

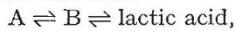
Societies and Academies.

LONDON.

Royal Society, November 5.—L. Ballif, J. F. Fulton, and E. G. T. Liddell: Observations on spinal and decerebrate knee-jerks, with special reference to their inhibition by single break-shocks. Simultaneous mechanical torsion-wire myograph and electrical records have been obtained of knee-jerks in decerebrate and spinal preparations. The spinal knee-jerk differs from the decerebrate: the mechanical response of the spinal jerk is two to three times longer in duration than that of the decerebrate jerk (or the motor twitch); the curve of relaxation of the spinal jerk is different; the electrical response tends to be more prolonged in the spinal knee-jerk; the interval between the tap and the electrical response is greater in the spinal preparations; and the spinal jerk is more difficult to elicit. The shortest spinal knee-jerk observed seems to be produced by a repetitive discharge of at least 4 to 8 volleys of impulses recurring somewhat asynchronously at 100 to 200 per sec. Both spinal and decerebrate knee-jerks may be inhibited by a single appropriately timed break-shock applied to an ipsilateral afferent nerve, the former much more readily than the latter. When recovering from an inhibition, the spinal knee-jerk has the same duration as a twitch or a decerebrate knee-jerk.—K. Furusawa: (1) Muscular exercise, lactic acid, and the supply and utilisation of oxygen. Pt. xiii. The gaseous exchanges of restricted muscular exercise in man. A simple ergometer, capable of being worked at any speed by the arms, has been constructed. As regards oxygen requirement, there is a marked optimal speed but no optimal load. Oxygen intake rises much more slowly to its maximum value than it does in the case of exercise involving most of the muscles of the body. It seems that lactic acid produced in excess by violent activity of a localised group of muscles may diffuse from them into the blood, and thence to other parts of the body (particularly resting muscles and liver), and there be removed or restored to glycogen under the influence of oxidation occurring in those tissues. There appears, therefore, to be possibility of an exhaustion due to complete using up of lactic-acid precursor, when the exercise involved is localised in a small group of muscles. (2) A spirometer method of studying continuously the gaseous metabolism of man during and after exercise. A new method is described of studying continuously the rapidly altering gaseous metabolism of man during and after muscular exercise. A spirometer of large capacity is used, the gases inside it being kept continuously stirred, the total ventilation being measured every 10 litres, and samples being abstracted at intervals for analysis.—D. T. Harris: The effect of light on the circulation. Irradiation of a localised area of skin with ultra-violet energy causes a widespread peripheral vaso-dilatation. Consequently, only a very slight transitory rise of blood-pressure results from the small increase in pulse rate of from two to five per minute in dark and white subjects respectively. The reaction was always less in pigmented subjects. The vaso-dilator response to ultra-violet radiation is enhanced by a previous exposure; this is not the case with radiant heat. The vascular response appears to be a nervous reflex initiated by a noxious stimulus; the whole phenomenon is one of incipient injury.—A. V. Hill: The surface tension theory of muscular contraction. The amount of lactic acid liberated when a muscle fibre 1 cm. long develops a force of 1 dyne is 1.46×10^{-11} gm. This is very

