

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—An examination will be held at Merton College on Tuesday, July 2, 1895, and following days, beginning at 10 a.m., for the purpose of electing to three open Natural Science Scholarships, of which one will be at Merton College, one at New College, and one at Corpus Christi College.

The scholarships are of the value of £80 per annum, and are open to all candidates whose age on July 8, 1895, will not exceed nineteen years. The subjects of examination will be (1) Chemistry, Mechanics and Physics, or (2) Biology. An English essay, and a paper in Algebra and Elementary Geometry, will also be set to all candidates. Candidates will have an opportunity of showing a knowledge of higher mathematics. Candidates who offer Biology are requested to send to the Tutor in Natural Science, Merton College, at least one fortnight before the examination, a general statement as to the portions of the subject which they have studied, and the practical work which they have done. All such candidates will be required to show some acquaintance with Chemistry, Mechanics and Physics.

CAMBRIDGE.—The following is the speech delivered on February 28th by the Public Orator, Dr. Sandys, Fellow and Tutor of St. John's, in presenting for the honorary degree of Doctor in Science Sir William MacGregor, M.D. (Aberdeen), K.C.M.G., Administrator of British New Guinea:—

Orbis terrarum inter insulas, praeter Australiam latissime patet insula Australiae parti septentrionali ex adverso posita. Tota quidem insula insulis Britannicis duplo maior: insulae autem pars a Britannis occupata Angliâ ipsâ maiori dimidio. Nostrae vero coloniae ibi administrandae praepositus est vir insignis, olim in Academiâ Aberdonensi medicinae doctor, nuper scientiarum complurium non modo fautor et adiutor, sed etiam ipse auctor atque investigator indefessus. Praesidis nostri auxilio, Anthropologiae, Geographiae, Geologiae, aliis denique scientiis nova lux affulsit, adeo ut coloniam illam remotissimam non tam imperii nostri propugnaculum quam scientiarum arcem et castellum longinquum appellaverim. De Caledoniae filiis, quibus ubique terrarum plurimum debet Britannia, nonnumquam dicitur, cum peregre absint, tum demum sese sentire esse domi. Huic Caledoniae filio paullisper reduci gratias hodie idcirco agimus, quod, a patriâ vocatus, non modo imperii nostri in utilitatem, sed etiam scientiae ad fructum, patriam relinquere est dignatus. Gens autem illa antiqua, ex qua ortus esse confitetur, olim sedibus paternis expulsa et ipso nomine prorsus privata, hodie, talium virorum auxilio, non sine nomine, non sine gloriâ est. Etenim gens illa Alpina, gentem fortissimam a poetâ Romano quondam laudatam aemulata,

duris ut ilex tonsa bipennibus,  
nigrae feraci frondis in Algidis,  
per damna, per caedes, ab ipso  
ducit opes animumque ferro.

Duco ad vos equitem insignem, WILLELMUM MACGREGOR.

The Report of the Syndicate for the encouragement of advanced study and research has just been issued. It proposes that approved graduates of other universities, of not less than twenty-one years of age, should be admitted as Advanced Students, with certain special privileges. Such students are to pursue, under the supervision of committees of the special Boards of Studies, (a) courses of advanced study, or (b) courses of research. The former class may be admitted, after three terms, to a part of a Tripos examination, and if they attain therein a sufficiently high standard, their names will appear in a special list distinct from the Tripos list. After residing two years, they may be admitted to the B.A. degree, and thereafter proceed in the usual course to the M.A. and other higher degrees. Research students are, after three or more terms' residence, to present a dissertation adjudged by a Degree Committee to be "of distinction as an original contribution to learning, or as a record of original research." For this a special "Certificate of Research" is to be granted by the University. Holders of the certificate who have resided at least two years, are to be entitled to the B.A. degree, and to proceed to higher degrees in the ordinary course. Cambridge graduates may, on like terms, obtain the "Certificate of Research." The original proposal to establish new degrees (B.Litt. and B.Sc.) for the class of advanced students, has been dropped; but the possibility of proceeding to the higher degrees of the University is a new feature of importance. The Report is signed by all the twelve members of the Syndicate, including the Vice-Chancellor and

eight professors, representing both the literary and the scientific departments of University study. It will come before the Senate for public discussion during the present term. The main lines of the scheme resemble those of the plan provisionally adopted at Oxford, with the important difference that Oxford has taken up the idea, discarded at Cambridge, of founding special literary and scientific degrees for post-graduate students, and does not propose that they shall be eligible for the degree of Master of Arts.

A University Lectureship in Pure Mathematics will be vacant at the end of the present term, by the resignation of Dr. Forsyth, elected Sadlerian Professor. The lecturer will hold office for five years from Midsummer, 1895. Applications are to be sent to the Vice-Chancellor before Wednesday, April 24, 1895.

An examination for diplomas in Agricultural Science will be held in Cambridge in the week beginning July 1, 1895. The names of candidates are to be sent to the Registry by June 12.

