RESEARCH ITEMS

Some Interesting Radulæ

YOSHIO KONDO, in his paper "The Dentition of Six Syncerid Genera Gasteropoda, Prosobranchiata, Synceridæ: (Assimineidæ)" (*Occasional Papers Bernice P. Bishop Museum*, Honolulu, Hawaii, **18**, No. 23; 1944) describes the radular teeth of certain land shells described by C. Montague Cooke, jun. and William J. Clench ("Land Shells (Synceridæ) from the Southern Western Pacific", *Occasional Papers Bernice P. Bishop Museum*, **17**, No. 20; 1943). *Electrina succinea* (Sowerby) and *Rapanella andersoni* Cooke and Clench were both found in the small island of Rapa but in distinct areas of distribution. The genus *Garretia* is limited to Cook Islands, the radula of *G. biangulata* (Pease) being dealt with here, *Fijianella calciphila* Cooke and Clench comes from Lau Islands, *Quadrasiella mucronata* Moellendorff from Guam, Marianne Islands. All these have a very peculiar operculum characteristic of each species and differ much in form of shell. The type of radula is found to be remarkably uniform for all six. There are no lateral processes, and the teeth themselves are peculiar and distinctive in form.

Manganese Content of Fruit Tree Foliage

DIFFERENT crops vary greatly in their susceptibility to manganese deficiency, and although manganese deficiency symptoms have been recognized in the leaves of apple, apricot, cherry, peach, plum (prune) and walnut (as well as in other crops), prunes remain healthy in locations where peaches develop severe manganese-deficiency chlorosis. These differences may be due to differing manganese requirements or to variations in the ability to absorb manganese or to a combination of these factors. Of interest in this connexion are data presented by E. Epstein and O. Lilleland (*Proc. Amer. Soc. Hort. Sci.*, **41**, 11; 1942). They report that different fruit trees, when grown under identical conditions, with manganese supplies adequate, have widely different contents of manganese in the leaves. Expressed as parts per million of dry matter of leaves the manganese contents found were for: filbert, 494; walnut, 246; almond, 96; apple, 81; prune, 73; peach, 66; pear, 63; and cherry, 62·7. Clearly, susceptibility of the peach to manganese deficiency is not due to an inability to absorb manganese as the peach leaves contain almost as much manganese as those of the 'resistant' prune.

Ascorbic Acid Content of Tomato Fruits

G. B. Reynard and M. S. Kanapaux (*Proc. Amer. Soc. Hort. Sci.*, **41**, 298; 1942) find that two small-fruited tomato species (*Lycopersicon peruvianum* (L.) Mill. and *L. pimpinellifolium* (Jusl) Mill.) have a much higher content of ascorbic acid than the various types of *L. esculentum*. The ascorbic acid content of the fruits of *L. peruvianum* varied between 58·9 and 63·0 mgm. per 100 gm. and of *L. pimpinellifolium* between 35·9 and 47·0 mgm. per 100 gm. Intermediate-sized types, for example, *L. esculentum* var. *cerasiforme* (Dun.) A. Gray (cherry tomato) and *L. esculentum* var. *pyriforme* (Dun.) C. H. Mull (pear tomato) gave fairly high values, but large-fruited commercial types of *L. esculentum* gave low values (11·2–21·5 mgm. per 100 gm.), while within each type fruit-size and ascorbic acid content showed a negative correlation. Possibly connected with this inverse relation between fruit size and ascorbic acid content are the high ascorbic acid values which have been re-ported for the fruits of tetraploid tomatoes, as these often have characteristically small fruits (E. C. Stair and R. K. Showalter, *Proc. Amer. Soc. Hort. Sci.*, **40**, 383; 1942).

