ström 5269·4) in the second, and is good in the fourth and even fifth spectrum.

Flat grating, 2 × 3 inches, 1200 lines to one millimetre. Shows very many more lines in the B and A groups than were ever before seen.

Flat grating, 2 × 3¼ inches, 14,438 lines to the inch. This has most wonderful brilliancy in one of the first spectra, so that I have seen the Z line, wave-length 8420 (see Abney's map of the ultra-red region), and determined its wave-length roughly, and have seen much further below the A line than the B line is above the A line. The same may be said of the violet end of the spectrum. But such gratings are only obtained by accident.

Concave grating, 2 × 3 inches, 7 feet radius of curvature, 4818 lines to the inch. The coincidences of the spectra can be observed to the tenth or twelfth spectrum.

Concave grating, 2 × 3 inches, 14,438 lines to the inch, radius of curvature 8 feet. Divides the 1474 line in the first spectrum, the E line in the second, and is good in the third or fourth.

Concave grating, 3 × 5½ inches, 17 feet-radius of curvature, 28,876 lines to the inch, and thus nearly 160,000 lines in all. This shows more in the first spectrum than was ever seen before. Divides 1474 and E very widely, and shows the stronger component of Ångström 5275 double. Second spectrum not tried.

Concave grating, 4 × 5¾ inches, 3610 lines to the inch, radius of curvature 5 feet 4 inches. This grating was made for Prof. Langley's experiments on the ultra-red portion of the spectrum, and was thus made very bright in the first spectrum. The definition seems to be very fine, notwithstanding the short focus, and divides the 1474 line with ease. But it is difficult to rule so concave a grating, as the diamond marks differently on the different parts of the plate.

These give illustrations of the results accomplished, but of course many other experiments have been made. I have not yet been able to decide whether the definition of the concave grating fully comes up to that of a flat grating, but it evidently does so very nearly.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The following awards have been made at St. John's College for proficiency in natural science:—Foundation Scholarships to Bateson, Goodman; Exhibitions to Edmunds, Love, T. Roberts (already scholars), and to Acton, Andrews, Clementson. T. Roberts also received a Wright's Prize, with augmentation of scholarship to 100*l.* for the year. In the Open Exhibition Examination at Easter, H. Stroud (Owens College) was awarded a a Foundation Scholarship of 100, and Fuller (Perse School, Cambridge), 50*l.* for three years.

In the long list of lectures on Natural Science for the ensuing academical year, lately published, we note as new courses or features of special interest, Mr. Shaw's lectures on some Applications of the Higher Mathematics to Physics (Michelmas Term); Dr. Roberts's lectures on Physiography (Michaelmas Term); Prof. Hughes's Course of Dynamical Geology (Lent Term); Dr. Vines's complete course of advanced Botanical Study, extending through the year; Prof. Newton's lectures on the Evidence of Evolution in the Animal Kingdom, in the Michaelmas Term, and on the Geographical Distribution of Animals, in the Easter Term; and Prof. Balfour's announcement of his lectures and practical work, as Professor of Animal Morphology.

The annual report of the Botanic Gardens Syndicate details work done in improving the Gardens, and amongst valuable additions to the collection, the Tonga plant, recently introduced from the Fiji Islands. A special collection of medical plants has been formed, which already contains the most important hardy plants, and some of considerable rarity. About 8000 labels have been written during the year.

With regard to the recent Mathematical Tripos (in which Messrs. Welsh of Jesus College, and Turner of Trinity College, were respectively Senior and Second Wranglers), although the twenty-nine Wranglers may enter for a further advanced examination in January next, they are by no means compelled to do so. The examination, so far as it has already proceeded, includes very many of the subjects of the old Mathematical Tripos, and we anticipate that unless the colleges decline to elect to Fellowships Wranglers who do not proceed to the higher examination, many will rest content with the test already undergone. The recent talk about the "abolition of the Senior Wrangler" has not a very valid basis.