ONE or two of the new provisions in the Revised Code for Elementary Day Schools, presented to the House of Commons last week, are worth noting here. Kindergarten methods of instruction have been recognised in infants' schools for some time, but they have usually ended in the infant school. "Object-lessons and suitable occupations" are now, however, to be counted as class subjects in the lower standards of elementary schools, so that the lessons which are so valuable in training the intelligence of the infant children will be extended. Properly carried out, these natural methods of instruction are of extreme importance in developing such powers of observation and reasoning as young children possess. Another commendable addition which Mr. Acland has introduced into the Code permits visits to be made, during school hours, to museums and art galleries; not more than twenty hours in the school year to be thus employed. Visits to the museums at South Kensington cannot but have a beneficial influence upon the minds of children, and if the guide is competent, they may be made of great value. Perhaps the new feature will lead to the establishment of science museums in towns where none at present exist. It may also assist in the reduction of the bric-a-brac element (which makes many small museums little more than variety shows), and improve the arrangement and character of the collections.

## SCIENTIFIC SERIALS.

*American Meteorological Journal*, February.—The cause of the cyclones of the temperate latitudes, by W. H. Dines. Two theories have found considerable support: (1) the convectional theory, commonly known as Ferrel's, because he so fully explained it, and showed that cyclones were caused by the convectional ascent of a current of warm air in the central parts, the heat necessary to sustain the current being supplied, at least in part, by the latent heat set free by the condensation of aqueous vapour; (2) the theory proposed by Dr. Hann, who considers that the storms are merely eddies formed in the general easterly drift of the atmosphere in temperate latitudes, just as small whirls are formed in a river. Dr. Hann found that the temperature at high mountain stations in the Alps is higher during anticyclonic conditions than during the passage of storms. Mr. Dines thinks that the evidence is in favour of Ferrel's theory, as mathematical laws show that it is a possible one, and that the latent heat set free by the condensation of moisture will, if it take the form of kinetic energy, be sufficient to produce a most violent storm.—Recent foreign studies of thunderstorms: Russia, by R. De C. Ward. The Imperial Geographical Society of Russia instituted a special study of thunderstorms in 1871, which has been continued until the present time. This service, and others subsequently established, such as that in south-west Russia by Prof. Klossovsky, have led to some valuable results. The district of greatest thunderstorm activity is the Caucasus, then the southern central region. The predominant direction of movement is north-east, and the storms occur most frequently in June and July, the maximum frequency being in the afternoon.—The *Journal* also contains other articles of minor importance, including one on the moon and rainfall, by Prof. H. A. Hazen. The figures for Boston show a remarkable maximum at the day of new moon, and an equally remarkable minimum two days after full moon.

*Journal of the Russian Chemical and Physical Society*, vol. xxvi. parts 2 to 8.—Among many valuable papers inserted in these issues, the following are especially worthy of notice:—On the speed of formation of the amines, by N. Menschutkin.—On the nitration of saturated hydrocarbons by means of nitric acid, by M. Konvaloff.—On the solubility of anhydrous calcium sulphate, by A. Potilitsine.—On the isomerisation of aromatic hydrocarbons obtained by Fridel's method, by M. Konvaloff.—On the structure of terpenes and similar compounds, by G. Wagner.—On the nitration of unsaturated hydrocarbons, by means of nitric acid, by M. Konvaloff.—On the halogen compounds of nitrogen, by Th. Selivanoff.—On the physical part: On the electric resistance of bismuth to alternating currents, by A. Sadovsky.—On the variation of electrostatic energy, by M. Schiller.—On the variation in length of iron wire during magnetisation, by M. Rosing.—Experiments with alternating currents of high frequency, by N. Slouginoff.

Part 2 of the *Journal* contains also, as a supplement, the first number of the *Memoirs (Vremennik)* of the Central Board of Measures and Weights, which was instituted in 1893, and is placed under Prof. Mendeléeff, who is also the editor of this publication. In this first part we find besides a preface by the editor, several papers of more than local interest, namely:—The measurements made to compare the iron *sajène* of the "Committee of the year 1833" with various units of length, accomplished in 1884, by MM. Glukhoff and Zawadski. The comparison was also made with the bronze and iron yards of Airy.—On the weight of a litre of air, a very elaborate paper by Prof. Mendeléeff, in which some remarks concerning the measurements of Leduc and Lord Rayleigh, and the corrections which should be introduced into their measurements, are especially valuable. The average value arrived at by Prof. Mendeléeff is, in grams,

$$e_0 = 0.131844 g \pm 0.00010.$$

—First list of the standard measures of weight and length at the Central Board, by Th. Zawadski.—Data for the elaboration of an instruction for verifying the weights and measures in the trade establishments.—Preliminary researches into new scales for grain, as a means of determining the quality of the latter, by Th. Selivanoff.

## SOCIETIES AND ACADEMIES.

### LONDON

Royal Society, February 7.—"On the Application of the Kinetic Theory to Dense Gases." By S. H. Burbury, F.R.S.

February 14.—"An Instrument for Cutting, Grinding, and Polishing Section-plates and Prisms of Mineral or other Crystals accurately in the desired direction." By A. E. Tutton, Demonstrator of Chemistry at the Royal College of Science, South Kensington.

