UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The following courses of lectures are being delivered this term:—

Mathematics—Prof. Stokes, Optics; Prof. Darwin, Theory of Potential and Attractions; Trinity College, Mr. Glaisher, Theory of Errors, Mr. Ball, Higher Solid Geometry, Mr. J. J. Thomson, Dynamics of a Rigid Body, Mr. Rowe, Higher Integral Calculus and Abel's Theorem, Mr. Forsyth, Thermodynamics; St. John's College, Dr. Besant, Analysis, for Schedules II. and III., Mr. Pendlebury, Laplace's and Bessel's Functions, Mr. Webb, Elementary Rigid Dynamics; Pembroke College, Mr. Burnside, Hydrodynamics; Emmanuel College, Mr. Webb, Elasticity.

Physics—Trinity College, Mr. Trotter, Electricity and Magnetism, Mr. Glazebrook, Elementary Physics; Cavendish Laboratory, Mr. Shaw, Elementary Physics; St. John's College, Mr. Hart, Elementary Electricity, Practical Physics, Cavendish Laboratory; Advanced Demonstrations in Light and Sound; and Elementary Demonstrations in Optics and Electricity.

Chemistry—Prof. Liveing, Course of Examinations and Personal Instruction of those who have attended his general course in the last two terms; Mr. Main, General Course, including Carbon Compounds; Mr. Pattison Muir, Non-Metals, and Elementary Organic; Mr. Sell, Elementary Chemistry; Mr. Scott, Gas Analysis; Mr. Lewis, Catechetical Course.

Practical Chemistry—Demonstrations for 1st M.B. by Mr. Sell and Fenton; Demonstrations in Qualitative Analysis (Sidney College), Mr. Neville; Practical Courses at St. John's and Caius College Laboratories.

Mineralogy—Prof. Lewis; and two Courses of Elementary Demonstrations.

Mechanism—Prof. Stuart, Differential and Integral Calculus for Engineering Students; Mr. Lyon, Machine Construction and Heat; Mr. Ames, Surveying and Levelling.

Physiology—Elementary, Prof. Foster; Structure and Function of the Central Nervous System, Mr. Langley; Advanced Physiology of Respirations, Dr. Gaskell; Preparation for 2nd M.B., Mr. Hill.

Human Anatomy—Prof. Macalister, Anatomical Basis of Anthropology, Advanced; Demonstrations and Dissections.

Elementary Biology, Mr. Sedgwick; Morphology of the Vertebrata, Mr. Sedgwick; Mollusca and Tunicata, Mr. Weldon; Mammalia, Mr. Gadow.

Botany—Prof. Babington, Structural and Systematic; Morphology, chiefly Cryptogamic, advanced, Dr. Vines; Demonstration Lectures on Physiology, Mr. F. Darwin; Demonstrations in Systematic Botany, Mr. Potter.

Geology—Stratigraphy, Local, Prof. Hughes; General Course, Carboniferous to Recent, Dr. R. D. Roberts; Palæontology, Elementary, Mr. T. Roberts; Microscopic Petrology, Mr. A. Harker; Climatology, Mr. E. Hill; Metamorphism, Mr. Marr; Field Lectures, Prof. Hughes.

