

Soviet Elektron and Proton spacecraft.

As sold by the US Government Printing Office for \$3.00, *Scientific Satellites* is surely the bargain of the year in terms of information per dollar for readers interested in finding out how actually to do scientific research in space. Unfortunately, just as with long streams of data received from a satellite, occasional bit errors have crept into the transmission. Thus, while the ISIS X (International Satellite for Ionosphere Studies) launch consisted of two spacecraft, a Direct Measurement Explorer and a Canadian Alouette, later members of the ISIS series will be single spacecraft carrying both US and Canadian experiments, not repeats of the X mission as listed in the Appendix. Similarly the description given in Chapter 10 of NASA's method of experiment selection, while correct in general is not exact in detail. Firm selections of experiments are made by the Associate Administrator for Space Science and Applications after the detailed evaluation of proposals by the Space Science Steering Committee and its Subcommittees, not tentative selections to be reconsidered after a year of development, as Corliss mistakenly states. Since the book was written, the Space Science Steering Committee has been broadened to the Space Science and Applications Steering Committee, and disciplinary Subcommittees in Communications, Geodesy and Cartography, Meteorology, Navigation, Earth Resources Survey and Planetary Biology have been added to those in Astronomy, Ionospheres and Radio Physics, Particles and Fields, Planetary Atmospheres, Planetology, Solar Physics and Bioscience. The open competition and review by the qualified peers system will now also be used in selecting experiments in the Applications disciplines.

On the whole, Corliss has provided a good account of the broad field of spacecraft engineering and of the scientific instrumentation used to make measurements in space. His book should be very useful to spacecraft engineers and to experimental scientists who want to make measurements in the space environment.

* * *

George F. Pieper made a number of measurements of particle fluxes in space in the early 1960's. He is now Assistant Director for Space Sciences of NASA's Goddard Space Flight Center.

Nonquantal basic structure

PRINCIPLES OF ATOMIC SPECTRA.
By Bruce W. Shore, Donald H. Menzel. 538 pp. Wiley, New York, 1968. \$18.95

by Richard B. Zipin

This new volume in the Wiley Series in Pure and Applied Spectroscopy will well serve its stated purpose. Its



AUTHOR'S DRAWING from *Principles of Atomic Spectra*. Menzel is having a one-man show in Denver next November.

authors tell us in their preface that they wrote the book to provide a self-contained introduction to the basic principles of atomic structure and atomic spectroscopy, including the tools of Racah algebra, without requiring any previous introduction to quantum mechanics. It is a textbook and treats its subject in an elementary but rigorous manner. The book reads well and moves along at a good pace, developing the mathematics required as the needs arise.

The exposition is essentially in three main sections, each of which is significantly longer than the one preceding it. This division, while mentioned in the preface, is not indicated in the table of contents. The first section discusses the basic observations of atomic spectroscopy and then uses them to develop the Bohr-Sommerfeld vector model of the atom. Next, the reader studies the theoretical foundations of quantum theory, and finally, the mathematical tools developed in the second part of the book are used in a reexamination and extension of the model developed in the first part. The

many tables and diagrams appearing throughout the book add greatly to its usefulness as both a text and a reference work. Lists of cited references that are found at the end of most subsections are also valuable. The extensive bibliography following the final chapter is always welcome in a book of this type, and together with the two indexes it comprises more than 6% of the volume.

For a book with so many equations, it is commendably free from typographical errors; at least I noted none on a first reading. One complaint that must be made is that the book does not include problems for use in college courses.

If the charming illustration on the dust jacket, of photons interacting with an atom, is any indication, then Donald Menzel, who is probably known to most physicists by his work and writings, might have had a successful career as a cartoonist if he had been so inclined.

While this excellent book should, and most certainly will, find its way to, and be quite useful on, the desks of research workers, its potential audience of advanced undergraduates who will be using it as a text may find its high cost an inconvenience.