THE eighth annual meeting of the Yorkshire College was held at Leeds on Saturday, Sir Edward Baines in the chair. Prof. Marshall, the principal, made a satisfactory report, and a resolution of the council was confirmed to proceed with the completion of the new college buildings. On the proposition of the Mayor of Leeds (Alderman Tatham) it was resolved that, in memory of the late Lord F. Cavendish, M.P., the late president of the college, who for twelve years had been one of its foremost promoters, a fund be established for the endowment ot a Cavendish Professorship of Physics or for such other purpose as the council should deem best.

SCIENTIFIC SERIALS

Notes from the Leyden Museum, vol. iv. No. 2, April, 1882, contain: On American Diptera, by F. M. van der Wulf.—On new species of Lycidæ, Lampyridæ, and Telephoridæ, and on a new Sumatran species of Callimerus, by Rev. H. S. Gorham.—On new species of Pedilidæ and Anthicidæ, and on a new African species of Hister, by S. de Marseul.—On the Holothurians in the Leyden Museum, by Dr. H. Ludwig.—On some British Indian reptiles and amphibia, by Dr. A. Hubrecht.—On the Pselaphidæ and Scydmænidæ of the Sunda Islands by Dr. L. W. Schaufuss.—Description of a new species of Apogonia, by Dr. D. Sharp.—On a new species of Pantolamprus from Liberia, by Dr. E. Candèze.

Bulletin de la Soc. Imp. des Naturalistes de Moscou, tome lvi. No. 3, 1882, contains; V. Kiprijanoff, on fish remains in the Siwerischen Osteoliths (2 plates).—Dr. Max Schmidt, on *Bolborhynchus monachus*.—Prof. K. Lindeman, on *Coleophora tritici*, a new injurious Russian insect.—Dr. J. v. Bedriaga.—On the Amphibia and Reptiles of Greenland.—F. v. Thumen, contributions to the fungal-flora of Siberia.—N. Vischniakoff, on the *Ammonites distractus* of Quensted.—Prof. Bredichen, report on the tails of comets 1881 *b* and *c*.—Dr. E. Kern, on a new milk ferment from the Caucasus (2 plates).—Th. A. Sludski, on two inequalities taking place in the movement of the solar system (in Russian).—A. Becker, journey to Southern Daguestan.—M. Menzbier, comparative review of the ornithological fauna of Moscow and Toula.—A. Regel, Correspondence.

Zeitschrift für wissenschaftliche Zoologie, vol. xxxvi., part 4, 1882, contains J. Brock, on the anatomy and systematic position of the Cephalopoda (with plates 34 to 37).—O. Katz, contribution to a knowledge of the tegumentary system of the pouch and its several accompanying organs in the marsupials (with plates 38-40).—R. Rössler, contribution to the anatomy of the Phalangidæ (with plates 41 and 42).

Archives des Sciences Physiques et Naturelles, May 15.—Study on the chemical composition of albuminoid substances (continued), by A. Danilewsky.—Mean diurnal heights of Lake Leman, at Secheron, from 1874 to 1881, by P. Plantamour.—The rheolyser, by E. Hartmann.—Darwin considered as regards the causes of his success and the importance of his works, by Alph. de Candolle.

Sitzungsberichte und Abhandlungen der naturwissenschaftlichen Gesellschaft Isis in Dresden, July to December, 1881.—On some lime-spar crystals, by A. Pungold.—Flora of Dresden and its environs, by C. F. Schulze.—On the oldest traces of fossil plants in Saxony, by H. B. Geinitz.—On the progress of Geological researches in North America, by the same.—On the occurrence of Cenomanian petrefactions at Dohne, by J. v. Deichmüller. On the occurrence of the Riesengebirge races of *Pinus Montana*, Müll., in the Saxon-Bohemian Oberlausitz, by O. Drude.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, June 15.—"On an Arrangement of the Electric Arc for the Study of the Radiation of Vapours, together with the Preliminary Results." By Professors Liveing and Dewar.

