RESEARCH ITEMS

Biology of Cerambycid Beetles

C. F. C. Beeson and B. M. Bhatia have published an article "On the Biology of the Cerambycidæ", in which they present data collected during twenty-four years on the food plants, distribution, life-cycle and other biological features of 350 species of this family of beetles from India, Burma and Ceylon (*Ind. Forest Rec.*, Ser. Entom., 5, No. 1 ; 1939). The total number of species of Cerambycidæ, or longicorn beetles, known to occur in the Indian region is 1182. It appears that the sal (*Shorea robusta*) is the tree which supports the largest number of species, some 37 different Cerambycidæ being known from it. The beetle *Stromatium barbatum* is recorded to have no fewer than 311 different food plants, which indicates a very unusual range of polyphagy. The food plants of at least 250 species of these insects have not been previously published, and a total number of 568 species of Indian trees, shrubs and woody climbers is now known to be attacked by one or more kinds of Cerambycids. *Hoplocerambyx spinicornis* is potentially the most injurious forest insect in India. This is partially due to its liability to cause bad epidemics among the sal forests. Even a small outbreak of this insect, affecting eight square miles of forest in the United Provinces, resulted in 45,000 trees being killed, representing nearly a million cubic feet of timber. The most serious epidemic was estimated to have attacked about seven million trees before it was checked. The new data given for the biology, etc., of this species are more complete than for any other : for many of the species little more than the host tree and the locality are at present available. It is mentioned that sun-loving or diurnally active species may frequent the foliage and flowers of trees without any of them breeding as larvæ in the wood or feeding as adult beetles on the foliage or other parts of such trees.

Ring Spot Disease of Lettuce

THE fungus *Marssoniana Panattoniana* in epidemic form rapidly destroys lettuce seedlings and may also destroy older plants. Even a mild attack causes browning and perforation of the leaves which give rise to the name 'ring spot'. The disease is an important one in England, and has at various times caused considerable damage in Europe and America. Winter lettuce is the crop most affected, the disease being rare on plants grown under glass or planted out in spring. Experiments carried out over three years by Greta B. Stevenson at the Biological Field Station of the Imperial College (*J. Pom. and Hort. Sci.*, 17, 27 ; 1939) have shown that the disease is readily transmitted by seed. Diseased plants gave apparently good seed which, however, under suitable conditions produced a heavily infected crop. On the other hand, sprayed and segregated mother plants gave seed which produced healthy plants where commercial seed gave valueless crops. The disease may also be contracted from the remains of a previous infected crop, though such remains normally lose their infectivity after about eight months. A similar fungus was found on a common weed (*Crepis capillaris* Wallr.) growing near diseased plants, and it is believed that this may be a source of infection. Sixteen commercial varieties of lettuce were all found to be equally susceptible to ring spot. Reduction of the disease was affected by spraying the seedlings with Bordeaux mixture (3 : 6 : 50) and by treatment of the seed with a filtered 10-per cent solution of bleaching powder.

Chemistry and Genetics

IN a paper given before a joint meeting of a number of American Societies (*Amer. J. Bot.*, 26 ; 1939), A. E. Blakeslee points out the growing importance of chemistry in genetics and other branches of botany. The paper is concerned mainly with the results achieved by treatment of plants by solutions of colchicine, a toxic substance which has proved remarkably effective in inducing polyploidy. It is recognized that polyploidy following hybridization has been a feature in the evolution of some species and the use of colchicine provides a means whereby such allotetrapoids (multiple diploids) may be produced at will from sterile hybrids. This fact alone opens great possibilities in plant breeding. Other possibilities are also outlined in a survey of induced variations of chromosome number in *Datura*. Reference is also made to the little explored field of chemistry in relation to genetical characters. It is described how two externally similar types of *Rudbeckia* can be readily distinguished by their colour reaction with caustic potash or caustic soda. It is quite possible that in other cases also simple reactions might be employed to distinguish between similar homozygous and heterozygous types, thus enabling much economy in breeding experiments. Some problems of cytology and propagation which might have light thrown upon them by such methods are discussed at the end of the address.