* * *

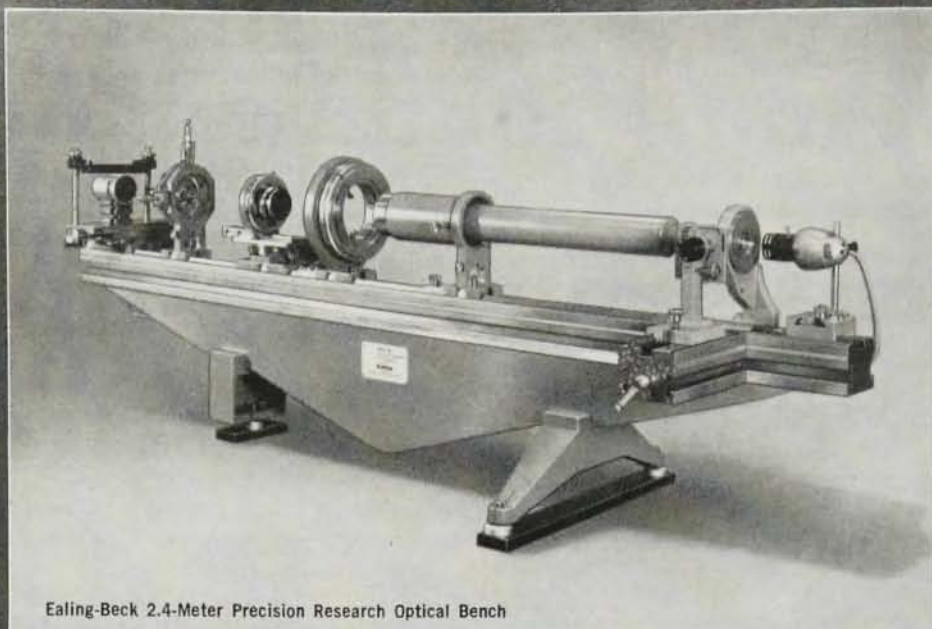
The reviewer is responsible for the application of optics to advanced dimensional measurement systems at The Automation and Measurement Division of The Bendix Corporation in Dayton, Ohio.

A dedicated humanist

THE COSMOS OF ARTHUR HOLLY COMPTON. Marjorie Johnston, ed. 484 pp. Alfred A. Knopf, New York, 1968. \$10.00

by Robert S. Shankland

This is a remarkable collection of writings and speeches of a truly remarkable man. Arthur Compton was not only one of the great scientists of our time, but was also a philosopher, administrator and a man of affairs. To those who knew him best the philosophical basis for all his thinking and action was his dominant characteristic, as this selection of his works clearly demonstrates. He was not, however, the type of philosopher who becomes lost in systems of philosophy; rather his entire outlook and actions were determined by basic attitudes and convictions that were always with him. His personal charm, deep insights and

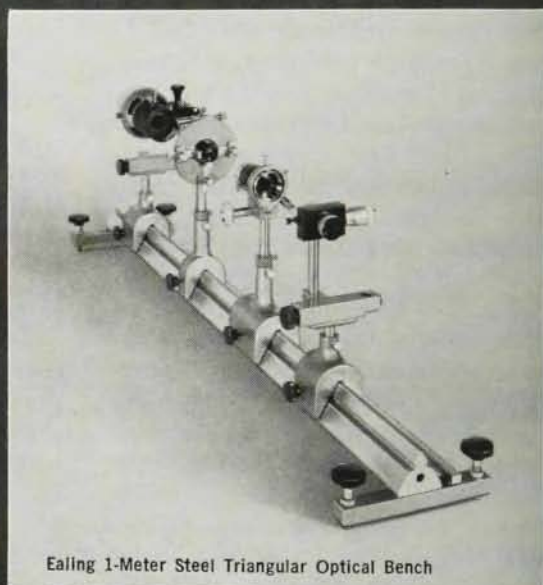


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human understanding gave him persuasiveness in his dealings with all people and was one of his strongest assets. These abilities and attitudes are clearly foreshadowed in a youthful letter (pages 131-135) to his father setting forth the reasons why he should be allowed to build and fly a large airplane glider. His father was professor of philosophy and dean of Wooster College in Ohio, and he and Arthur were always very close in their basic philosophical approach to problems.

