

RESEARCH ITEMS

Ptinid Beetles of Economic Importance

IN the *Bulletin of Entomological Research* (31, 331–381; 1941), H. E. Hinton, of the British Museum (Natural History), contributes a critical revision of 21 species of the family Ptinidæ that have been recorded as pests. The object of this work is to illustrate and describe these species in sufficient detail in order to facilitate their ready and accurate identification. In general, these beetles are known to infest an enormously wide range of stored products, and occur in houses, drug stores, warehouses and granaries. Some species have been found in association with such apparently unpromising substances as cayenne pepper, opium, argol and indiarubber. Others have been found in grain, nests of bees, in fish meal, cacao, in insect collections, birds' nests, etc. Three British species of *Ptinus* are of no economic importance, but have been included so as to make the paper applicable to all the British Ptinidæ. Six of the species of this family have not so far been found in Britain. It is interesting to note that several of the species have been known since the end of the eighteenth century, while *Ptinus fur* was described by Linnæus as *Cerambyx fur* in the "Systema Naturæ" (1758).

Chiasma Interference

H. B. NEWCOMBE (*Genetics*, 26, 128–137; 1941) has shown that coincidence values obtained from the direct observation of the position of chiasmata in *Trillium erectum* correspond with those of genetical analysis of cross-overs. Interference in an arm of a chromosome may still be present in a distance of 2 microns; above this distance the coincidence value does not differ from unity. Across the attachment constriction the value is significantly greater than unity. An increase in chiasma frequency is accompanied by decreased coincidence across the centromere and increased coincidence within an arm.

Inert Chromosomes

C. D. DARLINGTON and M. B. UPCOTT (*J. Gen.*, 41, 275–297; 1941), have examined the behaviour of the *B* or supernumerary chromosomes of maize. These chromosomes are heterochromatic and have an excessive nucleic acid charge. Their chiasma frequency is less than proportionate to their length on the *A* chromosome standard. Since these *B* chromosomes may be reduplicated, it can be shown that the crossing-over frequency is increased with odd numbers of chromosomes; this is due to the potential increase in change of pairing partners. *B* chromosomes are irregular in behaviour during mitosis and meiosis and may be lost or give rise to chromosomes with deletions. On the other hand, lines of maize show a constant number of *B* chromosomes. Therefore, there would appear to be a selection pressure favouring *B* chromosomes. Thus the inert chromosomes would appear to be active in some physiological sense.

Sexuality in Wild Populations

THE occurrence of peculiar sex forms in species of plants has been a puzzle to many workers. In contrast to pure diceism in higher animals, sex intergrades occur irregularly among plant species which are predominantly hermaphrodite. D. LEWIS (*New Phyt.*, 40, 56; 1941) has shown that male-sterility of hermaphrodites due to cytoplasmic causes has more chance of survival than that due to genic male-sterility. With genic male sterility the frequency of 'females' in a population is 50 per cent and in no case can an equilibrium between 'females' and 'hermaphrodites' be reached unless the females are initially twice as fertile as hermaphrodites. On the other hand, cytoplasmic male-sterility can produce 100 per cent 'females'. If the 'females' have only a slight advantage over the hermaphrodites they will spread in the population. This advantage may be one of compulsory outbreeding, thus giving rise to hybrid offspring. Cytoplasmic sterility, therefore, is sensitive to several selective agencies in the wild population.

North Pacific Earthquake of November 10, 1938

AN important investigation is at present being made by K. E. BULLEN and J. F. de LISLE on Rayleigh waves from the North Pacific earthquake of November 10, 1938. On account of the importance of this earthquake in the problem of Pacific crustal structure due to the unusually large and clear surface waves, J. F. de Lisle has estimated the degree of accuracy of the epicentre and origin-time used (Wellington, New Zealand: Dominion Observatory Bull. No. S-58; 1941). To do this a careful investigation was made of the *P* residuals, taking into account the ellipticity corrections. The author has shown by this work that the epicentre as assumed by the Jesuit Seismological Association, namely, 55.6° N., 157.7° W. is subject to an uncertainty probably not exceeding 0.3° in an east-west and 0.1° in a north-south direction, while the origin time of 20h. 18m. 48s. G.M.T. probably needs a correction of – 3 seconds.

