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Editorial and Publishing Offices :

MACMILLAN & CO., LTD.,
ST. MARTIN'S STREET, LONDON, W.C.2.

Telegraphic Address: PHUSIS, LONDON.
Telephone Number: GERRARD 8830.

Industrial Science.

THE appearance of the eighth annual report of the Department for Scientific and Industrial Research brings with it the reminder that time passes, and tells of much useful work performed. As usual, the report is divided into three sections: the report of the Committee of Council, the report of the Advisory Council of the Committee, and a summary of the work of the Research Boards and Committees of the Department with numerous appendices. The first section, in the main a formal résumé of the work done, records with apparent satisfaction a reduction of the estimates by some 20,000*l.*, a regrettable fact, in spite of the urgent need for economy, for wise expenditure in the application of science to present conditions might easily result in savings of far greater amount. After reference to the valuable work of the co-ordinating research boards established to connect the work of the scientific departments in the various services, both together and also with university and other scientific activities, the report directs attention to the fact that the Research Associations, supported out of the Million Fund, are approaching the end of the five years for which grants were made, and states the policy which, on the advice of the Advisory Council, has been adopted. "It must not be assumed," the report continues, "that further financial assistance will be recommended in every case. There will have to be ample proof that the industry is unable immediately to shoulder the entire responsibility, and further aid will only be given if the industry concerned is prepared to make a rapidly increasing effort towards complete responsibility."

Another direction in which the committee has taken an interesting step in its task of co-ordinating the scientific activities of the government departments is in the promotion of a joint exhibit at the British Empire Exhibition next year. After various consultations it has been agreed that there should be a central building in which the government departments concerned will arrange their exhibits, working in conjunction with a committee organised by the Department of Overseas Trade, while the Royal Society, financed by a grant from funds allocated by government, has assumed responsibility for an exhibit illustrating recent advances in pure science.

The report also records the fact that the French Government has established under the Minister of Public Instruction an *Office National des Recherches Scientifiques et Industrielles et des Inventions*, having objects much resembling those of the Department.

Turning now to the report of the Advisory Council, the ground covered is very extensive, the Research

Associations, the co-ordinating boards, the research boards, the National Physical Laboratory, the various other research institutions, and the organisation controlling grants to individual workers, are all passed in review. On the whole the record is one of continuous progress. Difficulties have been overcome and advances made in many directions. The Fuel Research Board has been weakened by the retirement of Sir George Beilby, who has for seven years guided its activities "and laid the foundations of a structure of new knowledge of great significance for the health and industrial welfare of this country." Dr. Lander succeeds him as director, while Sir Richard Threlfall becomes chairman of the Board. The gratifying fact is recorded that, at the International Conference on Radio-Telegraphy at Brussels last year, the programme of work prepared for the British delegates by the Radio Research Board found a ready acceptance as the basis of international research.

The appointment of Sir William Bragg to the Fullerian professorship at the Royal Institution is noted, and the arrangements by which he is to have the help of a staff of skilled assistants are referred to. Both he and the Advisory Council are to be congratulated on this; we may look forward to the Royal Institution and the Davy-Faraday Laboratory becoming the birthplace of a series of discoveries no less notable than those which have already made its name famous in the annals of science.

The committee which, in co-operation with the railway companies, has been set up under the chairmanship of Sir Alfred Ewing to investigate the stresses on railway bridges due to moving loads, has undertaken a difficult but important task. The weight and speed of trains have increased many fold since most of our bridges were built. Stress conditions are much more serious, the large factor of safety designed for is much reduced, and, while there may be no grounds for anticipating serious risks, investigation and fuller knowledge are urgently needed.

Growth of another kind is indicated by the purchase of land at Teddington for extensions of the National Physical Laboratory and other government institutions.

Only in one section is the note less assuring. After describing generally the scheme under which the Research Associations were established, the report of the Council continues: "The anticipations made at the inception have failed to be realised owing in large measure to industrial events since that date." The Associations were started during the last year of the War, four being founded before November 1918. It was hoped that they would be a flourishing product of the boom which was to follow and to last for five years

at least. This hope has not been fulfilled; the boom lasted two years, during which period seventeen associations came into existence. Since 1920, a period of intense depression, only one has been added to the list. The five years for which the grants were made are now coming to an end; funds are running out. The Associations are financed from the Million Fund, and the question comes, What is to be done? Few if any really can stand alone; what is their record? Is it sufficiently promising to justify further State assistance even if it be possible to find the money? The Advisory Council has considered the facts, and, while realising that "the five years of grant appear likely to be insufficient in many cases to fulfil the original hopes of the scheme," has decided that there is no justification for continuing the original contracts. Existing agreements, therefore, are to be terminated at the end of the quinquennial period; should any association apply for a further grant, the case will be considered on its merits and an inquiry will be made into the circumstances. New grants may as the result of this be made, but in no case, it is held, should the grant extend for more than an additional five years.

