small outlying engine house with storage tanks. The laboratory owns a small sail-boat to assist in the work of collecting."

Passing to Holland, we read—"Holland, in the summer of 1890, opened its zoological station in the Helder, a locality which, for this purpose, had long been looked upon with the greatest favour. There is here an old town at the mouth of the Zuyder Zee, the naval stronghold of Holland, a station favourable for biological work on account of the rapid running current which renews the waters of the Zee. The station was founded by the support of the Zoological Society of the Netherlands, whose valuable work by the contributions of Hubrecht, Hoek, and Horst has long been known in connection with the development of the oyster industry of Holland. The work of the society had formerly been carried on by means of a portable zoological station which the investigators caused to be transplanted to different points along the East Schelde, favourable on account of their nearness to the supplies of spawning oysters. The present station at the Helder is situated directly adjoining the great Dyke, a small stone building of two storeys, surrounded by a small park. In itself the laboratory is a model one—the rooms are carefully finished and every arrangement has been made to secure working conveniences. A large vestibule leads directly into two laboratory rooms, and by a hallway communicates with the large, well-lighted library, and the rooms of the director. The aquarium-room has, for convenience, been placed in a small adjacent building. The director of this station is Prof. Hoek, and the president of the society is Prof. Hubrecht."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Stanford University of California (the *Times* says) is rapidly becoming the wealthiest institution of the kind in the world. Yet there are several American Universities and colleges which enjoy enormous wealth. For example, Columbia University has an invested capital of £2,600,000; Harvard, £2,200,000; Yale, £2,000,000; the California, £1,400,000; and the Johns Hopkins, £600,000. The endowment fund of the Stanford University cannot at present be stated, partly because the benefaction exists in the shape of property which is rapidly increasing in value. But estimates which appear to be well founded have been made at San Francisco showing that at no distant date the University will be worth £40,000,000, yielding an annual income of £2,200,000.

SCIENTIFIC SERIALS.

Wiedemann's Annalen der Physik und Chemie, No. 8 (1893).—Polarisation of undiffracted infra-red radiation by metal wire gratings, by H. E. J. G. du Bois and H. Rubens. Polarised light passing without diffraction through silver wire gratings experiences in general a rotation of its plane of polarisation. The transmitting power of the gratings for light polarised in a plane perpendicular to the length of the wires was found to be greater than that for light polarised in a plane parallel to them. The present, experiments were conducted with finer gratings than before the smallest interval attained being 0·001 cm. and the measurements were taken in the infra-red region. The intensity of radiation transmitted was measured by the bolometer. It was found that as long as the wave length does not exceed a certain value, the grating transmits a larger fraction of the radiation when the electric vector is parallel to the wires; this value appears to be independent of the width of interval, but characteristic of the metal; for greater wave-lengths the transmittance is greater when the magnetic vector lies in the direction of the wires.—The superior limit of wave-lengths which may occur in the thermal radiation of solids; a conclusion from the second law of thermodynamics, by Willy Wien. Assuming the second law, and the existence of none but Maxwell's ponderomotor forces in the pressure exerted by a gas, the author shows that thermal radiation does not imply waves of all lengths, but that the curve of energy, when traced along the spectrum, falls continuously to infinitesimal values on the less refrangible side, and practically disappears in the region of Hertz's finite waves.—Electric oscillations of molecular structures, by H. Ebert. It is shown that the mechanism of luminescence may be fully explained by Maxwell's theory, regarding the luminous molecules as analogous to Hertz oscillators of very small dimensions.—A photometer, by E. W. Lehmann. This is constructed on the principle of Joly's photometer; it consists of two totally reflecting prisms placed side by side in a box. In each prism one of the adjoining faces is ground, and the two ground faces are turned in opposite directions so as to be illuminated by the two sources to be compared. The plain faces are turned towards the observer, with their edges touching. The observer looks at them through a tube containing a telescope; the box to which the tube is attached can be swung round through 180°, so as to exchange the ground faces. The sensitiveness is such that forty successive readings with amyl acetate burners at 120 cm. gave results not differing by more than 0·4 per cent.

