discussion of the hourly frequency and quantity of rain in a period of seven years (1878–84), derived from a self-registering Casella's hyetograph. The results do not seem of much practical importance. In the rainy season the rain is least frequent at the hour of maximum pressure, and most frequent at the coldest hour. At other seasons, dust-storms, with rain, are commonest in the evening. The greatest and least rainfall occur in general at the hours of greatest and least frequency.

III.—"The Meteorological Features of the Southern Part of the Bay of Bengal," by W. L. Dallas (pp. 11, and 1 plate). This is a discussion of the meteorology of a square district of 4° by 4° of the Indian Ocean, about half way between Ceylon and Sumatra, derived from the logs of ships. The air-pressure is at a maximum in January and at a minimum in May, with slight minima in July and October, which seem related to the occurrence of cyclones. The diurnal variation is extremely regular, the minima falling about 3h. 30m. and 15h 40m., and the maxima about 9h. and 22h. The range is markedly largest in April and September, *i.e.* at the two great seasonal changes. The mean temperature is 80°·9, and the range of the mean monthly temperature is only 3°, which is smaller than at any coast station: the diurnal range of the year is about 2°·7, varying from 3°·75 in April to 1°·8 in May, the maximum and minimum being thus close together. In the summer (south-west) monsoon calms are rare. From April to September the wind is pretty steady from south-west to west-south-west, and, from December to March, generally from north to north-east. Only thirteen gales are recorded in twenty-five years, and none of them over force 9 of the Beaufort scale.

Mr. Blanford's "Report" for 1884 is a discussion of the meteorology of India in 1884, on the same general plan as adopted for the ten years preceding. The discussion rests on observations supplied from 134 reporting-stations. Each meteorological element is discussed separately, beginning with the solar radiation as being the prime cause of all meteorological change; next, earth-radiation, temperature, humidity, cloudiness; and, lastly, rainfall. The great extent of India, and its isolation by ocean and mountain from other countries, render it a country most favourable for meteorological study. One singular feature is, that most considerable variations are of a somewhat lasting character, sometimes lasting two seasons, *e.g.* heavy snow in the spring in the Himálya is followed by steady north-west winds over the plains of Northern India, afterwards turning into the hot west winds.

The year under review was in some ways peculiar. Perhaps the most striking feature brought out is that, ever since 1878, the temperature of insolation and of the air have both steadily fallen, and were lowest in 1884 (1°·2 less than in 1878), although the sky was slightly less cloudy than in 1883: it seems likely that this is part of a cyclic change connected with that of the sunspots, the temperature being highest at the sunspot minimum, and *vice versâ*. The mean air-pressure was slightly (0″·01) above that of past years, and also much steadier. The average humidity was rather lower, and the average clearness of sky somewhat greater than in the recent years, and yet the total rainfall was somewhat greater: this was chiefly due to excess of rain in North-West, Central, and South-East India. Heavy snow fell in the North-West Himálya early in the year, bringing rain to the North-West Punjab, and dry north-west winds in North India generally, followed by a hotter summer than usual. The south-west monsoon bringing the rain sets in in North India in June. The storms of the year were somewhat singular. From July to September a series of cyclones formed in the Bay of Bengal, and followed a north and west course far into the plains of India: this course seems to be the usual cyclone track of the Bay of Bengal. One of these, in July, crossed the entire breadth of India, and one, in September, lasted over a fortnight. Heavy snow fell in the outer Himálya in September and October, followed by north-west winds in North India, and by an unusually cool winter in India generally. Twelve charts accompany this Report, showing the mean monthly temperature, air-pressure, and wind; the isotherms, isobars, and wind-resultants being plotted in colours on each monthly chart. This annual Report, of which a very brief summary only is here given, is the outcome of an enormous amount of labour: the detailed tables of data covering 305 quarto pages, these tables being themselves mostly the result of laborious computation from the data furnished by the observatories.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The Mathematical Examiners have bracketed as Senior Wranglers Messrs. Baker and Flux of St. John's, and Iles and Michell of Trinity. It is unprecedented to have a bracketed Senior Wrangler. No women students have this year been placed as Wranglers.