Tertiary Igneous Rocks of Eastern Otago

FOR many years W. N. Benson has been making a detailed study of the Tertiary igneous rocks of eastern Otago and their tectonic environment. Five papers, embodying the results to date, have recently appeared (I, *Trans. Roy. Soc. N.Z.*, **71**, 208 (1941); II, **72**, 85 (1942); III, **72**, 160 (1942); IVA, **73**, 116 (1943); IVB, **74**, 71 (1944)). These make a very notable contribution to the geological history, petrology and geochemistry of an extensive area centred on Dunedin. In I and II Prof. Benson recognizes: (*a*) a relatively stable region in the west, almost devoid of late Tertiary igneous rocks, though containing in the extreme north-east a great development of pillow lavas and minor intrusions of early Tertiary age; (*b*) a moderately deformed belt between (*a*) and the coast, which contains most of the rocks so far described in these papers; and (*c*) a strongly deformed Central or Dunedin area with Pliocene volcanic rocks belonging mainly to the basalt-trachyte and basanite-phonolite suites; these are to be described comprehensively later. II includes a summary of all the known outlying representatives of the Pliocene petrographic province from regions (*a*) and (*b*). A conspicuously differentiated sill of olivine-theralite in this group is described in detail in III. The distribution and geological setting of the Mid-Tertiary basalts, tholeiites and dolerites is dealt with in IVA, while IVB is concerned with their petrology. A special study of siliceous xenoliths and their reactions is promised in a forthcoming paper, IVC. In IVB special attention is given to the pyroxenes and the conditions governing their crystallization. The term 'subcalcic augite' is suggested for pyroxenes between pigeonite ($2V$ up to 30°) and augite ($2V <$ 45°). A wealth of optical detail has been provided by F. J. Turner and C. O. Hutton. The average Otago Mid-Tertiary magma corresponds closely with that of the quartz-dolerites of Scotland and the north of England, but the average Pliocene magma is considerably more alkaline and resembles that of the Lower Carboniferous province of the Midland Valley of Scotland.

The Gulf Stream and the Weather in Europe

J. W. SANDSTRÖM (*Ark. Math. Astron. Fys.*, **30**, No. 18; 1944) discusses the influence of the Gulf Stream on weather in Europe. It has been generally assumed that heat from the Gulf Stream is disseminated to the surrounding land by winds that have blown over it and are warmed. Sandström points out, however, that as the winds are mainly directed *towards* the Gulf Stream, the warmed ascending air over it being replaced by cooler air blowing from both sides of it, they cannot disseminate heat from it. The winds directed towards the Gulf Stream are deflected about 60° to the right by the rotation of the earth, their direction being from the south or south-south-west over Europe, and from the north or north-north-east over Greenland, and hence the heat produced in Europe and the cold produced in Greenland by the Gulf Stream are greater the warmer the Gulf Stream is. On the way from the tropics to the Arctic, the Gulf Stream loses a considerable amount of heat to the air and colder waters, and in order to transport any heat to the Arctic it must

convey a certain mass of water per second. The speed of the Gulf Stream was probably reduced in 1939, and hence it lost its power to produce low air pressures in the North Atlantic and southerly winds over Europe; hence the winter of 1939–40 was just as cold in Europe as in Siberia, Alaska and Greenland. The cooling of water in the Arctic, increasing its specific gravity, would cause it to sink and the surface water to set in from warmer regions, thus re-establishing the propelling force of the Gulf Stream and increasing its speed. Its waters advance rather slowly; thus in the winter of 1941–42 its warm front may not have reached farther than the south-west coast of Norway. This winter was, therefore, cold; but by the winter of 1942–43 the warm front had passed Scandinavia on its way to the Arctic, the direction of the winds over Europe became more southerly, and the winter was warm over Europe and cold over Greenland. It is suggested that a study of the Gulf Stream properties should make it a suitable medium for long-term weather forecasts.

Economics of Transformer Losses

In a paper recently read before the Institution of Electrical Engineers in London, W. Szwander discusses the valuation and capitalization of transformer losses, outlining a simple and comprehensive procedure for the practical application of the principles of economic selection of transformers. Two aspects are considered: one relating to purchase and the other to the designing of transformers to satisfy specific economic requirements in individual cases. Formulæ are developed and supplemented by practical information on the selection of the correct values for the requisite coefficients. A statistical survey is made of methods used by different buyers for the capitalization of the transformer losses. Finally, approximate values of the coefficients in the formulæ for the capitalization of losses are suggested; these may be used in the absence of more precise information. Of the two equivalent methods available for making an economic selection of transformers, namely, the comparison of the total annual operating costs and that of the total investment cost including the capitalized value of the losses, the first is the more popular and comprehensive. The more complicated problem of finding the most economic design of transformer to meet given operating conditions is analysed in detail. It is concluded that the economic choice of the loss ratio must be such as to ensure the annual costs of the iron and copper losses being equal, the total losses being fixed so that their total annual cost shall be about 2·5 times the total annual capital cost.