Chromosome Numbers for the British Flora

THE *New Phytologist*, 38, No. 1, May 1939, contains under the heading of "The Merton Catalogue" a first attempt to provide chromosome numbers for the species of the British flora, compiled by Pamela F. Maude of the John Innes Horticultural Institution, Merton. Such a list is, of course, incomplete at the present time, but that it can be attempted shows that cytologists have been much more thorough in their attack on the native flora than is generally realized, and the list, with its numerous gaps, is a stimulus to further work and gives invaluable indications where such work is particularly needed. The list reveals that of 526 British genera of flowering plants, 444 have been examined, and of 2,256 species in the London Catalogue, numbers can be supplied for some 1,300. Authorities are cited in each case, usually the latest reference being cited, but, at times, the preference is for a more important reference or to a more accessible (European) paper. This catalogue will be invaluable to both systematist and cytologist. It is published under the auspices of the Association for the Study of Systematics in Relation to General Biology.

Chromosomes of the Sawflies

THE characteristic diploid chromosome number in the Tenthredinidæ, the sawflies, is sixteen, although in Claudius and a few other species allied to this genus the number is twelve. A. D. Peacock and Ann R. Sanderson have investigated the cytology of another sawfly, *Thrinax macula* Kl. (*Trans. Roy. Soc. Edin.*, 1939), in which the diploid number is fourteen as found in the blastoderm, follicle cells, oogonia, oocytes and polar nuclei. This species is a female-producing parthenogenetic one in which, however, rare males sometimes make their appearance. Some of the latter were fortunately found and they appear to be haploid with a chromosome number of seven. During the maturation of the egg only one non-reductional division takes place in which there is neither synaptic pairing nor tetrad formation. The diploid number is presumably maintained in this species by the omission of synapsis, as is probably the case in the majority of parthenogenic animals in general. It is to be noted, however, that two maturation divisions do occur in some female-producing parthenogenetic sawflies. During spermato-genesis the first maturation division is abortive and the second is equational, as is commonly found in the Hymenoptera.

Chromosome Rearrangements in Drosophila

B. P. Kaufmann (*Genetics*, 23, 154; 1938; 24, 101; 1939) and B. P. Kaufmann and Ruth C. Bate (*Proc. Nat. Acad. Sci.*, 24, 368–371) have analysed some chromosomal abnormalities in the progeny of X-rayed *Drosophila melanogaster*. One individual showed a duplication *abcdgfeefgh* in the nature of a 'reversed repeat'. This is shown to have arisen from the breakage and reunion of two sister chromatids derived from one paternal chromosome. Complex configurations were found. One configuration involved ten breaks and attachments, of which five were in one chromosome arm. Another showed that both chromatids of the duplicated section had been broken at two similar loci accompanied by a third break in each of the chromatids which had occurred at different loci.

Position Effect

HAIRY wing (*Hw*), a well-known and much used dominant character near the distal end of the *X*-chromosome of *Drosophila melanogaster*, has been shown by M. Demerec and M. E. Hoover (*Genetics*, 24, 68, 271–277; 1939) to be due to a duplication of a single band of a salivary gland chromosome. This band is known to be associated with achæte (*ac*), which reduces the dorso-central bristles. Further, as in Sturtevant's Bar case, it is shown that when two bands are represented on one chromosome they have a greater effect than if they were distributed between two chromosomes. Unfortunately, no case of crossing-over between the two bands has yet been observed. This may probably be due to the fact that crossing-over is normally low in the region *y–sc* where *Hw* is placed.

Heterosis

L. C. LUCKWILL (*J. Genet.*, 37, 421–439) has investigated the stage in the life-cycle of hybrid tomatoes at which heterosis is manifested. There was little correlation between heterosis in the seed and in the mature plant. In some hybrids heterosis was present in the shoot primordium on the 16th day and persisted until the 145th day, while in other hybrids heterosis arose subsequent to the 16th day. The author considers that in intraspecific hybrids heterosis may be dependent on complementary size determining genes as visualized by Jones. For inter-specific hybrids, however, he produces evidence to support East's hypothesis.