A Closed Dyke-Sill Intrusion in the Transvaal

AN intrusion of altered quartz-dolerite of unique form, occurring in Marievale Mine and adjoining mines on the Far East Rand, is described by J. ELLIS (*Trans. Geol. Soc. Africa*, 43, 127–142; 1941). The shape of the intrusion is that of a stepped dome of alternating dyke and sill phases. The intrusion, known in the mines as the 'Old Lady', never reached the surface, the top being of sill-like form below the Kimberley Shale. Against the inside of the dyke phases the strata are vertically displaced, the down-throw being equal to the thickness of the sill phase and generally of the order 150–200 ft. The dyke phases form closed rings at the levels where they occur, and there has been little or no horizontal separation of the strata. The mechanics of the intrusion are discussed in considerable detail. It is

shown that the formations above the sill phases were not uplifted, but that subsidence of the rocks enclosed within the intrusion took place. The cause of subsidence, which cannot have been very deep-seated, is sought in the Basement Complex. It is suggested that the latter was weakened or melted by the rise of basic magma, and it is thought possible that the quartz-dolerite may be the result of contamination by granite of a parental basaltic magma. Evidence is presented that the age of the intrusion is just before or just after that of the Ventersdorp lavas which, petrochemically, are of similar type. Owing to the unusual shape, the reef displacement, and the toughness of the rock, the 'Old Lady' is everywhere a considerable source of embarrassment in mining operations.

Age of the Monchiquite Dykes of Colonsay

Two monchiquite dykes occurring in Colonsay belong to a suite of monchiquite and camptonite dykes, commonly following a north-west trend, of which members have been found in Coll, Iona, Mull and various parts of the mainland of Argyll. Although on grounds of petrographic analogy these are all thought to be of the same age, their geological relations nowhere provide direct evidence of what that age may be. The ages of the Colonsay examples have now been determined by the helium method by W. D. Urry, and for comparative purposes the ages of two Carboniferous basic rocks from Shropshire have also been measured. Petrological, chemical and other details of the rocks are provided by A. Holmes, who supplied the specimens, and the results are published in a joint paper (*Geol. Mag.*, 78, 45; 1941). Arising in part out of this investigation, it was found in 1937 that many of the helium ratios on which the 'helium' time-scale had been based were too high, because of a previously unsuspected error in radium determinations due to reliance having been placed on a radium standard which was seriously at fault. The new results, together with a few others, are given in the following table, which forms the nucleus of a revised 'helium' scale.

| Geological age | Rock type and locality | Age in millions of years, of the helium scale |
|---------------------|---|---|
| Pliocene | Basalt, Oregon (1) | 8 |
| Miocene | Basalts, Washington (3) | 10 |
| Oligocene | Basalts, Silesia (3) | 20 |
| Cretaceous—Jurassic | Granodiorites, California (5) | 60 |
| Triassic | Dolerites and basalts, New Jersey—Nova Scotia (8) | 93–105 |
| | Monchiquite, Colonsay (4) | 125 |
| | Biotite-monchiquite, Colonsay (4) | 130 |
| Upper Carboniferous | Dolerite, Clee Hills, Shropshire (1) | 135 |
| Lower Carboniferous | Basalt, Little Wenlock, Shropshire (1) | 140 |
| Devonian | 'Newbury Volcanic Rock', Massachusetts (1) | 180 |

The Colonsay results fall between those for the Triassic and the Carboniferous. It is therefore concluded that the Colonsay monchiquites are of late Carboniferous or Permian age, with considerable probability in favour of the latter. It should be noticed that although the 'helium' time-scale is internally consistent, the 'ages' therein are much lower than those given by the 'lead' method. The reason for this discrepancy is not yet known, and several investigators are collaborating in the attempt to elucidate it.