By the arrangement described, the authors are able to make observations as the temperature rises and as it falls, and so to trace the influence of temperature in many cases in which the extent of that influence was before doubtful. The temperature

attainable is doubtless far below that of the arc, but still it is quite sufficient to maintain iron and aluminium in the state of vapour, and show the reversal of the lines of these elements with singular sharpness. The temperature of the interior is sufficiently high to transform the diamond into coke, even in a current of hydrogen, and the result may be taken as proving that the temperature is above that of the oxyhydrogen flame.

The apparatus is thus constructed:—A rod of carbon, 15 millims. in diameter, perforated down its axis with a cylindrical hole 4 millims. in diameter, is passed through a hole in a lime block, and is connected with the positive electrode of a Siemens' dynamo electric machine; another carbon rod, unperforated, is passed into the lime block through a second hole at right angles to the first, so that its end meets the middle of the other rod inside the block of lime. The second rod is connected with the negative electrode of the dynamo-machine, and after contact is made between the two rods, is raised a little, so that the arc discharge continues between the two carbon rods within the block of lime. In this way, the outside of the perforated rod or tube becomes intensely heated, the heat is retained by the jacket of lime, and the interior of the tube gradually rises in temperature, and attains in the central part a very high point. By stopping the arc it can be made to pass through the same stages of temperature in the inverse order. Observations are made by looking down the perforation. When the light issuing from the tube is projected by a lens on to the slit of a spectroscope, the heated walls of the tube give at top and bottom a continuous spectrum, against which various metallic lines are seen reversed, while in the central part, when the tube is open at the farther end, the spectrum is discontinuous, and the metallic lines seen reversed against the walls at top and bottom, appear as bright lines.

By passing a small rod of carbon into the perforation from the further end, a luminous background can be obtained all across the field, and then, as the walls of the tube are hotter than the metallic vapours between them and the eye, the metallic lines are only seen reversed. A very slight alteration in the position of the carbon rod makes the lines disappear, or reappear, or show reversal, and as the core is adjusted by eye-observation before photographs are taken, all the conditions of the experiments are thoroughly known and are under easy control. The authors have taken photographs of the violet and lower part of the ultra-violet spectrum given by the tube at successive intervals while the temperature was rising, and noted the following results. When commercial carbons were used the first lines to be seen as the temperature rose were the potassium lines, wave-length 4044-6, next the two aluminium lines between H and K became conspicuous, then the manganese triplet about wave-length 4034, and the calcium line, wave-length 4226, then the calcium lines near M and an iron line, probably M, between them, and then gradually a multitude of lines which seem to be all the conspicuous iron lines between O and *h*. At this stage, when the small rod is used to give a background, the bright continuous spectrum is crossed by a multitude of sharp dark lines, vividly recalling the general appearance of the solar spectrum. In the higher region the continuous spectrum extends beyond the solar spectrum, and the magnesium line, wave-length 2852, is a diffuse dark band, while all the strong iron lines about T, and the aluminium pair near S, are seen as dark lines. The behaviour of the calcium lines H and K is peculiar. These lines are often absent altogether, when the line wave-length 4226 and the two near M are well seen, and when the two aluminium lines between them and many of the iron lines are sharply reversed. Even the introduction of a small quantity of metallic calcium or calcium chloride into the tube did not bring them out reversed. They were only seen as bright lines, not very strong, when the small rod was removed.

