

Bicycle" by Messrs. T. G. Allen and W. L. Sachtleben, an article on "Coasting by Sorrento and Amalfi," and one on "The Highroad from Salerno to Sorrento," all of them being well illustrated.

In addition to the magazines named in the foregoing, we have received *Longman's*, containing "Polar Bear Shooting on the East Coast of Greenland," by Dr. Nan-sen, and "Chamois Hunting above the Snow Line," by Mr. Hugh E. M. Stutfield.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The following are the speeches delivered by the Public Orator, Dr. Sandys, Fellow and Tutor of St. John's, on June 27, in presenting Sir John Bennet Lawes, Bart., F.R.S., Sir Joseph Henry Gilbert, F.R.S., and Prof. Mendeléef, for the honorary degree of Doctor in Science:—

(1) *Salutamus tandem par nobile collegarum qui de agrorum cultura, de pecudum alimentis variis, experimentis exquisitis una elaborandis annos quinquaginta, magnum profecto actatis humanae spatium, dedicarunt. Tot annorum autem labores non modo chartae fideles in perpetuum custodient, sed etiam saxum ingens nomine utroque insculptum inter posteros testabitur. Ab ipso autem "monumentum aere perennius" erit exactum, experimentis tam utilibus, tam fructuosis, munificentia ipsius etiam in posterum continuatis. Auguramur, nec nos fallit augurium, in agri culturae annalibus talium virorum nomina fore immortalia.*

Duco ad vos Baronettum insignem, Regiae societatis socium, virum doctoris titulo bis aliunde merito ornatum, IOANNEM BENNET LAWES.

(2) *Quos tot annorum labores una coniunxerunt, eos in laudibus nostris hodie divellere vix possumus. Constat tamen labores illos viri huiusce scientiae admirabili et industriae indefessae plurimum debere. Constat eisdem eiusdem scriptis, eiusdem orationibus, non modo in patria nostra sed etiam peregre maximo cum fructu esse profectos. Cum collega suo summa concordia coniunctus, Plinii verba iure optimo posset usurpare: "nobis erat nullum certamen, nulla contentio, cum uterque pari iugo non pro se, sed pro causa niteretur."*

"Felicis ter et amplius quos irrupta tenet copula."

Duco ad vos Regiae societatis socium, virum ab ipsa Regina equitem propter merita nominatum, IOSEPHUM HENRICUM GILBERT.

(3) *In scientia chemica investiganda diu inter peritos quaerebatur, quanam ratio interesset inter atomorum pondera e quibus rerum elementa constarent et vires eas, sive chemicas sive physicas, quae elementis ipsis velut propriae inhererent. Qua in ratione penitus perscrutanda atque ad certam quandam legem redigenda nemo plura perfecisse existimatur quam vir illustris qui Siberia in remota natus, et undecim abhinc annos a societate Regia Londinensi numismate aureo donatus, hodie nostra corona qualicumque decoratur. Magnum profecto est inter tot elementa rationem certis intervallis velut circuitu quodam recurrentem observasse, eque rerum notarum observatione etiam ignota providisse. Viri huiusce ingenio etiam elementa prius inaudita mentis divinatione singulari praedicta sunt posteaque in ipsa rerum natura reperta. Quae elementa, trium gentium insignium nominibus Gallium, Scandium, Germanium nuncupata, nomen ipsius illustris reddiderunt et Russorum famam, quantum ad ipsum attinet, feliciter auxerunt. Ergo virum de scientia chemica tam diu tamque praecclare meritum, totque titulis aliunde ornatum, hodie etiam nostrorum*

"turba Quiritium certat tergemini tollere honoribus."

Newtoni certe in Academia honos ei praesertim debetur, qui etiam in scientia chemica Newtoni in vestigiis tam fideliter insistit, ut alumni nostri "qui genus humanum ingenio superavit" imaginem intuent, Lucreti verba paululum mutata possit usurpare:—

"te sequor, o Grantae magnum decus, inque tuis nunc ficta pedum pono pressis vestigia signis."