nearly 10^{11} molecules. Spread out in a continuous mono-molecular film these would occupy about 2.1×10^{-4} sq. cm. If the mechanical response of muscle were due to a change of surface tension caused by such a film, the coefficient of surface tension required would be about 4800 dynes per centimetre. This is about 230 times the tension of a water—olive-oil interface, clearly an impossible value. Reckoned per gm. of muscle, the amount of lactic acid liberated in a maximal contraction of a frog's muscle is about 0.033 mgm., which would occupy an area of about 470 sq. cm.; *i.e.* about the surface area of the fibres composing the muscle.—J. F. Fulton and E. G. T. Liddell: Electrical responses of extensor muscles during postural (myotatic) contraction. Simultaneous mechanical and electrical records have been obtained of the responses of quadriceps femoris and rectus femoris of decerebrate cats to various forms of postural (myotatic) reflex. The knee-jerk seems to be produced by a somewhat asynchronous volley of impulses. The comparative absence of electrical responses in stretch reflex is due to complete asynchronism of afferent stimuli, for when a large number are recruited synchronously an action current invariably occurs. Since the exaggerated stretch reflex characteristic of the decerebrate condition is in large measure responsible for rigidity of extensor muscles in the decerebrate animal, we have inferred that these sustained postural reactions are produced by asynchronous all-or-nothing contractions of individual muscle fibres rather than by hypothetical fixing mechanisms.—L. N. Katz: On the supposed pluri-segmental innervation of muscle fibres. In the frog, when the two components of the sciatic nerve are stimulated in succession in an isometric tetanus, the sum of the tension developed is considerably greater than the tension produced when both components are stimulated simultaneously. The total heat developed on stimulating the two components of the sciatic nerve separately is, however, the same as that produced when they are stimulated simultaneously. This indicates that there is no pluri-segmental innervation of frog's muscle fibres apart from possible infrequent chance variations.—L. N. Katz and C. N. H. Long: Lactic acid in mammalian cardiac muscle. Pt. i. The stimulation maximum. The mammalian heart is dependent on its contemporary oxygen supply, and fails rapidly in its absence; the skeletal muscle, on the other hand, is independent at first of its contemporary oxygen supply. The data obtained from cats and rabbits show that the mean lactic-acid stimulation maximum of the heart is approximately one-third that of the skeletal muscle. The maximum "oxygen-debts" of these two tissues should therefore be in the same ratio.—H. J. G. Hines, L. N. Katz, and C. N. H. Long: Lactic acid in mammalian cardiac muscle. Pt. ii. The rigor mortis maximum and the normal glycogen content. The rigor mortis maximum, or the caffeine rigor maximum, of lactic acid in the heart is only half that in the skeletal muscle. A lack of lactic-acid precursor is not the cause of the relatively low stimulation maximum in the heart. The glycogen content of the heart is much smaller than that of skeletal muscle in well-fed cats. There is in the heart a greater discrepancy between resting glycogen content and the lactic acid produced in rigor mortis, than there is in skeletal muscle. It indicates that a greater portion of the lactic-acid precursor of the heart is in some other form than glycogen.—Phyllis Kerridge, L. N. Katz, and C. N. H. Long: Lactic acid in mammalian cardiac muscle. Pt. iii. Changes in hydrogen-ion concentration. The hydrogen-ion concentration of cardiac and of

skeletal muscles stimulated to fatigue are different; the difference is of the order of 0.2pH, the skeletal muscle being the more acid. In rigor mortis the difference is of the order of 0.4pH, the skeletal muscle being the more acid. Cardiac and skeletal muscle have different buffering powers which vary at different pH's. The maximum difference is at approximately 6.3pH, when the ratio of the buffering power of skeletal to that of cardiac muscle is about 2:1.—W. E. Garner: The mechanism of muscular contraction. It is suggested that the tension generated on applying a stimulus to a muscle fibre is due to the formation of a solid film on the surfaces of the ultimate fibrils of the muscle. Liquid crystals composed of long-chain carbon compounds are present in the anisotropic segments of the muscle, and the molecules of the long-chain carbon compounds are orientated with their chains in a direction parallel to the axis of the fibre. It is suggested that glycogen is converted into sodium lactate according to the series of reversible reactions



where A is a product formed from glycogen and B is an intermediate active form of both A and lactic acid. The direction of the chemical reaction may be influenced by alteration of the surface energy of the membranes during movements of the muscle. When the energy liberated during the conversion of glycogen into lactic acid is not utilised in doing external work, it may be stored, in part, by a reversal of the reactions.—R. W. Riding and E. C. C. Baly: The occurrence of helium and neon in vacuum tubes. [Proc. A 749 (September), pp. 186-193.]—O. W. Richardson: Structure in the secondary hydrogen spectrum (iii.). [Proc. A 750 (October), pp. 239-266.]—T. R. Merton and J. G. Pilley: On the excitation of the band spectrum of helium. [Proc. A 750 (October), pp. 267-272.]—H. Hartley and J. E. Fraser: The conductivity of uni-univalent salts in methyl alcohol at 25° C. [Proc. A 750 (October), pp. 351-368.]—C. S. Beals: The arc spectrum of palladium. Its Zeeman effect and spectral type. [Proc. A 750 (October), pp. 369-384.]—N. Ahmad: Further experiments on the absorption and scattering of γ -rays. [Proc. A 749 (September), pp. 206-223.]—R. A. R. Tricker: A determination of the variation of the mass of the electron with velocity, using homogeneous β -rays. [Proc. A 750 (October), pp. 384-396.]—E. H. Boomer: Experiments on the chemical activity of helium. [Proc. A 749 (September), pp. 198-205.]—R. M. Wilmotte: On the construction of a standard high-frequency inductive resistance and its measurement by a thermal method. [Proc. A 751 (November), pp. 508-522.]—R. B. Brode: The absorption coefficient for slow electrons in the vapours of mercury, cadmium, and zinc. [Proc. A 750 (October), pp. 397-405.]—P. Kapitza and H. W. B. Skinner: The Zeeman effect in strong magnetic fields. [Proc. A 749 (September), pp. 224-239.]—F. R. Weston: The flame spectra of carbon monoxide and water gas. Pt. ii. [Proc. A 751 (November), pp. 523-526.]—H. S. Hirst and E. K. Rideal: The thermal decomposition of nitrogen pentoxide at low pressures. [Proc. A 751 (November), pp. 526-540.]—R. W. Gurney: The number of particles in the beta-ray spectra of radium B and radium C. [Proc. A 751 (November), pp. 540-561.]

