

in various definite proportions of two derivatives of cotarnine which possess the same spectra as the two parent forms.

The study of the absorption spectra of the alkaloids has been applied with success, not only to the investigation of their structure but to their detection and estimation. These substances generally have very characteristic spectra by means of which they can be distinguished with certainty from one another, except when they are homologous or otherwise very closely related structurally. The spectroscopic method may, therefore, be used with great advantage in examinations for the presence of alkaloids to confirm the results obtained by the usual chemical tests. The chemical tests are no doubt as a rule sufficiently distinctive, but considering the gravity of the circumstances in which they have frequently to be applied, it is unnecessary to insist on the value of the confirmatory evidence which can be obtained by the use of the spectroscope.

The minutest quantities of alkaloids can be detected by this means, the method rivalling the colour reactions for the alkaloids in delicacy. Thus, with a quantity of strychnine not exceeding 1/500 of a grain, a clearly defined spectrum of the alkaloid can be obtained. The photograph of morphine already shown was obtained with 1/200 of a grain of the alkaloid, and that of nicotine with 1/100 (Fig. 4).

The use of the spectroscope in the detection and estimation of alkaloids in cases of poisoning possesses certain advantages of the highest importance. One is that the material is not destroyed. The solution which has been employed for the spectroscopic examination can be used afterwards for the chemical examination. Another is that a permanent record is obtained which is always available for reference.

So far my illustrations have been confined almost entirely to colourless substances, because it is in connection with the investigation of such substances that most of the recent advances in the subject have been made.

As my last example, I shall take the case of a coloured substance in which the method has been applied within the last year with marked success.

It will be remembered that considerable uneasiness was caused when it became known some time ago that nitrogen peroxide is sometimes employed to bleach flour. In the course of an inquiry into the subject, it became necessary to determine the nature of the colouring matter naturally present in flour. It was known that many of the yellow and orange pigments so widely distributed throughout the vegetable kingdom are either closely connected or identical with carotene, the orange colouring matter of carrots, and it had been suggested that the colouring matter of unbleached flour might be identical with, or belong to the same class of colouring matters as, this substance. It was impossible, however, to prove this by the usual chemical methods, because the amount of colouring matter in flour is so minute that its isolation in a pure state, and in sufficient quantity for chemical analysis, was scarcely practicable. Carotene, however, can be prepared in a pure state, and the happy idea occurred to Dr. Monier Williams, of the Local Government Board, who was conducting the investigation, to photograph its absorption spectrum and compare it with that of the colouring matter of flour, which could easily be obtained in the minute quantity required for this purpose. Inspection of the photographs shows that the spectra are very similar. There cannot, therefore, be any doubt that the colouring matter of flour, if not identical with, is closely allied to, carotene.

The underlying causes of the relations between

chemical structure and absorption spectra have been the subject of much speculation, but it must be confessed that no satisfactory explanation of the phenomena of absorption has yet been formulated, and that the theoretical development of the subject lags behind its practical application.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

ON the occasion of the installation of the Duke of Northumberland as Chancellor of Durham University on May 3, honorary degrees of the University were conferred on the following men of science:—*D.C.L.*, Lord Rayleigh; *D.Sc.*, Sir Archibald Geikie, *K.C.B.*, *P.R.S.*, Sir William Ramsay, *K.C.B.*, Sir T. C. Allbutt, *K.C.B.*, Sir J. A. Ewing, *K.C.B.*, Sir William Crookes, *O.M.*; Sir J. J. Thomson, *O.M.*, and Prof. E. B. Poulton.

IN the House of Commons on Monday, May 5, Mr. Asquith, replying to several questions referring to the recent decision of the Convocation of the University of Oxford as to Divinity degrees, said:—"I have for a long time had under consideration the various proposals for the appointment of a Royal Commission or Commissions to inquire into the constitution of, and other matters connected with, the Universities of Oxford and Cambridge. I have reluctantly come to the conclusion that in existing circumstances the setting up of such an inquiry might lead to delay in the prosecution of necessary reforms and is not likely to be productive of fruitful consequences."

