HER Majesty's Commissioners for the exhibition of 1851 have made the following appointments to science research scholarships for the year 1893, on the recommendation of the authorities of the respective Universities and colleges. The scholarships are of the value of £150 a year, and are tenable for two years (subject to a satisfactory report at the end of the first year), in any University at home or abroad, or in some other institution to be approved of by the Commissioners. The scholars are to devote themselves exclusively to study and research in some branch of science, the extension of which is important to the industries of the country. The list of scholars and of the nominating institutions is as follows:—Herbert William Bolam, University of Edinburgh; George Edwin Allan, University of Glasgow; James Wallace Walker; University of St. Andrews; Arthur Lapworth, Mason College, Birmingham; John Ellis Myers, Yorkshire College, Leeds; Arthur Walsh Titherley, University College, Liverpool; Edward Chester Cyril Baley, University College, London; John Cannell Cain, Owens College, Manchester; Ella Mary Bryant, Durham College of Science, Newcastle-on-Tyne; James Darnell Granger, University College, Nottingham; Mary O'Brien, University College of Wales, Aberystwyth; Frederick George Donnan, Queen's College, Belfast; James Alexander M'Phail, M'Gill University, Montreal; Norman Ross Carmichael, Queen's University, Kingston, Canada; William Henry Ledger, University of Sydney.

MISS MARIA M. OGILVIE, daughter of Dr. Ogilvie, of Gordon's College, Aberdeen, has passed the final examination for the degree of Doctor of Sciences of London University. The subject of her thesis was the "Geology of the Wingen and St. Cassian Strata in Southern Tyrol," published in the *Quarterly Journal* of the Geological Society for February.

THE electors to the Savilian Professorship of Astronomy will proceed to the appointment of a successor to the late Prof. Pritchard, in the couse of the ensuing Michaelmas Term. The duties of the Professor are defined by the following provisions of the statutes:—The Savilian Professor of Astronomy shall lecture and give instruction on theoretical and practical Astronomy. "Ne alia quapiam professione eodem tempore fungatur professor; nec munus observatoris Radcliviani, nec officium prælectoris alicujus in quovis collegio publice legentis cum munere suo conjungat." The Professor shall reside within the University during six months, at least, in each academical year, between the first day of September and the ensuing first day of July. He shall lecture in two at least of the three University terms. His lectures shall extend over a period not less in any term than six weeks, and not less in the whole than fourteen weeks, and he shall lecturetwice at least in each week. The University Observatory shall be open for eight weeks in each term, and at such other times and for such hours as the University may by statute determine. The Savilian Professor of Astronomy shall have the charge of the University Observatory, and shall undertake the personal and regular supervision of the same, and of the several demonstrators and other assistants employed therein, and shall be responsible for all the work carried on there. The emoluments of the Professorship as determined by statute are as follows:—He shall be entitled to the emoluments now assigned to the Professorship and derived from the benefaction of Sir Henry Savile, Knight, or from the University Chest; and shall receive in addition the emoluments appropriated to the Professorship by the statutes of New College. The total amount of all these emoluments is at present £850 a year. Applications, together with such papers as the candidate may desire to submit to the electors, must be sent to the Registrar of the University, Clarendon Building, Oxford, on or before October 31, 1893.

ARRANGEMENTS have been completed for the seventh session of the Edinburgh Summer Meeting, which begins on July 31, and lasts throughout August. Among the better known lecturers are:—M. Edmond Demolins, M. Paul Desjardins, Prof. Patrick Geddes (who will treat of contemporary social evolution), Prof. Lloyd Morgan (giving a course of comparative psychology—perhaps the first of its kind in Britain), and Mr. Arthur Thomson, discussing bionomics and evolution. A course on the history and principles of the sciences will be conducted by Prof. Cargill Knott, Dr. Charles Douglas, and others. A characteristic feature will be the series of studies entitled "A Regional Survey of Edinburgh and Neighbourhood." Among other subjects are Physiology, Modern History, Education and Elocution, and there will be practical classes in Botany, Zoology, and Geology. Work will be continued in the seminars and the studios, and a new departure is the course of Sloyd. While the student is obviously invited to serious work, a pleasant relief is promised in the shape of excursions.

THE New York *Nation* says that on June 14, at the University of Virginia, for the first time in its history, a certificate of attainment qualifying for graduation (in the School of Pure Mathematics) was given to a woman, Miss Caroline Preston Davis. Miss Davis, while excluded from the lectures, had taken successfully the same examinations on the same day with the male students, but "in a separate room"; and, at the request of the Chairman of the Faculty, the graduating class in a body handed the certificate to her.