MANCHESTER.

Literary and Philosophical Society, October 27.—S. J. Hickson: The life and work of Georg E. Rumphius (1627-1702). Among the early pioneers of the sciences of botany and zoology, Georg Everard Rumph (or Rumphius) occupies a prominent if not

an outstanding position. His work was done in the remote island of Amboyna in the Malay Archipelago, but owing to a series of calamities only his two books, "Het Amboinsche Kruidboek" and "D'Amboinsche Rariteitkamer," were preserved in a form sufficiently complete for publication. His three books on the land, air and water animals of Amboyna were lost, as were also the greater part of his books on the history of the island and the description of the country. Rumphius was born and educated in Hanau, a German city, but there is reason to believe that his family was of Dutch descent. The date of his birth must have been either 1627 or 1628. He arrived eventually in Amboyna in 1653, at the age of about twenty-six years. He exchanged from the Dutch army into the Civil Service and settled down as a Resident in the northern province of Hitoe of the island of Amboyna, and it was in the capital town, Hila, on the sea coast of this beautiful island, that the greater part of his work was done. For some years his life appears to have been happy and uneventful, but in 1670, when he was forty-three years of age, he became totally blind by cataract in both his eyes. He was removed to Amboyna, but with the help of his son Paul continued his work until his death in 1702. In 1674 his wife and youngest daughter were killed in the terrible earthquake that ravaged the island in that year. In 1687 many of his books, manuscripts and drawings were destroyed in a disastrous fire that burned down his house, and to complete the misfortunes of this most unfortunate man, the whole of the original manuscripts and drawings of the first six books of his Amboyna Herbarium were lost when the ship *Waterland*, in which they were being conveyed to Holland, was captured by the French and destroyed. Fortunately, by the order of the Governor-General a complete copy of this work was made before it left Java, and this copy reached Holland in safety.

PARIS.

Academy of Sciences, September 28.—F. E. Fournier: The prevention of collisions at sea. The international rules at present in force are insufficient to prevent collisions between vessels during fog. A scheme of wireless signals giving greater security is suggested.—H. Deslandres: Complementary researches on the structure and distribution of band spectra. On the basis of the data of Coblenz on infra-red spectra, the author finds confirmation of his general formula given in earlier communications.—E. Bataillon: The first parthenogenetic kinesis in *Bufo vulgaris* and the mechanism of the regulation.—A. S. Besicovitch: Some points in the theory of nearly periodic functions.—F. Carlson: Some mean values of an analytical function.—Jean Dufay: The polarisation of the zodiacal light. Visual observations have given contradictory results regarding the polarisation of the zodiacal light. The author has made use of a photographic method, details of which are given, and finds that his results confirm the view generally held, that the zodiacal light is only diffused solar light.—Arabu: The tectonic of the field of faults of Ribeaupvillé (Haut-Rhin) to the north of Strengbach.

WASHINGTON, D.C.

