the later years of his life. This interest occasionally gave rise to controversy, and some of his latest papers were wholly polemical.

Thomsen was a pronounced atomist, and to him a chemical process was a change in the internal structure of a molecule, and the chief aim of chemistry was to investigate the laws which control the union of atoms and molecules during the chemical process. He considered that chemistry should be treated mathematically as a branch of rational mechanics. But no one insisted more strongly than he how little we really know of these questions. In summarising his theoretical ideas in the *Thermokemische Resultater,* he says, "An almost impenetrable darkness hides from us the inner structure of molecules and the true nature of atoms. We know only the relative number of atoms within the molecule, their mass, and the existence of certain groups of atoms or radicles in the molecule, but with regard to the forces acting within the molecules and causing their formation or destruction our knowledge is still exceedingly limited." He fully realised that his own work was only the foundation on which the future elucidation of these questions must rest. "He worked," says Brönsted, "in the conviction that what we somewhat vaguely call the affinity of the atoms—their interaction, their attraction, and varying effect, &c.—follows the general laws of mechanics, and that, as he worded it, the principle that 'might is right,' holds good in chemistry as in mechanics. On this foundation he hoped to be able to evolve the laws for the statics and dynamics of chemical phenomena, even although the true nature of the action is unknown."

Thomsen's merits as an investigator received formal recognition from nearly every country in the civilised world. So far back as 1860 he was elected one of the thirty-five members of the Danish Royal Society of Sciences of Copenhagen, and from 1888 until his death he was its president. In 1876 he became an honorary foreign member of the Chemical Society of London. On the occasion of the fourth centenary of the foundation of the University of Upsala (created in 1477), he received the degree of Doctor of Philosophy *honoris causa.* In 1879 he was made an honorary M.D. of the University of Copenhagen. Two years later he was made a foreign member of the Physiographical Society of Lund, and in 1888 he was elected a member of the Society of Science and Literature of Gothenburg. In 1885 he became a member of the Royal Society of Sciences of Upsala, and in 1886 of the Stockholm Academy of Sciences.

In 1883 he and Berthelot were together awarded the Davy Medal of the Royal Society—a fitting and impartial recognition on the part of the society of the manner in which the two investigators, whose work not infrequently brought them into active opposition, had jointly and severally contributed to lay the foundations of thermochemistry.

In the same year Thomsen was made a member of the Accademia dei Lincei of Rome, and in the following year he was elected into the American Academy of Arts and Sciences in Boston, and of the Royal Academy of Sciences of Turin. In 1887 he was made a member of the Royal Belgian Academy.

In 1886–7, and again in 1891–2, he was rector of the University of Copenhagen. In 1888 he became Commander of the Dannebrog, and in 1896, and on his seventieth birthday, he was made Grand Commander of the same order. On the same occasion the Danish chemists caused a gold medal to be struck in his honour. In 1902 he became a Privy Councillor (Geheime Konferenz raad). In the same year he was elected a foreign member of the Royal Society of London.

He died on February 13, 1908, full of years as of honours, and was buried on the eighty-third anniversary of his birth and on the jubilee of the opening of the Oeresund factory. His wife, Elmine Hansen—the daughter of a farmer on Langeland—predeceased him in 1890.

I desire to express my acknowledgments to Director G. A. Hagemann, of Copenhagen, and to Prof. Arrhenius, of Stockholm, for their assistance in obtaining information concerning Thomsen's personal history. I am also much indebted to our fellow, Mr. Harald Faber, for his kindness in making for me a translation of Prof. Brönsted's account of Thomsen's scientific work, on which my own *résumé* is mainly based.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Sir J. J. Thomson has been nominated to represent the University at the celebration next October of the centenary of the University of Berlin.

Mr. S. Brodetsky, bracketted senior wrangler in 1908, has been elected to the Isaac Newton studentship, tenable for three years.

The adjudicators of the Smith's prizes and Rayleigh prizes are of opinion that the following essay sent in by a candidate is of distinction, "Discontinuous Motion in Gases," by Mr. G. I. Taylor. A Smith's prize is awarded to Mr. Taylor for this essay. The second Smith's prize is not awarded.