Structure of South-east England

DEFINING South-east England as the region lying south and east of the main chalk escarpment between Dorset and The Wash, S. W. Wooldridge and D. L. Linton have written a closely reasoned mono-graph on the development of its structure and relief ("Structure, Surface and Drainage in South-East England". Institute of British Geographers Publication No. 10. 1939. 12*s*. 6*d*.). The broad lines of the structure of this area are well known, but the two authors have added much detail and traced in lucid fashion the genetic development. They begin with the early Palæozoic floor. Particular interest is attached to the concealed junction of the Armorican and Caledonian structures which runs beneath the Lower Thames Valley. Southwards the cover rocks show competent folding and northwards only gentle flexuring. After the emergence of the chalk floor, a full cycle of erosion ran its course and the greater part of the area lost its upper divisions of the chalk. The mid-Tertiary flexures south of the Thames and the mid-Tertiary foldings and the subsequent pro-duction of the late Miocene and early Pliocene pene-plain are then traced. The invasion of the Pliocene sea and the emergence of the Pliocene sea-floor followed, and the lower Thames is shown to have had a course well north of its present channel. Then came the effects of the Chiltern and eastern ice sheets and the general subsequent uplift of the area. The monograph is well illustrated by maps and diagrams.

Range of Possible Existence of Stoneley Waves

THIS problem has been studied by K. Sezawa and K. Kanai (*Bull. Earthquake Res. Inst.*, Tokyo Imp. Univ., 17, Part 1, 1–8; March 1939). First they obtained the velocity equation for waves of this type which are particular forms of Rayleigh waves, and from this equation calculated the velocity of trans-mission in the critical conditions of the equation which allow waves of this type to exist. From tables and graphs in two limiting cases of Poisson's ratio, it is seen that Stoneley waves exist within a narrow range of μ'/μ for every ratio of ρ'/ρ. The authors point out that this feature is remarkable, particularly when the ratio of ρ'/ρ is nearly unity, at which con-dition Stoneley waves could not exist unless Wiechert's condition, $\rho'/\rho = \mu'/\mu$, be almost satisfied. On the other hand, when the ratio of ρ'/ρ is relatively small, say less than 0·5, or relatively large, say greater than 2, the range of μ'/μ in which Stoneley waves exist is relatively wide, Wiechert's condition being then rather unimportant. The greater the ratio ρ'/ρ, the greater the ratio μ'/μ for the real existence of the waves. The velocity of transmission of the waves is independent of the wave-length, that is, they are not dispersive. It is likely that in between the critical values the velocity of transmission is less than either one of the velocities of distortional waves in both media. The waves are found not to exist for the range $0·563 > \mu'/\mu > 0·4927$, the

corresponding velocities of transmission ranging between $\sqrt{\mu/\rho}$ and $0\cdot9926\sqrt{\mu/\rho}$, where ρ, ρ', are the densities and μ, μ', the elastic constants of the adjacent media.

Structure of Vitamin B$_6$

VITAMIN B$_6$ is that factor of the vitamin B complex which prevents or cures an acrodynia-like dermatitis in young rats. If factor 2 is added to the usual thiamin and riboflavin supplement, vitamin B$_6$ not only produces a cure of the dermatitis but also a stimulation of growth. It has also been found that a severe microcytic hypochromic anæmia developed in puppies when the rat antidermatitis factor (vitamin B$_6$) was apparently the only missing component of the diet, and the anæmia was cured by the addition of this factor to the diet. The constitution of vitamin B$_6$ has now been established by a group of workers in the research laboratory of Merck and Co., Inc. (*J. Amer. Chem. Soc.*, 61, 1237–1247 ; 1939), whose results confirm those obtained by Kuhn and co-workers published this year. The vitamin was isolated from rice bran as the hydrochloride $C_8H_{12}O_3NCl$ of a base $C_8H_{11}O_3N$(m.p. 160°). The methyl ester of vitamin B$_6$ was oxidized to a lactone and a dibasic acid. The acid was shown to be 2-methyl-3-methoxypyridine-4, 5-dicarboxylic acid and vitamin B$_6$ to be 2-methyl-3-hydroxy-4, 5-(hydroxymethyl)-pyridine. The 3-cyano-4-ethoxy-methyl-6-methyl-2-pyridone was made from ethoxy-acetylacetone and cyanoacetamide. This 2-pyridone derivative was used for the synthesis of the lactone of 2-methyl-3-methoxy-4-hydroxymethyl-5-carboxy-pyridine and the 2-methyl-3-methoxy-4, 5-pyridine dicarboxylic acid. This lactone and this acid were found to be identical with the lactone and dibasic acid obtained by the oxidation of the methyl ether of vitamin B$_6$, and the latter was thus proved to be 2-methyl-3-hydroxy-4,5-di-(hydroxymethyl)-pyridine. A complete synthesis of vitamin B$_6$ from ethoxy-acetylacetone and cyanoacetamide was accomplished. The synthetic vitamin B$_6$ hydrochloride was shown to be identical with the natural product. A single dose of 100 gamma of the synthetic vitamin B$_6$ hydrochloride gave a curative effect which paralleled that of the natural vitamin B$_6$.