Bulletin de l'Académie de Belgique, No. 6 (1893).—We notice the following among the scientific papers: Megamicros, or the sensible effects of a proportional reduction of the dimensions of the universe, by J. Delbœuf. According to Laplace, if the dimensions of all the bodies in the universe, their mutual distances and velocities were to increase or diminish in a constant proportion, these bodies would describe the same curves as they do now. The appearances presented to observers would be the same, and independent of the dimensions assumed. Hence the only facts we are able to appreciate are ratios. In opposition to this theorem, M. Delbœuf shows that if a system consisting of the sun and the earth were to be diminished in linear dimensions to one-half, all densities remaining the same at homologous points, and the orbital velocity of the earth were reduced to one-half its value, there would be certain changes in the relations of an observer to his surroundings which could not escape notice. The velocity of sound propagation will be the same as before, but the distance traversed during a certain number of vibrations will appear larger. If a metric system were to be determined on the reduced planet in a manner analogous to ours, the hectare will be a quarter, the litre one-eighth, and the kilogramme—owing to the reduction of gravitation—one-sixteenth of the corresponding actual measures. Hence the work done in lifting a kilogramme through one metre will be $\frac{1}{16}$ of an actual kilogramme-metre. Muscular power, on the other hand, being proportional to the volume or mass of muscle, will be only reduced to one-eighth, and the observer will be able to lift four times the previous maximum weight. All work necessary for life will proceed at four times the usual rate, and hence life itself will be more rapid. These considerations pursued by the author into the regions of building, thermometry, animal heat, respiration and circulation, go to show that real space is different from geometric space, and that the dimensions of the universe are absolute.—Note on the variations of temperatures of transformation below and above the critical temperature, by P. de Heen. The superior limit of pressure of superheated steam before the passage into the liquid state is the simple prolongation of the curve expressing the variation of the tension of saturated vapour.—On the production of ammonia in the soil by microbes, by Émile Marchal. Nitrification takes place in three principal stages, which may be described as ammonisation, nitrosation, and nitratation, resulting in the production of ammonia, nitrites, and nitrates respectively from the organic nitrogen. Ammonisation takes place essentially under the influence of microbes living in the upper layers of the soil. In arable land, the action of bacteria is predominant. The *Bacillus mycoides*, the most energetic of these, exerts a double activity in the production of ammonia, being ammonising in the presence of nitrogenous organic matter, denitrifying when embedded in easily reducible substances such as nitrates.

SOCIETIES AND ACADEMIES.

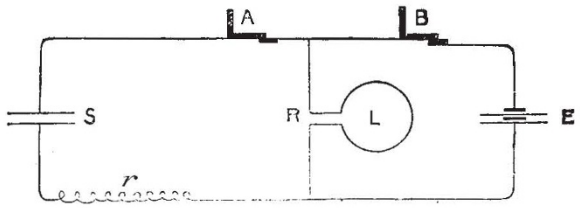
LONDON.

Royal Society, June 1.—"On the Flow in Electric Circuits of Measurable Inductance and Capacity; and on the Dissipation of Energy in such Circuits." By Alfred W. Porter, B.Sc., Demonstrator of Physics in University College, London. Communicated by Prof. G. Carey Foster, F.R.S.

The arrangement of the apparatus in the experiments described was as follows:—

L is a coil possessing self-inductance; S, a condenser; R, an

inductionless resistance; E, a battery; and A and B are two contact pieces of a pendulum interruptor. A and B are initially closed; B is first broken; A is then broken, and the charge remaining in the condenser is measured by discharging it through a galvanometer. The time interval between the two ruptures



can be varied one twenty-thousandth of a second at a time, and the manner of discharge of the condenser under the circumstances is thus determined. Curves were obtained showing (1) a merely leaking discharge; (2) the critical discharge that just fails to ever have negative values; (3) the critical discharge that just fails to be oscillatory; and (4) a thoroughly oscillatory discharge.

The differential equation to be satisfied by the discharge is—

$$\left(L\frac{d^2}{dt^2} + \rho\frac{d}{dt} + \frac{1}{S}\right)Q = 0,$$

where Q is the charge at any instant and ρ is the dissipation constant.

The solution of this for the case of oscillations is of the form—

$$Q = Q_0\epsilon^{-mt}\sec\phi\cos.(pt + \phi).$$

Experiment shows that the rate of damping is much greater than that calculated from the above, assuming that the wire circuit is the only seat of dissipation of energy. The explanation offered is that dissipation also takes place in the dielectric of the condenser. In accordance with this it is possible to reproduce the experimental curve by increasing the value of ρ from 28 ohms (the wire resistance in a particular case) to 59·4 ohms. The observed time period in this case is ·009147 seconds; the time period calculated on the above assumption is ·009154 seconds.

