

Research Items

Actions of Acetylcholine on the Brain

THE pharmacological actions of acetylcholine are of particular interest because, in almost every case in which this substance has been shown to have an action in the body, evidence has been obtained of the presence of a nerve which liberates acetylcholine locally in such a way as to produce this action. Henderson and Wilson have recently filled an important gap in our knowledge of the actions of this substance (*Quart. J. Exp. Physiol.*, 26, 83; 1936). They have injected acetylcholine into the ventricles of the brain in man. This causes vomiting, intestinal peristalsis and sweating. Its effects on the heart rate, blood pressure, respiration, the pupil, etc., were small and inconstant. The injection of eserine caused similar effects, and potentiated the effect of a later injection of acetylcholine. These effects were produced by comparatively small doses, and it is clear that they were due to a local action on the brain and not to a general action after absorption into the general circulation. Atropine, injected into the ventricles, prevented or abolished the effect. Apart from the interest of the observations themselves, these results are important because they suggest that certain impulses may be transmitted chemically by acetylcholine across synapses in the central nervous system.

Flour Beetles of the Genus *Tribolium*

THE small beetles of this genus are of great economic importance since they are able to subsist on a wide variety of food materials, and have become widely distributed through commerce. The ease with which they can be reared under controlled environmental conditions has also marked them out as very suitable material for population studies and other kinds of laboratory investigation. In Technical Bulletin No. 498 (March 1936) of the United States Department of Agriculture, Mr. Newell E. Good has brought together a mass of useful information respecting the biology, habits and control of the species of *Tribolium*, together with a selected bibliography of the genus. Keys are given as an aid to the identification of the economically important species, which are also admirably figured. Although primarily written from the economic point of view, the Bulletin will prove useful to laboratory workers also. In the latter connexion, the tabular data respecting development at specified temperatures and on oviposition and longevity may be specially mentioned.

Spotted Wilt Virus and the Hormone Heteroauxin

WE have received a communication from Dr. B. J. Grieve, of the Department of Botany, University of Melbourne, in which he describes the results of his investigations into the action of the spotted wilt virus upon the growth regulator heteroauxin. It is well known that spotted wilt arrests the growth of infected tomatoes, and it seemed likely that the virus inactivated the growth hormones in these plants. The technique of Went was first used to compare the effects of diseased and healthy juice upon the inward curvature induced by heteroauxin on split pea stems. In four experiments, such curvatures were observed upon the stems placed in healthy juice

with heteroauxin, but were absent from those treated with virus juice and the hormone. This seemed to show an inactivation of the growth regulator by the virus, but a further number of similar experiments did not indicate any difference between the two kinds of treatment. Another and more conclusive method of study involved the injection of various amounts of heteroauxin into healthy, and into diseased, tomato plants. Adventitious roots appeared upon the stem in the majority of healthy plants, but did not form upon diseased tomatoes, unless the plant appeared to have thrown off the disease. The inhibitory action of spotted wilt virus on heteroauxin is not shared by two other viruses which were used, namely, tobacco viruses 1 and 6.

X-Chromosome of *Drosophila*

THE X-chromosome of *Drosophila melanogaster* and *D. simulans* contains near the end an enlargement or 'bulb' in the salivary gland chromosome, the nature of which has been investigated by Dr. C. A. Offermann (*J. Genetics*, 32, 103). He finds that the bands run obliquely in two series in the 'bulb', and that it represents a symmetrical duplication or 'branch' of a short chromosome segment. This might arise through three breaks and two re-attachments in a pair of chromosomes, or by five breaks and three re-attachments. In either case, one of the breaks must occur at the same level in both chromatid strands. As the 'bulb' occurs in two closely related species, it must have arisen in their common ancestor and must therefore be a stable feature of the chromosome. This is accounted for by the fact that crossing-over can occur between the two arms of the duplication, the bands of which are in reverse order. The less condensed appearance of the 'bulb' in salivary chromosomes of the male than in the female is attributed to a lesser synaptic attraction between the chromonemata in the male nuclei.

Strength Tests of Structural Timbers

UNDER this title in *Forest Products Research Records*, No. 8, Part I dealt with general principles, with data on redwood from Gefle and Archangel. Part 2 of the same series (April 1936) deals with general procedure of selecting and testing joists, with data on British Columbian Douglas fir (*Pseudotsuga Douglasii*) by C. J. Chaplin and E. H. Nevard. The tests were carried out with small clear specimens and also on a full scale: the results are of considerable interest. In summarizing them, the Director of the Princes Risborough Laboratory says that "A comparison between the results given in this report and those published by the Forest Products Laboratories of Canada may show an apparent discrepancy in the strength values. This is due to difference in the relation between width and depth of cross-section of the pieces tested and to differences in character which may occur between samples of the timber. Such differences in character must be expected where a wide range of the timber is dealt with in the country of origin. The Forest Products Research Laboratory at Princes Risborough accepts completely the validity of the Canadian figures, and urges their use in all circumstances concerning the

strength of Canadian Douglas fir. The same applies to results published by the Forest Products Laboratory at Madison, U.S.A., for Douglas fir grown in that country."