The following women students have been placed in the first class of the Natural Sciences Tripos, Part I., E. E. Field, A. J. Flavell, and M. M. Smith, all of Newnham College.

The Honorary Degree of Doctor in Science has been conferred on Prof. Asa Gray, of Harvard.

SCIENTIFIC SERIALS.

Annalen der Physik und Chemie, No. 6, June.—R. Emden, on the vapour-pressures of saline solutions. Criticism of prior results, and fresh experiments conducted according to the method of Konowalow. Babo's law, that the vapour-tension of saline solutions is always proportional to that of pure water at the same temperature, is shown to be true between 20° C. and 95° C.—Max Planck, on the principle of increase of entropy. Application of this principle in the study of dissociation of gases.—C. R. Schulze, on the amount of water of crystallization held in various salts. Proves the existence of a new form of sulphate of magnesia having density 1·8981, containing six molecules of water, and therefore differing from Mitscherlich's salt of same composition of density 1·6151.—W. Voigt, on the theory of light for absorbing isotropic media. A development of the theory propounded by the author three years ago.—C. L. Weber, on the galvanic conductivity of amalgams. The amalgams examined were of tin, bismuth, lead, cadmium. Addition of tin increases conductivity of mercury; bismuth increases it until 10 per cent. of bismuth has been added, after which further addition decreases the conductivity; lead shows a maximum at about 25 per cent.; cadmium produces a steady increase in conductivity.—Adolf Koepsel, determination of magnetic moments and absolute strength of currents by means of the balance. The method is due to R. von Helmholtz, and is independent of the earth's magnetic field or its variations. The author has made by this method a new determination of the electro-chemical equivalent of silver, which he gives as 0·011740 ± 0·0000022 in C.G.S. measure. Lord Rayleigh's value was 0·011794.—Walter König, magnetic researches on crystals. A very careful research on magnetic susceptibility of quartz and calc-spar in magnetic fields of various degrees of intensity. The two principal permeabilities in calc-spar possess a constant difference in fields of various strengths up to 3000 C.G.S.; for quartz, the difference diminishes as the field is strengthened, and is less than that of calc-spar.—R. Clausius, reply to some remarks of Lorberg upon dynamo-electric machines.—A. Foeppl, electricity as an elastic fluid. A speculative paper: the author thinks the existence of the Hall effect a criterion of his theory.—K. Wesondonck, on the absence of polar difference in spark-potential.—G. Meyer, note on the index of refraction of ice; the value for sodium light is 1·3133.—E. Ketteler, on the dispersion of rock-salt. The author thinks he has established the law that the absorbing power of substances for heat-rays is proportional to the negative coefficient of the term in λ^2 in the formula which he uses in place of Cauchy's for the law of dispersion.—W. Voigt, reply to Wernicke's remarks on elliptic polarization.—F. Braun, on the diminution of the compressibility of solutions of sal-ammoniac with increase in temperature.—A. Overbeck, on the signification of the absolute system of measurement.

SOCIETIES AND ACADEMIES.

LONDON.

Geological Society, May 25.—Prof. J. W. Judd, F.R.S., President, in the chair.—The following communications were read:—On the remains of fishes from the Keuper of Warwick and Nottingham, by Mr. E. T. Newton; with notes on their mode of occurrence by the Rev. P. B. Brodie and Mr. E. Wilson.—Considerations on the date, duration, and conditions of the Glacial period with reference to the antiquity of man, by Prof. Joseph Prestwich. After showing how the discoveries in the valley of the Somme and elsewhere, twenty-eight years ago, led geologists who had previously been disposed to restrict the age of man to exaggerate the period during which the human race had existed, the author proceeded to

