that three of the Australian colonies are scarcely in a position to undertake this new work; but South Australia is freer, and if it can establish a solar observatory, either at Adelaide or elswhere, a gap in longitude will be satisfactorily filled. The scheme is receiving substantial private support. In addition to the promise of a telescope (a 6-in. Grubb equatorial refractor) from the trustees of the estate of the late Lord Farnham, Dr. W. Geoffrey Duffield, of the Physical Laboratories, Manchester University, has received from Mr. Frank K. McClean the offer of £500 towards the purchase of a large spectroheliograph, on condition that an additional sum of £1000 be privately subscribed towards the same piece of apparatus.

UNIVERSITY AND EDUCATIONAL NEWS

THE University of Toronto is conducting a course in hygiene of twenty lectures. Dean Reeve of the medical faculty will take up the eye and ear; Dr. George R. McDonagh, the nose and throat; Dr. Charles Sheard, contagious and infectious diseases; Dr. Abbott, color blindness, and Dr. William Oldright, general sanitation.

DR. CHAS. C. ADAMS, of the University of Chicago, has been appointed associate in animal ecology at the University of Illinois.

IN the faculty of engineering at University College, London, a new lectureship in electrical design has been instituted, to which Mr. Henry Metcalf Hobart has been appointed.

MR. W. JACKSON POPE, F.R.S., professor of chemistry in the University of Manchester, has been elected into the professorship of chemistry, at Cambridge, rendered vacant by the resignation of Professor G. D. Liveing, who has held the chair since 1861. Mr. Pope, who was born in London in 1870, was educated at Finsbury Technical College and the Central Technical College, London. Before going to Manchester he was head of the chemistry department of the Goldsmiths' Institute, London.

DR. HANS SPEMAN, of the University of Würzburg, has been appointed professor of zoology at the University of Rostock.

DISCUSSION AND CORRESPONDENCE

THE CHEMICAL FORMULA OF THE MINERAL BENITOITE

IN a recent issue of SCIENCE (May 1, 1908) Mr. Edward H. Kraus discusses the recently described mineral benitoite, and suggests a formula which differs somewhat from the one proposed by Professor Louderback in his original paper. The two analyses already reported, and a third which will be published shortly, all show that the empirical formula of the mineral is $BaTiSi_3O_9$ and the most reasonable assumption is that it is made up of the three oxides BaO, TiO_2 and SiO_2. Mr. Louderback's proposal is that the mineral is a very acid titano-silicate of barium, whereas Mr. Kraus suggests that the titanium here plays the part of a base and that therefore the mineral is a double metasilicate of barium and titanium. Though it must be admitted that absolute proof of the correctness of either of these two suggestions is at present scarcely possible it seems to me that the arguments advanced by Mr. Kraus are entirely unsatisfactory and I submit the following objections.

The main argument upon which Mr. Kraus bases his formula is the alleged isomorphism of benitoite with beryl, which mineral is usually regarded as a salt of metasilicic acid. If the most favorable values are chosen the ratios of the *a* axis to the *c* axis for the two minerals are 1.4989 and 1.4230, respectively. These figures show an actual difference of more than sixteen per cent. of the magnitude concerned, and even interpreting the law of isomorphism with that degree of looseness which is not uncommon among mineralogists, furnish no evidence upon which to base conclusions as to the molecular structure of the two compounds. The two minerals also differ widely as to form and habit; one is trigonal and the other holohedral. Further, many of the illustrations which Mr. Kraus cites as examples of isomorphism are open to serious question; galena and argentite most certainly can not be called isomorphous merely because they both crystallize in cubes.

The occurrence of benitoite in rock formations which are of a basic character, upon which Mr. Kraus bases a second argument, is to my mind of no significance. The benitoite and the natrolite matrix in which it occurs are clearly secondary and must have been formed from percolating solutions. Even if it be assumed that these solutions were also basic it by no means follows that the titanium which they contained would take the part of a base, on the contrary it is more probable that it would take the part of an acid. Associated with the benitoite are two other titanium-containing minerals, namely, titanite and a mineral to which the name carlosite was given, but which we have since shown to be identical with neptunite. All three minerals are found in the natrolite matrix and appear to have been formed contemporaneously. There is good reason for supposing that titanium takes the part of a base in both titanite and neptunite and it is not probable that a third mineral formed under similar conditions would differ in this respect.

There is on the contrary much to be said in favor of the formula suggested by Mr. Louderback. The properties of the element titanium, when in this degree of oxidation, are clearly those of a very weak acid. The entire lack of a definite compound of titanium and silicon, in view of the frequent occurrence of both oxides in the same formation, is striking. If benitoite is a double metasilicate of barium and titanium it is most remarkable that the proper conditions for the formation of both its constituent single salts have nowhere prevailed.

A cursory examination of the literature shows that many of the compounds in which titanium is supposed to take the part of a base have not been isolated in pure form, nor has their structural formula been satisfactorily determined. They are in all probability analogous to certain complex acids, such as those which phosphoric acid forms with the acids of the chromium group of elements rather than to simple salts.

Titanium is more closely related to silicon than to the more basic zirconium. Like the former element it shows a decided tendency to combine with itself and form complex molecules, and the substitution of one element for the other in such a chain would not seem unreasonable. Further, there is nothing unreasonable in the formation of compounds containing such a relatively large percentage of acidic elements if the acidic elements represented are very weak in their properties and the basic elements are very strong in theirs; the compound borax furnishes a good illustration.

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APPOINTMENTS IN AMERICAN UNIVERSITIES

To the Editor of Science: As a Scot, called some years ago to teach in an American university, I am much interested in Dr. S. J. Meltzer's communication, printed in Science of August 7, especially as two of the gentlemen to whom he refers are countrymen of my own. However, my purpose is not to traverse his protest, which seems to me well taken. Dr. Meltzer's letter involves a much larger question. I think that those of us who have to make recommendations for vacancies must have felt often that here, at least, we stand badly in need of a clearing-house. Why should not each great department of inquiry have its own bureau of information, to bring men and places together? Our present methods are largely haphazard, especially with reference to the less important appointments, whence the more important must be filled some day. One hears of vacancies after they have been settled; and one's knowledge of available appointees, especially of the younger men, is far from complete. Here is an opportunity for Science and similar publications to ventilate a need, with a view to common action.

R. M. Wenley

University of Michigan

SCIENTIFIC BOOKS

Musée Ostéologique. Étude de la Faune Quaternaire. Ostéométrie des Mammifères. Par Edmond Hue Médecin Vétérinaire, Membre de la Société Préhistorique de France. Album de 186 planches contenant vi + 50, pl. 93. Deuxième Fascicule, pl. 2,187 figures. Premier Fascicule, pp.