One of the finest pieces in this book is that entitled "Personal Reminiscences." This piece was written in the nature of a preliminary draft for an autobiography that unfortunately was never completed. Its inclusion in this volume, however, will be deeply appreciated both by those who knew Compton well and by others, especially young people who did not have this great privilege. The discussion on x rays, in which Arthur Compton was the great master and for which he received the Nobel Prize in 1927 at the age of 35, is a beautiful example of scientific exposition clearly intelligible to the layman. When he discusses the value of x rays for human beings, the reader realizes the sincerity of Compton's humanity and the depth of his convictions regarding problems of science as they affect the world generally. Another writing included in this volume, "Creativity in Science," is a masterful discussion of a very subtle matter.

Perhaps his description of the methods of Ernest O. Lawrence on pages 187 and 188 is the highlight of the entire volume. What he said of Lawrence could certainly be said of himself, but with characteristic modesty and generosity Compton chose to illustrate his major points in a tribute to another very great man.

There are several short biographical pieces prepared by Compton for various occasions. All of these pieces show insight into the character, personality and scientific methods of the men concerned. Those on Albert A. Michelson, Owen W. Richardson, Ernest Rutherford and Benjamin Franklin are exceptionally fine and could serve as models for this type of writing.

Perhaps the central core of this book concerns World War II, when Compton was one of the leaders in the development of atomic energy both for military applications and later peace-



ARTHUR HOLLY COMPTON

time uses. With the greatest generosity, he emphasizes the decisive role of others, especially Ernest Lawrence, in starting these vast programs. It must certainly be the judgment of those who know most about these events that Compton and Lawrence were the key figures in shifting academic nuclear research from its time-honored approach to the tremendous role that this subject occupied in World War II. The principal actors in this drama would be too modest to claim their due credit, but it now appears clear that the essential steps in the launching of this stupendous enterprise were made by the route from Lawrence to Compton to his personal friend Henry Wallace to President Franklin D. Roosevelt. Perhaps the clearest measure of Compton is the fact that he turned over the most interesting scientific and technical problems to others and assumed administrative burdens that were essential to the achievements of

Enrico Fermi, Robert Oppenheimer and others.

For a man of Compton's philosophical outlook and mode of life and with his deep religious convictions, the decisions he was required to make during this wartime work took more of his life blood than others can ever realize. This book contains an "outline" regarding the use of the atomic bomb. A study of this outline, which was never written out as a complete paper, provides more insight into the doubts, soul searching, and convictions of a great man whose duty it was to advise the government on this dilemma than other literature I have ever seen.

The intellectual honesty, humanity and courage of Compton can perhaps be seen most clearly in the statement he prepared in defense of Oppenheimer when the latter was being investigated by the Atomic Energy Commission on clearance matters. It would be difficult to imagine a more

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R. M. Sillitto. Completely updated, and rewritten, this second edition clarifies the relationship between formalism and interpretation and includes a number of additional topics.
1968 \$8.50

AMERICAN ELSEVIER PUBLISHING COMPANY, INC.
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forthright, honest and fair statement.

Toward the end of his life Compton, along with other distinguished men who had developed the atomic bomb, found it essential to express himself on nuclear testing. This was and still is a highly complex matter. The statements on this subject could well be studied today by those now in responsible positions relating to questions of nuclear testing.

Two sentences from the text will perhaps give a deep insight into Compton's attitudes and achievements. In the introduction, signed by people who knew him well, are the following lines: "... Such men as he are more rare even than genius . . . 'allumeurs d'âme' . . . kindlers of the spirit . . .," and the closing words of Vannevar Bush's forward, "Let me say that knowing him furnishes me with one of the most cherished of my memories, and that his friendship gave me an enhanced optimism as to the ultimate destiny of the human race."

