

RESEARCH ITEMS

Breeding of the Rock-Dove

FOLLOWING his finding of rock-doves (*Columba l. livia*) in full nesting activity in January 1944, at Eathie Shofe by Cromarty, John Lees has made further observations in the same caves, which show that breeding activity goes on more or less all the year round (*British Birds*, 34, No. 5, May 1946). There is a marked maximum in April, coinciding with the general nesting season for resident birds. The minimum occurs in July, and this may be coincident with the moulting of the body feathers; moulting certainly proceeds during the autumn months. Periods of nesting alternate with periods of quiescence, the latter being usually quite short and sometimes non-existent through the interlapping of active periods. The active periods fall into four groups. There is the main period of spring nesting, where hatching takes place about April. This is followed, after a break, by a summer activity, young birds appearing in August. After this come autumn and winter periods, with hatchings about November and January.

Classification of Dermestid Beetles

MISCELLANEOUS PUBLICATION No. 511 of the United States Department of Agriculture is of general interest to entomologists. It deals with the classification, based upon larval characters, of beetles of the family Dermestidae, and is written by Bryant E. Peck, of the Division of Insect Identification, U.S. Bureau of Entomology and Plant Quarantine. Included in this family are the larder, hide and carpet beetles, all of which are highly injurious to the activities and interests of man. In their larval stages these insects feed upon, damage or destroy a wide range of goods, especially those made of, or containing, leather, hair, fur, wool or silk, besides museum specimens and numerous stored products such as bacon, cheese, seeds, grain, cork, etc. In war-time, many kinds of military stores have to be protected against their attacks. The adult beetles, however, are not directly injurious to any great extent. In order to control the damage caused by Dermestidae, a knowledge of their larvæ is, therefore, of prime importance. While numerous scattered and usually inadequate descriptions exist, no general work on the subject had been undertaken. The present pamphlet will, it is believed, prove a useful aid to the identification of the various genera, and economic entomologists especially will welcome its appearance. It is interesting to note that a study of the larvæ of species of *Entomotrogus*, *Eucnocerus* and of several species of *Trigoderma* revealed no characters by which the three genera could be separated; they agree in all constant characters, and it is suggested the species may all be congeneric.

Bacteriostatic Substances in Fungi

W. H. Willkinst and G. C. M. Harris are continuing their examination of various fungi for the production of bacteriostatic substances (*Trans. Brit. Mycol. Soc.*, 27, (13) 1945). This third group of a hundred species and strains of *Aspergillus* shows quite a good measure of bacteriostatic activity against three representative types of bacteria—*Staphylococcus aureus*, *Bacterium coli* and *Pseudomonas pyocyanea*. It becomes increasingly clear, however, that every isolation should be treated as "an individual fungus whose physiological potentialities are probably quite

distinct from other isolations and strains of the same fungus". The production of bacteriostatic substances varies with different media. Malt, potato dextrose and modified Czapek-Dox agar have been found most generally suitable, but it seems possible that optimal media could be made to suit particular fungi.

Genetics of Blight-Resistant Potatoes

SEVERAL potato seedlings resistant to blight, *Phytophthora infestans*, have been produced by the Scottish Plant Breeding Station, Corstorphine, Edinburgh. William Black has recently analysed the genetics of these productions (*Proc. Roy. Soc. Edin.*, B, 62, Pt. 2, No. 20; 1945), which apparently owe their resistance to the 'wild' ancestor, *Solanum demissum*. Derivatives of the triple hybrid (*S. Rybinii* × *S. demissum*) × *S. tuberosum*, and of a multiple species hybrid involving *S. commersonii*, *S. maglia*, *S. edinense*, *S. demissum* and *S. tuberosum* have been tested for their reaction to strains 'A' and 'B' of the blight fungus. The evidence indicates that resistance to blight is controlled by major genes, though minor genes determine the degree of susceptibility in susceptible varieties. Consistent excesses of recessive individuals over the expected standard ratios were found in the segregation of resistant and susceptible plants. This may be due in part to chromosome homologies leading to multivalent-formation and double reduction. In the material studied, however, the deviation in favour of recessives diminishes in consecutive generations. This is interpreted as a lowering of residual incompatibility factors derived from the original 'wild' material, and should augur well for the practical usefulness of subsequent generations.