SOCIETIES AND ACADEMIES

LONDON

Royal Meteorological Society, April 16.—Mr. J. K. Laughton, M.A., F.R.A.S., vice-president, in the chair.—J. Y. Davidson and T. Wright were elected Fellows of the Society.—The following papers were read:—On the origin and course of the squall which capsized H.M.S. *Eurydice*, March 24, 1878, by the Hon. Ralph Abercomby, F.R.Met.Soc. It will be remembered that the *Eurydice*, which was a full-rigged corvette, when passing Ventnor in the Isle of Wight, running free before a westerly wind, with all sails set, was struck by a sudden squall from the north-west; and before sail could be shortened she went on her beam ends, and the lee ports being open, she filled and foundered. The author has investigated the character of the weather preceding and following the day in question, and finds that the squall was one belonging to the class which is associated with the trough of V-shaped depressions. The squall, which originated in the north of England, swept across the Isle of Wight at a rate of about thirty-eight miles an hour. The V-depression was of an uncommon class, in which the rain occurs after the passage of the trough, and not in front of it, as is usually the case. The weather generally for March 24 was unusually complex, and of exceptional intensity, and for this reason some of the details of the changes cannot be explained.—Waterspouts and their formation, by Capt. J. W. C. Martyr.—The weather forecasts for October, November, and December, 1883, by C. E. Peek, M.A., F.R.Met.Soc. This is a comparison of the weather indicated in the forecasts of the Meteorological Office with that actually experienced at Rousdon in Dorset.—On certain effects which may have been produced in the atmosphere by floating particles of volcanic matter from the eruptions of Krakatoa and Mount St. Augustin, by W. F. Stanley, F.G.S. In this paper were given details of a microscopical examination which had been made of some dust that fell, to the thickness of about two inches, upon the deck of the bark *Arabella*, in lat. 5° 37′ S., long. 88° 58′ E., at about 1000 miles from Krakatoa, and supposed to be from the eruption of that volcano. The dust under examination was contained upon a single microscopic slide. For the convenience of discussion of the subject the visible forms were separated into eight different kinds of particles:—(*a*) Small masses and single crystals of mineral matter visible by polarised light only. These were principally of augite and of certain felspars. (*b*) Very thin chips and scales of the above. (*c*) Very small masses of dense ordinary pumice. (*d*) Fractured chips of the above with one thin edge. (*e*) Light apparently *overblown* pumice in relatively large thin plates. (*f*) Fractured parts of *e*, but of larger bubbles traversed by seams upon which septa normal to the surface formerly existed. (*g*) Fractured parts of *e*, but of larger plates, with a thicker seam on one edge or on one corner only. (*h*) Thin glassy plates of *e*, formerly of relatively much larger size. These are of equal thickness throughout, and generally with one hollow surface. The particles *a* and *b* form only about half to one per cent. of the mass, the whole of the remainder being of the different forms of pumice described. The particles *g* and *h*, as being much the lightest in proportion to their extent of surface, were most dwelt upon. These particles, which the author termed *bubble-plates*, are of irregular, angular forms. They measure under the microscope, in different directions, from about ·5 to ·05 mm. The thickness of the plates is fairly uniform, varying between ·001 and ·002 mm. When there is a seam on one edge, the plate is smaller, and thickens towards the seam. By taking the interior part of a large mass of pumice and breaking it up into fine dust, some similar forms may be discovered. These plates being of quite transparent, volcanic glass (obsidian), they are invisible under the microscope, by direct light; but being placed in a medium of higher refractive power, as Canada balsam, they become clearly defined under oblique illumination, above a spot lens, with careful adjustment. Mr. Stanley suggested that these thin plates were from overblown bubbles of volcanic glass such as forms the mass of pumice; that most probably they were projected from about the centre of the volcanic chimney, where they could maintain a melting temperature until they reached the higher atmosphere; under which conditions the internal steam in each separate bubble would expand in volume through release of external pressure until the bubbles burst in the very thin fragments shown. These thin forms of bubble-plates, having great surface in comparison with their very small masses, were such as were eminently adapted to float in atmospheric currents to great distances. As such particles would descend with their convex sides downwards, they would also be especially adapted to reflect the sun's rays, when the sun sank to the horizon, whereas when the sun was at greater altitude his rays would pass through them nearly unobstructed. It was therefore proposed that the after-glow so often observed since the eruptions of Krakatoa and Mount St. Augustin was possibly due to reflection from these thin plates.

DUBLIN

Royal Society, March 17.—Section of Physical and Experimental Science.—Howard Grubb, M.E., F.R.S., in the chair.—On the success of an instrument for completing the optical adjustment of reflecting telescopes, by G. Johnstone Stoney, M.A., D.Sc., F.R.S., vice-president of the Society. The author had been astronomical assistant to the late Earl of Rosse, and while in charge of his observatory became impressed with the importance of increasing both the degree of accuracy and the facility with which reflecting telescopes can be adjusted. At the Cheltenham meeting of the British Association in 1857 he described an instrument designed to attain these ends, but had no opportunity of testing its performance till two years ago, when a twelve-inch mirror came into his possession of exquisite defining power, figured by the late Mr. Charles E. Burton, B.A., F.R.A.S. This mirror is mounted as a Newtonian telescope.