discuss the views of Dr. Croll on the date of the Glacial epoch. Dr. Croll, who had at first referred this to an earlier phase of orbital eccentricity, commencing 980,000 years ago, subsequently regarded it as coinciding with a minor period of eccentricity that commenced 240,000 and terminated 80,000 years since. This last estimate was chiefly supported by the amount of denudation that had subsequently taken place. The efficacy of the increased eccentricity of the earth's orbit in producing the cold of the Glacial epoch was shown to be very doubtful; for as similar changes in the eccentricity had occurred 165 times in the last 100 millions of years, there must have been many glacial epochs in geological time, several of them much more severe than that of the Pleistocene period. But of such glacial epochs there was no valid evidence. Another inference from Dr. Croll's theories, that each glacial epoch consisted of a succession of alternating cold and warm or interglacial phases, was also questioned, such alternations as had been indicated having probably been due to changes in the distribution of land and water, not to cosmical causes. The time requisite for such interglacial periods as were supported by geological evidence was more probably hundreds than thousands of years. Recent observations in Greenland by Prof. Helland, Mr. V. Steenstrup, and Dr. Rink, had shown that the movement of ice in large quantities was much more rapid, and consequently the denudation produced much greater than was formerly supposed. The average rate of progress in several of the large iceberg-producing glaciers in Greenland had been found to be 36 feet daily. Applying these data and the probable accumulation of ice due to the rainfall and condensation to the determination of the time necessary for the formation of the ice-sheet, the author was disposed to limit the duration of the Glacial epoch to from 15,000 to 20,000 years, including in this estimate the time during which the cold was increasing, or preglacial time, and that during which the cold was diminishing, or postglacial time. Details were then given to show that the estimate of 1 foot on an average being removed from the surface by denudation in 6000 years, on which estimate was founded the hypothesis of 80,000 years having elapsed since the Glacial epoch, was insufficient, as a somewhat heavier rainfall and the disintegrating effects of frost would produce far more rapid denudation. It was incredible that man should have remained physically unchanged throughout so long a period. At the same time, the evidence brought forward by Mr. Tiddeman, Dr. Hicks, and Mr. Skertchly of the occurrence of human relics in preglacial times, had led the author to change his views as to the age of the high-level gravels in the Somme, Seine, Thames, and Avon valleys, and he was now disposed to assign these beds to the early part of the Glacial epoch, when the ice-sheet was advancing. This advance drove the men who then inhabited Western Europe to localities such as those mentioned which were not covered with ice. Man must, however, have occupied the country but a short time before the land was overwhelmed by the ice-sheet. The close of the Glacial epoch, *i.e.* the final melting of the ice-sheet, might have taken place from 8000 to 10,000 years since. Neolithic man made his appearance in Europe 3000 to 4000 years B.C., but may have existed for a long time previously in the east, as in Egypt and Asia Minor civilized communities and large States flourished at an earlier date than 4000 B.C. After the reading of the paper there was a discussion, in which the President, Dr. Evans, Dr. Geikie, Prof. Boyd Dawkins, Dr. Hicks, and others took part. —Notes on some Carboniferous species of *Murchisonia* in our public museums, by Miss Jane Donald. Communicated by Mr. J. G. Goodchild.