Experimental curves have also been obtained when iron rods are inserted in the coil. Their chief characteristics are—

(α) A decrease in time-period as the discharge progresses.

(β) Much more rapid decrement.

That (β) is only very partially due to eddy currents in the iron, was shown by repeating with a brass rod inserted in the place of iron.

Experiments are also in progress in connection with circuits of negligible capacity; a Wheatstone's bridge method being employed.

SYDNEY.

Linnean Society of New South Wales, June 28.—The following papers were read:—Notes on Australian Coleoptera, with descriptions of new species, part xiii., by the Rev. T. Blackburn.—Notes on the family Brachyscelidæ, with descriptions of new species, part ii., by W. W. Froggatt. This paper deals with Schrader's two genera Opisthoscelis and Ascelis; the two original species of Schrader are re-described, and two new species of Ascelis are added.—On the habit and use of nardoo (*Marsilea Drummondii*, R. Br.), together with observations on the influence of water-plants in retarding evaporation, by T. L. Bancroft. The author has visited the south-western corner of Queensland, journeying there *viâ* South Australia and eastward across Queensland. He first encountered nardoo in quantity near Lake Copperamana on Cooper's Creek, where, as over all the drainage-areas of the Cooper, Diamantina, and Georgina Rivers, the Blacks still make use of it as in the days of Burke and Wills. As originally stated, the plant thus utilised under the name of nardoo is a Marsilea; though doubt has been cast upon the statement under the idea that it would be impossible to obtain the involucres (sporocarps) in sufficient quantity to serve as food; and by those who took this view the seeds of *Sesbania aculeata*, Pers., were supposed to furnish the nardoo of Burke and Wills. In a day one could gather about a hundredweight of the dried rhizomes of the Marsilea with involucres attached, yielding perhaps about forty pounds weight of the latter. It was found also that the nardoo did not grow in permanent water nor in swamps, but in country subject to inundation; and from specimens brought home vigorous pot plants were reared without difficulty. As regards floating water-plants retarding evaporation, the author has made experiments with a series of gallon glass cells, some furnished with *Lemna*, *Azolla*, and *Nymphæa gigantea*, others without, and with some of each placed out of doors in the sun, and others in the shade and under cover, he found that evaporation was neither retarded nor hastened by the presence of the aquatic plants.

PARIS.

Academy of Sciences, August 14.—M. Lœwy in the chair.—On the Tubulane, a truffle of the Caucasus, by M. A. Chatin. This is a new variety of the *Tirfezia Boudieri*, which is so widely distributed in North Africa and Arabia. The roundness of the spores resembles that of the African variety, whilst the surface markings are those of *Tirfezia Boudieri Arabica*. The new variety, found about Tiflis and Baku, and sent from there by the French Consul, M. Auzepi, has been named *Tirfezia Boudieri Auzepii*. The natives call it Tubulane. It is the size of a large walnut, and its good quality and low price renders it fit for European export.—Study of the microbian origin of purulent surgical infection, by MM. S. Arloing and Ed. Chantre. Purulent surgical infection has for its essential agent the ordinary microbes of suppuration (streptococci in the cases examined). If microbes other than the preceding ones exist in the wounds, they complicate the purulent infection, but are not necessary to its development. To produce purulent infection, the streptococcus must assume the virulence which it possesses in the acute and grave forms of puerperal septicemia, and not that shown in erysipelas. There is a suspicion of etiological relations between surgical purulent infection, puerperal septicemia, and erysipelas, but it is not known as yet where and how the transformation of the pathogenic properties of the streptococcus take place which enables it to produce alternately these different clinical states.—On a product of incomplete oxidation of aluminium, by M. Pionchon. Submitted to the action of an oxy-hydrogen blow-pipe flame containing an excess of hydrogen, aluminium oxidises with vivid incandescence and is changed into a substance of a greyish-black colour, in which the ratio of the weight of oxygen to that of the aluminium has a value approaching 0·6, and therefore very different from 0·888, the value characteristic of alumina. A treatment of the substance with hydrochloric acid gave rise to a disengagement of hydrogen and the formation of aluminium chloride in solution, besides leaving an insoluble residue. A quantitative estimation of these various constituents leads to the conclusion that the grey substance contains small quantities of freer aluminium and alumina, and consists of a new oxide of aluminium, probably represented by the formula $Al_6O_7 = Al_2O, 2Al_2O_3$, which may be either a mixture or a compound.—On a new reaction of eserine, and a green colouring matter derived from the same alkaloid, by M. S. J. Ferreira da Silva.—Synthetic preparation of citric acid by the fermentation of glucose, by M. Charles Wehmer.—On the changes which have taken place in the glacier of the Tête Rousse since the catastrophe of Saint-Gervais, of 12th July, 1892, by MM. A. Delebecque and L. Duparc. Nearly all the water from the glacier escapes at present at the bottom, so that there is no immediate danger of its accumulation. But this state of things is only temporary. The valley of Montjoie appears to be exposed to a catastrophe similar to that of 1892, which must happen sooner or later. No preventive measures seem possible. A diligent watch, and an evacuation of the valley at the proper times seem to be the sole remedies.