Duco ad vos scientiae chemicae professorem Petroburgensem, DEMETRIUM IVANOVITCH MENDELEEF.

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SCIENTIFIC SERIALS.

American Journal of Science, June.—Notes from the Bermudas, by Alexander Agassiz. The story of their present condition is practically that of the Bahamas, with the exception that at the Bermudas we have an epitome, as it were, of the physical changes undergone by the Bahamas. The development of the true reef builders, of the massive corals, is insignificant. Subsidence has brought about the existing outlines of the islands, but there is no evidence to show that the original annular coral reef was formed during subsidence. That reef has disappeared, and nothing is left of it except the remnants of the æolian ledges extending to sixteen or seventeen fathoms outside the reef ledge flats, ledges which owe their existence to the material derived from it: the former æolian hills of the proto-bermudian land.—Discovery of Devonian rocks in California, by J. S. Diller and Charles Schuchert. During the field seasons of 1884 and 1893, the U.S. Geological Survey acquired six lots of Devonian fossils, comprising about thirty species, mostly corals. They demonstrate the undoubted presence of middle Devonian deposits in California, where rocks of this age have long been looked for by geologists, more particularly since the recent discovery of Silurian fossils.—New method of determining the relative affinities of certain acids, by M. Carey Lea. This method is based on the principle that the affinity of any acid is proportional to the amount of base which it can retain in the presence of a strong acid selected as a standard of comparison for all acids. When to free sulphuric acid a salt is added in sufficient quantity to cause the whole of the sulphuric acid to saturate itself with the salt base, it is possible by means of the herapathite test to determine the exact point of such saturation. From this we can deduce the exact nature of the resulting equilibrium. A series of equilibria thus obtained with different salts enables us to determine the comparative strength of the affinities of the acids of these salts. The fact that even small quantities of weak acids added to sulphates will set free a certain quantity of sulphuric acid, can be rendered visible to the eye by a well-marked chemical reaction.—A recent analysis of Pele's Hair and a stalagmite from the lava caves of Kilauaea, by A. H. Phillips. The stalagmite is of the kind characteristic of the lava caverns of Kilauaea, differing very slightly from Pele's Hair in constitution, but widely from ordinary stalagmites formed by undoubted solution. They are suggestive of fused drops, which falling one on the other are at the time sufficiently plastic to be quite firmly welded together and congealed in a slightly drooping position.

Bulletin of the New York Mathematical Society, vol. iii. No. 8, May 1894. (New York: Macmillan).—"Utility of quaternions in physics" is an analysis by Prof. A. S. Hathaway of A. McAulay's essay, which is well-known to our readers (see *NATURE*, December 28, 1893, amongst other references). The reviewer considers it to be "of undoubted scientific value, and the work of a man of genuine power and originality," and that it will go far towards accomplishing the author's purpose of arousing serious interest in quaternion analysis.—Prof. Enestöm, in a note upon the history of the rules of convergence in the eighteenth century, calls attention to two other mathematicians, in addition to those named in a notice by Prof. Cajori, in vol. ii. pp. 1-10, viz. Maclaurin and Stirling: for the former he claims "a signal place in the history of these rules."—Prof. P. Franklin concisely abstracts Dr. Franz Meyer's "Bericht über den gegenwärtigen Stand der Invariantentheorie," a work which gives a remarkably full abstract of researches in the domain of algebraic forms and Invariants.—Cajori's "History of Mathematics" (pp. 190-197) is a work which Prof. D. E. Smith submits to a searching examination, the commencement of which is a severe condemnation of great part of the book, founded on a side by side comparison of Cajori's statements with those of previous writers on the subject, which he is alleged to have copied without giving due credit to the authors cited. He states the book to be weak in bibliography, and carelessly written. Its merits are that it tells the general story of the growth of mathematics in a popular way, is well printed and "altogether an attractive piece of book-making." Not having seen the work we cannot say if this witness is true, but he certainly adduces evidence which it will be hard to rebut.—"Gravitation and absolute units of force" is an abstract of a paper read before the New York Mathematical Society by Prof. W. Woolsey Johnson. Prof. Greenhill's views are