Zoological Society, June 7.—Mr. E. W. H. Holdsworth, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of May, and called attention to a Tooth-billed Pigeon (*Didunculus strigirostris*) brought home from the Samoan Islands, and presented to the Society by Mr. Wilfred Powell; to two Red-spotted Lizards (*Eremias rubro-punctata*) obtained at Moses' Well, in the Peninsula of Sinai, and presented to the Society by Mr. G. Wigan; and to a small scarlet Tree-Frog (*Dendrobates typographus*) from Costa Rica, presented to the Society by Mr. C. H. Blomefield.—Mr. Sclater called attention to examples of two North American Foxes now living in the Society's Gardens, which he referred to *Canis velox* and *C. virginianus*.—A communication was read from Mr. A. O. Hume, containing some notes on *Budorcas taxicolor*, the Gnu-goat or Takin of the Mishmee Hills, and some remarks on the question of the form of the horns in the female of this animal.—A communication was read from Mr. E. Symonds, containing notes on various species of Snakes met with in the vicinity of Krounstadt, Orange Free State, specimens of which had been forwarded to Mr. J. H. Gurney, and determined by Dr. Günther.—Mr. Martin Jacoby, gave an account of a small collection of Coleoptera obtained by Mr. W. L. Sclater in British Guiana.—Prof. G. B. Howes, read a paper on a hitherto unrecognized feature in the larynx of the Anurous Amphibians. This was the existence in many individuals of various species of a rudimentary structure, which appeared to correspond to the epiglottis of Mammals, and which in some instances attained a remarkable development as an organ of voice.

Institution of Civil Engineers, June 7.—Annual General Meeting.—Mr. Woods, President, in the chair.—The Report of the Council on the condition of the Institution, and the annual statement of the accounts, were received. The number of members on the roll of the Institution, on March 31, 1887, was 4347, of whom 20 were honorary members, 1568 members, 2275 associate members, and 484 associates. This was a net increase of 173, or 4·19 per cent., on the 4174 members of all classes recorded last year. The elections had included 34 members, 234 associate members, and 6 associates, while the deaths, resignations, and erasures were 106. Many deaths had occurred among the older members of the Institution during the past twelve months, chief among whom must be placed Sir Joseph Whitworth, whose world-wide renown as a mechanician it was unnecessary to dwell upon. By his will he bequeathed to the Institution 80 shares, of £25 each, in the firm of Sir Joseph Whitworth and Company, Limited. During the twelve months under review, 211 candidates were admitted as students. On the other hand, 82 were elected into the corporation as associate members, and 106 ceased, from various causes, to belong to the class. The total number of students on March 31 last was 949, as against 926 at the same date in 1886. There were twenty-six ordinary meetings during the session, when twenty original communications were read and discussed. The Howard Quinquennial Prize had been adjudged to Dr. John Percy, in recognition of his researches on the uses and properties of iron. To the authors of some of the papers read and discussed at the ordinary meetings medals and premiums had been awarded, viz.: Telford Medals and Telford Premiums to Alexander B. W. Kennedy, Dr. J. Hopkinson, Colonel E. Maitland, and W. Willcocks; a Watt Medal and a Telford Premium to E. A. Clowes; Telford Premiums to W. J. Dibdin, W. S. Crimp, J. J. Webster, and J. Kyle; and the Manby Premium to L. H. Ransome. For papers printed in Section II. of the Proceedings, without having been publicly discussed, the following awards had been made: a Telford Medal and a Telford Premium to J. G. Gamble; a Watt Medal and a Telford Premium to W. J. Last, and Telford Premiums to J. Hetherington, K. W. Hedges, C. J. Wood, A. Leslie, and D. A. Stevenson. Twelve students' meetings had been held on alternate Friday evenings, at which thirteen papers were read and discussed.—The ballot for Council resulted in the election of Mr. G. B. Bruce, as President; of Sir John Coode, Mr. G. Berkley, Mr. H. Hayter, and Mr. A. Giles, M.P., as Vice-Presidents; and of Mr. W. Anderson, Mr. B. Baker, Mr. J. W. Barry, Sir Henry Bessemer, F.R.S., Mr. E. A. Cowper, Sir James N. Douglass, Sir Douglas Fox, Mr. C. Hawksley, Mr. J. Mansergh, Mr. W. H. Preece, F.R.S., Sir Robert Rawlinson, C.B., Sir E. J. Reed, K.C.B., F.R.S., M.P., Mr. W. Shelford, Mr. F. C. Stileman, and Sir William Thomson, F.R.S., as other Members of Council.

