Institute:—Head of the chemical department, Dr. H. Reynolds; head of the physical department, Mr. J. H. Vincent.

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SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 28.—"Researches on Tetanus." By Prof. Hans **Meyer** and Dr. F. **Ransom.**

The experiments were in the first place made with the object of finding an explanation for local tetanus. One of the earliest and most striking symptoms of tetanus in man is, as its popular name implies, stiffness of the masseter muscles (lockjaw); this is the case wherever the infected wound may be situated. In certain animals, however, as cats, dogs, and rabbits, when tetanus toxin is injected subcutaneously into a limb, the first symptom is a rigidity of the muscles of the injected member; this is known as local tetanus. Afterwards, if enough toxin has been given, the rigidity becomes general. An experimental explanation of this condition has hitherto been wanting.

The authors believe that their experiments prove conclusively that the course of events in experimental tetanus is as follows:—The toxin is taken up from the point of injection by the motor nerves (probably their naked endings). Passing along these it reaches first the corresponding motor centres in the spinal cord and excites there an over-irritability, so that the discharges which normally give rise to muscular tone become abnormally strong, and produce in the muscles of the injected limb the condition known as tetanic rigidity. The toxin also passes from the point of injection into the lymphatics and thence into the blood.[1] From the blood-lymph stream, if enough has been given, other motor nerve ends take up toxin, and general muscular rigidity ensues.

The authors show experimentally that the toxin only reaches the nervous centres by way of the motor nerves, and further, that the movement of the toxin in the nervous system does not take place in the lymphatics, but in the protoplasm of the nerves. Tetanus toxin never reaches the spinal centres along the sensory nerves, but, if it is injected into a posterior root, sensory disturbance is the result.

The greater part of what is known as the period of incubation, that is, the interval which elapses between the injection of toxin and the first symptom of intoxication, is the expression of the time occupied in the conveyance of the toxine from the periphery along the motor nerves to the susceptible centres.

Relying upon the results of their experiments, the authors are of opinion that the tetanus of warm-blooded animals consists of two processes, separated from each other both in time and space. Of these the one is primary, a motor intoxication, local muscular rigidity; the other, secondary, is a local sensory intoxication, a diffused reflex tetanus starting from the intoxicated neuron.

Repeated experiments showed that, when tetanus toxin was introduced direct into a motor nerve, antitoxin, though present in large quantities in the blood, was unable to prevent the outbreak of the disease, or even to hinder a fatal result. This was the case both when large doses of antitoxin were given before and after the toxin, as well as when an actively immunised animal was employed. The experimenters therefore conclude that injected antitoxin does not reach the substance of the nerve fibrils and centres, and that even with highly immunised animals the neurons remain free from antitoxin. As regards the serum treatment of tetanus, it is clear that in these circumstances any toxin which is already in the motor nerves, though not yet in spinal centres, will not be neutralised by antitoxin, whether injected under the skin or direct into the blood. An attack corresponding to the amount of toxin absorbed by the nerves will break out and run its course in spite of antitoxin. On the other hand, any toxin in the blood or lymph will be rendered harmless by an injection of antitoxin, and so a further intoxication will be prevented.

The authors have further made successful attempts to prevent the access of tetanus toxin along the motor nerve to the susceptible centres by injecting antitoxin into the nerve substance (ischiadicus), so, as it were, blocking the passage of the toxin.

Just before this paper was read, a case occurred at Marburg of a man who received an injury of the hand from the breaking of a flask of tetanus toxin. Antitoxin in large quantity was injected under the skin a quarter of an hour after the injury; nevertheless, after eight days, a local tetanus of the arm broke out. This was treated by injection of antitoxin into the nerve trunks of the affected limb, and the patient recovered. The occurrence of a local tetanus in spite of the large quantities of antitoxin, and the satisfactory result which followed, and perhaps was due to the injection of antitoxin into the motor nerves of the affected limb, show that the conveyance of the poison from periphery to centre takes place in men, as in animals, along the motor nerve, and affords, further, a valuable hint for the treatment of tetanus.

The full report of these experiments appears in *Archiv für experimentelle Pathologie und Pharmakologie*, Band xlix.

[1] Ransom, Hoppe Seyler's *Zeitschrift f physiol. Chemie*, Band xxix and xxxi.