The collimator proposed in 1857 was made for it last autumn by Mr. Howard Grubb, M.E., F.R.S., and its performance has been fully tested with the most satisfactory results during the present observing season. The new collimator is a short telescope of eleven inches focus and two inches aperture, which, when used, is to be inserted into the eyepiece-holder of the large telescope. A spark between platinum points is produced in the focus of this instrument by a small Rhumkorff's coil such as those sold with toy apparatus, and the light of the spark emerging from the collimator is reflected by the small mirror of the Newtonian, and so reaches its large mirror. By pushing the eyepiece and platinum points of the collimator a little inside its focus, the beam of light, as it passes down the large telescope, is rendered slightly divergent, and falls normally on the large mirror. If everything is in perfect adjustment, the beam of light will then, after reflection by the large mirror, retrace its steps, and, reentering the collimator, will form an image coincident with the spark. Any want of adjustment is at once betrayed by the image in the field of view of the collimator not being coincident with the spark. On commencing the night's observing, the mirrors of the large telescope are first adjusted in the usual way. The collimator is then put into the eyepiece-holder, and if the telescope has been tolerably well adjusted, the image of the spark will be found not farther from the spark than a quarter or a third of the field of view of the eyepiece of the collimator. The adjustment is then completed in the following way:—The eyepiece-holder, instead of being rigidly attached to the tube of the telescope, is mounted on a triangular plate fastened to the side of the telescope by screws acting against springs at the corners. By these screws the line of collimation of the eyepiece-holder can be slightly altered, and by moving them the image of the spark is made to coincide with the spark. The instrument is then in a condition of optical adjustment vastly more perfect than has hitherto been attainable with reflecting telescopes. This whole process occupies less than half a minute, and is so easy of application that the author is in the habit of repeating it every time the telescope is moved to a fresh object. He is rewarded by having the last degree of refinement applied to the adjustment of his telescope in using it upon every object, an advantage the importance of which will be appreciated by every astronomer who uses a sufficiently fine mirror and is working on a sufficiently good night.—Mr. J. Joly, B.E., read a paper entitled "Notes on a Microscopical Examination of the Volcanic Ash from Krakatoa." The ash examined was part of some which fell on board the Norwegian barque *Borjild* while she lay at anchor off the great Kombuis Island on August 27, 1883. Her position was some 75 miles to the north-east of Krakatoa, a strong south-westerly gale prevailing at the time. She was hence most favourably placed for receiving good samples of the dust. A specimen of the floating pumice, picked up by the *Borjild* in the Straits of Sunda, was compared with the ash. Microscopically they were found to present the same features. Two species of pyroxene occur—a monoclinic and a rhombic variety. The first was augite; the second presents many of the optical characteristics of hypersthene. Both contain much magnetite. A triclinic felspar is very abundant, showing many different crystalline shapes. The identity of many of these with the triclinic felspar is shown by their occurrence, twinned with and superimposed upon crystals presenting undeniable plagioclastic characteristics. They show small angles of extinction. The presence of sanadine appeared doubtful. Iron pyrites was found in the ash, both embedded in vitreous fragments and free, as aggregations of cubes, showing the striations at right angles for adjacent faces. Magnetite is abundant. The frequency of lines of growth on the felspars seemed indicative of a comparatively tranquil formation. Most of the crystals showed a fine coating—much pitted and reticulated—of vitreous matter. A sudden mechanical separation from a viscous magma would explain this appearance, which somewhat resembled that produced by rapidly separating two flat surfaces compressing a viscous substance. Organic remains were found abundantly in both ash and pumice. A foraminiferal shell, very perfect, was found in the ash, and another in the pumice. Fragments, apparently of some algæ, were found plentifully in the former.—Dr. R. S. Ball, F.R.S., exhibited Mr. Common's photograph of the great nebula in Orion.—Prof. G. F. Fitzgerald, F.R.S., exhibited Ayrton and Perry's new spring ammeter.

Section of Natural Science, W. Frazer, F.R.C.S.I., in the chair.—On spherical or globular phosphorites of Russian Podolia, by Prof. J. P. O'Reilly, C.E.—Catalogue of Vertebrate fossils from the Siwaliks of India, by R. Lydekker, B.A., F.G.S., F.Z.S. Communicated by V. Ball, M.A., F.R.S.—On the action of waves on sea-beaches and sea-bottoms, by A. R. Hunt, M.A., F.G.S. Communicated by Prof. A. C. Haddon, M.A., F.Z.S. After detailing the conflicting views put forward by various authors, Mr. Hunt discusses Mr. Scott Russell's theory of oscillatory waves being converted into waves of translation, with observations and experiments to disprove it. The author then treats of the action of waves, currents, and wind currents on beaches, shingles, and sandbanks as observed in the neighbourhood of Torquay, and describes experiments conducted in a specially constructed tank.

