge at our disposal. The rest is poetry, imagination."

It is a very readable book. In support of his thesis, the author quotes many examples in electricity, relativity, cosmic rays, light, heat, the dual nature of the carriers of radiant en-

ergy, atomic and nuclear physics, etc. As one can see from this enumeration, the thesis is supported by evidence taken almost completely from physics, with a little astronomy (or, more properly, cosmology) thrown in. There is hardly any mention of chemistry and a total omission of all other sciences.

The historical aspects of the book overshadow the main theme. By that I mean that the book does not document sufficiently the motivation behind an important discovery. To a great extent the author is satisfied with a nicely written historical presentation of the research in question, but obviously he has not inquired deeply into the psychology of the researcher. A good part of the book is devoted to the tracing of precursors of ideas. This is very useful; for instance, An-

naliese Maier's excellent book on the precursors of Galileo shows how a scholarly study on that subject can be conducted. Within the scope of the present book even this aspect lacks depth, and with the relative predominance of the historical aspects the investigation of the role of imagination appears to be almost secondary. I am inclined to say that the title of the book is not well chosen. In fact, the book points towards a need for a good investigation of the role imagination plays in scientific creation. Probably a team of scientists would be needed for such a task, taken from the natural and the behavioral sciences.

A few more criticisms can be levelled against the book. One is that of omission. Maybe limitations on space or time confined the author to