

RESEARCH ITEMS

Logarithmic Series and the Index of Diversity as Applied to Ecological Problems

In a recent paper in the *Journal of Animal Ecology* (32, May 1944), Dr. C. B. Williams of the Rothamsted Experimental Station discusses this subject. He describes the application of a logarithmic series to a number of problems. It is found to fit extremely well to a large number of frequency series whether they be taken from insects, birds or plants. It also fits well to the number of genera with different numbers of species in standard classifications of groups of both animals and plants. The idea of the index of diversity is applied to problems of the number of species of plants on different areas and to the comparison of floras of different areas with interesting results. The author gives a classification of the 171 families of dicotyledons according to their index of diversity. It is hoped in this way to stimulate discussion of the factors which control differences and resemblances in this index. As a general rule it is found that those families with numerous species and genera have a large index of diversity, but yet there may be a very wide range of index in families of about equal size. This paper is one of considerable interest and deals in the main with problems of species, area and numbers of individuals and with the grouping of species into genera, many examples of both being quoted.

New Zealand Turridæ

THE Turridæ is the largest family of gasteropod molluscs, and not only does it contain numerous living members, but it also has a large number of fossil representatives extending back with certainty to the Cretaceous if not earlier. In view of its extent and mixture of living and fossil forms it is not surprising that it presents a number of problems. 398 species of New Zealand Turridæ are described and figured in a well-produced memoir by A. W. B. Powell (*Bull. Auckland Inst. and Mus.* No. 2; 1942); 31 genera and subgenera and 144 species are new. The author takes advantage of this large amount of material to treat of several matters of general importance in the family, and includes a section on nomenclature in which he has endeavoured to give a synonymy of the generic names. The 362 names that have been employed are reduced to 284, which he considers are satisfactory both from the points of view of nomenclature and taxonomy. The second of the major general problems is the classification of the group with keys to the sub-families and genera. In this respect it is interesting to notice that classification according to the type of radula cannot be correlated with that based on shell features, but as too few of the radulæ are known it is not desirable to draw useful conclusions from this.

Fishes from the Panama Bight

John Treadwell Nicholls and Robert Cushman Murphy describe a most valuable collection of fishes based mainly on material from an expedition conducted by the junior author on behalf of the American Museum of Natural History, February–May 1941, using as a base of operations the Diesel schooner *Askoy* ("A Collection of Fishes from the Panama Bight, Pacific Ocean", *Bull. Amer. Mus. Nat. Hist.*, 83; 1944). The Panama Bight is defined as the part of the Pacific bounded by the concavity of the

American coast between the Gulf of Panama and Point Santa Elene, Ecuador, and extending offshore towards the west and south. The pelagic collection at Station 49 (between the Colombian Coast and Malpelo Island) is of special interest. Here was encountered the upwelling of deep water, and the ocean was troubled by vertical waves in completely calm weather, resulting in large surface hauls of deep-water animals. The bulk of the material from this collection, however, was from coral brought up chiefly by the diving operations of Dr. John C. Armstrong, second in command of the expedition. The value of this paper is much augmented by the biological notes taken on the spot from the live specimens. These include descriptions of behaviour and coloration, not only of the captured fishes but also of those observed in their natural surroundings in the sea, such as the 'leaping mantas' which make somersaults in the air, and large sharks.

Inheritance of Resistance in Melons

S. S. IVANOFF (*J. Hered.*, 35; 1944) describes the methods and results obtained in raising melons suitable for market which are resistant to downy mildew and aphid attacks. Resistance behaves as a partial dominant during segregation. For example, the number of aphids on susceptible leaves was 433, on F_1 leaves 62, and on resistant leaves 4. Similarly, the number of lesions due to the fungus showed incomplete dominance. There would appear to be some connexion between resistance to aphid attack and resistance to the fungal attack, but the mechanism whereby resistance is achieved is unknown. The present resistant characteristics were derived from West Indian varieties of melons. When the original selections from the F_2 's were made, powdery mildew was not prevalent, so the new strains do not possess resistance to powdery mildew; but new selections are being made to obtain varieties resistant to all three troubles.

Changes in X-Ray Sensitivity in Different Stages of Meiosis

A. H. SPARROW (*Proc. U.S. Nat. Acad. Sci.*, 30, 147; 1944) has irradiated the different stages of meiosis from leptotene to the end of anaphase I in *Trillium erectum* and has compared the number of aberrations at each stage. He finds that if the sensitivity at leptotene-zygotene is 1.0, early pachytene is 2.3, pachytene 1.7, late pachytene 2.6, metaphase I, 5.9, anaphase I, 8.7, and microspore resting nucleus between 1 and 1.7. He suggests that the high concentration of desoxyribose nucleotides found at metaphase and the sensitivity to X-ray dosage are correlated. It is concluded that X-ray hits do not induce immediate breaks but potential breaks, which are not actually realized until the following division. The relationships of tumour and radio-sensitivity to nucleic acid content are discussed.

Hot Water Injury of Narcissus Bulbs

THE practice of treating narcissus bulbs with hot water at 110° F. for three hours is now a standard control for internal pests. Occasional subsequent damage to the flowers has been reported, however, and J. Wood (*J. Roy. Hort. Soc.*, 69, Pt. 10; Oct. 1944) has investigated the difficulty. Splitting of the corolla can be minimized by storage at 80° F. instead of 60° F. after lifting and before treatment

with hot water. Early lifted bulbs are also more susceptible to trumpet splitting, whereas late lifting may bring damage to the roots. Storage after treatment should be at a cool temperature of 48° F.

