case. He then considers radial motion of an elastic sphere in a magnetic field and magnetothermoelastic interactions in an infinite solid owing to instantaneous heat sources, respectively. As in the other paper in this volume, Paria's presentation is straightforward and generally conventional. Again the paper has a value similar to that of Lick's and also performs the worthwhile service of providing a current and good list of references.

For those whose interests are in applied mathematics as well as in applied mechanics this tenth volume in the series should prove a good reference and research document.

* * *

James B. Kelley is a professor of physics at Marquette University. He has worked in several areas of applied mechanics and electromagnetic theory.

Laboratory benches in space

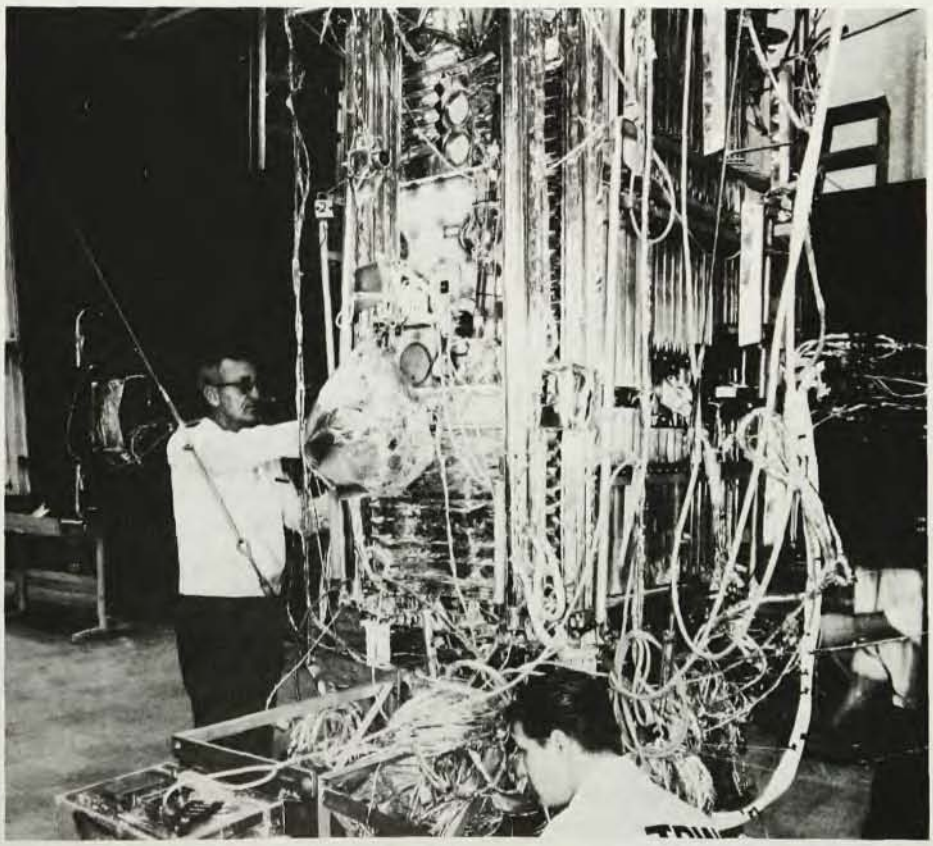
SCIENTIFIC SATELLITES. By William R. Corliss. 822 pp. NASA, Washington, D. C., 1967. Paper $3.00

by George F. Pieper

The exploration of space by unmanned scientific satellites has come a long way since the Russians launched Sputnik I over a decade ago and the US experienced frustration and failure in getting its own space program started. We have discovered the solar wind and mapped the earth's radiation belts and magnetosphere; we have determined the earth's shape to a high degree of accuracy; we have measured radiations from the sun and stars in wavelength regions not accessible on earth . . . and the list goes on through aeronomy, geomagnetism, cosmic-ray physics, cosmology and the other disciplines that make up the space sciences. The scientific results are generally well documented in the literature. Not so well documented are details of the equipment used to sense the physical phenomena under study, to process their signals and record their data and details of the spacecraft on which the scientific experiments have flown. William R. Corliss, a specialist in space propulsion and a professional science writer with an MS in physics, has addressed himself to this problem.

Corliss's book (which is under NASA sponsorship) is a storehouse of information. Following brief reviews of the objectives, status (already somewhat out of date), and history of satellite science, he plunges into details of satellite dynamics, communications and data handling, tracking, guidance, attitude control, satellite testing, launch-pad activities and data reception and launch vehicles. Throughout this part of his book, which covers 324 pages and culminates in a long (128-page) chapter on the design of scientific satellites, Corliss works entirely in terms of ten subsystems (such as power-supply subsystem, attitude-control subsystem and structure subsystem) that make up the spacecraft system and the interfaces between the subsystems and the launch vehicle and earth-based facility systems. Especially valuable is the depth of illustrative detail. Pages 141–143 show the 32-word OSO II data frame and wheel- and sail-commutator channel assignments; pages 222–225 give the chronology of IMP B between 13 August, 1964 and its lift off to become Explorer 21 at 2245 UT, 3 October, 1964. These and dozens of other similar illustrations taken from actual cases should give the reader a firm feeling for the solid reality of spacecraft technology if he does not already have it from his own experience.

The third major part of *Scientific Satellites* is a 262-page review of instruments and experiments in the fields of astronomy, solar physics, biology and geophysics. Included between solar physics and geophysics is the field that has come to be called solar–terrestrial relations. Missing is satellite meteorology, defined admittedly arbitrarily by Corliss as an "application." The same writing technique is used here as earlier in the book, with general descriptions of experiment types and illustrative detailed descriptions, drawings and pictures of particular experiments. For example, ten pages are given to the four experiments that will fly on Orbiting Astronomical Observatories A2, B and C. The book closes with a good 38-page bibliography and a splendid 98-page appendix listing "all the unclassified scientific satellites known to the author." Included in brief form is just about everything Corliss was able to find out about these satellites including orbital data, project-management responsibilities, descriptions of subsystems and a list of experiments with experimenter and institution. The list covers foreign as well as US satellites and includes what details are known about the



TECHNICIANS MAKE FINAL ADJUSTMENTS in NASA's Orbiting Geophysical satellite (OGO-E). Cables monitor performance in simulated space conditions.

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optical properties of solids

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200 PAGES PP SEPTEMBER 1968 $12.50

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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.

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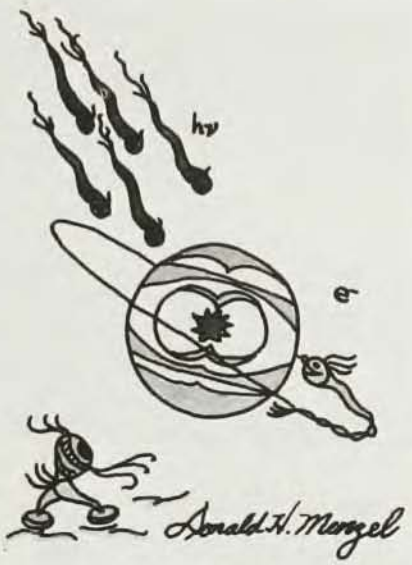
George F. Pieper made a number of measurements of particle fluxes in space in the early 1960's. He is now Assistant Director for Space Sciences of NASA's Goddard Space Flight Center.

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 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.



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

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 reëxamination 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