RESEARCH ITEMS

Choline and Phospholipid Synthesis

THE action of dietary choline in preventing and curing certain types of fatty liver in rats is well known. There is now considerable evidence, reviewed by E. W. McHenry and J. M. Patterson (*Phys. Rev.*, **24**, 128; 1944), that this 'lipotropic' action is due to the part which choline plays in the formation of phospholipids. It is believed that fat is normally transported from the liver in the form of phospholipid and that choline, being a constituent of certain phospholipids, is necessary for their synthesis and therefore for fat transport. In choline deficiency, the normal transport of fat from the liver is interrupted and fat accumulates therein; while administration of choline can accelerate the removal of fat from various types of experimentally produced fatty livers. More recently, W. H. Griffith and N. J. Wade (*Proc. Soc. Exp. Biol. Med.*, **41**, 188; 1939) described another result of choline deficiency, hæmorrhagic degeneration of the kidneys. This lesion was produced much more readily in young growing rats than in adults. J. M. Patterson and E. W. McHenry (*J. Biol. Chem.*, **145**, 207; 1942) found in such cases that the phospholipid content of the kidneys (both percentage and absolute) was below normal and suggested that the lesion resulted from a failure of phospholipid synthesis at a period when phospholipid was required as a protoplasmic constituent for the development of the growing kidney. J. M. Patterson, N. B. Keevil and E. W. McHenry (*J. Biol. Chem.*, **153**, 489; 1944), using radioactive phosphorus, have shown that the rate of phospholipid turnover in the rat's kidney is greatest at the time (sixth day of life) when the kidney is most susceptible to choline deficiency, and that the turnover is greatly reduced in choline-deficient animals. It seems, therefore, that both the liver and kidney lesions of choline deficiency can be ascribed to a failure of phospholipid synthesis.

Control of Pear Midge

S. H. Bennett and H. G. H. Kearns (*J. Pom. and Hort. Sci.*, **22**, 38; 1946) report the successful control of *Contarinia pyrivora* by the application of tar oil and dinitro-orthocresol washes to the soil. The larvæ pupate in the surface soil and the midges emerge in the spring to lay their eggs on the flower buds and open flowers. On hatching, the larvæ bore into the developing fruitlets, which become malformed and fall to the ground. Some control has been effected hitherto by repeated cultivations of arable soil after the fruit has fallen, by digging calcium cyanide into the soil, or by nicotine washes applied to the blossom when the midges are on the wing. Trials were made with 3 per cent high boiling neutral tar oil, and 0·1 per cent D.N.C. with 5 per cent petroleum oil, sprayed on the soil at low pressure, both as sulphite lye emulsions. A plantation of Williams' Bon Chrétien and Fertility pear trees was used and the treatments randomized to find the effects of the washes when applied at the time of bud burst (March 1, 1944) and 4–5 days before the 'white bud' stage (March 27, 1944) respectively. 900–1,200 gallons of wash per acre were applied over the surface, the top soil being dry enough to absorb it. Examination of random samples of fruitlets and comparison of crop weights at picking time showed that a high degree of control was obtained. No significant differences were obtained between the two washes or the time of application. With an infestation of 64 per cent of fruitlets on the control plots, the treatments gave from 46 to 101 per cent increase in the fruits harvested, and 31 to 53 per cent increase in the crop weights.

Genetics and Plant Breeding

D. U. GERSTEL (*J. Hered.*, **36**, 197; 1945) shows that by back-crossing *Nicotiana tabacum* ($n = 24$) $\times$ *N. glutinosa* ($n = 12$) with *N. tabacum*, true-breeding lines with 25 and 26 pairs of chromosomes occur in the progeny. The extra chromosomes which are derived from *N. glutinosa* carry genes which may be useful in tobacco. For example, resistance to mosaic disease was incorporated in the new lines. A general account is given of single chromosome additions in evolution.