Experiments with 'Electrets'

A COMMUNICATION entitled "The Disengagement of Energy in Melting Electrets" has been received from Drs. G. Groetzinger and H. Frei, of the University of Vienna. An 'electret' is produced by solidifying certain types of wax, for example, carnauba wax, in a strong electric field. The wax thereby acquires a polarization, in the direction of this applied field, which may be retained unimpaired over very long periods of time. It may be said to be the electrical equivalent of the permanent magnet. A paper by A. Gemant, published in the *Phil. Mag.* (20, 929; 1935) describes much research work on the subject, with a bibliography of earlier papers. Drs. Groetzinger and Frei state that, when an electret is melted, the stored charge is released as an electric current, and that this charge is the same whether the electret is melted immediately or several days after its preparation. This, however, is to be expected, since it is known that electrets can retain their original charge for a considerable period. The authors also record that, when the electric field is applied to an already solid sample of the electret material, the stored charge is much less than before, and instead of being retained, as in the normally produced electret, it disappears fairly rapidly. This is quite a normal procedure, and the experimental result is what would naturally be expected.

Transmutation of Platinum by Deuterons

TRANSMUTATION by bombardment with artificially accelerated deuterons, which is nearly general among the light elements, has now been observed with very heavy elements. J. M. Cork and E. O. Lawrence (*Phys. Rev.*, 49, 788, June 1) have bombarded platinum foils with deuterons of maximum energy 5×10^6 volts. The induced radioactivity was composite in character; periods of 28 min., 8.5 hr., 49 min., 14.5 hr. were detected, and a chemical investigation showed that the first two periods were associated with iridium and the second two with platinum. Both positrons and electrons were emitted. The transmutation of such heavy elements is not to be explained on the Gurney-Condon-Gamow theory of the penetration of potential barriers, and the formation of iridium isotopes is not explained by the theory of Oppenheimer and Phillips, in which only the neutron part of the deuteron enters the nucleus. The direct action of secondary neutrons was excluded by a special experiment. The production of iridium isotopes probably follows the entry of deuterons of special velocities into the nucleus by a 'resonance' process, and the dependence of transmutation efficiency on deuteron velocity is in accordance with this view.

Velocity of Rapid Reactions

SOME years ago, Hartridge and Roughton devised a method for the study of rapid reactions in which two solutions were mixed and then made to flow down a tube. The progress of the reaction at points along this tube was measured by optical methods. The method has now been improved by the use of photo-electric cells and by reducing the scale of the apparatus (F. J. W. Roughton and G. A. Millikan, *Proc. Roy. Soc.*, A, 155, 885, June 2). The mixing arrangements and the character of the flow down

the tube have been specially studied. The smallest apparatus may be used with 20-30 c.c. of fluid to study reactions with half-periods of 0.0005 sec. Some experiments on reactions which have been studied by other methods confirm the validity of the method.

Low Temperature Carbonization of Coal

THE Department of Scientific and Industrial Research has published the results of tests made in accordance with a standing arrangement by the Director of Fuel Research on a plant erected by the Coal Research Syndicate, Ltd., at Mansfield, for the carbonization of coal at low temperatures (London: H.M. Stationery Office. 9d. net). The process has interesting features. A charge of lump coal (35 tons), almost devoid of caking properties, is carbonized in a chamber 10 ft. in diameter and 25 ft. high by the combustion at the top of the column of part of the gas made. The products of combustion and distillation are drawn downwards through the charge, and leave the bottom for the gas treatment plant. A portion of the gas is returned to the top of the carbonization chamber when, as mentioned above, it is burnt after the addition of air. At the end of the carbonization, the bottom of the retort is withdrawn by hydraulic gear, and the whole charge is dropped for quenching. The coke product was found, on test, to be a satisfactory fuel for the open grate. This process is interesting because, unlike most low temperature processes, it handles the material in bulk comparable and exceeding that in modern coke ovens.

Development of the Coiled-Coil Lamp

IN the *Technical Review* of April published by the Philips Laboratory, Eindhoven, Holland, there is an instructive paper by W. Geiss on the development of the coiled-coil lamp. The first material used for lamp filaments was carbon and later graphite. A further increase in temperature was made possible by the adoption of metals with high fusion points like osmium, tantalum and tungsten. At present, tungsten is considered the best material for lamp filaments. To obtain a high efficiency, it is essential to keep the rate of volatilization as low as possible. A 'filling' of argon or nitrogen at 50-100 cm. pressure greatly diminishes the rate of volatilization. Unfortunately, the gas filling increases the losses by thermal conduction and convection. In this respect thick filaments give much more satisfactory results than thin ones. If a long thin filament is wound in the form of a spiral, its total heat losses are of the same order as for a filament of the same length and cross-section as the spiral. It has been found possible to reduce the effective length of the coil still farther by winding the coil itself round a core, and this gives the 'coiled-coil' arrangement. The first attempts to use coiled coils were made twenty years ago, and failed mainly because the filaments expanded during service. By suitable pre-treatment, this difficulty was overcome. A mixture of argon and nitrogen has been used for filling these lamps. If krypton or xenon were used as a filling, the heat losses would be greatly diminished. Whether they will ever be used depends on the progress that is made in isolating these rare gases. If the flux from a single-coiled and a coiled-coil lamp is the same, the saving in power in the latter lamp is 7-10 watts; in addition, it maintains its efficiency better during life. The increase in the efficiency obtained by coiling the filaments is more marked for lamps of small candle-power.