In some of the photographs H is visible as a bright line without K. The authors have formerly observed that K shows reversal in the electric arc spectrum taken in a lime crucible on the addition of aluminium, when H remains bright, and such a condition as that shown by the hollow carbon tube when H is present without K, might legitimately have been predicted. The lithium lines at 4603 and 4131 are often bright when many other lines in the neighbourhood are reversed, and must therefore be regarded as relatively difficult of reversal. As a rule, the lines less refrangible than 4226 are balanced as to their emissive and absorptive power and therefore disappear, while the more refrangible are reversed. The cyanogen group at 3883 remain bright when the iron lines on either side are reversed; they often, however, disappear on the continuous spectrum. Many lines about P and Q of the solar spectrum are reversed. The cyanogen band above K is generally to be found in the photographs of the spectrum when only air is in the tube. It is then very faint, and is the only cyanogen group visible. If ammonia is passed into the tube the fine set above K, the N group, and, although less plainly marked, the set at 4218 appear. In one plate the thin lines at 4380 and the group of seven at 4600 appear along with the blue hydrocarbon set. It is well known that ammonia reacts on carbon at a white heat, producing cyanide of ammonium and hydrogen, so that the genesis of the cyanogen spectrum under the present conditions is a crucial test of the validity of the author's former observations on this subject.

Both the indium lines 4101 and 4509 are persistently reversed, together with several lead lines. Tin gives lines partly reversed in highly refrangible portions of the spectrum, and silver gives a fine fluted-looking spectrum in the blue. Chloride of calcium gives a striking set of six or seven bands about M, which may be seen both bright and reversed.

When the small rod is removed, it is easy at any moment to sweep out the vapours in the tube by blowing through it; it is equally easy to pass in reducing or other gases. Ammonia introduced seems to facilitate the appearance of reversed lines. On passing this gas through a tube containing magnesia, the set of lines just below *b*, which the authors have always found to be associated with the presence of magnesium and hydrogen, and is most probably due to some compound, instantly appear. When the authors can command several electric arcs to heat a considerable length of carbon tube, and are enabled to examine the radiation of a powerful arc passing through the vapour in the tube, valuable results may be anticipated.

Linnean Society, June 15.—Sir J. Lubbock, Bart., M.P., F.R.S., in the chair.—The following gentlemen were elected Fellows of the Society:—The Rev. R. Collie, Chas. A. Ferrier, J. D. Gibson-Carmichael, Sir J. R. Gibson-Maitland, Bart., W. D. Gooch, M. Murphy, Rev. H. A. Soames, H. C. Stephens, H. G. W. Stephens, and James Turner.—Mr. W. T. Thiselton Dyer exhibited specimens of *Equisetum giganteum* from Brazil, which is said to have aërial stems attaining 30 feet.—Mr. C. B. Clarke drew attention to a bundle of Hampshire *Orchis*, in support of his view regarding the *O. incarnata*, L.—Mr. H. N. Ridley showed a *Carex glauca* with two pediceled spikes and lower male spike, each arising from a complex utricle; and he also showed a specimen of *Lolium perenne* exemplifying transition from plumes to carpellary leaves.—Mr. G. J. Fookes exhibited and explained peculiarities of malformation in specimens of wallflower and *Clematis lanuginosa*, var. *alba*.—Sir John Kirk gave information concerning specimens of fruit leaves and the rubber of *Landolphia florida* obtained from the island of Pemba, North Zanzibar; and he showed native bells and rubber beaters from East Central Africa, pointing out the beaters were the only application of the rubber made use of by the negroes.—Sir J. D. Hooker read a paper on "*Dyera*," a new genus of rubber-producing plants belonging to the natural order Apocyneæ, from the Malayan Archipelago. The nearest affinity is with *Alstonia*, from which it differs in the sessile stigmas and singular pistils. Its flower is very minute, scarcely 1-8th of an inch long, and ovules of 1-200th of an inch diameter, yet these are succeeded by fruits of immense size.—The next communication was on the caoutchouc-yielding Apocynaceæ of Malaya and Tropical Africa, by W. T. Thiselton Dyer (for which see science notes).—Prof. E. Ray Lankester afterwards read notes on some habits of Scorpions. Of *Androctonus funestris*, Ehr., he referred to their manner of burrowing in the sand, making horizontal tunnels occasionally 8 inches long. The process of exuviation was described, the scorpion then pushing its large chelæ into the sand and scraping rapidly backwards with the three anterior pairs of walking legs. *Androctonus* in walking raises its body well from the ground, and carries the tail and sting arched over the back, thus differing from *Euscorpius*, which keeps the body low, and drags the tail behind, with only the very tip bent. *Androctonus* feeds at dusk, seizing its prey with the left chela, and, swinging the tail overhead, pierces its victim, and, afterwards grasping the body by the short cheliceræ, sucks the nutrient substances. The comb ordinarily is not sensitive, though it may be more so during the breeding season. Specimens of *Euscorpius* fought with each other, then using the chelæ, and not the sting.—Mr. G. Brook read a paper on a new genus of Collembola (*Sinella*), allied to