SOME years ago (writes the Allahbad *Pioneer Mail*), the Senate, or the Syndicate, of the University of Madras promulgated a rule that any examiner who failed to send in his marks by a certain fixed date would be fined 20 rupees for each day's delay. The Syndicate, however, refrained from acting on this remarkable rule until this year, when its sense of humour was too strong for it, and it determined to carry its little joke to its conclusion. A number of examiners were accordingly fined. One gentleman earned a fee of 210 rupees, but he was fined 200 rupees, and received a pay bill for 10 rupees. Entering into the spirit of the thing, he returned this amount to the Registrar as a present to the University, and possibly it will be invested, and the proceeds devoted to the purchase of an infinitesimal medal, as the custom is. But, seriously, it is most regrettable that the Syndicate should deliberately degrade its examiners in this way. Surely it is possible to find a sufficient number of gentlemen who can be trusted to do their work with such promptness as is compatible with fairness to the candidate, and more than this the Senate cannot desire. If an examiner is guilty of great delay, the remedy is simple—do not appoint him again. But to treat an examiner like a careless domestic is as insulting to him as it is undignified on the part of the University.

MR. F. W. GAMBLE, B.Sc. (Victoria), formerly Bishop Berkeley Research Fellow in Zoology, has been appointed to the post of Assistant Lecturer and Demonstrator in Zoology in the Owens College, Manchester

BISHOP BERKELEY Research Fellowships has been awarded by the council as follows:—H. B. Pollard, M.A. (Oxon.), in Zoology; Albert Griffiths, M.Sc. (Vict.), in Physics; J. A. Harker, D.Sc. (Tübingen), in Physics; Bevan Lean, B.A., B.Sc. (Lond.), in Chemistry; and a Fellowship has been renewed to Stanley Dunkerley, M.Sc. (Vict.), in Engineering.

SCIENTIFIC SERIALS

Bulletin of the New York Mathematical Society, Vol. ii. No. 9, June, 1893.—The mechanics of the earth's atmosphere is a collection of translations by Cleveland Abbe (published by the Smithsonian Institution, 1891, 324 pp. 8vo). An account of it is furnished by R. S. Woodward (pp. 199–203). The volume contains twenty papers, all but two of which were published originally in the German language. The opening paper is by Hagen (1874), then follows the classic memoir by Helmholtz (1858), with five others by the same author. Then comes the extension of one of the last cited papers by Kirchhoff (1869); we then have five memoirs by Oberbeck, a paper by Hertz (1884), three papers by Bezold (1888–1889), a paper by Lord Rayleigh (1890, on the vibration of the atmosphere), and papers by Margules (1890) and Ferrel (1890). It will be readily inferred from this outline that Mr. Abbe has performed a work of prime importance to mathematical meteorologists. Dr. T. S. Fiske (pp. 204-211) also gives an outline sketch of mathematical investigations in the theory of values and prices, by Dr. I. Fisher (reprinted from the Transactions of the Connecticut Academy, July, 1892). The number closes with a few brief notes and a list of recent publications.

Wiedemann's Annalen der Physik und Chemie, No. 6.—On the determination of electrical resistances by means of alternating currents, by F. Kohlrausch. This is a minute study of the errors involved in measuring liquid resistances with alternate currents and the telephone. For potassium chloride solution between clean platinum electrodes, the error by which the resistance of the liquid was found too great remained below 1 per cent. so long as the product of the resistance in ohms and the surface of the electrode in sq. cm. did not fall below 250. In cases of high resistance, say 100,000 ohms, where MM.

Bouty and Foussereau failed altogether to obtain consistent results, these may be secured by using certain precautions, such as placing the induction coil at a sufficient distance (1 m. at least) from the bridge, directing its axis perpendicular to that of the rheostat, and placing the telephone perpendicular to the lines of force of the induction coil. In the case of water and very dilute solutions the electrostatic capacity of the containing cell is a source of disturbance, which may, however, be obliterated by introducing a small condenser of adjustable capacity.—The temperature coefficient of the dielectric constant of pure water, by F. Heerwagen. This was investigated with a kind of differential electrometer, in which two needles were suspended by one wire in two electrometers arranged vertically one above the other. The needles, the vessel, and one pair each of the quadrants were joined to one point in a constant voltaic circuit, and the other pairs to two other points. The lower electrometer was alternately empty and filled with pure water. Under these circumstances the ratio of the sensibilities was inversely as the ratio of the squares of the differences of potential. The value obtained for K was $80{\cdot}878 - 0{\cdot}362\,(t - 17)$, where t is the temperature of the water in degrees centigrade.—Polarising effects of the refraction of light, by K. Exner. Glass gratings, necessary in order to obtain a sufficiently large angle of diffraction, have the disadvantage of producing polarisation effects due to change of medium in addition to those due to diffraction. This difficulty was overcome by attaching the cut surface to a semi-cylindrical lens by a drop of oil of the same refractive index. The polarisation effects show a fair agreement with Stokes's cosine law.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 8.—"The Process of Secretion in the Skin of the Common Eel," by E. Waymouth Reid, Professor of Physiology in University College, Dundee.

By special attention to the condition of the fish at the time of fixation of their skins for histological investigation, the author has succeeded in obtaining pictures of the various phases of secretory action. The *lowest* phase of activity was obtained by rendering hybernating fish suddenly motionless by a successful transfixion of the medulla, and then removing skin before recovery from "shock" admitted of reflex secretion. The *highest* phase of secretory action was produced by artificial stimulation of the intact animal by the vapour of chloroform, by faradisation, or by simply allowing a pithed summer eel to "slime" after recovery from the primary "shock." The following are the main conclusions:—

(1) The secreting elements of the epidermis of the common eel consist of goblet cells and club cells, both direct descendants of the cells of the palisade layer. The former supply a mucin, the latter threads and a material appearing as fine granules in the slime.