Metabolism of Chloronaphthalenes

R. V. Cleary, J. Maier and G. H. Hitchings (*J. Biol. Chem.*, 127, 403 ; 1939) have studied the metabolism of a mixture of polychloronaphthalenes. The substance was found to be absorbed completely when given in olive oil solution to albino rats in doses up to 15 mgm. per day. No significant storage of the material could be detected in lung, liver, skin or kidney, nor was any significant amount excreted in the urine. Both the rat and dog apparently were able to remove and excrete the chloride promptly. A rise in the urinary ethereal sulphate fraction, but no significant change in the neutral sulphate excreted, was noted following chloronaphthalene feeding in the dog.

Testing of Electric Fuses

IT is of considerable importance to know the time necessary for the melting of fuses upon the occurrence of an electric short circuit. This time must be short enough to prevent damage to the apparatus or to the lines in series with the fuse, before the fuse has melted. It is particularly important in the cases of branches of a network, which is protected by a main fuse, when each branch contains an auxiliary fuse. These fuses protect the main fuse, so that the 'blowing' of one of them does not disturb the other branches. In a paper in the *Philips Technical Review* of April, by J. A. M. van Liempt and J. A. de Vriend, an easy method is described of testing fuses by a cathode ray oscillograph. The melting time of a fuse depends on the short-circuit current. If this time is sufficiently short to allow the dissipation of the heat being neglected, then the short-circuit current is several times the limiting current, that is, the maximum current the fuses can carry for unlimited time. G. C. Meyer found in 1906 that the melting time could be expressed by a formula. He found that if the fuses were initially at room temperature, then the time multiplied by the square of the short-circuit current equals a constant for a given material which is called the relative inertia constant. The value of this constant, for example, may be 1,000 for copper and 40 for lead. By recording the current at the moment of the melting of the fuse as a function of the time until it melts with the aid of a cathode ray oscillograph, the short-circuit current and the time can be determined from the same oscillogram. The authors also show how the measurement can be made with alternating current. In this case it is simplified, as for the calibration of the time no separate oscillogram is necessary, the time-scale being read off immediately from the oscillogram for the calibration of the current.

Supernovæ

H. ZANSTRA (*Occasional Notes, Mon. Not. Roy. Astro. Soc.*, No. 4, March 1939) has dealt with the main characteristics of these objects. Some of these extra-galactic novæ have a brightness equal to nearly 100 million suns, a remarkable contrast to the ordinary nova, which has a brightness about one thousandth of this. In 1934 Baade and Zwicky suggested that these extremely bright objects were not ordinary novæ, but presented a class by themselves—the class of supernovæ. In the *Contributions from the Mount Wilson Observatory* (Nos. 600, 601 and 602), there is a comprehensive study of all these supernovæ from 1885 to 1938, and in these Baade deals with their photographic brightness at maximum, Baade and Zwicky with their light curves, and Minkowski with their spectra. It is remarkable that the absolute photographic magnitudes of the supernova and the spiral nebula in which it appears are nearly the same, on the average about $-14\cdot2$. The origin of such a cataclysm, producing a brightness of 7×10^7 suns, presents a problem on which it is possible to speculate, and which will probably exercise the minds of the theorists for some time. A supernova outburst is something entirely different from an ordinary nova outburst on a large scale, although there is a close similarity in the spectra. Certain differences, however, exist, and Minkowski, who has examined the bright bands in the later stages of the supernovæ, has not been able to identify them with certainty as belonging to known atoms or ions. The behaviour of the spectrum is peculiar, and it is very probable that the conditions under which matter is excited in supernovæ are most abnormal. Zwicky at the Palomar Observatory is undertaking a systematic survey with an instrument of large field, and since the autumn of 1936 has discovered seven supernovæ. It is hoped that sufficient material will soon be available for a study of these very interesting objects.