Chemical Society, June 2.—Mr. William Crookes, F.R.S., President, in the chair.—The following papers were read:—The equivalent of zinc, by Lieut.-Colonel Reynolds, late R.E., and Prof. W. Ramsay.—The magnetic rotation produced by chloral, chloral hydrate, and hydrated aldehyde, by Dr. W. H. Perkin, F.R.S.—Note on a new class of voltaic combinations in which oxidizable metals are replaced by alterable solutions, by Dr. C. R. Alder Wright and Mr. C. Thompson. It appeared to the authors probable that just as a liquid capable of parting with oxygen, chlorine, &c., can be used in conjunction with an electrode of unchangeable material at one side of a voltaic cell (as in Grove's nitric acid battery and analagous combinations), or may be replaced by a solid conducting electrode, itself capable of losing oxygen (*e.g.* a plate of strongly compressed peroxide of lead), so conversely might a conducting plate of oxidizable material (*e.g.* zinc) at the other side be replaced by an unchangeable electrode in conjunction with a liquid capable of taking up oxygen, chlorine, &c., without producing any fundamental change in the character of the actions

taking place in the cell whilst generating a current. The electrode immersed in this oxidizable substance, like the zinc of an ordinary cell, would acquire the lower potential, and the opposed plate the higher potential; *i.e.* the wire connected with the latter would be the "positive pole" of the construction in reference to the external circuit. On trial, it has been found that such is the case, and that in consequence a large variety of novel forms of cell becomes easy of construction. For example, sodium sulphite or potassium ferrocyanide solution opposed to chromic-sulphuric acid solution; preferably with an intermediate layer of some neutral salt solution, such as sodium sulphate, to prevent the direct action of the two fluids on one another. During the passage of a current, sodium sulphate or potassium ferrocyanide is formed in quantity proportionate to the electricity passing, *i.e.* to the amount of silver thrown down in a silver voltameter included in the circuit; whilst chromium sulphate is produced at the other side Various analogous cells are described, in particular one where lead oxide dissolved in caustic soda is opposed to alkaline hypobromite: in this case lead dioxide is produced and separates out in the solid form; and one where chromium sesquioxide dissolved in caustic soda is opposed to chromium trioxide dissolved in sulphuric acid; here sodium chromate and chromium sulphate are formed, an E.M.F. about equal to that of a Daniell cell being set up.—The composition of Prussian blue and Turnbull's blue, by Mr. Edgar F. Reynolds.—Phlorizin, by Prof. E. H. Rennie.—Further notes on the chemical action of *Bacterium aceti*, by Mr. Adrian J. Brown.—Note on the cellulose formed by *Bacterium xylinum*, by Mr. Adrian J. Brown.—The oxidation of ethyl alcohol in the presence of turpentine, by Mr. C. E. Steedman, Williamstown, Victoria.