Degeeria, Nic. The former differs from the latter in possessing four, and not sixteen eyes, in the absence of the long abdominal hairs, and in the different construction of the claws and mucrones. —Mr. McLachlan made a communication on a Marine caddis-fly from New Zealand. Material for examination of this curious discovery having been received by the author from Prof. Hutton of Canterbury, New Zealand, who found larvæ, &c., in rock pools between high and low water-mark in Lyttleton Harbour. The small pupa case is surrounded with and strengthened by portions of a coralline. Mr. McLachlan finds that the caddis-fly in question has been referred to as a new genus, *Philanisus*, by Walker, and apparently the same form described by Brauer under the name of *Anomalostoma*, but neither of these entomologists seem to have known anything regarding the development or habits of the insect.—Prof. P. M. Duncan, in a paper on the genus *Pleurochinus*, L. Agass., now shows that the linking it with the fossil forms from Gand, as described by D'Archiac and Haime, is erroneous. The minute anatomy of its test corresponds closely with that of *Temnopleurus*, with which he places it as a sub-genus; it being distinct from *Temnochinus*, and the Nummulitic so-called Temnopleuridæ of D'Archiac and Haime.—Mr. F. M. Campbell gave his observations on a probable case of parthenogenesis in the house spider (*Tegeneria*). He submits that the fertility of one of the spiders he kept in confinement for 11 months, during which time she twice moulted and afterwards laid eggs, which were duly hatched, can only be explained by one of the two alternatives—(1) either impregnation must have occurred prior to the casting of the two exuviæ, and therefore in an immature stage; or (2) parthenogenesis takes place in the Aracnidea, of which no case (virgin reproduction) has hitherto been recorded in the true spiders. —A paper was read, on the indication of the sense of smell in Actiniæ, by Messrs. W. H. Pollock and G. J. Romanes. From their experiments, it appears probable that a kind of diffused olfactory sense is possessed by these lowly organised creatures. —Thereafter the following papers were read:—On the fungi of Queensland, Australia, by Messrs. M. J. Berkley and C. E. Broome; on a new Infusorian allied to *Pleuronema*, by F. W. Phillips; on *Teredo utriculus*, Gm., and other ship-worms, by S. Hanley; on a collection of ferns from the Solomon Islands, by J. G. Baker; and the fifteenth contribution to the Mollusca of the *Challenger* expedition, by the Rev. R. Boog Watson.—With a few remarks from the President, concluding the session, the meeting adjourned till November 2.