THE first session of the new University of Western Australia was inaugurated on Monday, March 31, with an address on the place of mathematics and physics in a university education, by Prof. A. D. Ross. About 150 students have enrolled in the faculties of arts, science, engineering, and agriculture. At present the teaching is being carried on under considerable difficulties, as the portion of the temporary buildings which has already been erected does not afford accommodation for laboratory instruction. The work of extending the premises is, however, being pushed on rapidly, and the various science departments should be in a position to carry on their practical work in the third term.

THE April number of *The Eugenics Review* is mainly occupied with the report of the Eugenics Education Conference, which took place on March 1, and was reported in *NATURE* of March 6. As a practical outcome of the conference a deputation, having for its object the introduction of teaching of eugenics in training colleges, waited on Mr. Trevelyan, *M.P.*, at the offices of the Board of Education on April 2. The deputation, which included, among others, the president of the Eugenics Education Society, the Dean of St. Paul's, the headmaster of Eton, the principal of Bedford College, and Mr. Nicholls, ex-president of the National Union of Teachers, was sympathetically received by Mr. Trevelyan, who said that the Board of Education recognised the importance of the matter referred to, and would consider carefully the recommendations made by the deputation. From the "Notes" column of the review we learn of the formation on January 29 of the *Société Française d'Eugénique*. The president of this society is M. Edmond Perrier, the general secretary M. le Dr. Apert, and the treasurer and librarian M. Lucien March. In Italy a eugenics society is in course of formation, and in Denmark, at the instigation of Dr. Soren Hansen, a eugenics section of the Anthropological Committee has been organised. The research committee of the Eugenics Education Society

issues an appeal for help (not financial) in a cooperative research recently set on foot, particulars of which may be obtained on application to the chairman of the research committee, Eugenics Education Society, Kingsway House, Kingsway, London, W.C.

At the annual meeting of the National Education Association, held on May 2, Lord Sheffield made some interesting comparisons between the educational systems of Scotland and England. Supplementary courses are recognised for all schools in Scotland, where, at the end of August, 1911, there were 2056 such courses in 3173 primary schools, and they had 49,497 pupils above twelve years of age in average attendance, out of a total of 783,792 pupils in average attendance. The grants to pupils in these courses amount to more than 4*l.* a head, while in England the grant is 2*l.* a head to pupils in elementary schools. In Scotland 6.3 per cent. of the pupils are under advanced instruction in ordinary schools, or about 30 per cent. of the pupils above twelve years of age in ordinary elementary schools. In England there are no such pupils and no such classes, but there were, in 1911-12, 1,032,000 pupils above twelve years. There are 194 higher grade schools in Scotland, with more than 24,000 pupils in average attendance, or 3.2 per cent. of all the pupils in elementary schools. In 1910-11 there were only forty-seven such schools in England and Wales, with 8852 pupils, or less than one-twentieth of the Scotch proportion. The grants for these schools in Scotland are 2*l.* 10*s.* a head for the first year, 3*l.* 10*s.* for the second year, 4*l.* 10*s.* for the third and further years, all capable of an increase of 10 per cent. for good work. The grants of the English code for higher elementary schools are: first year, 30*s.*, second, 45*s.*, third, 60*s.*, or an average just above 2*l.* a head, and, with the fee grant and aid grant, a total of 3*l.* a head. The assimilation of the English higher elementary schools to the Scotch higher grade schools in all matters could be done by departmental action alone. The Scotch report for 1912-13 shows that more than 95 per cent. of the teachers are certificated, and 68 per cent. trained, and there is one certificated teacher to thirty-nine pupils. In England and Wales there is one certificated teacher to about fifty-two pupils, and in 1911-12 less than 65 per cent. were certificated. The average salaries of teachers certificated are, in Scotland in 1910-11, men, 138*l.*, women, 83*l.*; in England, men, 127*l.*, women, 92*l.* In Scotland the salaries work out at about 3*l.* per pupil, and in England and Wales at about 2*l.* 17*s.* 4*d.* per pupil. The total cost of board schools in Scotland for school maintenance and interest and repayment of loans is about 4*l.* 16*s.* In England it is between 4*l.* 8*s.* and 4*l.* 10*s.*

#### SOCIETIES AND ACADEMIES.

##### LONDON.

**Royal Society**, May 1.—Sir Archibald Geikie, K.C.B., president in the chair.—Prof. E. H. Griffiths and Ezer Griffiths: The capacity for heat of metals at different temperatures. The thermal capacity, at various temperatures between 0° and 100°, of the following metals has been determined:—Cu, Al, Fe, Zn, Ag, Cd, Sn, and Pb. The work at lower temperatures will be published later. The variation in the thermal capacity can be represented (over the range 0° to 100°) by the following parabolic equations, the difference between the calculated and experimental values in no case exceeding 0.2 per cent. In the large majority of cases the difference is less than 0.1 per cent.