National Academy of Sciences (Proc. Vol. II, No. 9, September).—C. Dale Beers: Encystment and the life cycle in the ciliate *Didinium nasutum*. Under favourable and adequate conditions, there is no definite life cycle, and encystment does not occur periodically. Scarcity of food causes the formation

of cysts which are all considered to be protective in nature. Excretion products of Paramoecium inhibit encystment: excretion products of Didinium promote it.—Sophia Satina and A. F. Blakeslee: Studies on biochemical differences between (+) and (-) sexes in Mucors: tellurium salts as indicators of the reduction reaction. Of the 264 heterothallic races of Mucor examined, the (+) races show a higher average power of reducing certain tellurites and selenites than the (-) races. This reducing power seems to be influenced by the sex differential, but other non-sexual factors exert an influence which varies from race to race.—Howard B. Frost: Tetraploidy in Citrus. "Thick-leaved" citrus appears to be tetraploid (18 chromosomes, but the number is very variable), the doubling of the chromosome number taking place in the nucellus or in the very young embryo.—C. E. Seashore and Milton Metfessel: Deviation from the regular as an art principle. Emotion in music is expressed by slight deviation from the exact and can be analysed by photographing the sound waves. These records show the character of the vibrato used to express emotion in singing, and indicate how various singers obtain their effects by gliding to a note, attacking it, correcting for illusions of hearing by singing what is actually a wrong note, and making slight deviations from exact time.—C. E. Seashore: The rôle of mental measurement in the discovery and motivation of the gifted student. A new type of senior high school examination testing training and aptitude gives a forecast of probable success in college. This is followed by a freshman examination in each subject, which makes possible the immediate organisation of sections on the basis of fitness. These records give a trustworthy measure of each student's capacity.—G. A. Miller: Arithmetisation in the history of mathematics.—Francis G. Benedict: Skin temperature and heat loss. Skin temperature surveys are made rapidly under various conditions by thermojunction; heat loss is measured by pyranometer (for radiation) and calorimeter chamber (total). Generally there is distinct correlation for all parts of the body, for skin temperature and temperature of the environment. As regards radiation of heat, the human skin seems to act as a true "black-body." Except under exceptional conditions, heat production and heat loss are essentially independent processes.—A. J. Dempster: The passage of slow canal rays through hydrogen. Protons of velocity $4 \cdot 16 \times 10^7$ cm. per sec. (900 volts) pass through many molecules without causing ionisation or exciting light.—George Porter Paine: Energy transformations in an unobstructed air current, in an air current containing a dry obstacle, and in an air current containing an evaporating surface; with applications to an aerodynamic psychrometer and to the measurement of atmospheric humidity.—Samuel K. Allison and Alice H. Armstrong: Note on the experimental determination of the relative intensities of some of the molybdenum and copper K series lines and the tungsten L series lines.—P. A. Ross: (1) X-rays scattered by molybdenum. The radiation scattered from the molybdenum shield of the cathode of a standard tungsten tube and of a water-cooled molybdenum tube was examined by an ionisation spectrometer. In each case the measured change of wave-length agreed well with that calculated from Compton's theory of scattering. (2) Ratio of intensities of unmodified and modified lines in scattered X-rays. A photometric study was made of numerous spectrograms and some of Compton's results were incorporated. There is roughly a linear relation between atomic number and the ratio of the intensities.—Ernest Merritt: The effect of light on the behaviour of selenium contact rectifiers. The high resistance of

the selenium contact and the tendency of the surface to deteriorate make it unlikely that it will prove of value in radio work. Illuminating the contact has different effects on the rectified current according to the contact pressure and other circumstances.—Carl Barus: The acoustic pressure in tubes capped by high resistance telephones, vibrating in different phases.

Official Publications Received.