June 11.—"Observations on the Physiology of the Cerebral Cortex of the Anthropoid Apes." By Dr. A. S. F. **Grünbaum** and Prof. C. S. **Sherrington,** F.R.S.

June 18.—"Cyanogenesis in Plants. Part iii. Phaseolunatin; the Cyanogenetic Glucoside of *Phaseolus lunatus.*" By Wyndham R. **Dunstan,** M.A., F.R.S., Director of the Imperial Institute, South Kensington, and T. A. **Henry,** D.Sc. Lond.

The poisonous seeds produced by partial cultivation in Mauritius of the plant *Phaseolus lunatus* have been examined and found to contain a cyanogenetic glucoside of the formula $C_{10}H_{17}O_6N$, to which the name *Phaseolunatin* has been given. The glucoside crystallises in colourless needles, and when acted upon by the enzyme emulsin, which is also present in the seeds, or by warm dilute acids, it is hydrolysed into *dextrose, acetone,* and *hydrocyanic acid.*

$$C_{10}H_{17}O_6N+H_2O=C_6H_{12}O_6+CH_3.CO.CH_3+HCN.$$

Alkalis convert the glucoside into *phaseolunatinic acid* ($C_{10}H_{18}O_8$), and this, by the further action of hot dilute acids, is hydrolysed into *dextrose* and *α-hydroxyisobutyric acid.* Phaseolunatin is therefore the *dextrose ether of acetonecyanhydrin* $(CH_3)_2:C(CN).O.C_6H_{11}O_5$.

The seeds produced by *Phaseolus lunatus* vary in toxicity and in the colour of their seed-coats, depending upon the care bestowed on the cultivation of the plant. In Mauritius, where the plant is grown for use as a green manure, the seeds furnish, when moistened with water, from 0·041 to 0·088 per cent. of prussic acid, and possess dark brown or purple seed-coats; in India the seeds, which are imported into this country under the name of "Rangoon" or "Paigya" beans, and are used for the manufacture of cattle foods, are pink with purple spots, and yield only 0·004 per cent. of this acid, whilst the large, white Lima or duffin beans, produced by long-continued cultivation of the plant, yield no prussic acid, although they still contain the enzyme emulsin.

It is suggested that if hydrocyanic acid or its precursors—the cyanogenetic glucosides—in plants, may be regarded as formative materials utilised for the synthesis of proteids, then the absence of such glucosides from the cultivated seeds of *Phaseolus lunatus*, and from those of the cultivated almond, may be the result of more active metabolism induced by improved conditions of growth, so that no supplies of the glucoside are available for storage as reserve material in the seeds.

Faraday Society, June 30.—Mr. J. Swinburne, vice-president, in the chair.—Mr. W. C. Dampier **Whetham**, F.R.S., gave an abstract of his paper on the present position of the theory of electrolysis. The fact that the products of electrolysis appear at the electrodes only led to the Grotthus chain hypothesis. Faraday's laws suggest opposite convective streams of anions and cations. Hittorf's observations on the unequal concentration of the solution lead to the conception either of complex ions, dragging along salt or solvent, or else unequal velocities of the ions the ratio of which can be measured. Kohlrausch's measurements of the resistance of electrolytes enable the absolute velocities to be measured. The fact that electric conduction in solutions obeys Ohm's law shows that the E.M.F. is merely directive, and that the ions have migratory freedom. The fact that ionic mobilities only vary slowly with dilution, while the conductivity of a dilute solution is proportional to the first power and not the cube of the concentration, shows that the ions must be free of the solute molecules—not necessarily of those of the solvent. The osmotic properties of electrolytes lead to the same conclusion. A short consideration of conduction in non-aqueous solution and in fused salts completes the paper.—Mr. **Swinburne** gave a short account of his paper on chlorine smelting, with electrolysis, an abstract of which we print elsewhere (p. 285).—A paper by Dr. R. A. **Lehfeldt**, on the total and free energy of the lead accumulator, was taken as read, and the discussion adjourned until the next meeting.—Dr. **Perkin** exhibited and explained several novel pieces of electrolytic apparatus devised by him for laboratory work.

PARIS.

