

RESEARCH ITEMS

Avian Tumour Virus and 'Carrier' Hens

It is stated that losses in poultry flocks due to neoplastic diseases amount to 20 per cent or more, and despite the urgency of the problem of etiology and control of avian cancer, there is little information which can be used as a basis for prevention. Although it is not known whether all spontaneous tumours are virus-induced, most of the successfully transplanted sarcomas were found to be associated with a causative virus. Susceptibility to Rous No. 1 filterable sarcoma is inherited, and resistant birds frequently respond to infection by this virus by the production of no growth or by a small and transient growth. The virus remains latent in these birds for years after clinical recovery from the infection. Fowl-tumour viruses are disseminated about the body of a host bearing a freshly induced filterable tumour and, although such fowls have only a brief reproductive period left, the virus passes to the egg and hence to the offspring of the tumour-host. The laying capacity of the 'carrier' fowls, on the other hand, appears not to be affected, and it would be expected that their immunity would be passed similarly to their eggs. In attempting to find whether these virus 'carriers' might be responsible for the spread of malignant diseases in such flocks, J. G. Carr (*Proc. Roy. Soc. Edin.*, 52, B, 54; 1944) has investigated the neutralizing ability of the eggs of the 'carriers' and of normal hens, and has found that 'carriers' lay eggs which contain a considerable amount of virus-neutralizing antibody in the yolk. Virus could not be detected in the egg-embryo or chick from such birds, nor did the 'carriers' infect other birds in the same pen with the sarcoma virus. The fact that no neoplasms developed in a flock which, by careful husbandry, had been raised free from parasites or infectious diseases, suggests the elimination of some factor operating in ordinary flocks.

Feeding Apparatus of Biting and Sucking Insects

UNDER the above title, R. E. Snodgrass has contributed an important paper in the Smithsonian Miscellaneous Collections (104, No. 7, Oct. 1944). This work is an extension of the same author's previous memoir on the feeding apparatus in biting and disease-carrying flies published in the Smithsonian Miscellaneous Collections for July 1943. The letterpress and illustrations in the last-named paper are included in the new publication, while the additional matter comprises accounts of the feeding organs of Anoplura, Siphonaptera, Thysanoptera and Hemiptera. Dr. Snodgrass's work supplements, and also brings up to date, the accounts given of those organs in present-day text-books. It makes available a thoroughly modern interpretation of the organs of feeding among both biting and sucking insects. For this reason it will be found to be a valuable aid to students and teachers of medical entomology in particular. The general entomologist also cannot afford to pass over this paper since the author gives an entirely new interpretation of the morphology of the mouth-parts in the Siphonaptera. The actual organs used for piercing, it is claimed, are not the mandibles, as almost every authority has maintained for many years past, but are the laciniae of the maxillae. A further point of importance is that the median stylet, almost always regarded as the labrum, is interpreted as being the hypopharynx. It is main-

tained that blood is sucked up through the fine channel in this organ and so reaches the gut. This interesting, and by no means improbable, re-interpretation of the mouth-parts of Siphonaptera must wait the verdict of future embryological study as a likely means of testing its claims.

Germ Cell Cycle in Trematodes

RECENT work by W. W. Cort on reproduction of the intermediate stages of digenetic trematodes supports the germinal lineage hypothesis of multiplication of the cells of the germinal line (*Quart. Rev. Biol.*, 19, No. 4; Dec. 1944). It is a polyembryony by which great numbers of germinal cells are produced from the original zygote. These germinal cells remain distinct from the soma of the germinal sacs (sporocysts and rediae) and come to lie in their body cavities. Finally, the germinal cells form the adult gonads and the polyembryony is succeeded by gametogenesis with the production of haploid spermatozoa and ova. The germinal lineage hypothesis maintains that these gametes are the only cells in the entire life-cycle that have the reduced number of chromosomes. The theory therefore disagrees with the early explanation of Steenstrup (1842), who said that reproduction in sporocysts and rediae was a process of asexual budding; with Grobben (1882) who maintained that it was parthenogenesis, and Woodhead (1931) who described in the Bucephalidae ovaries and testes of sporocysts and rediae and who believed that true bisexual reproduction occurred even in the intermediate stages.

Vitamin C in Drumstick Leaf

OF the many rich natural sources of ascorbic acid, some, such as lucerne, rose hip, blackcurrant and gooseberry, have been successfully processed to yield concentrates which can be used in small quantities to meet human daily requirements of this vitamin. In a communication to the editors, T. B. Panse and A. Sreenivasan, of the Department of Chemical Technology, University of Bombay, now suggest adding the leaf of the drumstick (*Moringa oleifera*) to this list since the leaf by titrimetric estimation contains 900-1,100 mgm. ascorbic acid per 100 gm. Furthermore the leaf provides in addition 100-120 mgm. of β -carotene per 100 gm. and is thus richer in this respect than either lucerne or rose hip. Aqueous extracts of drumstick leaves, if sampled during the pre-flowering stage, are reasonably stable, losing only 25 per cent of their ascorbic acid after three days storage. On the other hand, a powerful oxidase system is apparently developed in the leaves when the tree is in flower, so that larger amounts of the vitamin are lost during the extraction. This is particularly marked with the flowers themselves, the ascorbic acid of which is practically instantaneously destroyed in the aqueous extract.