EDINBURGH

Royal Physical Society, April 23.—Dr. Traquair, F.R.S., in the chair.—Mr. Hugh Miller, A.R.S.M., read a paper on boulder-glaciation and striated pavements. Starting from local observations made near Edinburgh by Charles Maclaren and Hugh Miller upon the glaciation *in situ* of boulders and boulder pavements in the till, the author has been led to the conclusion that boulder-glaciation *in situ*, registering the ice-movement during the formation of the till, is extremely common. The glaciation of the county of Northumberland, to which he referred in passing, may be roughly divided into upland-glaciation, valley-glaciation, and glaciation of the seaboard. All these are registered equally well in the striation of the larger boulders (whether singly or in groups) as in that of the rock below. He confirmed the older observations that the glaciating agent was the same in both the rocks and the boulders, adducing the fact as strong evidence of the glacier origin of the deposit. That floating ice should striate in fixed directions so many blocks lying in soft mud at the sea-bottom he regards as impossible. As registering changes in ice-movement, the intercrossing of erratics, and a distinction between successive boulder-clays, this widespread glaciation of boulders *in situ* may prove of general importance and a distinguishing mark of the true till.

PARIS

Academy of Sciences, April 21.—M. Rolland in the chair.—Letter of condolence to the family of the late M. Dumas from the *savants* of Geneva.—On a theorem of Kant relating to the celestial mechanism, by M. Faye.—On the scale of temperatures and on molecular weights, by M. Berthelot. The author endeavours to show that a profound study of specific heats tends to establish the fact that heat, which resolves compound molecules into their elements, has also the effect of resolving the highly complex groups of particles which constitute the bodies hitherto regarded as *elementary*.—On the optical identity of the crystals of herderite of Ehrenfriedersdorf with that of the State of Maine, by M. Des Cloizeaux.—Account of a young gorilla recently brought from the Gaboon and now in the menagerie of the Natural History Museum, Paris, by M. Alph. Milne-Edwards. This specimen is described as of a much more ferocious character than the chimpanzee or orang-utan, and greatly inferior in intelligence even to the gibbon.—Note accompanying the presentation of the marine charts and hydrographic documents offered to the Academy by the Depot of Charts and Plans on behalf of the Department of Marine, by M. de Jonquières.—On the separation of phosphoric acid in arable lands, by M. de Gasparin.—On the speed attained by Lapps with their snowshoes; extract from a letter addressed by M. Nordenskjöld to M. Daubrée. From the result of races instituted for the purpose of determining this point, an average speed of over six miles per hour was verified at Quickjock in Lapland.—Further observations on the present appearance of the planet Uranus as observed at the Observatory of Nice during the month of April, by M. Perrotin.—Changes observed in the rings of Saturn, by M. E. L. Trouvelot. From continued observations made since the year 1875 at the Meudon Observatory the author is able definitely to confirm the conclusion already arrived at, that the rings, so far from being fixed, are extremely variable.—On surfaces of the third order, by M. C. Le Paige.—On uniformly inclined surfaces and proportional systems, by M. L. Lecornu.—On the principle of the prism of greatest thrust, laid down by Coulomb in the theory of the limited equilibrium of sandy masses, by M. J. Boussinesq.—On the diffusion of light through unpolished glass or metal surfaces, by M. Gouy.—On the propagation of sound through gases, by M. Neyreneuf.—On the boiling-point of oxygen, air, nitrogen, and the oxide of carbon under atmospheric pressure, by M. S. Wroblewski.—On a metallic radical, by M. P. Schutzenberger.—Determination of the densities of the vapours of the chloride of glucinium, by MM. L. F. Nilson and Otto Pettersson.—On the neutral molybdate of didymium, and on the equivalence of didymium, by M. Alph. Cossa.—On the curves of solubility of salts, by M. A. Étard.—On the bark of *Xanthoxylum caribæum*, Lk., as a febrifuge, by MM. Heckel and Fr. Schlagdenhauffen.—On the application of the digester for the destruction of microbes in liquids, by M. L. Heydenreich.—On some siliceous spicules of living sponges obtained from the dredgings executed during the last expedition of the *Talisman*, by M. J. Thoulet.—On the generic relations of *Orbulina universa* with Globigerina, two illustrations, by M. C. Schlumberger. From the comparative study of these organisms the author infers that the dimorphism of the Foraminifera is an initial character resulting from two original forms.—On the action of heat on the phenomena of vegetation: (1) on the development and direction of the roots; (2) on the heliotropism of certain plants, by M. A. Barthélemy.—On marine and fresh-water deposits considered from the economical standpoint, according as they are or are not sulphuretted; alluvia of the Durance, by M. Dieulafait.—New report on the diamantiferous deposit at Grâo Mogol, province of Minas Geraes, Brazil, by M. Gorceix.—On the bones of the head of the Simœdosaurians, and on the various species of this extinct reptile found in the Cernay formations in the Rheims district, by M. V. Lemoine.—Note on the crepuscular phenomena observed at the Imperial Observatory of Rio de Janeiro during the winter months of 1883-84, by M. L. Cruls.—Note on the scientific mission to Cape Horn 1882-83 in connection with the question of the periodicity of barometric oscillations, by M. Ch. V. Zenger.