Royal Microscopical Society, May 11.—Rev. Dr. Dallinger, F.R.S., President, in the chair.—Mr. Crisp called attention to a number of slides of hair which Dr. Ondaatje, of Ceylon, had forwarded to the Society with a request for information as to its peculiarities of structure; also to a donation by Mr. Deby of sixty-two slides, chiefly of Micro-Hymenoptera, which came from the collection of the late Mr. F. Smith.—Mr. J. Mayall, Jun., said that he took it for granted that the Fellows were interested in whatever concerned the history of the microscope, and would therefore be glad of any new facts which tended to throw light upon the subject. He had lately come across evidence which showed that magnifying glasses were used at least as early as 1513–20, for, in the celebrated portrait of Leo X., by Raphael, the Pope is shown holding one in his hand. The picture was painted between 1513 and 1520, as the Pope was elected in 1513 and Raphael died in 1520. He brought to the meeting a large volume (lent for the purpose by Mr. Quaritch) which contained an engraving of Raphael's portrait of Leo X. During a recent visit to Florence he also paid some attention to the microscopes which had been attributed to Galileo. It was of course rather difficult to say in such matters what was really authentic and what was not. He could not, however, help noting that all the telescopes made in 1660, or about that time, had cardboard tubes, and wood or horn cells for the lenses, whereas these microscopes were made with substantial brass body-tubes with strong and well-made screw threads and firm tripod support. He could only say, therefore, that if the microscope-makers had arrived at that stage of perfection in Galileo's time, they had reached a point not attained by his successors until many years afterwards.—Mr. J. Mayall, Jun., also exhibited a microscope which had come from Japan. It was made after one of the old upright tripod models and had a ring of inlaid silver ornamentation at both top and bottom.—Dr. Maddox's paper, on the different tissues found in the muscles of a mummy, was read.—Professor Bell gave an account of a recent visit which he had paid to M. Pasteur's laboratory in Paris.—Mr. Deby called attention to a series of double-stained sections of the rare parasitical plant, *Brugmansia Lowii*, one of the Rafflesiæ, but differing in its being hermaphrodite. It grows on the overground roots of a species of Cissus, and was collected by him in 1884 in the Raritau range of mountains in Central West Sumatra. The sections showed the development of the plant from the time it begins to raise the bark of its host as a minute tubercle up to the complete maturity of its ovules. The double staining allows of distinguishing between the tissues of the parasite and of its host, which in unstained sections cannot be determined. The formation of the locula of the ovary is very remarkable, and partakes more of a fungoid growth than phanerogamic.

PARIS.

Academy of Sciences, June 6.—M. Janssen in the chair.—Researches on the density of sulphurous acid in the state of liquid and of saturated vapour, by MM. L. Cailletet and E. Mathias. Having already described the method employed by them for determining the density of ethylene, of the protoxide of nitrogen, and of carbonic acid as liquids and saturated vapours, the authors here generalize their method by applying it to the study of a substance (sulphurous acid), whose critical point, approaching 156° C., is much higher than that of the former gases. Their researches show that the densities of the liquid and of the saturated vapour have a common limit, which is opposed to the conclusion arrived at by Avenarius; also that the critical density is 0·520.