Cu	$s = 0.09088 (1 + 0.0005341t - 0.00000048t^2)$ ,
Al	$s = 0.20957 (1 + 0.0009161t - 0.0000017t^2)$ ,
Fe (ingot)	$s = 0.10452 (1 + 0.001520t - 0.00000617t^2)$ ,
Zn	$s = 0.09176 (1 + 0.0005605t - 0.00000178t^2)$ ,
Ag	$s = 0.05560 (1 + 0.0003396t - 0.000000141t^2)$ ,
Cd	$s = 0.05475 (1 + 0.000520t - 0.000000725t^2)$ ,
Sn	$s = 0.05363 (1 + 0.0006704t - 0.000000458t^2)$ ,
Pb	$s = 0.030196 (1 + 0.000400t - 0.00000036t^2)$ ,

Many forms of equations were tried, but it was found that the experimental results were more closely represented by the parabolic than by any other form.—**A. Robertson** and **G. Cook**: The transition from the elastic to the plastic state in mild steel. The paper deals with the reduction of stress at the yield point in mild steel. Apparatus for limiting the extension during yield to a value comparable with the elastic extension, and for securing axial loading, are described. Under these conditions twelve specimens were tested, and a reduction of stress of 24 to 36 per cent. observed in eleven, and of 17 per cent. in the other one.—**F. P. Worley**: Studies of the processes operative in solutions. XXVIII., The influence of acids on the rotatory power of cane-sugar, of glucose, and of fructose. Experiments on the hydrolysis of cane-sugar by solutions of benzene-sulphonic acid have confirmed the conclusion previously arrived at from those in which sulphuric acid was used, that the ratio of the negative optical rotation at the completion of hydrolysis to the initial positive rotation increases rapidly as the concentration of the acid is increased. The increase is proportional to the concentration of the acid, and in the case of benzenesulphonic acid amounts to about 20 per cent. when the concentration is increased from zero to twice normal. It has been found that the increase is due entirely to the influence of the acid on the rotatory power of the three sugars, cane-sugar and glucose being made somewhat less dextro-rotatory and lævulose considerably more lævo-rotatory by the presence of the acid.—**H. G. J. Mosley**: The attainment of high potentials by the use of radium. A radio-active substance which emits  $\beta$ -radiation should, when insulated, continue to gain a positive charge until a potential of the order of a million volts is reached. Experiments have been made to test this point. A small bulb containing radium emanation was supported by a quartz rod at the centre of a highly exhausted flask. A disc suspended from a quartz spring in the neck of the flask formed a simple attracted disc electrometer. It was found that a bulb of 9 mm. diameter reached a potential of 160,000 volts in the course of a few minutes. A sudden discharge then occurred through the residual gas in the flask. A bulb of 5 cm. diameter charged up much more slowly: no discharge took place, and the final potential, 110,000 volts, was limited by a leak of electricity along the quartz support.—**E. Marsden** and **Dr. T. S. Taylor**: The decrease in velocity of  $\alpha$  particles in passing through matter. The relative velocities of the  $\alpha$  particles of radium C before and after passing through foils of various thicknesses have been investigated by means of the deflection caused by a magnetic field. Tables are given showing the results for gold, copper, aluminium, mica, and air.

**Linnean Society**, April 17. Prof. E. B. Poulton, F.R.S., president, in the chair.—**M. P. Price** and **N. D. Simpson**: Plants collected on the Carruthers-Miller-Price expedition through north-west Mongolia and Chinese Dzungaria.—**E. G. Baker**: Some British varieties of the bee-orchis, *Ophrys apifera*, Huds. In the typical form of the bee-orchis the labellum is broad convex, with a terminal, reflexed appendage, brown-purple, disc spotted with orange-yellow. In 1840 Hegetschweiler, in "Die Flora der Schweiz,"