- Department of Commerce: U.S. Coast and Geodetic Survey. Serial No. 269: Geographic Dictionary of the Virgin Islands of the United States. By James William McGuire. (Special Publication No. 103.) Pp. iii+211. 25 cents. Serial No. 311: Tides and Currents in San Francisco Bay. By L. P. Disney and W. H. Overshiner. (Special Publication No. 115.) Pp. iv+125. 20 cents. (Washington: Government Publishing Office.)
- The Indian Forest Records. Silviculture Series, Vol. 12, Part 1: Volume and Outturn Tables for *Sal* (*Shorea robusta*). By S. H. Howard. Pp. iv+87+7 plates. (Calcutta: Government of India Central Publication Branch.) 1.2 rupees; 2s.
- Peradeniya Manuals, 3: Bibliography of Books and Papers relating to Agriculture and Botany to the end of the Year 1915. By T. Petch. Pp. ii+256. (Peradeniya: Department of Agriculture.) 2.25 rupees; 3s.
- University College of Swansea. Prospectus of the Department of Engineering for the Session 1925-26. Pp. 68+2 plates. (Swansea.)
- Proceedings of the United States National Museum. Vol. 66, Art. 33: Notes on the Fishes of Hawaii, with Descriptions of Six new Species. By Eric Knight Jordan. Pp. 43+2 plates. (Washington: Government Printing Office.)
- Report of the Aeronautical Research Institute of Tôkyô Imperial University. Vol. 1, No. 11: On the Valve Method of Measuring small Motion, with Special Reference to the Precise Recording of Sounds, Pressure-Variations and Vibrations. By Jûichi Obata and Yaei Yoshida. Pp. 305-319+4 plates. (Tokyo: Maruzen Kabushiki-Kaisha.) 80 sen.
- Canada. Department of Mines: Geological Survey. Memoir 145, No. 125 Geological Series: The Palaeozoic Outlier of Lake Timiskaming, Ontario and Quebec. By G. S. Hume. Pp. ii+129+16 plates. (Ottawa: F. A. Acland.) 35 cents.
- Canada. Department of Mines: Geological Survey. Summary Report, 1924, Part A. Pp. 159A. (Ottawa: F. A. Acland.)
- Ministry of Finance, Egypt: Survey of Egypt. Survey of Egypt Paper No. 39: Determination of the Exact Size and Orientation of the Great Pyramid of Giza. By J. H. Cole. Pp. 9+1 plate. (Cairo: Government Publications Office.) 10 P.T.
- Battersea Polytechnic. Report of the Principal for the Session, 1924-25. Pp. 35. (London.)
- Journal of the Marine Biological Association of the United Kingdom. New Series, Vol. 13, No. 4, October. Pp. 755-1021. (Plymouth.) 8s. net.
- Experiment Station of the Hawaiian Sugar Planters' Association. Red-Strips Disease Studies. By the Staff of the Department of Pathology. Pp. v+99. (Honolulu, Hawaii.)

Diary of Societies.

FRIDAY, NOVEMBER 13.

- ROYAL ASTRONOMICAL SOCIETY, at 5.—B. P. Gerasimovic: On the Masses of Stars of Spectral Types F to K.—W. M. H. Greaves: The Solar Motion from Stars of Spectral Types F to M.—W. J. Luyten: A List of Dwarf M Stars.—Prof. E. A. Milne: The Equilibrium of the Calcium Chromosphere (Second Paper).—W. M. H. Greaves and C. R. Davidson: Preliminary Note on the Determination of Effective Stellar Temperatures by the "Prism-across-Grating" Methods.—K. Lundmark and W. J. Luyten: The Relation between Mass and Luminosity.—K. Lundmark: Double Spiral Nebulae.—Prof. A. S. Eddington: Electrostatic Forces in a Star and the Deviation from the Laws of a Perfect Gas.—W. M. Smart: A Comparison of Schlesinger's Proper Motions of the Harvard A.G. Zones with Proper Motions Photographically Determined at Cambridge.—Dr. H. Jeffreys: On the Surface Waves of Earthquakes.

SATURDAY, NOVEMBER 14.

- ASSOCIATION OF MINING ELECTRICAL ENGINEERS (North of England Branch) (at Newcastle-upon-Tyne), at 3.—J. A. B. Horsley: The Selection, Lay-out, and Maintenance of Electrical Equipments at Collieries.
- INSTITUTE OF TRANSPORT (North-East Centre) (at Newcastle-upon-Tyne), at 3.—C. J. Allen: British Main Line Passenger Train Services.
- INSTITUTE OF CHEMISTRY AND SOCIETY OF CHEMICAL INDUSTRY (Bristol and S.W. Section) (at University College, Exeter), at 7.30.—Dr. S. Glasstone: The Measurement of Over-Voltage.
- PHYSIOLOGICAL SOCIETY (at Cardiff).

MONDAY, NOVEMBER 16.

- ROYAL GEOGRAPHICAL SOCIETY (at Lowther Lodge), at 5.—F. Rodd: The Origin of the Tuaregs.
- ROYAL SOCIETY OF MEDICINE, at 5.30.—Sir Arthur Keith: Man's Structural Defects (Lloyd-Roberts Lecture).
- ROYAL AERONAUTICAL SOCIETY, at 6.—Informal Discussion on The Autogyro.
- INSTITUTION OF ELECTRICAL ENGINEERS (Mersey and North Wales (Liverpool) Centre) (at Liverpool University), at 7.—T. Carter: The Engineer: his Due and his Duty in Life (Lecture).