

to describe many of the new results in solar x-ray burst activity; but this field has only recently spawned forth its results.

Tandberg-Hanssen is a member of the staff of the High-Altitude Observatory, National Center for Atmospheric Research, and a lecturer at the University of Colorado. The book encompasses depth in reviewing the research material with sufficient development of concepts to reach the graduate student. The volume is vital for background in solar activity; other volumes fail to cover the theoretical development with same clarity.

The illustrations are sparse but ample for the models studied. The book is highly recommended as a coherent analysis of current ideas in solar activity.

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The author is Chief of the Radio Astronomy Branch of the Air Force Cambridge Research Laboratories.

Aspects of cosmic radiation

PROGRESS IN ELEMENTARY PARTICLE AND COSMIC RAY PHYSICS, VOL. 9. J. G. Wilson, S. A. Wouthuysen, eds. 315 pp. North-Holland, Amsterdam (Interscience, New York), 1967. \$15.50

by HENRY VALK

Following their procedure of alternating review volumes on elementary-particle physics and cosmic rays, the publishers of *Progress in Elementary Particle and Cosmic Ray Physics* devoted the four articles of volume 9 to various aspects of cosmic radiation.

The first article on the origin of the solar wind and cosmic-ray variations, by E. N. Parker of the University of Chicago, discusses qualitatively the dynamical properties of the solar corona and the manner by which its supersonic expansion pushes back the galactic cosmic rays, thus providing for much of the observed variations in cosmic-ray intensity. Because Parker has been one of the prime contributors to our present understanding of the interplanetary magnetic field, it is not surprising to find that his article is concisely (34 pages of text) and lucidly written.

When primary cosmic rays with energies greater than 10^{13} eV enter the earth's atmosphere, they produce secondaries that in turn interact producing more and more particles. As these off-spring of the initiating event progress

towards the earth's surface, they spread out laterally to yield what are called extensive air showers. It has been convenient to detect these events by means of large counter arrays spread over a considerable area. The construction and maintenance of such arrays is sufficiently costly, however, to warrant an investigation of other types of detectors. The second article, by J. V. Jelley of Harwell, concerns the progress that has been made in developing one such alternative: that of detecting and measuring the Cerenkov radiation that these showers produce in the atmosphere. Jelley's review is comprehensive and self-contained, including all aspects of the subject: the theoretical, experimental and practical.

The third article, by M. G. K. Menon and P. V. Ramana Murthy of the Tata Institute, examines the status, as of 1965, of cosmic-ray-intensity measurements deep underground. Here emphasis is placed on the relationship between such measurements and the determination of the energy spectrum of sea-level muons and the detection of high-energy natural neutrinos.

The fourth and final article in the book, by V. S. Murzin of Moscow State University, discusses in some detail the principles and application of the ionization calorimeter. The author emphasizes the versatility of the instrument, particularly as it is used in conjunction with other detection devices such as the cloud chamber and nuclear emulsions.

All in all, the present volume is authoritative, fully maintaining the high standard of its predecessors. It should be a valuable addition to the library of anyone interested in cosmic-ray physics.

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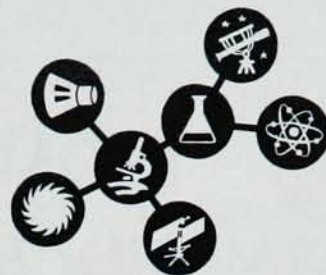
Henry S. Valk is chairman of the physics department, Behlen Laboratory of Physics, University of Nebraska. His special fields include theoretical nuclear and high-energy physics, scientific research administration and elementary-particle theory.

Beyond the atmosphere

TELESCOPES IN SPACE. By Zdeněk Kopal. 140 pp. Faber & Faber, London, 1968. 50s

by PETER G. BERGMANN

This is a nontechnical presentation of the contribution that space technology has made, and will make, to optical astronomy. The author, professor at Manchester University, is also associ-



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The reviewer is a professor of physics at Syracuse University where he specializes in general relativity.

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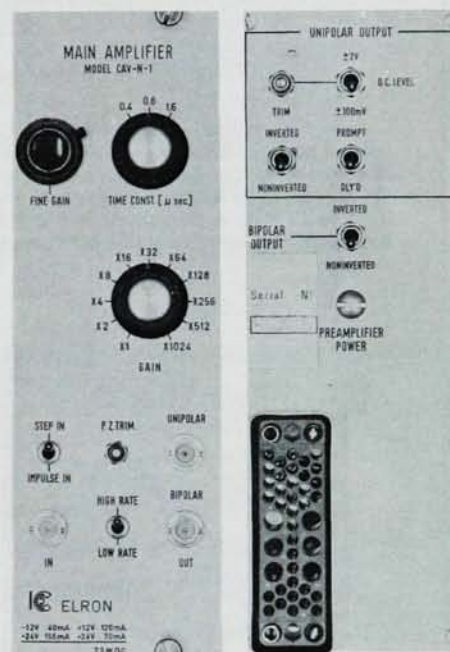
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