—Heats of combustion, by MM. Berthelot and Recoura. Continuing their studies of the heats of combustion by the new calorimetric method, the authors have determined the mean for glucose at 3·762 calories; for quinone, 6·102; for napthalene, 9·688; for benzoic acid, 6·345; and for salicylic acid, 5·326. These studies are being continued with a view to determining the heat of combustion of liquid and volatile bodies, and the measure of the heat of combustion of pure carbon in its various states. Notwithstanding its fundamental importance for calculating the heats of formation of organic compounds, this element has been neglected since the time of Favre and Silbermann.—Heats of combustion, by MM. Berthelot and Louguinine. Mean determinations are given for several compounds, such as napthalene, 9·6961 calories; phenol, 7·8105; benzoic acid, 6·3221; cuminic acid, 7·5533; quinone, 6·0613; hydroquinone, 6·2295; pyrogallol, 5·0262.—A new endless tape odograph, by M. Marey. The ingenious instrument here described has been prepared for the purpose of automatically recording the velocity of men walking or running with or without burdens, and under the varying conditions of level or inclined, smooth or rugged tracks, with or against the wind, and so forth. It is especially applicable for determining the marching capacity of troops, as well as the velocity of locomotives and other engines, of water and atmospheric currents.—Action of oil on troubled waters, by Admiral Cloué. The author has studied the results of over two hundred experiments, made especially in England and the United States, and concludes that the question is now definitely settled. There can no longer be any doubt that oil has a most efficacious effect in calming storm-tossed waters, and thus saving vessels in danger of foundering at sea. Fish oils appear to be the best, mineral oils owing to their lightness the least effective, but kitchen refuse of all sorts and similar substances floating compactly on the surface, tend to produce the same result.—On the character and results of the improved methods of amputation lately introduced into hospitals, by M. Trélat. The author's observations for the Charité and Necker Hospitals in Paris show that since 1880, when the antiseptic methods came into general use, the mortality under all kinds of amputations has fallen from 50 and upwards to an average of about 15 per cent.—On the density of the celestial vault, in relation to the radiant-points, by M. Alexis de Tillo. According to their right ascensions the 1315 radiant-points of the northern hemisphere are shown to be disposed in such a way as to make it evident that the regions traversed by the Milky Way (0°–90° and 270°–360°) have a perceptibly greater meteoric density than the others (90°–180° and 180°–270°) which lie mainly beyond that stellar zone.—On the melotrope, a new musical apparatus, by M. J. Carpentier. This instrument is intended to serve as a complement to the recently described melograph, the automatic records of which it faithfully reproduces on any piano. But it may also be so adjusted as to constitute itself an independent instrument suitable for the performance of automatic music generally.—Action of an electro-static field on a variable current, by M. Vaschy. It is shown that in a magnetic field of varying intensity a closed conductor placed in this field is traversed by induced currents, and in general there arises in each point of the space an electric force capable of being calculated. In other words, the variations of the magnetic field develop a true electrostatic field exercising a mechanical action on the electrified bodies. In virtue of the principle of equilibrium between action and reaction, the latter must react on the magnets or variable currents to which is due the magnetic field.—On the conductibility of abnormal salts and of acids in extended solution, by M. E. Bouty. The author's previous conclusion is here confirmed, that in respect of their conductibility these acids differ greatly from each other, not even excepting sulphuric, nitric, and hydro-