Meteorological Society, June 21.—Mr. J. K. Laughton, F.R.A.S., president, in the chair.—The following papers were read:—A new metal screen for thermometers, by the Rev. F. W. Stow, M.A., F.M.S. This screen differs from the ordinary Stevenson in the following respects:—(1) It is somewhat larger. (2) It has a single set of double zinc louvres. (3) It is partially closed at the bottom to cut off radiation from the ground. The advantages claimed for the use of zinc louvres are:—(1) The conductivity of metal causes the heat derived from the sun's rays to be distributed over every part of the louvres. (2) The louvres being much thinner than those of wood, the circulation of air through the screen is not only much greater absolutely, but much greater also in proportion to the bulk of the louvres. (3) The zinc louvres, therefore, are much more sensitive to changes of temperature than wooden ones. Comparative readings of thermometers in this screen, along with those in an ordinary Stevenson screen, were made during the summer of 1881. From these, the author is of opinion that the Stevenson becomes unduly heated when the sun shines, but this may be as much due to its small size as to the material of which the louvres are made. The thermometers in it are only three to five inches from the louvres at the back of the screen, against seven to eight inches in the zinc screen. The roof, too, is single, and the box is open at the bottom. The author also says that there is no need to condemn all wooden screens, but there does seem to be some reason to think that screens with metal louvres might be better.—On the effect of different kinds of thermometer cribs, and of different exposures in estimating the diurnal range of temperature at the Royal Observatory, Cape of Good Hope, by David Gill, LL.D., F.R.A.S. Meteorological observations were commenced at the Cape Observatory in 1841, when the thermometers were placed in a well-ventilated crib, before a south window, through which they could be read. The buildings were, unfortunately, burnt in 1852. A small wooden house with double roof, and affording a free passage of air, was then erected on the site of the old meteorological observatory. The instruments were placed in the middle of this building, and observations were recommenced on the same plan as before, and continued until the end of August, 1858. On September 1 the thermometers were transferred to a crib erected in front of the south-west window of the transit-circle room. This crib is well ventilated, except on the side next the transit-room window, but the great mass of solid masonry in the immediate neighbourhood of the thermometers appears seriously to affect the range of temperature. For many years a Glaisher stand has been in use, and at the end of 1880 the author caused a Stevenson screen to be erected in its immediate neighbourhood. In this paper the author gives results of observations made in the window, Stevenson and Glaisher screens, during the year 1881, from which it is evident that the exposure of the thermometers in the window crib gives a distinctly smaller, and on the Glaisher stand a larger, daily range of temperature than in the Stevenson screen.—Some account of a cyclone in the Mozambique Channel, January 14–19, 1880, by C. S. Hudson.—Rainfall of Frere Town, Mombassa, East Coast of Africa, 1875–1881, by R. H. Twigg, M.Inst.C.E., F.M.S.

Anthropological Institute, June 13.—General Pitt-Rivers, F.R.S., president, in the chair.—Mr. Mann S. Valentine, of Richmond, Virginia, exhibited a series of figures carved in steatite and mica schist, forming part of a large collection found by him in Virginia and North Carolina. The whole collection consists of some 2000 specimens, consisting of various animals and household utensils, cups, &c.; the human beings are all clothed, and are represented riding on animals and sitting on chairs, and indicating a remarkably advanced state of civilisation; and in some instances, obvious traces of contact with Europeans. Mr. A. H. Keane described the district in which the objects had been found, and the tribes that were known to have inhabited that country.—The following papers were read: Nepotism in Travancore, by the Rev. S. Mateer; the Laws of Madagascar, by Dr. W. G. Parker; and Cummer Co., Wexford, by G. H. Kinahan, Esq.