(2) The goblet cells contain mucin granules, and, after reaching the surface and discharging their load, are capable of undergoing regeneration by growth of the protoplasmic foot and re-formation of mucin.

(3) The threads of the slime resemble those of *Myxine glutinosa*, but are usually of finer texture. As in *Myxine*, they are developed from the club cells, but there are no special glandular involutions of the epidermis. The club cells of *Petromyzon fluviatilis* also supply slime threads.

(4) The granular material of the slime is the contents of vesicular spaces developed in the club cells in the immediate neighbourhood of their nuclei, and is set free enclosed in a lattice work developed by vacuolation of the surrounding material, and finally extruded, carrying with it the original nucleus of the club cell.

(5) The remainder of the club cell, after extrusion of its vesicle and nucleus, becomes a spirally coiled fibre, which finally breaks up into the fine fibrils of the slime.

(6) Severe stimulation, especially by the vapour of chloroform applied to the intact animal, causes so sudden a development of the coiled fibres from the club cells that the surface of the epidermis is thrown off and the secretory products set free *en masse*. This process is of reflex nature, for similar excitation applied to excised skin is without effect.

(7) A system of connective tissue cells, distinct from chromatophores, exists in the epidermis developed from cells which are direct descendants of leucocytes, and which can be traced from the blood vessels of the corium through the basement membrane into the epidermis. The number of these wandering cells in the epidermis is greatly increased by stimulation, probably with a view to providing subsequent support to the secretory elements during regeneration.

The paper was illustrated by photo-micrographic lantern slides.

June 15.—"On the Ratio of the Specific Heats of the Paraffins and their Monohalogen Derivatives." By J. W. Capstick, D.Sc. (Vict.), B.A. (Camb.), Scholar and Coutts-Trotter Student of Trinity College, Cambridge. Communicated by Prof. J. J. Thomson, F.R.S.

The object of the experiments was to throw light on an obscure point in the kinetic theory of gases, viz. the distribution of energy in the molecule.

From the ratio of the specific heats we can calculate the relative rates of increase of the internal energy and the energy of translation of the molecules per degree rise of temperature, by the well-known formula, $\beta + 1 = \frac{2}{3(\gamma - 1)}$, where γ is the ratio of the specific heats and β the ratio of the rate of increase of the internal to that of the translational energy.

In order to make the results comparable it was decided to keep the translational energy constant by working at a constant temperature—the temperature of the room.

The ratio of the specific heats was calculated from the velocity of sound in the gases. This was determined by Kundt's method, a double-ended form of apparatus similar to that described in *Pogg. Ann.* vol. cxxxv. being used.

The calculation requires the density of the gas to be known, a circumstance which makes the method very sensitive to small amounts of impurity. Regnault's value of the density was used for methane and the theoretical value for ethane, an analysis of the gas being made after each experiment to determine the correction for the air that was unavoidably present. All the other gases were freed from air by liquefaction immediately before being admitted into the apparatus, and the vapour density of the material in the state in which it was used was determined by a modified form of Hofmann's apparatus, which gave results concordant to one part in a thousand.

The formula used in calculating the ratio of the specific heats was

$$\gamma = 1{\cdot}408 \times \rho \times \left(\frac{l}{l'}\right)^2\left(1 + \frac{1}{p}\frac{d}{dv}(pv)\right),$$

the last factor being added to the ordinary formula to correct for the divergence of the gas from Boyle's Law.

The correction is obtained at once by putting in the equation

$$u^2 = -\gamma v^2\left(\frac{dp}{dv}\right)_t \text{ the value of } \left(\frac{dp}{dv}\right)_t \text{ given by the equation}$$

$$\left(\frac{dpv}{dv}\right)_t = p + v\left(\frac{dp}{dv}\right)_t.$$

From the vapour density determinations a curve is constructed giving pv in terms of v, and the slope of this curve at any point gives the value of $\frac{d}{dv}(pv)$ in arbitrary units. Dividing by the corresponding value of p in the same units, we obtain the amount of the correction.

The correction increases the ratio of the specific heats by from 1 to 2 per cent. in most cases.

Observations varying in number from three to nine were made on each gas, the extreme range of the values being 2 per cent. for marsh gas, 1½ per cent. for methyl iodide, and 1 per cent., or less, for the rest.

The mean values of the ratio of the specific heats are shown in the following table:—

Methane	CH_4	... 1·313
Methyl chloride	CH_3Cl	... 1·279
Methyl bromide	CH_3Br	... 1·274
Methyl iodide	CH_3I	... 1·286
Ethane	C_2H_6	... 1·182
Ethyl chloride	C_2H_5Cl	... 1·187
Ethyl bromide	C_2H_5Br	... 1·188
Propane	C_3H_8	... 1·130
Normal propyl chloride ...	nC_3H_7Cl	... 1·126
Isopropyl chloride	iC_3H_7Cl	... 1·127
Isopropyl bromide	iC_3H_7Br	... 1·131