Marsh Spot Disease of Peas

SOME disorders of plants require the joint ministrations of a pathologist and chemist for diagnosis and control. Marsh spot of peas, where dark-brown lesions appear on the flat sides of the cotyledons, is not caused by any parasite; it is a symptom of manganese deficiency. Thomas Walsh and Stephen J. Cullinan (*Proc. Roy. Irish Acad.*, 50, B, No. 15, 279, June 1945) have shown that the varieties Laxton's Superb and Blues were unaffected, Marrowfat and Alderman had moderate attacks, while Onward and Giant Stride showed severe lesions. Application of 56 lb. of manganese sulphate an acre reduced the malady somewhat, but spraying the foliage with 1 per cent manganese sulphate solution at flowering time resulted in complete control.

Rust of Cultivated *Rosa*

OF nine rusts recorded on species of *Rosa* in the United States only *Phragmidium mucronatum* is of economic importance, and this is virtually restricted to the western seaboard. A detailed study by V. W. Cochran (*Cornell Univ. Agric. Exp. Sta.*, Mem. 268; 1945) shows that the uredospores are relatively short-lived and are killed by extremes of temperature. In California the mild climate enables uredospores to persist all the year and to maintain a high level of infection, whereas in the eastern United States, spring infection is entirely from teleutospores, and uredospore formation is checked by the heat of summer. Host-parasite relations and conditions of spore germination and development are fully tabulated.

Currents of the Bosphorus

In a paper on the hydrography of the Bosphorus published in the *Geographical Review* of January 1946,

P. Ullyott and O. Ilgaz bring forward new facts on bathymetry and current flow confuting the old idea of a simple surface flow southward from the Black Sea and a bottom flow northward to the Black Sea. New facts regarding submarine relief show a threshold at the Black Sea end of the Bosphorus against which ends the deep canal of the strait. This fact, and that of the low salinity of the deep waters of the Black Sea, will not conform to the usually accepted theory. The authors agree that currents in the Sea of Marmora and Bosphorus are as generally accepted, but that the northward flow in the deep canal, on account of the shallow threshold, never reaches the Black Sea, but is turned back and incorporated in the southward setting surface current. Thus the Black Sea does not receive any water through the straits, and a balance is effected by gain through drainage supply, loss by evaporation and outflow by surface current into the Aegean Sea. This balance sheet of gain and loss, if true, would account for the low salinity of the deeper waters of the Black Sea.

Porosity of Rocks and Geospheres

G. A. MAXIMOVICH (*Bull. Acad. Sci. URSS, Sér. géograph. géophys.*, 298; 1944), after making a compilation of several thousands of determination of rock-porosity, including numerous unpublished data from Russian sources, has calculated the average porosities of different types of rocks and has also calculated the average porosities of the geospheres. These, in percentages, are as follows: pedosphere (soils), 55; pelosphere (oozes, etc.), 50; hypopedosphere (subsoils, etc.), 40; stratisphere (sedimentary rocks), 25; metamorphosphere (metamorphic rocks), 2½; granitosphere (acid igneous rocks), 1; basaltosphere (basic igneous rocks), less than 1. These calculations allowed him to calculate the average degree of compaction for various rocks and to draw some conclusions which may be of interest to oil- and water-geologists, geophysicists and geochemists.