BERLIN

Physical Society, June 9.—Prof. Roeber in the chair.—Prof. Neesen described experiments on the relation between specific heat and temperature; and first, in the case of distilled water. In these, he used the method of cooling, and the ice-calorimeter; the manipulation of which he indicated. Each time, after filling the calorimeter, and before the heated substance was introduced, the mercury-column, whose displacement, due to the melting ice, was to be observed, showed spontaneous movements, first back and then forwards; which source of error could be partly avoided by using glass for the external envelope of the calorimeter, instead of the zinc-vessel. It further appeared, that the first two measurements always gave too small values, and were useless, probably because the ice, which was to be melted by the cooling body, was not at 0° C. at the beginning of the experiment, but at a lower temperature, and therefore a part of the communicated heat was used in heating to 0° C. The carefully purified distilled water, whose specific heat was to be ascertained, was in a platinum or glass capsule; in the former the soldering occasioned great difficulties, so that most experiments were made with glass. The measurements already made (they will be extended next winter) range in temperature from 2° to 30° C. (by a normal air-thermometer). If the directly observed changes of volume be taken as ordinates, and the temperatures as abscissæ, a curve is obtained, differing little from a straight line. A close examination of the numerical values shows that the mean specific heat of distilled water from 2° C. slowly increases to a maximum between 20° and 21°, beyond which, to 30°, it slowly decreases; but the divergences from the mean value are always very slight. According to the mercury-thermometer, the maximum of the specific heat is about 12° C., instead of 20°. Prof. Neesen does not regard the numerical values as absolute, but merely, for the present, indicative (*orientirende*); and he hopes to verify them by further measurements. —Dr. Hertz reported on experiments which he had made on the vapour-tension of mercury, by a different method from that lately described by Dr. Hagen. The vapour-tension was measured at high temperatures, and values were obtained which likewise were smaller than Regnault's, but greater than those found by Dr. Hagen. From his values, Dr. Hertz calculated a formula, according to which he produced a curve of the vapour-tension of mercury with varying temperature; its zero point being at absolute zero (−273° C.). For low temperatures 0° C., 10°, and 20°,

the values he deduces from his formula, are under those obtained experimentally by Dr. Hagen for the same temperatures.

BERLIN

Physiological Society, June 2.—President, Prof. du Bois-Reymond.—Prof. Kronecker reported upon the experiments which Dr. Melzer made to determine the action of the vagus and superior laryngeal nerves upon respiration. The idea that the action of the vagus in respiration has already been definitely determined, proved to be unwarranted by the facts of the case. It is known that stimulation of the nerve can both suspend inspiration and expiration; but the conditions of the opposed effects are still to be investigated. Now the experiments of Dr. Melzer have shown that these conditions are very manifold and complicated. In a succession of cases, it is the strength of the electric current that determines a particular effect; slight stimulation of the vagus, producing a cessation of respiration in inspiration, great stimulation producing the cessation in the position of expiration, whereas stimulation of medium intensities produced cessation in an intermediate position. Further, the condition in which the respiratory apparatus was at the moment of stimulation of the vagus, determined the results of the stimulation; the effect of an equal degree of stimulation during inspiration being exactly the reverse of what it would have been if applied during expiration. Simultaneous stimulation of the vagus and the superior laryngeal had likewise very diverse effects. If one nerve was more strongly stimulated than the other, the effects of the more strongly stimulated nerve overcame those of the other. If the stimulation in both was equally strong, the results were cessation, either in the position of deep expiration (this taking place when the vagus assisted the action of the superior laryngeal), or in an intermediate position when the two nerves acted antagonistically. Dr. Melzer has also had opportunities of observing individual differences in the action of the vagus, and supposes that the sex of the animal experimented upon may have some influence. Since Hunter's time there have been very few attempts to count the pillars in the electric organs of the Torpedoes, and his view as to their number was universally received as accurate. By the numerous careful countings of Prof. Fritsch, on the contrary, it was discovered that the number of the pillars only differed slightly in large and small specimens of the same species, being often even greater in small specimens than in large ones; embryos of Torpedoes were examined by him, and these already exhibited the same number of pillars as are to be met with in adult specimens of the same species. On the whole the number of pillars in several species of Torpedoes, which are to be regarded as "good species," is pretty nearly the same. It varies between 400 and 600; very large differences in the number of the pillars are to be regarded as "species-characters," and are to be taken into consideration in diagnosis. And from this point of view Hunter's results admitted of an explanation. For Herr Fritsch had an opportunity of seeing two preserved specimens of the American *Torpedo occidentalis* in Vienna. These were, in spite of their shrinking in the spirit, one metre long, and they turned out, when a calculation was made of the number in their electrical organ, to have more than 1000 pillars; it is hence probable that Hunter's giant electric rays were specimens of *Torpedo occidentalis* that were washed upon the English coasts by the Gulf-stream, and that Hunter's enumerations do not in the least contradict the doctrine of preformation.