The position is a difficult one; the circumstances of the past three years have been such that the scheme has not had a fair chance. What will the chances be in the next five years? The inquiries to be set on foot will throw some light on this question, and the plan proposed is probably the best that can be devised. But there are other difficulties, as the report points out. Scientific inquiry is coming to be recognised more and more as the basis on which advance in industry rests, while the calls of industry are no small inducement to science to advance. But co-operation in industrial investigation is novel. In Germany, in pre-War days, great firms could maintain their staffs of skilled workers; the same is possible in America now; but there are few concerns in England so large and so flourishing as to bear the expense of a private research laboratory. Such can probably be counted on the fingers of one hand; the Brown-Firth laboratories, the G.E.C. works at Wembley, and the laboratories of Barr and Stroud are well-known examples. Such firms do not participate in the work of the Associations; and among those who do the differences of position are very marked. By some the need of scientific inquiry is fully grasped: others have scarcely realised it. Some through long experience have gained a store of useful practical knowledge; why should they share it with others less happily placed? We give much, we gain little, they may not unnaturally say; wherein do we profit?

Yet we find that where there have been mutual trust and confidence; where each member of an Association

has been willing to give of his best, anxious to improve the common stock of knowledge and to profit by the new knowledge placed at his disposal by the research staff, the Association has prospered most; the firms which knew most have learnt more, and it has not been a question of giving everything, receiving nothing. Time only can solve the question. We may be allowed to hope that, as the welfare of its citizens depends on the prosperity of a State as a whole, so the advances of industrial science will benefit the whole industry, and not least those who by previous knowledge and experience are most able to profit it by them.

Popular Astronomy.

- (1) *The Star People*. By Gaylord Johnson. Pp. xi+107. (London: Methuen and Co., Ltd., n.d.) 4s. 6d. net.
- (2) *The Vault of Heaven: An Introduction to Modern Astronomy*. By Sir Richard Gregory. Second edition, rewritten. Pp. vii+202. (London: Methuen and Co., Ltd., 1923.) 6s. net.
- (3) *The Heavens and their Story*. By Annie S. D. Maunder and E. Walter Maunder. Pp. 357. (London: The Epworth Press, n.d.) 4s. net.
- (4) *The Kingdom of the Heavens: Some Star Secrets*. By Charles Nordmann. Translated by E. E. Fournier d'Albe. Pp. 262. (London: T. Fisher Unwin, Ltd., 1923.) 12s. 6d. net.

THE practically simultaneous appearance of four books, all written mainly with the object of making available the fundamental truths of astronomy, demonstrates alike the eagerness of the public to be informed and the willingness of those qualified by experience to minister to this praiseworthy curiosity. Naturally, there is much repetition; the same facts, or many of them, appear in each of the several volumes, but the method of presentation varies according to the assumed intelligence of those addressed.

(1) In the first, Mr. Gaylord Johnson addresses an audience of children and adopts kindergarten methods with the object of teaching them how to recognise and identify the constellations. The method is novel and, if it prove successful, we imagine that the ability of the teacher, the gift of creating interest in what is unfamiliar, the power of rapidly comprehending the direction of a child's thoughts, and the art of giving it expression will play as great a part as the ingenuity exhibited by the author of the scheme. Mr. Johnson's book may act as a stimulant, but against one danger we may utter a word of warning—the attempt to recollect too many stars and their delineations. This is an error into which we think the author has fallen. Many of the stars depicted are too faint, some of the

fourth and lower magnitudes being included. Such faint stars might be allowed in groups, as in the Pleiades, but for isolated stars it is doubtful whether any below the second should be included. But adherence to such a rule would have prevented the drawing of the outline of the constellation figures, and this feature is naturally relied upon to increase the interest of the children.

(2) A second edition of "The Vault of Heaven" has long been needed. This early work from Sir Richard Gregory has been a warm favourite with the writer of this notice, who has lent it to many students anxious to become acquainted with the plan of the solar system and the constructive machinery of the stellar universe. Whether from politeness or conviction, all have expressed approval, and it is to be hoped that another generation will find equal pleasure with the contents.

This new edition, written up to date, serves a further purpose to those who have read the earlier. They will learn what has been accomplished by the improvements in the construction of instruments, and the continuous application of these potent engines of research to the study of the heavens. Spectroscopy and photography have advanced by leaps and bounds in the interval, and much information that was hoped for, but seemed outside the reach of human effort, has become part of the general stock of knowledge. The drift of the stars through space, the dimensions of the whole stellar universe, the growth and decay of worlds, with much else that invited speculation, have become certainties, and a new set of problems lies before the astronomers of the future, though it must be admitted some of the older and apparently simpler problems still stand tantalisingly on the border-land of the unknown, and individual judgment may interpret the evidence as temperament dictates. Among these may be placed the "canals" of Mars and the theories built on them, the varying appearances on the lunar surface, which Prof. W. H. Pickering and others have noted to recur with a regularity that betokens a cosmic cause. Concerning the correct interpretation of the observations, Sir Richard Gregory preserves a judicial attitude, presenting the evidence impartially, and leaving the verdict to the decision of instructed opinion. The class for whom the book is intended is clearly indicated, and this class should benefit from the well-arranged and accurate contents.

(3) We confess that we have read this book with no small measure of surprise, for it is apparently put forward as a recent compilation. It bears no date, and there is no suggestion that it is a reprint of an ancient work. But such well-informed authors could not, if the work were new, refer in the preface to the late Sir W. H. M. Christie as the Astronomer Royal, and afterwards