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Mineralogy and Crystallography in Cambridge.

THE claims of crystallography to be constituted as a separate department in the University of Cambridge, independent of mineralogy, were fully discussed in the Senate House on March 10. The occasion was the discussion of a report by the Council of the Senate containing recommendations for immediate steps to be taken in the reorganisation of the present Department of Mineralogy, which has been under consideration for the last three years.

This is the second of two important discussions dealing with the problem. The first, held on Jan. 28, 1930, dealt with a report by a Syndicate appointed in May 1928 to consider the position of mineralogy in the studies of the University. This discussion and the report of the Syndicate were the subject of articles in NATURE of July 13, 1929, and March 15, 1930. Taken together, the report and the two discussions afford an interesting outline of the development in Cambridge and the possible future scope of the three inter-related subjects of mineralogy, crystallography, and petrology.

The main problem which confronted the Syndicate in 1928 was to provide for the adequate development of crystallography on one hand and of pure mineralogy on the other. The recommendation was to unite petrology (at present taught in the Department of Geology) with mineralogy, and to create two departments, one of crystallography and the other of mineralogy-and-petrology, the latter to be housed in a new building to be erected near the Sedgwick Museum. This accorded equal treatment to the two proposed new departments, and the recommendations received the unanimous support of the original members of the Syndicate. In the discussion which followed its publication, enthusiastic support was given by mineralogists and geologists to the proposed union of mineralogy and petrology, with the proviso that students taking the subject of mineralogy and petrology should also take the subject of geology.

The report, however, raised questions of increased expenditure, additional accommodation, and rearrangement of the examinations, and it is these practical problems which the Council of the Senate has had to face in framing its recommendations.

The question of the place of the subjects of crystallography and of mineralogy-and-petrology in the examination system seems to be nearing a satisfactory solution. The Natural Sciences Tripos Committee has not adopted the recommendations

of the original Syndicate, which involved the creation of 'half-subjects', but it has proposed an alternative and almost equivalent scheme suggested by the professor of mineralogy.

This scheme, published in the *Cambridge University Reporter* of March 10, 1931, unites the subjects of crystallography and mineralogy-and-petrology proposed by the Syndicate into a single full subject, which would require a course of study extending over two years, with provision in the second year of alternative courses for candidates whose interests may be mainly physical and chemical or mainly geological.

The adoption of this scheme will, it is believed, facilitate the close relations of crystallography with chemistry and physics and of mineralogy-and-petrology with geology, which was one of the main objects of the original Syndicate's report.

On the questions of finance and of laboratory accommodation, no immediate practical solution is in sight, and the Council of the Senate has had to proceed on the assumption that the examination system now before the Senate will be adopted, and that steps to put it into practice must be taken before the present professor of mineralogy retires in October, and without incurring any immediate increased expenditure.

The proposal of the Council is, briefly, to establish a new professorship of mineralogy and petrology, to leave the subject of crystallography for the time being under his care, and to make use of existing accommodation, petrology continuing to be housed in the Sedgwick Museum although administered by the new professor.

It is considered highly desirable that suitable accommodation under one roof be provided for mineralogy and petrology, on the site next to the Sedgwick Museum, as soon as funds for building can be made available. No final recommendation is made on the question of the future housing of crystallography, though the possibility of removing it to the new building with mineralogy is favourably considered.

These recommendations give definite priority to the claims of mineralogy and petrology, and on that ground they were attacked by many speakers in the discussion on March 10.

In coming to its decision, the Council has no doubt taken into account the fact that crystallography has for a century been carefully fostered and well taught in the present Department of Mineralogy, and the assumption that this state of affairs will continue has been abundantly justified by the expressions of opinion of mineralogists and petrologists in the discussions both on the original report and on the present recommendations.

Some of those interested in the wider applications of X-ray crystallography are not so sanguine as to the success of the proposed temporary arrangement. They see in the Council's recommendations a danger that crystallography will be relegated to a position subordinate to mineralogy and petrology, too closely associated with these subjects, deprived of separate representation on the Board of Physics and Chemistry, and driven from its present quarters close to the Cavendish Laboratory to, they fear, the less sympathetic neighbourhood of the Sedgwick Museum.

Sir William Bragg emphasised the great change in the scope of the modern subject of crystallography, which, he said, could now with justice be called the chemistry and physics of the solid body, and bore no more relation to mineralogy than to biology, or physics, or engineering. Sir Gowland Hopkins spoke of the bearing of the X-ray study of crystals on an important line of research in biochemistry; and Mr. Bernal indicated wide application in the fields of chemistry, physics, and metallurgy.

Almost without exception, the speakers were in favour of a separate organisation for crystallography, with accommodation on or near its present site in close proximity to the laboratories of physics and chemistry, and with independent control of a sufficient sum for research work, and representation on the Board of Physics and Chemistry.

