

Not so long ago it was a considerable labour and effort to piece together Sherrington's biography, but thanks to Prof. E. G. T. Liddell ("Obituary Notices of Fellows of the Royal Society", 8, 241; 1952), Lord Adrian (*Proc. Roy. Soc. Med.*, 50, 991; 1957), and others the effort has long since become less exacting, and opportunities for originality in Lord Cohen's Lecture 1 correspondingly less. One should, however, add the Beaumont Lecture given at Yale University on November 15, 1957, by "Sherrie's" son, Mr. C. E. R. Sherrington, for it is a noteworthy complement to other sources and is not too widely known.

Of his Lecture 2 Lord Cohen modestly wrote, "I have been able to touch only briefly and superficially on Sherrington's contributions to physiology. The work of a genius, who for half a century laboured with undiminished zest to unravel some of Nature's secrets, cannot be compressed, even in its essentials, into one lecture. It may well be that others would have chosen different examples from his work and a different emphasis to convey their assessment of his contribution to neurophysiology". Lord Cohen also refers to Sherrington's influence on the development of clinical neurology, where not only did he add, "as no-one had previously done, to the facts but above all he provided the concepts which made them hang together".

Lecture 3 is the most difficult to review, for it passes from physiology to the age-old problem of life and mind, posing difficulties at which Sir Charles did not balk but which he recognized rather than solved. Then it completes the writer's would-be scope by referring to Sherrington's poetry and poetic thought, which make up a very interesting part of the full story, but need a poetic atmosphere for their proper discussion.

This review cannot give that, but perhaps enough has been said to reveal the scope of the lectures, and to whet the would-be reader's appetite for more. One cannot be too much in thought with Sherrington, or be too thankful that so wonderful a person lived in our time. We are in debt to Lord Cohen for his delightful tribute to so outstanding a member of the Liverpool faculty of an earlier day.

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## MISSILE ENGINEERING DESIGN

### Missile Engineering Handbook

By C. W. Besserer. (Principles of Guided Missile Design, Vol. 4.) Pp. xi+600. (Princeton, N.J.: D. Van Nostrand Company, Inc.; London: D. Van Nostrand Company, Ltd., 1958.) 109s.

### Guided Missiles

Operations, Design and Theory. (Sponsored by the Department of the Air Force.) Pp. vi+575. (New York: McGraw-Hill Book Company, Inc.; London: McGraw-Hill Publishing Company, Ltd., 1958.) 62s.

THE ever-increasing development of guided weapons for military purposes, research rockets for upper atmosphere measurements, and earth satellites and space probes implies a huge host of scientists, technicians and engineers working in the many disciplines of science and technology involved in these new devices. Despite the growing need for authoritative text-books on the associated wide range of applied science, it has, until recently, been difficult

to find more than semi-popular expositions, liberally strewn with illustrations of war-time German missiles and American missiles at the instant of launch. The American series of admirably produced volumes on "Principles of Guided Missile Design", edited by a retired U.S. Navy captain for many years closely associated with missile development, and published by Van Nostrand, has gone far to rectify the situation.

This series began in 1955 and the fourth volume—"Missile Engineering Handbook"—is intended as a compendium of design data for use by engineers and technicians who may be assumed to have acquired a good knowledge of basic principles from the earlier volumes. It contains 400 pages of closely packed tables, graphs, nomograms and charts providing a remarkable accumulation of engineering data in the various subjects which make up the complex applied science of missile design. One may browse through specific gravity tables with such curious items as porphyry, hemlock or pine-yellow long-leaf, and speculate on their usefulness in the mundane business of fabricating anti-aircraft rockets, or pause to check the cumulative probability of meteor hits on journeys through space. In the intervals, however, can be found exhaustive tables of properties of materials, rocket propellant performance, the Earth's principal characteristics and gravitational field out to great heights and many other topics, together with most of the basic formulæ useful for design calculations. Much information is given of great value for preliminary design studies, divided into chapters on properties of the atmosphere, materials, aerodynamics, propulsion, avionics and space flight. The data on materials and structural design are particularly extensive. However, the sections on specifications for environmental tests and ground equipment and what seemed to be reminder lists for the process of detail design, all based on American practice, are of limited interest. The chapters on aerodynamics and avionics are rather brief. At the end is a 160-page glossary of terms commonly used in missile engineering, which should prove most valuable to newcomers in the subject. The layout and printing are extremely clear. There are, however, quite a number of misprints and some errors in basic constants, for example, the powers of  $\pi$  on p. 23 are completely inaccurate. These errors raise some doubts regarding the accuracy of the multitude of quantitative facts throughout the book, which only detailed and intensive study could check.

By contrast the second book, "Guided Missiles—Operations Design and Theory" deals almost entirely with elementary principles. It is based on a military training manual written some three years ago at the U.S. Air Force Missile School in Colorado and is obviously intended for general instruction of military personnel. Although at times unsound on basic principles, for example, force, momentum and weight are sadly confused in stating Newton's laws, the book gives a very understandable account of the main design principles and features of typical missile guidance and control components. The sections on systems are less successful, and there are noticeable gaps in the treatment of servo-mechanisms and closed-loop systems. The text is profusely illustrated throughout by exceptionally clear line and half-tone diagrams. The subject-matter should be easily grasped by a reader with mathematics and science to Intermediate B.Sc. standard and, despite a tendency towards diffuseness and occasional inaccuracy, forms a good introduction to all aspects of missile development.