noticed. The "notes" say that in a discussion on the paper, Mr. C. S. Peirce proposed that the term "Galileo" be applied to the unit of acceleration in the C.G.S. system. We also find in them an account of the proceedings at the centenary celebration of the birth of Lobachevsky by the Physico-Mathematical Society of the University of Kazán. Further we learn that Lambert's essay (*cf.* our notice of the *Bulletin* for December 1893) is to be incorporated in a volume entitled "Die Theorie du Parallellinien" (Teubner, of Leipzig), to be edited by Drs. P. Stoeckel and F. Engel. The prime factor will be the "first book of the marvellous work by Saccheri, 'Euclid vindicated from every fleck,' in which (in 1733) the two hypotheses which, besides Euclid's, are possible are developed, and all the results obtained which have been ascribed to Legendre. There is a list of new publications in higher and applied mathematics.

Wiedemann's Annalen der Physik und Chemie, No. 7.—Further electro-optical experiments, by J. Elster and H. Geitel. The capacity of thin layers of sodium, potassium, and rubidium applied to the walls of vacuum tubes of promoting the passage of a current when illuminated differs for different colours. For long waves, rubidium is the most, and potassium the least sensitive. If the layers are illuminated by polarised light the current intensity is greatest when the plane of polarisation is perpendicular to the plane of incidence. Electric oscillations of small period can be transferred to rarefied gas by illumination in presence of an alkali metal.—A new phenomenon attending the passage of electricity through badly conducting liquids, by O. Lehmann. This is a description of the formation of halos round the electrodes in a solution of pigments in water thickened with gelatine, sugar, or glycerine. Considerable disturbance is produced where the different coloured halos meet, while the rest of the solution remains undisturbed.—Experiments with Tesla currents, by F. Himstedt. The author gives an account of methods by which Tesla's experiments can be repeated with ordinary laboratory apparatus. High potential and rapid oscillations were produced by a Lecher wire combination used for producing Hertz oscillations.—On the demonstration of Hertz's experiments, by P. Drude. The author avoids the necessity of a high tension accumulator, as used by Zehnder, by allowing the sparks of the resonator to discharge an electro-scope charged by a dry pile. The point behind the concave mirror is put to earth; also one pole of the dry pile, the other pole being connected with the electro-scope and the sphere behind the mirror. When sparks pass, the leaves of the electro-scope collapse partly or totally. This may be shown to a large audience by projecting an image of the electro-scope on to a screen.—The change of phase of light by reflexion at thin films, by W. Wernicke. Under the name of "optical phase analysis" the author describes a method of detecting exceedingly minute impurities on the surface of polished glass or glass covered with a thin layer of gelatine. The influence of the play of cohesive force upon free molecules as regards their optical properties is investigated for pigments and the metals, with especial reference to silver.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 8.—"Thermoelectric Properties of Salt Solutions." By George Frederick Emery, late Scholar of Trinity College, Cambridge.

In a circuit formed by a metallic wire and a solution an electromotive force is developed proportionately to the difference of temperature between the junctions. The solution to be examined is put in a U-tube with an electrode and thermometer in each limb, round one of which is a hot water-jacket. δ is \equiv E.M.F. per 1°C ., unit δ being 10^{-4} volt. Experiments were made with acetate chloride and sulphate of zinc, and sulphate nitrate and acetate of copper. δ varied considerably with concentration. The value for pure water appears to be about 8.6, but cannot be measured directly; for some salts δ increases with concentration, for others it diminishes. In all cases examined the current would go from hot to cold through the solutions. With zinc salts amalgamated zinc electrodes were used; with the copper salts the electrode used was a fine wire projecting from the end of a drawn-out glass tube. Values of δ for mixed salts

seemed to show that differences from the water value are qualitatively but not quantitatively additive. Thus δ , starting from about 8.6, tends for moderate concentrations to a nearly constant value for each salt. M. Bouty, with very strong solutions of zinc chloride, found that δ rapidly diminished, whence the entire curve for all concentrations between zinc chloride and pure water would have a point of inflexion. If, keeping the salt a fixed quantity, we use mixtures of two solvents, we get a complete curve for δ . Experiments on 1 per cent. of cadmium bromide gave good results with all solvents used; with mixtures of methyl alcohol and water with alcohol, it gave the following values:—