BERLIN

Physical Society, March 21.—Dr. Frölich spoke of some modifications of Wheatstone's bridge which had been applied to the measurement of the electric resistance of galvanic elements and batteries. Wheatstone's bridge consisted, as was known, of a wire quadrilateral and two wire diagonals. Of the two diagonals one contained a battery of constant electromotive force, the other the galvanometer. In these circumstances the resistances of the four lateral wires showed the proportion $W_1 : W_3 = W_2 : W_4$. For the purpose of measuring the resistance in a galvanic battery, the arrangement was so far empirically changed that the battery to be measured was inserted in one of the lateral wires. A second empirical method consisted in inserting the galvanometer into one diagonal wire and interrupting the second; the battery to be measured was placed in a lateral wire. Dr. Frölich showed that both arrangements were only modifications of Wheatstone's bridge. The way in which these modifications originated might be conceived by supposing that the bridge was formed of cords, and that the angles of the square were successively shifted; the proportion which applied to Wheatstone's bridge would still hold in the new case. Dr. Frölich laid down a general law applicable to all individual cases. If in a Wheatstone bridge an element be inserted into each wire, while one diagonal wire contained the galvanometer, and the other was interrupted, if, moreover, on opening this wire, the electromotive force in the other diagonal remained unchanged, then the proportion above stated between the resistances of the lateral wires would still hold. Whether this general law included such a case as could be applied practically and with certainty to the measurement of the resistance of elements must be determined by experience.—Dr. Frölich then gave a report on the continuation of his measurements of solar temperature. At a former sitting he communicated the measurements he had made during the previous year. These measurements yielded an almost equal result on June 29 and July 1, an increase of solar heat of 6 per cent. over this last estimate on August 14, and a value pretty nearly equal to that of July 1 in the middle of October. Since then doubts had been expressed as to whether the calculated increase of solar heat in August corresponded with the fact, seeing that the amount of the difference was not so much greater than might be accounted for by assuming an error, not easily avoided, in an observation. In opposition to this consideration, Dr. Frölich contended that, even if it were claimed that the difference would have to be three times greater than any error in observation which might probably occur, the increase in August had such a high degree of probability in its favour that one might bet $22\frac{1}{2}$ to 1 for its accuracy. All doubt, however, on the matter was completely removed by two measurements Dr. Frölich made on February 19 and March 17. Both measurements yielded pretty nearly equal values of solar heat, and one was 15 per cent. higher than the estimate of the middle of October last year. In this case the probable error was surpassed eight times. Dr. Frölich was of opinion that the increase of solar heat in August was connected with an assumed formation of sunspots, and seeing that the spots were bound up with the magnetism of the earth he made inquiries with a view to ascertaining the state of the terrestrial magnetism at that time. From the average of the reports collected by him he found that in correspondence with the increased solar heat in the middle of August there was a diminution of the earth's magnetism.—At the close Dr. Frölich produced a large lump of magnesium as the product of an electrolytic industry. The piece was wrought in a factory according to a patented method based essentially on the melting of chloride of magnesium, and decomposing it in the melted state by an electric current.

VIENNA

Imperial Academy of Sciences, March 20.—L. Martin, on the polydimensional argument.—R. von Drasche, on some new and less-known ex-European Ascidia.—T. Latschenberger, on testing and determining ammonia in animal fluids.—W. Fossek, synthesis of dyad alcohols by action of alcoholic potash on aldehydes.—On the action of phosphorus trichloride on aldehyde, by the same.—F. Wiesner, on geotropic curvature of roots.—F. W. Dafert, synthesis of glycuronic acid from mannite (sealed packet).—K. Olszewski, determination of density and of coefficient of expansion of liquid oxygen.—Determination of the temperature of solidification of some gases and liquids, by the same.

April 3.—A. Adamkiewicz, preliminary communication on new stainings of the spinal cord, part ii.; results obtained by staining the diseased spinal cord with saffronine.—M. Loewit, contributions to theory of blood-coagulation, part i.; on the coagulating power of the blood-disks.—A. Lustig, contributions to development of gustatory buds.—T. V. Tanowski, on direct substitution-products of azobenzene and on an asymmetrical trinitroazobenzene.—E. Witlazil, on polymorphism of *Chætophorus populi*, L.—M. Strainsky, on tides and their reaction on the configuration of the earth's surface.—R. Benedikt and K. Hazura, on morin.—R. Benedikt and P. Julius, on diresorcin and diresorcinphthaline.—K. Hazura and P. Julius, on resorcin-ether.—P. Julius, on a new reaction of benzidine.

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