Pests of Cotoneaster

G. FOX WILSON has described nine insect pests of *Cotoneaster horizontalis* (*J. Roy. Hort. Soc.*, **70**, Pt. 9; Sept. 1945). Woolly aphis, and peach or European brown scale, *Lecanium corni*, are two pests already known on fruit trees. The web-spinning Tineid caterpillar, *Scythropia cratægella*, is usually an inhabitant of hawthorn bushes, but is increasing on *Cotoneaster*. It can be controlled by D.D.T. dusts and sprays. The Pyralid moth, *Eurhodope suavella*, also lives in silken galleries. It can be controlled by nicotine dusts in warm days of autumn and spring, while arsenical washes afford preventive treatment. The four major pests here mentioned appear to be most prevalent in the south-eastern counties of England.

Dry Rot of Potatoes

Phytophthora infestans and *Fusarium cœruleum* are the principal causes of fungal wastage of potatoes in clamps, but a recent survey has shown that *Fusarium avenaceum* also causes loss, especially in the varieties King Edward and Doon Star (F. Joan Moore, *Ann. Appl. Biol.*, **32**, 304; 1945). A comparison of the two species of *Fusarium* showed that *F. avenaceum* caused most rotting at 20–25° C., and in conditions of high humidity, while *F. cœruleum* caused maximum loss at 15° C. and was less sensitive to low humidities; it was noted that the more susceptible the potato variety the higher was the optimum temperature for both species of *Fusarium*. Rotting was much more severe in clamps than in stores or in open trays held at the same temperature. This is apparently due to the higher humidity obtaining in the clamp; the amount of rotting is little affected by volatile excretions from the tubers.

Recession of Glaciers

IN a paper on researches on snow and ice, 1918–40, in the *Geographical Journal* of January–February, Prof. H. W. Ahlman outlines his contention that a climatological improvement in arctic latitudes began slowly in the middle of the nineteenth century and has increased rapidly in recent decades. His investigation on certain Norwegian glaciers shows that from being stationary they have reached a state of retreat and, if the rate of retreat continues, several will disappear in a few more decades. Work in west Spitsbergen and in North-East Land again showed that ablation exceeded accumulation. On Iceland glaciers comparable results were obtained. Lastly, in North-East Greenland regression was noted and, as elsewhere, at an increasing rate. Prof. Ahlman points

also to the results of Russian researches north of Siberia, which indicate a vast reduction since 1924 of the sea area covered with pack-ice, a reduction in the average thickness of floes, an increase in temperature of the Kara and other seas, and a northward shift of the southern limit of permanently frozen ground. The meteorological causes of these changes lie in increased flow of warm air to the regions around the North Atlantic and the northward movement of the Icelandic low-pressure area. Prof. Ahlman stresses the need of comparable quantitative researches in the Antarctic and elsewhere.

Space Charge in the Magnetron

THE method employed by L. Page and N. I. Adams, jun. (*Phys. Rev.*, **68**, 126; 1945) to solve the space charge equation of the cylindrical diode has been applied by the same authors to solve the similar equation for the plane magnetron, consisting of two infinite parallel plane electrodes (*Phys. Rev.*, **69**, 492; 1946), and for the cylindrical magnetron, consisting of two coaxial cylindrical electrodes (*Phys. Rev.*, **69**, 494; 1946). The relationship between the current and the magnetic field is determined in both cases, as also the effect of the magnetic field on the distribution of potential and charge. An interesting feature of the plane magnetron, as shown by one of the curves, is that the current decreases only slightly with increasing magnetic field strength until quite close to the cut-off. The corresponding curve for the cylindrical magnetron is in accord with A. W. Hull's experimental values (*Phys. Rev.*, **18**, 31; 1921).