BERLIN.

Physical Society, June 16.—Prof. von Helmholtz, President, in the chair.—Prof. Kœnig gave an account of the construction of the newest forms of artificial larynx, more especially the one described by Prof. Julius Wolff. The capabilities of the latter were demonstrated on a patient operated upon by Prof. Wolff, who could not only speak continuously so as to be audible throughout the whole lecture-room, but could also sing. The president pointed out that this case fully substantiated his theory as to the production of vowel-sounds, inasmuch as the tones being initially produced by a vibrating elastic membrane acquired their vowel quality solely by means of the varying shapes of the resonating buccal cavity. Prof. Fraenkel exhibited a man who without either a natural or artificial larynx could both speak and repeat the whole alphabet. It appeared that the patient while speaking swallowed at frequent intervals

and ejected forcibly a considerable mass of air from the open end of the trachea. Careful investigation showed that there was no communication between the trachea and œsophagus; Prof. Fraenkel referred the power of speech to the existence of a fold of mucous membrane at the end of the widened pharyngeal cavity, at about the level of the former larynx, which was thrown into vibration during speech. It had not been possible to ascertain whence the patient obtained the air requisite to keep the fold in vibration; possibly the air which had been swallowed sufficed for this purpose. Dr. Krigar Menzel had, in conjunction with Dr. Raps, studied the motion of plucked strings by the method previously employed for stroked strings. The string is stretched across the long axis of a narrow brightly illuminated slit, and thereby casts a small punctiform shadow on a screen. When the string swings, a curve is traced on the moving screen, which admits of being fixed by photography. The speaker developed the theory of strings vibrating as above, and deduced formulæ which corresponded to the curves obtained. Dr. Wien spoke on the upper limits of wave length for radiant heat as based upon certain properties of Hertz's waves and the second law of thermodynamics.

Physiological Society, June 23.—Prof. du Bois Reymond, President, in the chair.—Prof. Koenig exhibited the two patients with extirpated larynx as described in the preceding report of the Physical Society.—Dr. Benda gave an account of his microscopical investigations on the development and function of the mammary gland. He had studied the development on five- and eight-month-old calves, and the functions on cows and bitches during lactation, and arrived at the conclusions that the mammary gland must be regarded as a tubular gland, and that there is no evidence of a new formation of cells during its activity. The idea that the secretion of milk depends on a breaking-down of the gland cells cannot apparently be supported by the results of microscopic investigation.

July 7.—Prof. Holowinsky, of Warsaw, spoke on a microphone he had constructed, by means of which it is possible to render audible rhythmic movements of long period, such as the cardiac impulse, the radial and carotid pulse, &c. The action of the instrument was demonstrated on several persons.—Dr. Baginsky had studied the relation of the nerves to the sensory end-organs in the case of the glossopharyngeal and olfactory nerves, by section of the nerves and subsequent investigation of the behaviour of the terminal sensory cells in each case. In the case of the tongue he found these cells unaltered after degeneration of their nerve; whereas in the case of the olfactory cells, both they and the whole mucous membrane degenerated after removal of the olfactory bulb. He, however, attributed the result in the latter case to injury of the ethmoid artery.

July 21.—Dr. Lilienfeld made a further communication on the clotting of blood arrived at by an examination of fibrine and of fibrinogen which he regarded as a nucleo-albumin. He came to the conclusion that some substance is present in normal blood which leads to clotting in presence of minimal amounts of calcium chloride. Dr. Paul Strassmann had studied the mechanism of the closing of the ductus Botalli in man, dogs, and cats, and found it dependent upon the anatomical arrangements of the entrance into the aortic arch, supporting his views by a series of preparations. Dr. Jacobs had investigated the action of extracts of a series of animal tissues on the number of the white corpuscles. He found that extracts of liver, kidney, pancreas, and thyroid had no effect on their number, while, on the other hand, extracts of spleen, thymus, and the marrow of bones, after producing a short fall, led to an increased production of leucocytes which continued for many hours, and was marked both in the peripheral as well as in the central blood-vessels and in the heart.