* * *

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Physics with chemistry

HANDBOOK OF THE PHYSICO-CHEMICAL PROPERTIES OF THE ELEMENTS. G. V. Samsonov, ed. Trans. from Russian. 941 pp. Plenum Data Corp., New York, 1968. \$40.00

by Michael E. Straumanis

This handbook is a collective work written by 30 contributors (ten among them are women) and edited by G. V. Samsonov, who is director of the Laboratory of Metallurgy of Rare Metals at the Academy of Sciences of the Ukrainian SSR, Kiev. The first part of the handbook (pages 7-446) deals with physical properties of elements, such as the atomic, crystallographic, nuclear, thermodynamic, thermal, electrical, magnetic, optical, mechanical and electrochemical properties. The second part (pages 457-856) gives some chemical characteristics of the elements: their electrochemical potential, reactions with various reagents, corrosion behavior of metals, reaction with gases (H_2 , N_2 , O_2), with boron, carbon, silicon, phosphorus, sulphur, selenium and tellurium. Finally the toxicity of the elements and their reactions with refractory materials is given. All this information

is presented in the form of tables with very little text. 2598 references, mostly in books and journals of the USSR, on 84 pages conclude the book. There are no subject and no author indexes.

Although it is claimed that the volume was updated and revised by the editor, many of the newer data are missing such as recent experimental densities and room-temperature thermal-expansion coefficients for some elements. It is also not mentioned that the atomic-weight table (IUPAC, 1961 revised values) is based on C^{12} .

Was it necessary to translate the book? It is said on the dust cover that the book would be valuable to teachers, graduate and undergraduate students, and to researchers in physical and engineering sciences as well. I doubt this possibility because we have good reference books. The *Handbook of Chemistry and Physics*, which contains information on more than 3500 pages, is steadily revised, covers nearly all the tables of the book under review and is, in addition, much lower in price. However, for those solid-state scientists who need quick information on the chemical behavior of elements, the translated handbook may be useful because of the unique combination of physical tables with the chemical properties of elements.

* * *

The reviewer works in the field of solid state and corrosion of metals at the Graduate Center for Materials Research at the University of Missouri, Rolla.

Science, society and culture

SCIENTIFIC PROGRESS AND HUMAN VALUES. Conf. proc. (Cal. Inst. of Tech., Pasadena, Oct. 1966). Edward Hutchings, Elizabeth Hutchings, eds. 219 pp. American Elsevier, New York, 1967. \$7.50

by R. Bruce Lindsay

In these days a celebration of any sort at an academic institution usually involves a conference devoted to a consideration of some human problems. The common pattern brings together a group of scholars and scientists, recognized experts in their respective fields, and allows each to hold forth on the relevance of his discipline to the fundamental topic at issue. At a time when there is much soul search-

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An Introduction to the Theory of Superconductivity

By CHARLES G. KUPER, *Israel Institute of Technology*. This book explains the theory of superconductivity for engineers, applied physicists, and other users. The reader is assumed to be familiar with Fourier transforms and classical thermodynamics. Part I describes the Ginzburg-Landau phenomenological theory. Part II provides a deeper understanding with a straightforward account of the Bardeen-Cooper-Schrieffer microscopic theory. (*Monographs on the Physics and Chemistry of Materials*.) \$9.60

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Electronic Impact Phenomena

By SIR HARRY MASSEY, and E. H. S. BURHOP, *University of London*; and H. B. GILBODY, *Queen's University, Belfast*. Since the publication of *Electronic and Ionic Impact Phenomena* in 1952, there has been a great increase in research activity on this subject throughout the world. Because of the large amount of new information acquired, the new, revised edition is being presented in two two-volume sets, of which *Electronic Impact Phenomena* is the first. Volumes I and II deal with electron collisions with atoms, electron collisions with molecules, photoionization and photodetachment. (*International Series of Monographs on Physics*.) In two volumes, \$3.50

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