Methyl alcohol per cent.	δ	Water per cent.	δ
100.0	11.3	100.0	7.0
90.0	11.0	98.9	6.86
81.3	10.76	90.0	5.83
70.0	10.4	75.0	5.053
50.0	10.27	50.0	4.075
30.0	9.86	25.0	4.123
18.7	9.64	0	8.15
10.0	8.9		
0	8.15		

In the first we have an inflected curve never far from the mean, in the second a small admixture causes a large drop in δ . These two pairs of solvents represent two classes. The alcohols mix quietly without chemical action, while alcohol and water mix with evolution of heat, and change in bulk.

A few experiments, believed to be entirely novel, were made on the E.M.F. in a circuit composed of two kinds of liquid with junctions at different temperatures. Zinc sulphate 4 per cent. and weak zinc chloride gave $E/(t' - t) = 1.36 \times 10^{-4}\text{V}$.

Zinc acetate and zinc sulphate gave $E/t' - t = 0.8 \times 10^{-4}\text{V}$, $1.05 \times 10^{-4}\text{V}$, $1.13 \times 10^{-4}\text{V}$, mean value $= 1 \times 10^{-4}\text{V}$.

Lastly, measurements of the Peltier effect at a metal-liquid junction were made with various apparatus with fairly consistent results.

For 15 per cent. copper sulphate and copper, different measurements gave the heat evolved per unit $\equiv H = 0.1992$, 0.1927 , 0.1956 , 0.2078 , 0.2091 , 0.1952 .

The last and best gives $H/T = 6.83 \times 10^{-4} = \delta$ for the solution. Cupric nitrate with $\delta = 6.14$ gave $H = 0.1764$, $H/T = 6.1$. Thus these thermoelectric effects are of a reversible nature.

May 10.—"The total eclipse of April 16-17, 1893. Report of results obtained with the slit spectroscopes." By Captain E. H. Hills, R.E.

This paper deals with the results obtained from the photographs of the spectrum of the eclipsed sun taken in Brazil and Africa at the total eclipse of April 1893. The instruments employed, of which there were four, were slit spectroscopes of the ordinary type, and were each arranged to take one photograph during totality. Of the four resulting photographs two were partially unsuccessful and were not measured. The two others each show a strong prominence spectrum, and on both sides of this a continuous coronal spectrum, in which latter are seen a number of very faint lines. The wave-lengths of these lines were determined by using the known lines in the prominence spectrum as reference points, and from these constructing an interpolation curve. The coronal lines, whose wave-lengths were thus fixed, were, in almost all cases, apparently identical with lines which had been observed at previous eclipses, instruments of a similar type having been employed at the eclipses of 1882, 1883, and 1886.

The prominence spectrum, as shown on the photographs, extends from w.l. 3667 to w.l. 5316. It is chiefly remarkable for the extended hydrogen series, there being eight lines beyond the one at w.l. 3699, the wave-lengths of which are given as 3692.5, 3687, 3682, 3678, 3675, 3672, 3669.5, 3667.

"Researches on Modern Explosives" (preliminary communication). By William Macnab and E. Ristori.

A series of experiments with explosive compounds has been undertaken by the authors for the purpose of studying chemical reactions at high temperatures and pressures, and of elucidating certain thermal constants relating chiefly to the specific heat of gases under such conditions. Nitroglycerin, nitrocellulose, and several combinations of these two bodies, which are used as smokeless powders, have been chiefly employed in these experiments. The results given in this communication relate princi-