

Praktische Arbeitsphysiologie

Von Prof. Dr. Gunther Lehmann. Zweite, überarbeitete und erweiterte Auflage. Pp. viii+409. (Stuttgart: Georg Thieme Verlag, 1962.) 59 D.M.

PRAKTISCHE ARBEITSPHYSIOLOGIE is a book familiar to anyone interested in the application of physiology in industry. The text of the second edition, now available, varies only in detail from the original version and is based mainly on research carried out by the author and his colleagues in the Max-Planck Institute in Dortmund.

After defining work physiology, the author describes briefly the structure and function of muscles, their reflexes and co-ordination. A long chapter follows, dealing with the physiological responses to work, the relationship of fatigue and recovery and the way in which rest pauses can best be arranged. Alterations to the original text in this chapter are concerned mainly with an expansion of information on the assessment of periods of work and rest and include an attempt to assess the combination of frequency and force in estimating maximal allowable activity by certain groups of muscles; a complete section, on body posture, has been removed in the second edition from this to a later chapter.

Next comes a chapter concerned with energy expenditure during different kinds of work and which considers the relationship between the duration of work and the maximum permissible energy expenditure for that period of time. The following chapter, which now includes the section on body posture, otherwise remains similar, illustrating the use of physiological results in the assessment of work routines and machine design.

The effect of working in different climates is then considered. Here the original text has been altered mainly in the assessment of environmental limits for different occupations. In the remaining chapters, the text dealing with the effects of noise and vibration on work has been expanded, while comments relating to atmosphere pressure, nutrition, wages systems and hours of work remain similar.

The production of the book is excellent, and, over all, it successfully shows the value of applied physiological research in industry. It would be satisfactory to see English added to the various languages into which the original version was translated.

A. R. LIND

The Challenges of Space

Edited by Hugh Odishaw. Pp. xviii+379. (Chicago and London: University of Chicago Press, 1962.) 6.95 dollars; 52s.

IN 1961 the *Bulletin of Atomic Scientists* published a special double issue devoted to scientific aspects of space exploration; the articles in the *Bulletin* have been expanded and revised to form this book. The first of the book's five sections is entitled "Applications of Space Research" and includes chapters on meteorological satellites by H. Wexler and D. S. Johnson, and on communication satellites by L. Jaffe and J. R. Pierce. There is also a chapter on "Space Research and the Earth Sciences", which could more appropriately have been placed in the second section, on "Space Research". This section contains contributions on biology in space, the zones of radiation, orbiting telescopes, the Earth, Sun and Moon; the authors include J. Lederberg, J. A. Van Allen and G. de Vaucouleurs.

The third section of the book, entitled "National Space Programs", brings a rather different emphasis. The United States space projects, both civil and military, are outlined in useful detail by W. H. Shapley, H. E. Newell and A. G. Waggoner, and the activities of other nations are described by J. Orlan. Part 4 is on "International Space Co-operation", and gives an account of the various organizations which seek to promote such co-operation. Part 5 is entitled "Space Technology" and is largely

devoted to propulsion, with chapters on existing and future systems by G. P. Sutton, R. S. Cooper and A. T. Forrester. To complete the book there are notes on the authors and an excellent index.

A compilation of this kind, with separate articles written by acknowledged experts, is always useful, but it has dangers too, some of which are not entirely avoided here. For example, very little is said about research into the upper atmosphere, or ionospheric studies, because these subjects happen to fall in gaps between the areas covered by the individual contributors. Apart from these slight reservations, the book is a satisfactory review of space science.

D. G. KING-HELE

Thermodynamic Assessment of Rocket Engines

By B. A. Nikolayev. Translated by W. E. Jones. Translation edited by B. P. Mullins. (International Series of Monographs in Aeronautics and Astronautics. Division 7: Aerodynamics, Vol. 4.) Pp. xviii+150. (London and New York: Pergamon Press, 1963.) 63s. net.

THERMODYNAMIC Assessment of Rocket Engines is the fourth in the Aerodynamics Division of the International Series of Monographs in Aeronautics and Astronautics published by Pergamon Press. Its scope is rather less than might be expected from its high-sounding title. In fact, the whole book is taken up in providing an arithmetically simple solution for two problems of rocket performance calculation, namely: given a combination of rocket propellants containing only the elements carbon, hydrogen, oxygen and nitrogen burnt at a particular pressure, (1) What are the equilibrium conditions in the combustion chamber? (2) What is the specific impulse obtained from an equilibrium expansion of these products to a lower pressure?

The standard method of solution is, of course, well known. One writes down the mass balance equations for each of the elements involved, the enthalpy and entropy balances and an equilibrium equation for each of the dissociation reactions. Suitable relationships between enthalpy, entropy, equilibrium constants and temperature are provided, and the whole set of simultaneous equations is programmed for a computer. Many thousands of such calculations have been performed and the results are available in, for example, publications issued by the National Aeronautics and Space Administration.

Suppose, however, one had no computer and no access to American literature, then, and only then, one would be prepared to examine Mr. Nikolayev's short cuts and empirical graphs and accept an answer of unknown inaccuracy (probably less than 1 per cent over the limited range to which his methods apply), rather than face wearisome weeks of trial and error computation. To any man in such a position this book may well prove useful.

The standard of translation is high, and the text is certainly as comprehensible as that of the original. However, a pedant might complain of the sentence on page 86 which reads, "It is impossible to *anticipate* large scale errors in the results of the calculations" (my italics).

S. L. BRAGG

Essays 1958-1962 on Atomic Physics and Human Knowledge

By Niels Bohr. Pp. x+100. (New York, London and Sydney: Interscience Publishers, a Division of John Wiley and Sons, Ltd., 1963.) 30s.

THE present volume is the third in a series and contains seven articles written by Niels Bohr during the five years before his death in November, 1962. The first four articles reflect Bohr's interest in philosophy, in the unity of human knowledge and the connexion between the sciences, particularly between physics and biology. The last three articles deal with developments in atomic