In response to an appeal for funds for the purpose of purchasing a site and for building, equipping, and conducting a field laboratory on the outskirts of Cambridge, mainly for the study of protozoal and parasitic diseases, donations amounting to 988*l.* 17*s.* have been received. A donation of 1000*l.* has been promised, anonymously, when the fund has reached 6000*l.* In addition to the foregoing, the Government of Cape Colony has placed the sum of 500*l.* at the disposal of Prof. Nuttall for the purpose of investigating East Coast fever. By permission of the Government, a part of this sum will be utilised for the construction of the laboratory.

OXFORD.—The fact that Halley occupied the Savilian chair of astronomy at Oxford gives this University a special interest in Halley's comet. This interest the University proposes to mark by conferring the honorary degree of Doctor of Science on Mr. P. H. Cowell, F.R.S., chief assistant, and Mr. A. C. D. Crommelin, assistant, at the Royal Observatory, Greenwich, by whose joint calculations the exact determination of the re-appearance of Halley's comet was successfully accomplished. The actual ceremony of conferring the degree will probably take place in May, at the time when the comet is expected to be at its brightest. It has further been arranged that the first discourse given on the new foundation of the Halley lecture shall be delivered by the founder himself, Dr. Henry Wilde, F.R.S., and it is hoped that this may take place at the same time as the conferring of degrees on the two Greenwich astronomers.

ST. ANDREWS.—Besides the munificent gifts to the chemical department of the University already noted, Dr. Purdie recently handed 2000*l.* to the University Court to aid in paying a chemical assistant.

Prof. Percy Herring (physiology) has been appointed dean of the faculty of science, and he enters on his duties at the end of the winter session, the pro-dean (Prof. Butler) meanwhile officiating during the enforced retirement of Prof. Musgrove from illness.

The spacious new Pettigrew Museum of Natural History (the gift of Mrs. Pettigrew) is approaching completion, and the hothouses and conservatories in connection with the botanical department, to which Mrs. Pettigrew also liberally contributed, are well advanced.

A JOINT conference of members of the Geographical Association and of the Federated Associations of London Non-primary Teachers will be held at 3 p.m. on Saturday, March 12, at the Polytechnic, Regent Street, W., when an address will be given by Mr. H. J. Mackinder on "The Regional Method in Geography." Tickets may be obtained from the honorary secretary of the Federated Associations, Miss R. F. Shove, 26 Blessington Road, Lee, S.E.

EDUCATIONAL and charitable institutions, says *Science,* have received 32,400*l.* by the will of the late Mrs. Frances E. Curtiss, of Chicago. Among the institutions which have benefited is Williams College, Williamstown, Mass., 5000*l.* Cooper Medical College, San Francisco, has received a bequest of 1000*l.* by the will of the late Mrs. Myrick. In connection with these bequests to higher education, it is interesting to note that our contemporary reports President Schurman, of Cornell University, as having said in a recent address: "I should like most to see at Cornell a score of research professorships with salaries, say 1500*l.* each, which would call for a capital of some 600,000*l.* or 800,000*l.*, a really small amount in this age of American multi-millionaires."

THE issue of "The Public Schools Year Book" for 1910, which is now available, is the twenty-first, and the coming of age of this useful annual publication is marked fittingly by its adoption by the Headmasters' Conference as their official book of reference. The first part of the work is devoted to the proceedings of the Headmasters' Conference and to full information relative to the public schools. The second part deals with entrance scholarships at the public schools, entrance examinations to the universities, and the conditions of admission to the Navy, Army, Civil Service, and other professions, including engineering and chemistry. A general list of preparatory schools where young boys may be prepared for admission to a public school is also included. To parents proposing to send a boy to one of the public schools, the year book will prove invaluable, since the information respecting the organisation and instruction, fees and other charges, and so on, is just what they will require.