Limiting Flow of Gas through a Nozzle

As previously mentioned in *Nature* (154, 90; 1944), J. R. Green and R. V. Southwell investigated the two-dimensional flow of a compressible fluid through a nozzle by Southwell's general 'relaxation' method. This method failed when the velocity was *supersonic*, that is, exceeded the local velocity of sound in the fluid. To deal with the supersonic case an iterative method, not depending on 'relaxation', was suggested. This has now been worked out in detail by L. Fox and R. V. Southwell (*Proc. Roy. Soc., A*, 183, 38; 1944) for irrotational flow with steadily decreasing pressure and density. It is recalled that Osborne Reynolds's early (1886) approximate treatment of the nozzle problem found that the velocity of discharge could never exceed a certain limit, which was attained when the velocity in the narrowest section or 'throat' was equal to the local velocity of sound. He also concluded that there were two and only two possibilities after the gas had left the throat. Either its density and pressure steadily increased as it passed to the exit, or they steadily decreased. One of these two states, it was conjectured, was unstable. No intermediate state was possible. The more exact treatment of the present paper shows that there are *two* slightly different limiting values of the velocity of discharge. One of these is attained when the velocity both before and after the throat is subsonic, though, curiously enough, the velocity has supersonic values at two small regions near the wall at the throat. The other limiting value is for the case when the velocity is supersonic at the part of the nozzle between the throat and the exit. The second value is very slightly greater than the first, by 0.045 per cent. Osborne Reynolds's estimate of the first needs a small increase of 0.083 per cent. The convergence of the iterative process appears to show that the irrotational flow is stable from low velocities up to the lower limit, which gives great stability. On the other hand, the unique supersonic state appears to be unstable, though it may exist. The discussion of the physical interpretation of the work is reserved for a later paper.

Hydrogen Bonds in Ethyleneimine

ALTHOUGH the existence of N—H—N bonds in nitrogen compounds has often been discussed, the compounds have been relatively complicated, such as pyrazoles, indazoles, amidines, etc. W. H. Thompson and G. P. Harris (*J. Chem. Soc.*, 301; 1944) have found good evidence of hydrogen bonding in the simple compound ethyleneimine. The infra-red absorption band at 3 μ due to the NH-group in this is appreciably displaced in wave-length on passing from the vapour to liquid, whereas other bonds are not much affected. Solutions in carbon tetrachloride, examined with wave-lengths between 2.9 μ and 3.5 μ , showed the sharp band at 3.01 μ in dilute solution giving way at higher concentrations to a broader and more intense band with a maximum at about 3.1 μ . The effect is precisely similar to the 'association' band found with hydroxylic substances, and points to association through N—H—N bonds. This is supported by boiling point relations.

The Faintest Star

THE March issue of *Sky and Telescope* contains an account of van Biesbroeck's discovery of a faint companion to the star BD + 4.4048°; Science Service has also described the discovery. Van Biesbroeck was comparing two plates taken at the prime focus of the 82-in. McDonald Observatory reflecting telescope when he discovered the companion of magnitude 18 at a separation of 74" from the brighter star of magnitude 9.5. This separation corresponds to a distance of about 440 astronomical units, the distance of the system being nearly 20 light-years. The absolute magnitude of this star is 19 as compared with 5 for our sun, and about a million of these faint stars would be required to produce a combined brilliance equal to that of the sun. Owing to its great distance from the brighter star, it is almost certain that it shines, not by reflected light, but by its own light, and hence is a real star, not a planet. In the case of the invisible companion of 61 Cygni, the mass but not the luminosity were determined, and as its mass was about sixteen times that of Jupiter it was classified as a planet. If van Biesbroeck's new star has a mass comparable with that of the companion to 61 Cygni, it seems highly possible that the distinction between planet and star may cease to exist. Information which may be of assistance to astronomers is as follows: The position angle of the faint star is 150°; the common proper motion is 1.45" towards position angle 204°, and the parallax is 0.17".

The Solar Eclipse of June 19, 1936

S. VSESVIATSKY and E. Bougoslavsky, Kiev Astronomical Observatory, Sverdlovsk, U.S.S.R., deal with the coronal structure and the relationship observed between chromospheric and coronal phenomena during this eclipse (*Mon. Not. Roy. Astro. Soc.*, 104, 3; 1944). Four standard chronographs were located in the path of the eclipse at Beloretchenskaya, Ural, Omsk and Kuibyshevka, and thirty excellent plates of the corona and chromosphere were obtained. A number of important conclusions were deduced as a result of the work, but these cannot be dealt with in full. A very brief outline of them is as follows: Phenomena in the chromosphere and in higher-lying coronal regions are due to foci or centres of excitation on the sun's surface. Their frequency as well as their peculiarities of distribution are related to the heliographic latitude and they change with phases of the sun's activity. The coronal arch systems and the fan forms involved occasionally take on a helmet-shaped summit. This changes into thin rays distributed over the centres of excitation, these rays being connected by dark fibrous formations or dark flocculations. In the chromosphere, excitation gives rise to prominences which are 'imprisoned' in the interior of the coronal arch systems. The fan-shaped forms which characterize the structure of the corona over excited areas of the sun's surface have a discrete structure and represent a system of successive arches. From the presence of the helmet-shaped summits observed on many of the fans it is inferred that there are vertical fields in different regions of the corona at distances of $\frac{1}{2}$ to 2 solar radii. The influence of the general field of the sun is reflected in the peculiarity of the inclination of the axes of the fans to the normal and also by the change in their inclination in relation to the phase of solar activity. This influence is also shown by the existence of a weakened luminosity inside the corona in a narrow equatorial belt of width about 7°.