Antispasmodics

Twenty-eight basic-alkyl esters of substituted α-thienylhydroxyacetic, $C_4H_3S.CR(OH)COOR'$, and substituted α-thienylacetic acids, $C_4H_3S.CRHCOOR'$, prepared by F. F. Blicke and M. U. Tsao (*J. Amer. Chem. Soc.*, 66, 1645; 1944), in which the substituents R were such groups as methyl, cyclohexyl, benzyl, phenyl, *p*-xenyl, α-naphthyl and α-thienyl, and the basic-alkyl groups R' were β-diethylaminoethyl, β-morpholinoethyl, β-piperidinoethyl, γ-diethylaminopropyl and γ-dibutylaminopropyl, were examined for antispasmodic activity. In general, the activity of the esters of hydroxyacetic acids on the isolated intestinal strip which had been stimulated by acetylcholine was much greater than that of the esters of acetic acids, and some esters, especially those containing a cyclohexyl group, were equal to, or greater than, atropine in activity, a potency seldom found hitherto in synthetic antispasmodics.

Action of Sulphanilamide on Pepsin, Rennet and Urease

In a third communication on the mechanism of the action of sulphanilamide, read before the Academy of Athens (meeting of Feb. 10, 1944), N. Klissiunis has examined the influence of sulphanilamide compounds on pepsin, rennet and urease. Prof. Klissiunis finds that the digestion of egg albumin in pepsin solution is retarded by 'Prontosil soluble'. The clotting of milk is also retarded by 'Prontosil soluble', if the experiment is carried out in the presence of a pepsin solution and calcium chloride solution. For the work on urease, the latter was prepared according to the Van Slyke and Cullen method. The *p*H of the solution was stabilized with a mixture of phosphates at 7·0. The decomposition of urea was measured by the amount of ammonia developed by the reaction. This reaction was retarded in presence of sulphanilamide ('Prontalbine'). Sulphanilamide ('Prontalbine') was also effective in retarding ammoniacal decomposition of urine; the *p*H of this urine was very little changed.

Data on Meteors

Under the title, "An Analysis of British Meteor Data: Part 2. Analysis" (*Mon. Not. Roy. Astro. Soc.*, 104, 257; 1945), J. G. Porter concludes his investigations on the subject (see *Nature*, 152, 420; 1943). After a brief description of the method of classifying and grouping the material for analysis, Porter discusses the errors and their correlation and shows that errors of different kinds—sliding errors, magnitude errors and timing errors—tend to increase with the length of the path of the meteor and also with its brightness. It is not easy to explain this correlation, though in the case of magnitude errors it is suggested that the brighter the meteor the further the observer has to go for standards of reference, and for meteors of planetary brightness or more, these are usually recollected standards only. Adhering to the rules of statistical analysis, it is shown that no essential difference exists between the data for shower and non-shower meteors. In addition, the heights of comparable groups are the same and the 'seasonal effect' is merely of a statistical character. Hoffmeister's assumption of a uniform distribution of meteor paths in space is shown to be without any justification, and the non-distribution of meteor directions is responsible for the apparent seasonal variations on heights. An interesting point appears in Table viii. There it is shown that the average shower meteor appears and disappears at greater heights than does the average sporadic meteor, a fact which Öpik noticed; but the groups are drawn from very different ranges of elongation of the radiant from the apex of the earth's way, and here previous investigators have been misled. Further conclusions are that the low speeds derived from double or triple observations are real, meteors suffering some retardation by atmospheric resistance before they become visible, and that hyperbolic velocities seldom or never exist. The analysis has given the *coup de grâce* to many of the conclusions of the Arizona Meteor Expedition, and, it is hoped, has finally settled the question regarding so-called 'hyperbolic velocities', establishing beyond dispute that meteors are members of the solar system.