Surface Tension of Mercury

THE surface tension of mercury has been the subject of many investigations under very different conditions and by many different methods; but measurements are in nearly all cases confined to temperatures above 0° C. Bircumshaw, in 1931, was, according to his own statement, the first to measure the surface tension within the region 0° C. and the freezing point -38.6° C. He used the maximum bubble pressure method and found that at the lower temperatures the relationship between the surface tension and the temperature was not linear and that there was some evidence that mercury has a positive temperature coefficient of surface tension just above the freezing point. Since Bircumshaw's work it would appear that the only determination of the surface tension below 0° C. is that of S. Mussa and B. Takla at the Fouad I University in Cairo. A report of their work has just recently reached Britain (*Bull. Fac. Sci.*, No. 24, 1; 1941). They determined the surface tension at approximately 5° C. intervals over the range 67° C. to -20° C. using the large-drop method as modified by A. E. Bate. The surface tension increases linearly from 67° C. to -5° C., but as the temperature is still further reduced the surface tension decreases considerably and there is a marked deviation from a linear relation. The shape of the curve resembles somewhat that obtained by Bircumshaw. No explanation is given for the fall in the surface tension; but it is asserted that it can scarcely

be due to experimental error or to impurity in the surface of the mercury. The mercury used was purified and doubly distilled and the surface tension measured *in vacuo*.

Phosphorylation

ESTERS and amides of phosphoric acid play an important part in many biological processes, but their laboratory synthesis is still a matter of difficulty. In work on marine glycosides, a convenient method for the phosphorylation of alcohols, in particular carbohydrates, and amines is necessary. F. R. Atherton, H. T. Openshaw and A. R. Todd (*J. Chem. Soc.*, 382; 1945) give a review of known phosphorylation procedures and describe experiments on the use of dibenzyl chlorophosphonate, $(\text{CH}_2\text{Ph})_2\text{POCl}$, as a reagent. It cannot be distilled but can be used in carbon tetrachloride solution. It readily reacts with amines to form dibenzyl aminophosphonates, and with alcohols in presence of pyridine and with sodium salts of phenols, to give dibenzyl phosphoric esters. The benzyl groups in these products can be removed by hydrogenolysis. H. McCombie, B. C. Saunders and G. J. Stacey (*J. Chem. Soc.*, 380; 1945) also describe the preparation of some esters containing phosphorus. Dialkyl chlorophosphonates (dialkylphosphoryl chlorides) are formed by the reaction of a dialkyl hydrogen phosphite with chlorine in the cold; the dialkyl chlorophosphonate, obtained in high yield, is readily identified by the formation of crystalline aminophosphonates with amines. Other methods of preparation are described.

General Magnetic Field of the Sun

T. G. COWLING (*Mon. Not. Roy. Astro. Soc.*, 105, 3; 1945) has reviewed some previous theories to explain the sun's electric field, and he points out that all are inadequate. A first investigation by the author shows that the time of decay of the sun's magnetic field, assuming that it decays only as a result of electromagnetic effects, is about 5×10^9 years, and as this seems a long time, the matter is investigated in more detail. As a result of this investigation, Cowling finds that the period is about 10^{10} years, which is of the order of the time-scale of the expanding universe, and the magnetic field may be a relic from a different primeval state. The assumption that the sun's magnetic field is explained by some unassigned cause operative so long ago is a confession of ignorance, for which reason Cowling examines an alternative hypothesis, that the sun's general field may be due to thermal effects in a rotating mass—a view advanced by W. M. Elasser in 1939 to explain the earth's magnetic field. On developing this theory it is found that the results, while giving a field of the correct sign, give less than 10^{-7} of the observed field. The question arises whether the small field due to thermal currents may not be magnified by dynamo action, due to the circulation of material in meridian planes. This hypothesis, however, must be rejected, because it would require a time equal to 1.6×10^{18} years to produce the present field in the sun. Other possible explanations are briefly considered, including the view that the material in the far interior of the sun is capable of permanent magnetization; and although it requires that a very hot and ionized material is capable of acquiring a regular, crystal-like structure—a possibility usually disregarded—nevertheless Cowling thinks that it is worthy of further investigation, in view of the difficulties of other hypotheses.