Lord Rutherford estimated the initial cost of a separate professorship of crystallography, apart from buildings, at between three and four thousand a year, and he thought if such a department was to be created they must look outside the University of Cambridge for funds. He deprecated the further postponement of a decision advocated by Sir William Pope, and insisted on the necessity of taking immediately such steps as were practicable with the means at their disposal. He thought that they should consider very carefully what could be done with the site adjoining the Cavendish Laboratory, and that they should try to arrange for crystallography to have reasonable support and a connexion with the Faculty of Physics and Chemistry. Mr. T. C. Nicholas, who spoke as a member of both the original Syndicate and of the General Board, said that he saw no reason why these provisions should not be made. The recommendations as regards crystallography were only intended as a temporary measure, and the future of the subject was bound to be considered by the

University before any move to new laboratories was made.

These assurances were repeated in a notice published by the Council of the Senate, and on April 24 the recommendations of the Council were passed unopposed. The discussion made it evident that men of science in Cambridge are fully alive to the need for a central institution for the X-ray study of the solid state, equipped to attack the fundamental problems of the other sciences, The alternative appears to be, as Prof. J. B. S. Haldane remarked, the much less economical establishment of separate X-ray research in the individual departments.

All the new developments which would be made possible by the provision not only of such a department of crystallography, but also of the proposed new laboratories for mineralogy and petrology, will assist not merely purely scientific research but also its application to industry. It should, therefore, not be impossible to adopt the practical suggestion made by Lord Rutherford, and to look outside the University for some at least of those funds the lack of which is holding Cambridge back in fields of research where formerly it led the way.

Rock-Paintings in South Africa.

Rock-Paintings in South Africa: from Parts of the Eastern Province and Orange Free State. Copied by George William Stow. With an Introduction and Descriptive Notes by Dorothea F. Bleek. Pp. xxviii + 70 + 72 plates. (London: Methuen and Co., Ltd., 1930.) 42*s*. net.

GEORGE W. STOW, a native of Warwickshire, went to South Africa at the age of twenty-one, when he entered business and took up the study of geology. His life was passed in eastern Cape Colony, Griqualand West, and the Orange Free State. He became keenly interested in the natives, particularly the Bushmen, and as in the course of his travels he had come across a large number of rock-shelters containing paintings, in 1867 he began to make copies of them. By 1870 he had conceived the idea of utilising his material in a history of the civilisation of the Bushmen as painted by themselves, an undertaking upon which he was engaged from that time forward until his death in 1882. He neglected no opportunity to add to his information about the race. In his later years he availed himself of the assistance of a young prospector who was attached to him.

It is difficult for anyone in Europe to form an adequate idea of what travelling was like in those days of long treks in an ox-cart, and of the difficulties Stow experienced in obtaining paper suitable for his drawings. His name will stand for ever on a heroic page of ethnographical studies in South Africa. He was a real pioneer and truly worthy of our admiration.

It was not Stow's practice to copy the whole of the figures on each rock, but to select what appeared to him most noteworthy. The figures are shown in their exact relationship to one another only when the whole formed a group. The scale is always shown. Stow died before he was able to publish; but a posthumous work appeared in 1906 under the title "The Races of South Africa", in which were a number of fine plates and a mass of interesting information. After his decease, Miss L. C. Lloyd, a well-known authority on the language and folk-lore of the Bushmen, acquired his drawings, but was unable to publish owing to lack of funds. Miss Dorothea F. Bleek, who inherited this material, thanks to the assistance of the Carnegie Trustees, has now published a selection consisting of 72 plates, for which all ethnographers and artists will be deeply grateful. The plates, mostly in colour, are very fine and do honour alike to Stow, to Miss Bleek, and to the publishers.

Miss Bleek tells us that in 1928 she made a special journey to all the localities visited and recorded by Stow. Out of the 72 plates now published, she has been able to locate and identify the subjects of 60. She has assured herself of the accuracy of the copies, and at the same time has noted the ravages of the weather and of man and beast on the paintings, which Stow found in a very different state of preservation sixty years ago. With a scruple that is over-delicate, Miss Lloyd asks our indulgence for publishing the original copies rather than fresh ones; but, as she says, Stow saw the material he copied in conditions that have now vanished for ever. She has, therefore, been content to assure herself of the substantial and adequate accuracy of the copies, and to note in each case the variations due to the hand of time or of the copyist.

Miss Bleek, as everyone knows, is herself an authority on the ethnography, the folk-lore, and the language, or rather languages, of the Bushmen; and it is our good fortune that she should have dealt with them in an introduction. Here then, in the first place, is what she has to tell us of the rock-paintings. They are found particularly, as is only natural, in country in which there are rocks—that is to say, in country of irregular conformation: from