Telephone Interference Arising from Power Systems

IN a recently published paper (*J. Inst. Elec. Eng.*, **93**, Part 1, No. 66, June 1946), Messrs. P. B. Frost and E. H. Gould review the investigations on telephone interference which have been carried out in Great Britain between 1934 and 1944. Under the heading of electromagnetic induction at fundamental frequency, they discuss the precautionary measures available for power and telephone systems to avoid damage to equipment and injury to personnel from high induced voltages, and under interference at audio-frequency the serious effects which may arise from faulty power lines which are maintained in operation through the use of arc-suppression coils, and the possibilities of interference from power lines supplying large rectifier units. The paper enumerates the conditions under which it is permissible to employ multiple earthing in high-voltage systems, and gives evidence to show that the inter-connexion of low-voltage systems, each earthed at one point, is unlikely to cause interference. Recent apparatus developments affecting the problem, such as gas discharge tubes, noise-eliminating filters and noise-measuring instruments, are reviewed. The paper is supported by a lengthy discussion, several contributors to which emphasize the need for closer co-operation between the power supply undertakings and the telephone authorities, particularly in respect of new installations.

Raman Spectra of Mixed Crystals

SODIUM and potassium nitrates form a continuous series of mixed crystals above 130° when the two lattices unite to form a unique lattice. M. Kanaka Raju (*Proc. Indian Acad. Sci.*, **22A**, 150; 1945) has examined the Raman spectra of this system and finds frequency shifts which are regarded as corresponding with the lattice and with internal oscillations. With mixed crystals containing 25–75 per cent of potassium nitrate, there was a gradual change of frequency from that of pure sodium nitrate to that of pure potassium nitrate, and this fact, and the result that there is a unique line representing the total symmetric vibration in the mixed crystals (a mixture of the same composition showing the two lines of $NaNO_3$ and KNO_3 separately), confirm the formation of a unique lattice in the mixed crystal, the vicarious elements replacing one another atom for atom. This result is in agreement with many other investigations on mixed crystals and confirms the structure suggested for them by Vegard.

Purification of Benzene and Toluene

THE separation of thiophene and methylthiophene from benzene and toluene is not easy, and the usual methods are either tedious, or expensive and unsuitable for large amounts. J. Bougault, E. Cattelain, and P. Chabrier have described in a paper only recently available in Britain (*Bull. Soc. Chim.*, **7**, 780; 1940) a very simple process by which large amounts of the two hydrocarbons can be freed from thiophene and its derivatives so as to give no indophenene reaction. The liquid is shaken for a short time at the ordinary temperature with Raney nickel, previously washed with alcohol and ether. The preparation of the nickel was described by the same authors in an earlier paper (*Bull. Soc. Chim.*, **5**, 1699; 1938). In another paper (*Bull. Soc. Chim.*, **7**, 781; 1940) they show that Raney nickel when introduced into solutions or suspensions of many inorganic and organic sulphur compounds leads to an evolution of hydrogen, and the sulphur is completely removed in combination with nickel as sulphide. Tetrathionate and thiosulphate are rapidly converted into sulphite, and the latter then slowly converted into alkali hydroxide. Carbon disulphide in alcohol evolves a mixture of hydrogen and methane. Raney nickel is thus a valuable desulphurizing agent.

Synthesis of Methanol

THE reactions of hydrogen and carbon monoxide over a great range of experimental conditions have been studied, and one of the products is methanol (methyl alcohol, CH_3OH). The reactions of hydrogen and carbon dioxide have received little attention. V. N. Ipatieff and G. S. Monroe (*J. Amer. Chem Soc.*, **67**, 2168; 1945) have studied this latter reaction in presence of copper-alumina catalysts over a temperature range of 282–487° and a pressure range of 117–410 atm. Copper and alumina separately had no catalytic effect. The most active catalyst had a copper content of 8–28 per cent and gave conversions of 94 per cent at 410 atm. and 285°. Similar experiments with carbon monoxide and hydrogen gave much smaller conversions of 39–43 per cent, with as much as 15 per cent and 41 per cent of the carbon monoxide charge reacting to give methane and dimethyl ether, respectively. When carbon dioxide was added to the carbon monoxide in the mole ratio $CO : CO_2 = 3{\cdot}1 : 1{\cdot}0$, the methanol conversion was raised to 64 per cent and the formation of dimethyl ether reduced to about 1 per cent. Other experiments indicate that the reaction with carbon dioxide and hydrogen follows two paths: after reduction to formaldehyde, part of the methanol is formed by direct hydrogenation of formaldehyde and part by a Cannizzaro reaction.