

clear as to the method of formation of lightning and auroral discharges, the phosphorescent glow of the clouds, ball lightning, and other every-day phenomena. Is a cloud to be considered as one big conductor, or does it insulate and separate the electrified masses on either side of it? Are the great displays to be seen on the summits of the Rocky Mountains due to the influence of the atmosphere or to something going on in the earth beneath? Are large drops really made up by the agglomeration of small cloud particles, or are both the drops and electricity formed simultaneously by the sudden dissipation of unstable molecular equilibrium that exists in supersaturated cloudy air (as suggested by the editor in his article of 1891 in *Agricultural Science* on the "Artificial Production of Rain")? Do the larger drops of rain really possess a greater electrical density on their surfaces than the small drops and particles, or do they not rather lose their charges immediately either by evaporation or by gentle discharge to the neighbouring drops? These and other questions crowd upon our thoughts; but satisfactory replies can only be given after physicists have invented appropriate methods of investigation. Meteorological observers may contribute to the solution of the problems by collecting both general data and special observations of exceptional phenomena, but the discussion of the data and the definitive decision by means of experimentation as to the merits of conflicting hypothetical explanations must be left to the leading physicists of the world.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The election of a professor as member of the Council of the Senate, to fill the place of Prof. Robinson, now Canon of Westminster, will take place on Friday, March 17.

Prof. Woodhead is appointed an Examiner in State Medicine, in the place of the late Dr. Kanthack.

Syndicates are to be appointed to obtain plans and estimates for the new buildings of the Medical School and of the Botanical Department.

MR. FREDERICK TREVES, consulting surgeon to the London Hospital, has been appointed an Emeritus professor of surgery to the London Hospital, and will give a course of lectures in clinical surgery in the winter session. The special subjects and dates will be announced in due course.

PROF. A. H. SAYCE, of Oxford University, has been appointed Gifford Lecturer in Aberdeen University for 1900-1902. The honorary degree of LL.D. has been conferred upon Mr. Charles Stewart, F.R.S., Curator of the Museum of the Royal College of Surgeons, England; and Mr. George F. Stout, Lecturer on Comparative Psychology in Aberdeen University.

As will be seen from our advertisement columns a successor to the late Prof. Rutherford in the chair of Physiology of the University of Edinburgh will shortly be appointed. Applications for the post, accompanied by relative testimonials, should reach the Secretary to the Curators, at 66, Frederick-street, Edinburgh, on or before May 20.

In connection with the inauguration of the new buildings of the Middlesex Hospital Medical School, Dr. F. Hetley, a former student, has contributed the sum of 1000*l.* to perpetuate the Hetley Clinical Prize of 25*l.* per annum, founded in 1884.

A CHAIR of Hygiene has been endowed in Harvard University by a donor whose name is withheld.

THE following appointments abroad are announced in *Science*.—Dr. James Monroe Taylor to be president of Brown University; Dr. T. J. J. See to be professor of mathematics at the Naval Academy, Annapolis; Prof. Fritz Regel, of Jena, to be professor of geography at Würzburg; Dr. Erich v. Drygalski, of Berlin, to be professor of geography at Tübingen.

THE resignation of Dr. Robert Otto, professor of chemistry in the Institute of Technology at Braunschweig, is announced.

SCIENTIFIC SERIALS.

American Journal of Science, February.—Contact metamorphism, by J. M. Clements. The various Huronian sediments which form a great portion of the iron-bearing districts of the Upper Peninsula of Michigan have in all of these districts been found to be penetrated by dikes of igneous rocks, which are predominantly basic in character. The author describes the products which have resulted from the intrusion of basic dikes in the Mansfield slate formation. Between the dolerites and

the slates there are masses of hard, peculiar hornstone-like rocks, which have a well-banded character. Beginning with the clay-slate, the least metamorphosed rock in the district, the series passes through phyllites, spilositcs, and desmosites to those which are known as adinoles, the latter being those which immediately adjoin the intrusive.—The origin of mammals, by H. F. Osborne. The author traces the ancestry of mammals to the Upper Permian, and in doing so he adopts Gill's two subclasses of mammals, namely the *Eutheria*, comprising marsupials and placentals, and the *Prototheria* or monotremes. There are grounds for the view that the *Theriodontia* are the *Hypotheria* or *Promammalia*, because it appears that within the order may well have existed some small insectivorous types, far less specialised in both structures than either the carnivorous Cynodonts or herbivorous Gomphodonts, as one of those conservative species of adaptive radiation which form the focus of a new progressive type.—Chemical composition of tourmaline, by S. L. Penfield and H. W. Foote. The composition was deduced from the results of an analysis of a few specimens carried out with the utmost regard to accuracy. The specimens selected were the colourless tourmaline from De Kalb, St. Lawrence County, New York, and the pale green variety from the felspar quarries at Haddam Neck on the Connecticut River. The authors regard all varieties of tourmaline as salts of the acid $H_9Al_3(B.OH)_3Si_3O_{19}$, in which the complex aluminium-borosilicic acid radicle exerts a mass effect by virtue of which the remaining hydrogens may be replaced by metals of essentially different character without bringing about any pronounced change of crystalline form.—The thermodynamic relations for steam, by G. P. Starkweather. Discusses the application of Van der Waals's equation of condition to steam along the saturation line.—A volumetric method for the estimation of boric acid, by L. C. Jones. This is based upon the reaction $5KI + KIO_3 + 6HCl = 6KCl + 3H_2O + 3I_2$. The liberated iodine may be removed by sodium thiosulphate, and a solution obtained which is absolutely neutral, containing only neutral salts, potassium iodide, iodate, and tetrathionate. Boric acid in moderate amount in solution has not the slightest action on a mixture of iodide and iodate.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 16.—"The Thermal Deformation of the Crystallised Normal Sulphates of Potassium, Rubidium, and Cæsium." By A. E. Tutton, B.Sc. Communicated by Captain Abney, C.B., F.R.S.

In this memoir are communicated the results of sixty-four determinations of the thermal expansion of the orthorhombic crystals of the normal sulphates of potassium, rubidium, and cæsium, carried out for the three axial directions of the crystals with the aid of the compensated interference dilatometer previously described by the author.

The coefficients of cubical expansion exhibit a progression, corresponding to the progression of the atomic weights of the three respective metals. This is true of both the constants a and b in the general expression for the coefficient of cubical expansion, $\alpha = a + 2bt$, for any temperature t .

The order of progression of the two constants is inverted; a , the coefficient for 0° , diminishes with increasing atomic weight of the metal, while b , half the increment of the coefficient per degree of temperature, increases. Consequently, the coefficients of cubical expansion of the three salts converge, with rise of temperature, and attain equality in pairs. Beyond the temperature of identity divergence occurs, and an increase of atomic weight is now accompanied by an increase of expansion.

The differences between the coefficients of linear expansion along the three axial directions of any one salt, although only amounting to one-eighth of the total coefficient, are large compared with the differences between the values for the same direction of the three salts. This, together with the fact that the replacement of one metal by another is accompanied by considerable modifications of the relations of two of the three values for the original salt, those corresponding to the axes a and c , prevent the coefficients of linear expansion for any one direction of the three salts from exhibiting any progression corresponding to that of the atomic weights of the three metals.

The increment of the linear coefficient of expansion along the axis c of each salt is about twice as large as the increments for