A RECENT table prepared for the London County Council Education Committee provides instructive particulars as to the ages of the boys and girls in the London secondary schools aided by grants from the Council. During the educational year 1909–10 there were in attendance in these schools 9244 boys and 5468 girls. Of the 9244 boys, 2131 were under 12 years of age, 1589 between 12 and 13 years, 1786 between 13 and 14 years, 1767 between 14 and 15 years, 1191 between 15 and 16 years, 465 between 16 and 17 years, 224 between 17 and 18 years, and 91 were more than 18 years. As regards the 5468 girls, 1467 were under 12 years of age, 896 were between 12 and 13 years, 863 between 13 and 14 years, 922 between 14 and 15 years, 805 between 15 and 16 years, 327 between 16 and 17 years, 154 between 17 and 18 years, and 34 above 18 years. In other words, only 780 of the total number of boys in the London secondary schools aided by the Council, or only 8·4 per cent., are above 16 years of age, and only 515 of the total number of girls in the schools, or 9·4 per cent., are above 16 years of age. It must be remembered that, with the exception of the greater public schools, the majority of the public secondary schools in London receive aid from the rates, and consequently it has to be admitted that the number of boys and girls receiving what may be called a complete secondary education is very small.

THE London County Council aids upwards of fifty secondary schools in London. The grants are paid partly with the view of enabling the schools to accommodate a larger number of pupils than would otherwise be possible, and partly with a view of increasing the efficiency of the work. The income of the "aided" schools is derived from four main sources—endowment, Board of Education grant, fees, and grant from the London County Council. The total amounts of these sources of income for the educational year 1908–9 were as follows:—Endowment, 52,533*l.*; Board of Education grant, 49,818*l.*; fees, including fees of London County Council scholars, 114,334*l.*; and the Council's grant, excluding the fees of scholars, 41,415*l.*; making a total of 258,100*l.* It is estimated that during the present educational year the amounts will be:—Endowment, 53,190*l.*; Board of Education grants, 57,678*l.*; fees, 120,963*l.*; and Council's grant, 40,346*l.*; bringing the total up to 272,177*l.* In the case of each "aided" school, the Council requests the governors to submit a statement of receipts and expenditure for the completed year, and also an estimate of the receipts and expenditure for the coming year, and the grant made by the Council is estimated to be sufficient, together with endowments, fees, and Board of Education grant, to admit of the efficient carrying on of the school, and to provide a reasonable working balance throughout the educational year.

THE prospectus for the current session of the Pusa Agricultural Research Institute gives particulars of the courses available for students in agricultural chemistry, economic botany, economic entomology, mycology, agricultural bacteriology, and agriculture proper. The work in each of these departments is respectively under the supervision of the Imperial agricultural chemist, economic botanist, entomologist, mycologist, agricultural bacteriologist, and agriculturist, who act under the principal as chiefs of the teaching staff. In the absence of experience of the class of student likely to be received, it has been found impossible to lay down a permanent syllabus of the training in each subject. The syllabuses are, for the present, tentative, and subject to the condition that time will not be wasted in taking students over ground that is already familiar to them. It may be remembered that the Pusa Agricultural Research Institute owes its inception to the generosity of Mr. Henry Phipps, who in 1903 placed at the disposal of Lord Curzon, then Viceroy of India, a donation of 20,000*l.* (which he afterwards raised to 30,000*l.*) with the request that it might be devoted to some object of public utility in India, preferably in the direction of scientific research. Part of this donation was devoted to the construction of a Pasteur institute at Coonoor, in southern India, and it was decided that the balance should be utilised in erecting a laboratory of agricultural research to form a centre of economic science in connection with that occupation on which the people of India mainly depend. This conception was subsequently enlarged, and the Government of India has now constructed a college and research institute, to which a farm of some 1300 acres is attached, for purposes of experimental cultivation and demonstration. The Pusa Institute is consequently in a position to enable students who have passed with distinction through a course at a provincial college, by means of a post-graduate course in one of the specialised branches of agricultural science, to qualify for the higher branches of agricultural work.