Physiological Specialization of Oat Stem Rust

Newton and Johnson (*Can. J. Research*, Sec. C, 22, Oct. 1944) have identified twelve physiological races of *Puccinia graminis Avenae* in Canada from 2,586 isolates studied during the period 1921-43. Annual surveys of the prevalence of physiological races during this period show that each year races 1, 2 and 5 have comprised the bulk of the oat stem rust in Canada. The predominance of these races has been greatest in the three Prairie Provinces, where barberry is virtually non-existent. In regions where barberry is present, other races of greater range of pathogenicity have been found more frequently. The

occurrence of such races, however, was sporadic until 1943, in which year races 8, 10 and 11 attained a wide distribution, apparently traceable to wind-borne uredospores from the south. There is evidence that the strains of these races present in 1943 remain in the uredospore stage for much longer periods than do strains of the same races collected in previous years, a fact that may have favoured their spread that year. The role of the barberry in the origination of generally virulent physiological races is discussed. The possibility that such races may also originate by mutation is suggested by spontaneous pathogenic changes that occurred in the greenhouse, in a culture of race 3 that gave rise to several cultures of race 7.

Effect of Stock on Grafted Plants

'A LOVER of planting' in the "Complete Planter and Cyderist" (1685) writes: "It's manifest that amongst fruit trees of one kind in the same orchard some shall bear better fruit than any of the rest and it's not known what to impute this excellency to than to the rootstocks they were grafted on". The variability in tree growth and development and in fruit quality is greatly reduced by grafting the trees on to clonal rootstocks vegetatively raised and hence of uniform genetical constitution. Nevertheless, trees grafted on to seedling stocks of varying genetical constitution are often remarkably uniform in character. Especially does this seem to be so under American practice, where trees are generally bench-grafted on to 'root pieces' so that the rootstock does not include any stem piece, and R. H. Sudds and P. C. Marth (*Proc. Amer. Soc. Hort. Sci.*, 42, 326; 1943) find that trees on seedling stocks are almost as uniform over a period of nine years as those on a number of clonal stocks, while E. W. Greve (*ibid.*, 337) in experiments with five varieties of apples on their own roots and on seedling stocks reports no greater variability in the grafted trees than in the 'own rooted' ones.

Theory of the Focault Test

S. C. B. GASCOIGNE has discussed (*Mon. Not. Roy. Astro. Soc.*, 104, 326; 1944) a diffraction theory for the Focault knife-edge test. His paper is highly mathematical, and only a brief summary of it is possible. A short account of the theory of the Focault test is given and then a closed expression for the variation of intensity over the mirror with arbitrary error, not necessarily small compared with λ , when it is tested with a knife-edge, is derived. From the equation giving the disturbance $D(x)$, it is shown how the usual explanation of the knife-edge test follows from the diffraction theory by considering the limit of the equation when $\lambda \rightarrow 0$. Examples are then given of a number of commonly occurring errors. The well-known phenomenon of the appearance of fringes on a mirror with a turned edge is explained, and intensity curves for mirrors with central and zonal errors are computed. Most of the work was carried out during the author's tenure of the Michael Hiatt Baker Scholarship, University of Bristol.

Chain Reactions

THE breaking of chains on the walls of the vessel is one of the most characteristic and essential features of chain reactions and was introduced by Semenov in 1927 and by Hinshelwood in 1928; its existence being quantitatively proved by Trifonoff in 1929. Since then, many mathematical and experimental memoirs on the subject have appeared. N. N. Semenov (*Acta Physicochim. U.R.S.S.*, 18, 93; 1943)

has now presented a clear account of the theory in a form convenient for applications, partly because he has himself found difficulty in working out experimental results, and partly because serious errors have been made in mathematical papers by other authors. A careful consideration of the possibility of small values of the chain-breaking probability ϵ is presented, and results for spherical and cylindrical vessels are worked out. The effect of inert gases is also considered, and some attention is given to the action of solid dusts as 'anti-knocks'. It is, of course, quite impossible to summarize a paper of this character; but attention is directed to it as an important contribution to the literature of chain reactions.

Permanent Magnets

THE economic utilization of modern permanent magnets was the subject of a paper read by D. J. Desmond on February 16 before the Institution of Electrical Engineers. In this paper the author first establishes the equation to the demagnetization curve and then proceeds to discuss the uses of permanent magnets in typical pieces of apparatus. The working of the magnet under these various conditions is considered and the useful part of the magnetic energy is calculated, this introducing a new method by making use of the unit permeance of a circuit. Certain approximations are made in this calculation and the limitations of the simple theory are then discussed. A method is given of designing a magnet in terms of the constants of the iron circuit. Figures are provided for two modern alloys in common use, and curves are plotted for the complete solution to all design problems. The interchangeability of these two alloys is discussed, and it is pointed out that not all the additional energy of the anisotropic alloy can usefully be employed. This is due to the larger curve factor, which reduces the recovery when a demagnetizing force is removed. It is shown that the $(BH)_{\max}$ value is not the criterion of usefulness of a magnet, except in the simplest case, nor is it necessary for the magnet to work at the $(BH)_{\max}$ point.

Radioactivity of Sedimentary Rocks

A RAPID method for the determination of uranium, thorium and potassium in rocks (based on the use of β -ray counters calibrated with radioactive standards) has been devised by R. F. Beers and C. Goodman, and applied to more than three hundred samples of various types of sediments from oil wells drilled through Palaeozoic formations (*Bull. Geol. Soc. America*, 55, 1229; 1944). The results indicate that the principal loci of radioactivity are in (a) heavy minerals in sands and sandstones; (b) potash-rich sediments; and (c) sediments of colloidal deposition. It is shown that organic black shales show excellent correlation of uranium content, organic matter, abundance of grades of colloidal size, and a high ratio of thorium to uranium. All these correlations have an important bearing on genetic relationships in petroleum source beds. Goodman's prediction (*J. App. Phys.*, 13, 276; 1942) that petroleum source beds should have high thorium-uranium values has been supported. Evidence is recorded showing that in primary igneous rocks and organic black shales, potassium and uranium increase directly with one another. It is also established that rocks of high uranium and thorium content possess high emanating power, a feature which complicates the technique of the radioactivity measurements.