BOOKS, PAMPHLETS, and SERIALS RECEIVED

BOOKS.—Orchids of South Africa, Vol. 1, Part 1: H. Bolus (Wesley).—British Locomotives: C. J. B. Cooke (Whittaker).—Euclid, Books 1 to 6. D. Brent (Rivington).—Tables for the Determination of the Rock-forming Minerals: F. Lœwinson-Lessing, translated by J. W. Gregory (Macmillan).

City and Guilds of London Institute, Programme of the Technological Examinations, Session 1893-94 (London).—Catalogue of the Madreporarian Corals in the British Museum (Natural History). Vol. 1, the Genus Madrepora: G. Brook (London).—Transactions of the Sanitary Institute, Vol. xiii. (London).—Naturalist's Map of Scotland: J. A. Harvie Brown and J. G. Bartholomew (Edinburgh, Bartholomew).—Papers and Proceedings of the Royal Society of Tasmania for 1892 (Hobart).—Edelsteinkunde: Dr. C. Doelter (Leipzig, Veit).—Mineral Resources of the United States, 1891 (Washington).—Monographs of the U.S. Geological Survey, Vol. xvii., the Flora of the Dakota Group: L. Lesquereux (Washington).—Monographs of the U.S. Geological Survey, Vol. xviii.; Gasteropoda and Cephalopoda of the Raritan Clays and Greensand Marls of New Jersey: R. P. Whitfield (Washington).—General Report on the Operations of the Survey of India Department, 1891-2 (Calcutta).

PAMPHLETS.—The Yucca Moth and Yucca Pollination: C. V. Riley (Washington).—Parisitism in Insects: C. V. Riley (Washington).—Intorno all' Assorbimento della Luce nel Platino Diverse Temperature: G. B. Rizzo (Torino).—Wurde Bernstein von Hinterindien nach dem Westen Exportirt: A. B. Meyer (Dresden).—Some Ancient Relics in Japan: R. Hitchcock (Washington).—The Ancient Burial Mounds of Japan: R. Hitchcock (Washington).—Shinto, or the Mythology of the Japanese: R. Hitchcock (Washington).—The Ox Bot in the United States: C. V. Riley (Washington).—U.S. Department of Agriculture, Report of the Entomologist for 1892 (Washington).—Department of Agriculture, Victoria, Report on a Poisonous Species of Homeria: D. McAlpine (Melbourne).—Zi-Ka-Wei Observatory, the "Bokhara" Typhoon, October, 1892: Rev. S. Chevalier (Shanghai).—Guide to Ben Nevis (Edinburgh, Menzies). Description of some Fossil Plants from the Great Falls, Coal Field of Montana: W. M. Fontaine (Washington).—On the Occurrence of the Spiny Boxfish on the Coast of California: C. H Eigenmann (Washington).—Report on the Actiniæ Collected by the U.S. Fish-Commission Steamer *Albatross*, during the winter 1887-88: J. P. McMurrich (Washington).—Massachusetts Institute of Technology. Boston, a brief Account of its Foundation, Character, and Equipment (Boston).—National Association for the Promotion of Technical Education, Sixth Annual Report, 1892-93.—Cholera Prospects and Prevention: R. Thorne Thorne (Allman).—L'Anthropologie aux Etats-Unis: Dr. P. Topinard (Paris, Masson).—Revised Report on the Copepoda of Liverpool Bay: J. C. Thompson (Liverpool).—On the Evolution of the Art of Working in Stone, J. D. McGuire (Washington).—Guide to Sowerby's Models of British Fungi in the Department of Botany, British Museum (Natural History), W. G. Smith (London).—Maupertuis, E. du Bois-Reymond (Leipzig, Veit.).

SERIALS.—Memoirs and Proceedings of the Manchester Literary and Philosophical Society, Vol. 7, Nos. 2 and 3 (Manchester).—Mittheilungen der Deutschen Gesellschaft für Natur und Völkerkunde Ostasiens in Tokio 51 Heft (Tokio). Aus dem Archiv der Deutschen Seewarte, xv. Jahrgang, 1892 (Hamburg).

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