chloric acids ; further, that these varying degrees of conductibility are not directly comparable with those of the neutral salts. —On cyanoacetic acid, by M. Louis Henry. These researches show, as anticipated, that the hydrogen element (CH_2) in this acid, $CN—CH_2—CO(OH)$, has a basic character ; also that the acid itself may be obtained in well-defined and perfectly white crystals, and that it dissolves, not at 55° C., as indicated by Van't Hoff, but at 65°-66° C.—On the periodicity of magnetic perturbations and solar rotation, by M. Ch. V. Zenger. A comparative study of observations recorded at the Parc Saint-Maur and Paulovsk Observatories shows that the dates of magnetic perturbations largely coincide either with the days of the solar period or with those of the periodic shooting-stars. This coincidence is observed at points far distant from each other on the surface of the globe, and in years of least (1878) as well as of greatest solar activity (1883-84).

BERLIN.

Physiological Society, May 27.—Prof. Munk, President, in the chair.—Dr. Lœwy spoke on the respiratory centre in the medulla oblongata. His experiments were carried out on rabbits in the laboratory of Prof. Zuntz. He found that severing the medulla from the brain had no influence on either the frequency, depth, or rhythm of the respiration. On cutting one vagus in the animal operated upon as above, he observed a slight slowing of the respiratory movements ; in order to produce any marked alteration of the respiration, he found it necessary to cut both vagi. After this operation the frequency of the movements was considerably lessened, the inspirations being very deep, while the expirations either did not take place at all, or were passive : in some few cases active expiration continued. The volume of the respired air was considerably diminished, while the rhythm was normal. By the above experiments it was shown that the centre in the medulla is able to maintain the rhythm of the respiratory movements after it is severed from both the brain and the peripheral parts of the vagi. Moreover the centre when thus isolated was found to be equally susceptible to stimuli, whether applied directly or arriving from the periphery, as when it was still connected with the brain and lungs. In one experiment after the medulla was separated from the brain and both vagi were divided, the spinal cord was cut through, and the muscles of the hind-limbs tetanized ; this produced a quickening of the respiratory movements similar to that observed in normal animals, in accordance with the experiments of Zuntz and Geppert. (Muscular contractions lead to the formation of some product of their metabolism which has not yet been isolated, but which stimulates the respiratory centre when brought to it in the blood.) Similarly an excess of carbonic acid gas in the respired air had the same stimulating effect on the isolated respiratory centre as on the centre of normal animals. The irritability of the centre was not altered either qualitatively or quantitatively by its severance from the brain and lungs ; thus equal percentage increments of carbonic acid gas in the respired air produced an equal increase of the respiratory movements in animals with isolated and unisolated respiratory centre. Dr. Lœwy has also endeavoured to find experimentally an answer to another important question connected with respiration. The vagus, as is well known, is the only nerve that is in a state of continuous stimulation. Hering and Breuer have explained this as the result of the distension of the lung-alveoli during respiration, which acts as a stimulus to the endings of the vagus in the lungs. But inasmuch as they found that this continuous stimulation of the vagus does not entirely disappear when the lungs are no longer distended, after making an incision into the thorax, they assumed the existence of other unknown factors to explain the phenomenon. Dr. Lœwy spoke against this view, pointing out that even in the collapsed lungs the alveoli are distended beyond their real size and that they are of normal size only in the atelectatic lung, and will then no longer stimulate the endings of the vagus. Experiments made by him confirmed this opinion : by occluding the bronchus of one lung, this lung became completely atelectatic, and then the vagus of the other side was severed. The immediate result of this was a considerable diminution in the frequency of the respiratory movements, greater in fact than is usually observed by section of only one vagus. Subsequent section of the vagus of the atelectatic lung produced no further effect on the respiration, thus showing that this vagus was not in a state of tonic stimulation.—Dr. Gad has carried on researches in his laboratory on the reaction-time for stimulation and inhibition. The experiments were made on the masseter muscle of man ; the lower jaw was fixed so that the muscles antagonistic to the masseter did not come into play, and the contraction or relaxation of the muscle was graphically recorded on a Marey drum by means of a specially constructed muscle forceps. The experiments showed that as nearly as possible the same time elapsed between a given signal and the subsequent contraction of the muscle as between the given signal and its relaxtion. According to this, the will has an equally exact control of the inhibitory as of the stimulatory process.—Dr. Benda recommended the use of the kidney of mice for studying the structure of the glomeruli, and demonstrated this structure on a series of preparations which he exhibited.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

A B C Five-Figure Logarithms : C. J. Woodward (Simpkin).—Elementary Microscopical Technology, Part 1 : Dr. F. L. James (St. Louis).—Summary and Review of International Meteorological Observations, July to December 1885 (Washington).—Histoire des Sciences Mathématiques et Physiques, tome xi. : MM. Marie (Gauthier-Villars, Paris).—A Dictionary of Philosophy : J. R. Thomson (Dickinsons).—Results of Observations of the Fixed Stars made with the Meridian Circle at the Government Observatory, Madras, in the years 1862-63-64 : N. R. Pogson (Madras).—Rustic Walking Tours in the London Vicinity : W. R. Evans (Philip).—Encyclopædia Britannica, 9th ed., vol. xxii. (Black, Edinburgh).—Ocean Birds : J. F. Green (Porter). —Philips' Handy-Volume Atlas of the World (Philip).—Scala Naturæ : J. Cleland (Douglas, Edinburgh).—British Dogs, No. 8 : H. Dalziel (Gill). —Annals of the Astronomical Observatory of Harvard College, vol. xvii. The Almucantar : S. C. Chandler (Cambridge, Mass.).—Higher Algebra : Hall and Knight (Macmillan).—Beiträge zur Biologie der Pflanzen, Vierter Band, Drittes Heft (Breslau).—Journal of the Liverpool Astronomical Society, vol. v.—Bulletin of the U.S. National Museum, No. 31.—Synopsis of the North American Syrphidæ : S. W. Williston (Washington).

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