Academy of Sciences, July 13.—M. Mascart in the chair—On the stability of a particular mode of flow of a sheet of water of infiltration, by M. J. **Boussinesq**.—On the torsional movements of the eye during the rotation of the head, by M. Yves **Delage**.—Remarks by M. Alfred **Picard** on the third volume of his "Rapport général sur l'Exposition universelle de 1900."—On the deformation of surfaces, by M. M. **Servant**.—On the measurement of coefficients of self-induction by means of the telephone, by M. R. **Dongier**. A special telephone invented by M. Mercadier was used in this work. It only reinforces sounds of a determined period, and remains insensible to the harmonics caused by capacity or by magnetic substances in the core of the bobbin. Measurements of self-induction of the order of 10^{-2} Henry were made with an accuracy of one-half per cent.—A combination of ferric sulphate with sulphuric acid, by M. A. **Recoura**. A ferrisulphuric acid has been isolated, possessing an analogous composition to the chromosulphuric acid previously described; unlike the latter, however, it is immediately decomposed by water.—On the action of carbon monoxide upon iron and its oxides, by M. Georges **Charpy**. Ferric oxide, heated in a current of carbon monoxide, is completely reduced to metallic iron, containing carbon, at all temperatures between 200° and 1200°, the velocity of reduction increasing with the temperature. Metallic iron takes up carbon at all temperatures between 560° and 1190° C., the metal remaining free from deposited carbon at temperatures above 750° C.—On the so-called colloidal silver, by M. **Hanriot**. The conclusion is drawn that the albuminoid material in collargol, the oxide of iron in the preparation of C. Lea, and the silica in the silicargol are not to be regarded as impurities, but as integral portions of the molecule, not only because it is impossible to separate them without destroying the colloidal silver, but also because these bodies have then lost their characteristic properties.—The action of hypophosphorous acid on diethylketone and on acetophenone, by M. C. **Marie**. Acids containing phosphorus have been obtained analogous in composition with acids derived from other ketones; the oxidation products are also similar.—On the chloride of phenylpropargylidene, $C_6H_5.C{:}C.CH.Cl_2$, by MM. Ernest **Charon** and Edgar **Dugoujon**. Phenylpropargylic aldehyde was treated with phosphorus pentachloride, and the chloride separated by fractional distillation. Its stability is greater than that of cinnamylidene chloride. The addition products with chlorine and bromine were isolated, and also proved to be very stable towards air and water.—The preparation of the secondary amides, by M. J. **Tarbouriech**. Two methods were used, the action of the acid on the corresponding nitrite, and the action of the acid chloride upon the primary amide; the latter gave better yields. The properties of dibutyramide, diisobutyramide, divaleramide, and diisovaleramide are described.—The action of ammonium persulphate upon metallic oxides, by MM. A. **Seyewetz** and P. **Trawitz**.—The action of bromine upon pinene in the presence of water, by MM. P. **Genvresse** and P. **Faivre**.—The influence of the nervous system on the ontogenesis of the limbs, by M. P. **Wintrebert**. From the experiments described the conclusion is drawn that the nervous system is not necessary in the production of the limb, neither for its growth, general morphogeny, nor for its differentiation.—The geographical distribution of the Coleoptera (Bostrychides) with respect to the food requirements of these insects, by M. P. **Lesne**.—On a lactic diastase capable of hydrolysing salol, by MM. A. **Miele** and V. **Willem**. The authors regard the existence in milk of a ferment capable of hydrolysing salol as doubtful.—On the modifications in respiration due to age, with especial reference to the guinea-pig, by M. Léopold **Mayer**.—On the variation of *Bornetina Corium* according to the nature of the medium, by MM. L. **Mangin** and P. **Viala**.—The influence of common salt on the transpiration and absorption of water in plants, by M. H. **Ricôme**.—On a bud graft on the lilac, by M. Lucien **Daniel**.—The presence of cordierite in the eruptive products from Mont Pelée and Mont Soufrière at St. Vincent, by M. A. **Lacroix**.—The origin of the folds in the Pyrenees, by M. Joseph **Roussel**.—Experimental researches on dreams. The relation between the depth of sleep and the nature of the dreams, by M. N. **Vaschide**. In light sleep the dreams have reference to things which occurred immediately preceding sleep, but in profound sleep the dreams have no reference to recent events.

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