Variability of Rainfall in New Zealand

WHEN considering the suitability of a climate for most agricultural purposes it is necessary to know not only the average rainfall but also its variability. It is doubtless this fact which has led to the publication of *Meteorological Office Note No. 24 of the Air Department, New Zealand*, by C. J. Seelye, entitled "Variability of Annual Rainfall in New Zealand". Since the annual rainfall only is dealt with, the variability can be shown in a single map which brings out clearly the main features of its geographical distribution, variability being expressed by the average percentage variation from the mean for a selected period, in this case 1901–35. In New Zealand, low variability results when the fall comes largely from persistent westerly winds, while the rainfall derived mainly from easterly winds and from tropical cyclones shows high variability. For these reasons, areas with more than 18 per cent variability are found only in the north, and those with less than 8 per cent only in the extreme south, while the east on the whole is more variable than the west. The extremes are 8.7 at Queenstown and 21.2 at Petane, to the north of Napier. New Zealand is slightly less fortunate than the British Isles, where variability ranges from about 6 to 17 per cent only, with an average of roughly 11 per cent, but is far more fortunate than many countries bordering the tropics, for example, Arabia and Egypt, where variability exceeds 50 per cent. Nevertheless, in individual years single stations in New Zealand sometimes show departures from the average that must be very disturbing from the point of view of agriculture, the district including Nelson and Marlborough providing extremes of only 44 per cent in 1915 and as much as 232 per cent in 1936; in Southland, on the other hand, the corresponding extremes are only 63 (in 1907) and 153 per cent (in 1913).

Harmonic Analysis of Barometric Pressure

THE harmonic analysis of barometric pressure has been greatly extended geographically in recent years, and the latest addition comes from the Meteorological Office of New Zealand. In *Meteorological Office Note No. 23 of the Air Department, New Zealand*, C. J. Seelye discusses the variations at Wellington, New Zealand, for the period July 1914 to December 1938, during which time a Short and Mason barograph was in operation, at first at a height of 16 ft. above mean sea-level, but after September 1930 at a height of 425 ft. The indications of the barograph were corrected by means of mercurial barometer readings at 9 a.m. N.Z.M.T., supplemented after September 1930 by additional readings at 11.30 a.m. and 3 p.m. N.Z.M.T. Monthly values of the amplitude and phase angle for the 24-hr., 12-hr., 8-hr. and 6-hr. terms are discussed in detail. Of these, the second is, of course, the largest, the amplitude varying from 0.49 millibars in November (early summer) to 0.40 mb. in June. It is on an average for the whole year roughly three times as large as the amplitude of the 24-hr. term. The existence of one annual minimum value of the amplitude of the 12-hr. term had been noted at eight other stations in the southern hemisphere by Kochanski, who observed that the normal rule is for maxima to occur at the equinoxes and minima at the solstices. The 8-hr. term has very regular characteristics, although much smaller than the two already described; it reaches a maximum in January and July, and almost disappears in March

and October. An item of practical importance in weather forecasting, which is included in this study of pressure variation, is a table showing the mean barometric 'tendency' (that is, change in tenths of a millibar in 3 hr.) for different hours of the day, a quantity which when subtracted from the observed tendency leaves the portion which may be attributed to the movement or development of anticyclones or depressions.

Distribution of Electricity in Thunderclouds

OBSERVATIONS made on thunderstorms at Kew Observatory during 1937-39 are reported in detail by Sir George Simpson and G. D. Robinson (*Proc. Roy. Soc., A*, 177, 281; 1941). In every thundercloud there is a positive charge of electricity near the top of the cloud, where the temperature is below -10°C ., and a negative charge below the upper positive charge. The generation and separation of these charges occurs in the ice region, and the most probable cause is the collision of ice crystals in the turbulent air associated with the strong ascending currents in a thunderstorm. The collisions charge the ice negatively and the air positively, and it is the settling of the ice crystals relatively to the air which separates the positive and negative charges. Below the main negative charge in the lower half of the cloud there are in most, if not in all, thunderstorm, regions containing positive charges. With few exceptions the temperature where these positive charges occur is above the freezing-point. These low positive charges are associated with heavy rain and they are probably generated by the breaking of raindrops in ascending currents of air.