PARIS

Academy of Sciences, June 19.—M. Jamin in the chair.—The following papers were read:—On the reaction-current of the electric arc, by MM. Jamin and Maneuvrier. With a Gramme machine and an arc between unequal carbons, or between some metal and carbon, there is a differential current, by which a galvanometer is affected—largely when copper, zinc, or mercury is used; little (and about equally) with lead, iron, and carbon: these latter show the greatest resistance. The current is explained, not by a difference of resistance, but by an inequality in the inverse reactions of the arc in the two directions. With a mercury arc, the differential current wholly changes the working of the machine, one system of currents being greatly weakened, while the other grows in strength.—On the reciprocal displacements of halogen substances, and on the secondary compounds which rule them, by M. Berthelot.—Separation of gallium, by M. Lecoq de Boisbaudran. He describes the separation from zirconium, manganese, and zinc.—M. du Moncel presented his work, "On the Microphone, Radiophone, and Phonograph."—Total eclipse of the sun observed at Souhag (Upper Egypt), May 17 (civil time), 1882, by M. Thollon.—Same subject: Observations of M. Trépied. He concludes as follows: The position of the green line of the corona corresponds exactly with that of 1474 (Kirchhoff). The relative intensities of dark lines do not seem to be preserved in the spectrum of bright lines. There seems to be a relation between the frequency of the spots and the structure of the corona. There was undoubtedly an increase of intensity of absorption lines in the group B, on the moon's contour; but the author cannot confidently infer a lunar atmosphere.—Same subject, by M. Pinseux.—The President, on a proposal by M. Dumas, asked the Astronomical and Navigation Sections to prepare a programme of observation for the solar eclipse in 1883.—A letter from M. Ferry announced the opening of the Volta competition for a second period of five years.—On a linear equation, by M. Darboux. The displacements through small dilatation or condensations produced in any indefinite homogeneous and isotropic medium, are calculable like a Newtonian attraction, by M. Boussinesq.—On the determination of carbonic acid in the air at Cape Horn, by MM. Müntz and Aubin. They describe apparatus for their method, furnished to Dr. Hyades, who has been familiarised with its use.—On the products of distillation of colophany, by M. Renard.—On microzymas as cause of the decomposition of oxygenated water, by the tissues of animals and plants, by M. Béchemp. He shows that the microzymas of different organs and tissues show unequal energy in action on oxygenated water. Numerical results are given in a table. The microzymas of the lung have the greatest activity; it is as great at first as that of bioxide of manganese, but soon diminishes. Microzymas of the blood and the liver rank next.—On various properties of hydrocyanic acid, by M. Brame. The bodies of animals poisoned with the acid remained in good preservation after a year, though sometimes exposed to 38° C. Preserved in closed vessels, they lose the smell of the acid, and acquire that of formiate of ammonia, which is found in the serous liquid. To embalm with the acid, a little of some substance which absorbs water while hardening (chloride of zinc) should be introduced after the acid.—Chemical composition of different layers of a lava current of Etna, by M. Ricciardi. There is more sesquioxide of iron in the parts in contact with aqueous vapour and atmospheric air.—Lithological determination of the meteorite of Estherville, Emmet County, Iowa (May 10, 1879), by M. Meunier.—On the branchia and circulatory apparatus of *Ciona intestinalis*, by M. Roule.—Comparison of alkaline chlorides as regards toxical power or minimum fatal dose, by M. Richet. These experiments, with chlorides of lithium, sodium, potassium, rubidium, and cæsium, were on guinea-pigs, and by injection under the skin. There seems to be no relation between atomic weight and toxical power.—M. Neujean, in a note, proposed manufacture of manures from the basic scoriæ (containing 10 to 15 per cent. of phosphoric acid) from Bessemer retorts, Martin furnaces, and others.

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