REPLYING to the toast of his health at the annual dinner of the Bristol University Colston Society on February 17, Sir William Ramsay, K.C.B., spoke of the administration of British universities. Professors should not, he said, be paid less than the average income obtainable in kindred professions. If a professor is paid at a much lower rate than he would obtain by entering some corresponding profession, it means that persons of one of three classes will occupy chairs. First a few men, from love of teaching or research, will carry on work on a pittance. Secondly, there are the men with a competence, who will take professional work for the love of it. They are few. The third result of underpayment is that professorial chairs will be filled with men of mediocre talent and capacity; students will suffer, and generations, as they succeed one another, will deteriorate. Scholarships, he continued, are mostly a waste of money. The bestowal of scholarships is not always a failure; but if granted as loans on the evidence of the power of application and good conduct, the money can, in most cases, be bestowed more profitably. What the public wants to buy, or should want to buy, is the educated brains of one who will in future prove useful to the State. The present method is one by which the article is uncertain and the price paid incommensurably high, owing to the high percentage of failures in attaining the standard of mind which the public has a right to demand. If the money distributed in scholarships were applied to the development of universities, England's universities would be rich.—The question of adequate remuneration for professors is to some extent a question of ways and means; until more money is forthcoming in this country for the purposes of university and higher education generally, there seems little possibility that the emoluments of men engaged in teaching and research will be increased. British universities seem unable to arouse the generosity of our men of wealth to the same extent as has been done in the United States, for instance. We notice in *Science* for February 11 that in one week donations were announced of 50,000*l.* to the Sheffield Scientific School of Yale University, 200,000*l.* for the establishment of a teachers' college, and 90,000*l.* for the general purposes of higher education. A few gifts on this scale would soon make it possible to remedy the defect to which Sir William Ramsay directs attention.

NEW science laboratories at St. Leonard's School, St. Andrews, N.B., were opened by Sir Ernest Shackleton on February 1. The building comprises two large laboratories each 34 feet by 30 feet, a lecture theatre to seat sixty pupils, a room for the preparation of experiments by the science mistresses, a dark-room for work in optics, a conservatory for botanical experiments, a cloak-room, and a spacious corridor, to be fitted with dust-proof museum cases. The chemical laboratory, which is also to be used for practical work in geography, is fitted with six benches, at each of which four girls work. The tops of the benches have been kept as clear as possible, carrying only Bunsen burners and two movable trays, each of which can hold ten reagent bottles. These trays, with the bottles they contain, fit into cavities in the sides of the benches, so that the tops can be cleared in a moment when required for practical geographical work. The reagent bottles are double-labelled, so that they can be used by two pupils working opposite each other. Attached to the front of the demonstrator's bench is a shelf, which hangs vertically when not in use. This has been designed for the purpose of holding the apparatus required for the lesson, and two girls from each bench come to this dispensing shelf and take from it all they require for their experimental work. The laboratories are both supplied with many light trays of varying sizes, each capable of holding a dozen beakers, flasks, burettes or pipettes, &c. These trays fit into the bench cupboards. Neither cupboards nor drawers have been set apart, as is usual, for the individual use of the pupils except in the case of the more advanced students, as experience has shown that they are apt to become receptacles for burnt matches, corks, soiled filter papers, &c. Placed in each stool recess is a shelf which holds a trough, test-tube rack, tripod, and retort-stand. The same principle has been observed in the fittings of the physical and botanical laboratory. The fume cupboards, of which there are four—two in the chemical laboratory, one in the physical laboratory, and one between the lecture theatre and the preparation room—are all supplied with both gas and water. The building is fitted throughout with electric light. In the lecture theatre there is an electric lantern, and a part of the cream-coloured wall acts as the screen, and allows a picture 10 feet square. This room is fitted with dark blinds, and ventilated, when these are in use, by means of an electric fan. In the conservatory are benches at which the pupils work when fitting up apparatus for botanical experiments. The usual precautions have been taken against accident by fire, and Minimax fire extinguishers stand in prominent positions.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 13.—D. P. **Phillips**: Re-combination of ions at different temperatures. The ionisation was produced in a layer of air of uniform thickness by means of a single discharge through a Röntgen bulb. The layer of air ionised was situated midway between two parallel electrodes, and was separated from each by a layer of un-ionised air. The quantity received by each electrode depends upon the field established between them, and from the variation of the quantity with the field the coefficient of re-combination can be calculated. By placing the pair of electrodes in a double-walled jacket the temperature was varied, and the coefficient of re-combination found at different temperatures. The values which were found are:—

Temp. Centigrade ...	16°	100°	155°	176°	273°
Coeff. of Re-combination	1·00	0·50	0·399	0·36	0·178

The value at the temperature of the room, *i.e.* at 16°, was taken as unity, and the other values were compared with this. The object of having the layer of ionised air separated from the electrodes by un-ionised air was to decrease the number of ions reaching the electrodes by diffusion, and so causing an apparent increase in the re-combination. With this arrangement the effect of diffusion would be to decrease the apparent re-combination. In order to test the magnitude of the error introduced by diffusion, the thickness of the ionised layer of air was altered, and the coefficient of re-combination determined for each thickness. At each temperature it was found that the coefficient of re-combination apparently falls off when the thickness of the layer is reduced below a certain value. Thus it was shown that in this experiment the diffusion was negligible up to 176° C., but that at 273° C. it probably caused a serious reduction in the apparent value of the re-combination.