Ferric Thiocyanate

THE blood-red colour formed from ferric salts and thiocyanates in solution, usually attributed to ferric thiocyanate $\text{Fe}(\text{CNS})_3$ (which is soluble in ether) has been regarded by Schlesinger and Van Valkenburgh (*J. Amer. Chem. Soc.*, 53, 1212; 1931) as due to a complex anion $\text{Fe}(\text{CNS})_4'''$, and this view has found its way into the literature. H. E. Bent and C. I. French (*J. Amer. Chem. Soc.*, 63, 568; 1941) have made a new investigation of the matter by a method in which the dependence of the molecular extinction coefficient of the solution on the concentration of ferric and thiocyanate ions at constant $p\text{H}$ and ionic strength is measured, and they find no evidence for the existence of an ion $\text{Fe}(\text{CNS})_6'''$. The supposed migration of the coloured ion towards the anode could not be confirmed; there was only a slight movement towards the cathode. The conclusion is reached that the coloured substance is a cation, FeCNS^+ , but more work is obviously necessary before the old view that it is undissociated ferric thiocyanate is definitely rejected.

Electrical Properties of Solids

THE properties over a wide temperature range have been determined by R. M. Fuoss for a number of polar polymers, such as polyvinyl chloride, subjected to alternating current at 60-10,000 cycles (*J. Amer. Chem. Soc.*, 63, 369, 378, 385; 1941), the work extending also to mixtures. Characteristic maxima in absorption and dispersion in dielectric constant were found which are interpreted as determined by the size and strength of the polar group, by the length and flexibility of the bond of the polar

group to the polymer chain, and by the nature and amount of a second component present as a plasticizer. The fundamental mechanism of alternating field response, it is concluded, is dipole rotation in a medium of high viscosity, the primary effect of temperature being to change this internal viscosity. A transition temperature is described as relating to a process of internal melting. For mixtures, the loss factor for a given frequency and temperature passes through a maximum at a concentration which is characteristic of a given plasticizer. The electrical properties are markedly non-linear in composition in the low concentration range. A method of calculating the distribution of relaxation times from the loss factor — frequency curve is given, and for systems containing polyvinyl chloride an approximate equation is given for these curves. The C-Cl moment in polyvinyl chloride is calculated as 2.0. The theory is in agreement with previous empirical conclusions concerning chain interaction in polymeric systems.

Molecular Anisotropy of Urea and Related Compounds

A CONSIDERABLE amount of data on the magnetic and optical properties of urea and related substances has been correlated in a paper by K. Lonsdale (*Proc. Roy. Soc., A*, 177, 272; 1941). From comparisons of the magnetic anisotropy of urea with that of the carbonate and nitrate groups it appears that the hydrogen bonds contribute little to the anisotropy. The anisotropy of the refractivities is greater in urea than in the carbonate group. Urea nitrate, urea oxalate, cyanuric acid dihydrate and anhydrous cyanuric acid all crystallize in larger structures, as shown by cleavage, X-ray, magnetic and optical data. Although the molecules in each layer are joined together by hydrogen bonds, the links between successive layers may not be hydrogen bonds since the layer to layer distance of $3.05 \pm 0.10 \text{ \AA}$. is characteristic even of cyanuric triazide, which contains no hydrogen bonds.

Comet Cunningham, 1940 c.

It is reported from the McDonald Observatory, Texas (*Harvard Announcement Card*, 556; Jan. 8, 1941) that spectrograms of Comet Cunningham show near 3360 and 3090 \AA . two prominent groups of lines not hitherto observed in cometary spectra. The first group consists of seven lines of the (0, 0) and (1, 1) bands of the ${}^3\Pi \rightarrow {}^3\Sigma$ system of NH. The second, also comprising seven sharp lines, arises from the (0, 0) transition of the ${}^2\Sigma \rightarrow {}^2\Pi$ system of OH. Other ultra-violet lines on the same spectrograms are attributed, though with less certainty, to CH and CN. The identification of NH and OH adds two more molecules to the five previously recognized in comets: CN, C_2 , CH, CO^+ and N_2^+ . As with these latter, the observed lines of the newly discovered molecules arise from resonance transitions, and the current theory of resonance excitation is adequate to account for their presence. In the visual region, the D lines of sodium appeared faintly in emission at the end of December and strengthened rapidly in early January. This, too, is to be expected since the comet made its closest approach to the sun in mid-January. A series of excellent direct photographs of the comet appearing in the *Telescope* of Jan.-Feb., 1941, traces its development from discovery in September 1940 to the end of the year.