In a recent communication (*Phil. Trans.* 1894, Series A, p. 887) the author described an instrument for grinding accurately orientated section-plates and prisms of crystals of artificial preparations. The success of that instrument is so complete that another instrument has been devised and constructed, which enables equally accurately orientated plates or prisms to be prepared from the relatively harder crystals of natural minerals. The instrument is not intended to replace the one previously described, which is fully adapted for all the purposes of chemical crystallographers, and the cost of which is only two-thirds that of the one now described. It is intended especially for the use of mineralogists, but, naturally, will serve all the purposes of the smaller instrument. It is constructed upon a scale one-fifth larger than the former one as regards such parts as are fundamentally similar, to confer greater strength. The mode of supporting the outer fixed cone within which the movable axes rotate, the construction of the circle and its axis and fine adjustment, and of the gun-metal axis and its counterpoising levers designed for controlling the pressure between crystal and lap, as also of the inner steel axis from which are suspended the crystal and its centering and adjusting movements, are similar in principle to the corresponding arrangements in the smaller instrument, although many details are altered for the sake of greater rigidity. The same likewise applies to the goniometrical telescope and collimator and their

mode of support. The main innovations are those of a cutting apparatus, and a larger grinding table capable of being readily furnished with any one of nine interchangeable grinding and polishing laps, suitable for use with crystals of every degree of hardness. Four metallic laps are provided, of iron, gun-metal, hard white metal, and pewter respectively, the first for rough grinding with coarse emery and brick oil or water, the second and third for fine grinding with flour emery, and the fourth for polishing with rottenstone and water. A polishing lap of hard felt, for use with putty powder and water, and a lap of box-wood, are supplied. Three glass laps, one coarsely ground, another finely ground, and the third of ordinary polished plate glass, are likewise provided for use with artificial crystals. The cutting apparatus is carried upon a horizontal arm pivoted about the back pillar of the instrument, in order to permit of its removal out of the way during grinding and polishing operations, and further supported when in use upon an adjunct of the right front pillar. It consists of a 4-inch disc of soft iron, supplied with diamond edge, and intended to be lubricated with brick oil, driven by an independent driving gear carried upon the arm. The supporting attachment to the front pillar is removable when not required, and includes a traversing apparatus for directing and controlling the cutting, and a safety back-spring to prevent the possibility of undue pressure being induced between the cutting disc and the crystal by injudiciously rapid rotation of the traversing screw. Instead of actuating the driving gear of the cutting or grinding apparatus by hand, a small electric, gas, or water motor may be employed.

"On the Ratio of the Specific Heats of some Compound Gases." By Dr. J. W. Capstick, Fellow of Trinity College, Cambridge.

The experiments described are a continuation of those of which an account is given in the *Phil. Trans.* vol. clxxxv. p. 1, Kundt's dust-figure method being used, and the ratio of the specific heats corrected for deviation of the gas from Boyle's law. The results are as follows:—

Name.	Formula.	$\gamma$
Methylene chloride.....	CH <sub>2</sub> Cl <sub>2</sub>	1.219
Chloroform .....	CHCl <sub>3</sub>	1.154
Carbon tetrachloride ...	CCl <sub>4</sub>	1.130
Ethylene chloride .....	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	1.137
Ethylidene chloride.....	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	1.134
Ethylene .....	C <sub>2</sub> H <sub>4</sub>	1.264
Vinyl bromide.....	C <sub>2</sub> H <sub>3</sub> Br	1.198
Allyl chloride .....	C <sub>3</sub> H <sub>5</sub> Cl	1.137
Allyl bromide .....	C <sub>3</sub> H <sub>5</sub> Br	1.145
Ethyl formate .....	HCOOC <sub>2</sub> H <sub>5</sub>	1.124
Methyl acetate.....	CH <sub>3</sub> COOCH <sub>3</sub>	1.137
Sulphuretted hydrogen	SH <sub>2</sub>	1.340
Carbon dioxide .....	CO <sub>2</sub>	1.308
Carbon disulphide .....	CS <sub>2</sub>	1.239
Silicon tetrachloride ...	CCl <sub>4</sub>	1.129

From these, and the results given in the former paper, it follows that

- (1) Replacement of one halogen by another in a compound has no effect on  $\gamma$ .
- (2) One H in a paraffin molecule may in some cases (e.g. ethane and propane) be replaced by Cl without altering  $\gamma$ , but a second replacement always causes a fall.
- (3) Carbon and silicon can be interchanged without effect on  $\gamma$ .
- (4) Isomeric compounds have the same  $\gamma$ .
- (5) Using  $\gamma$  to calculate  $\beta$ , the ratio of the rates of increase of intramolecular and translational energy of the molecule on a rise of temperature, we find  $\frac{\beta+1}{\gamma}$  is constant for the

paraffins and their monohalogen derivatives, whence it follows that for these the ratio of the increase of mean total energy to the increase of kinetic energy of translation of the molecule is proportional to the number of atoms in the molecule.

"On some Considerations showing that Maxwell's Theorem of the Equal Partition of Energy among the Degrees of