Sir Edward **Thorpe** and A. G. **Francis**: The atomic weight of strontium. The principle of the methods employed consisted in determining the ratios of the weights of strontium bromide and chloride and of pure silver and of the silver halides respectively. The strontium salts, $SrBr_2$ and $SrCl_2$, purified by fractional crystallisation and precipitation, were fused in a stream of dry halogen acid and allowed to solidify in dry nitrogen. While the halides were still warm the nitrogen was replaced by dry air and the salts transferred to the weighing flasks. The fused salts were ice-like in appearance, and yielded perfectly clear neutral solutions in water. The silver needed to precipitate completely the halogen was dissolved in a specially devised burette, so contrived that the solution could be delivered without loss to the strontium solution. After eighteen hours the slight excess silver left in solution was titrated with a solution of strontium halide of known strength. Finally, the silver halide was dried, fused, and weighed. The apparatus was so devised that these operations could be done without removing the silver salts from the vessel in which it was formed. As an independent check, the ratios of $SrBr_2$ and $SrCl_2$ to $SrSO_4$ were also determined by converting the strontium halides into strontium sulphate by direct treatment with sulphuric acid. The possible sources of error are discussed, and all known corrections were applied. In all, six series of observations were made. The mean results are as follows:—

Series A.	$2Ag : SrBr_2$ (6 exp's.) ...	... 87·645±0·0037
,, B.	$2AgBr : SrBr_2$ (5 expts.)...	... 87·653±0·0045
,, C.	$2Ag : SrCl_2$ (6 expts.) ...	... 87·642±0·0017
,, D.	$2AgCl : SrCl_2$ (5 expts.)...	... 87·645±0·0020
,, E.	$SrBr_2 : SrSO_4$ (3 expts.)...	... 87·629±0·021
,, F.	$SrCl_2 : SrSO_4$ (4 expts.)...	... 87·661±0·0078
Mean of	A, B, C, D	... 87·646±0·0016
,,	E, F	... 87·645±0·0107
,,	A, B, C, D, E, F	... 87·646±0·0029

The authors adopt 87·65 as the definite value for the atomic weight of strontium—a number only 0·03 in excess of Richards's final value as given in the last report of the International Committee on Atomic Weights.

February 17.—Sir Archibald Geikie, K.C.B., president, in the chair.—E. **Marsden**: Phosphorescence produced by α- and β-rays.—Prof. E. **Rutherford**: Theory of the luminosity produced in certain substances by α-rays.—Dr. H. **Geiger**: The scattering of the α-particles by matter. In a previous note on the same subject experiments have been described which gave direct evidence of the scattering of the α-particles in passing through matter. These experiments have been continued with the object of determining quantitatively the amount of scattering under various conditions. In particular the influence of the thickness and nature of the scattering material and of the velocity of the α-particles has been studied in detail. With the exception of a few modifications, the experimental arrangement was the same as that employed in the preliminary experiments. A strong source of homogeneous α-radiation was placed at one end of a long tube, and the α-particles, after passing through a narrow circular opening, fell upon a zinc sulphide screen sealed to the other end of the tube. When the pressure inside the tube was very low the scintillations produced by the impact of the α-particles on the screen were confined to a very small area. When, however, the α-particles were intercepted by a thin sheet of metal, the scintillations were spread out over a much greater area, this being due to the scattering of the α-particles when passing through the metal sheet. The distribution of the scintillations over the screen was determined by counting them at different parts of the screen. From the distribution curve the most probable angle through which the α-particles were turned in passing through the metal sheet under investigation could be found. In all experiments the scattering was measured by this angle, and the following results were obtained:—(1) The most probable angle of scattering increases for small thicknesses approximately proportional to the square root of the thickness of matter traversed by the α-particle. For greater thicknesses the scattering angle increases more rapidly. (2) The most probable angle of scattering is proportional to the atomic