The Moon

Our Nearest Celestial Neighbour. By Prof. Zdeněk Kopal. Second edition. Pp. viii+152+24 plates. (London: Chapman and Hall, Ltd., 1963.) 30*s*. net.

THIS book, first published in 1960, has been substantially revised for the new edition. Considerable attention has been paid to the Moon during the past three years, and many of the recent investigations are incorporated.

The pattern of the book is unchanged. Beginning with "Facts and Figures", Prof. Kopal gives a general description of the lunar surface features, after which he turns to what he appropriately calls "The Story of Moonlight". Problems of the surface structure are then discussed, followed by a short chapter devoted mainly to the outbreak inside the crater Alphonsus reported in 1959 by N. A. Kozyrev. The final section, "Destination Moon", is intriguing and speculative. Lunar vehicles of the present and future are described; the uses of a lunar base are outlined, and there are comments on matters such as the transfer of lunar ores to Earth by means of a "gravitational pipeline", and the possible use of the Moon as a temporary haven for humanity in the event of a disastrous nuclear war on our own world.

The style is clear and concise, while the photographs and line-drawings match the high standard of the text. Though a great deal of information is given, there are no mathematical formulæ. It is worth noting that the beginner should not be put off by a curious quote on the back cover, said to be from a review of the first edition, in which it is stated that "the reader must be prepared to take a good deal of arithmetic in his stride". One can only assume that this review related to some other book.

It may be argued that the revisions have not been carried quite far enough; for example, events of 1959 are said to have occurred "last year", while there is no mention of some of the important recent work, such as the studies of the lunar grid system carried out at the University of London by G. Fielder. However, further amendments will no doubt be made in the future edition which will undoubtedly be called for. Meanwhile. the author has produced a very pleasant, useful little book which deserves to be widely read.

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Space Carrier Vehicles

By Oswald H. Lange and Richard J. Stein. (Advances in Space Science and Technology, Supplement 1.) Pp. viii+317. (New York: Academic Press, Inc.; London: Academic Press. Inc. (London), Ltd., 1963.) 86*s*.

THIS book aims to provide an introduction to the wide variety of subjects, both scientific and technological, which must be mastered if space launching missiles are to be successfully designed and developed. The book begins with a useful conspectus of United States space launching missiles from the *Juno* 1 to the *Saturn C*-5: a list of their achievements is included, which shows the *Thor-Agena B* to be well in the lead, with 39 successful launches before the end of 1962. Two other topics, "aerodynamics and structures" and "rocket engines", are covered particularly well: the essential principles are adequately described, but there is also a strong current of practical detail. Further subjects discussed are inertial guidance and control, the fabrication of the missiles (including an informative series of photographs of the Saturn vehicle under construction), procedures for checking that the missiles will function correctly, and, finally, the layout and construction of launching sites (with photographs of the Saturn launch complex at Cape Kennedy).

In general, the book fulfils its purpose well, though inevitably the transitions from one subject to another sometimes seem rather hurried. The book is up to date, has a good index, and is illustrated with 223 diagrams and photographs. The printing is clear, and usually accurate; but there are some errors, as in Equation 33, where $\left(\frac{2}{-1}\right)$ should be $\left(\frac{2}{\gamma-1}\right)$. The book shows a bias in favour of German or American achievements: p. 1 gives the impression that the first satellite was launched by the United States. Since the names of only two authors appear on the title page it is rather surprising to read in the preface that, of the book's nine sections, three were written by R. L. Scott and one by S. P. Hale, while one was 'collated and edited' by W. G. Kelsoe. However, it turns out that these five sections make up only about one-third of the book; so it is not unreasonable to regard O. H. Lange and R. J. Stein as the authors.

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Lapses in Mathematical Reasoning

By V. M. Bradis, V. L. Minkovskii, A. K. Kharcheva. Translated by J. J. Schorr-Kon. (The Commonwealth and International Library of Science Technology, Engineering and Liberal Studies.) Mathematics Division. Vol. 3. Pp. xii+201. (Oxford, London, Paris and Frankfurt: Pergamon Press; New York: The Macmillan Company, 1963.) 15*s*.

THE good teacher is not content to correct a pupil's error; he will endeavour to find the root of the error, to see why it should ever have been made. This translation from the Russian gives in its first chapter an account of various possible classifications of errors at the school-level and then supplies a large number of instances from arithmetic, algebra, geometry and trigonometry. There are of course many old friends (or foes), but a great many new ones, some trivial, some subtle. The analysis is not usually pushed as far as it is in Dr. Maxwell's excellent *Fallacies in Mathematics*, but the book is a good companion to Maxwell's since it provides a further supply of fallacious arguments likely to arise at the Ordinary Level of the General Certificate of Education, and will help the teacher not only to be on his guard but also to be ready with an antidote.

Introduction to the Theory of Integration

By T. H. Hildebrandt. (Pure and Applied Mathematics: a Series of Monographs and Textbooks, Vol. 13.) Pp. ix+385. (New York: Academic Press, Inc.; London: Academic Press, Inc. (London), Ltd., 1963.) 100*s*.

THE road from seeing the integral as the area under a curve to its abstract concept as a linear functional is a long one, and even the student who has firmly grasped the notion of the Riemann integral through upper and lower approximative sums may need considerable help at the next stage of his journey.

Zaanen's excellent book (1958) had this need in mind, and the present volume by Hildebrand has much the same intention, though differing in approach. Instead of beginning with measure theory, Hildebrand starts with the Moore–Smith doctrine of general limits and directed sets to supply a unified limit process, and then applies this to integrals of Riemannian type, particularly the Riemann–Stieltjes integral. Only then does he discuss sets, measure theory and measurable functions and so arrive at the Lebesgue–Stieltjes integral. Even so, the book is not easy reading, and before tackling it the student should be firmly grounded in elementary real-variable theory, particularly the properties of functions of bounded variation.

Though chiefly concerned with existence theory in one variable, the book opens doors to other fields: orthogonal functions through the Riesz–Fischer theorem; multiple integrals through product measures; the relation of integrals to derivatives and the mean value theorem, leading on to the condition for a function to be an integral given by Lebesgue, extended by Radon, and generalized into an abstract setting by Nikodym. The exposition is clear and careful, and would suit the student with the right background and the right motivation.

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