

RESEARCH ITEMS

Origin of South American and African Freshwater Fishes

WILLIAM A. GOSLINE (*An. Acad. Brasil. Ciências*, 16, No. 3; 1944) criticizes some of the arguments advanced by biologists who have marshalled geological evidence to agree with their own interpretation of the biological data. While the author does not attempt to offer final conclusions concerning the African and South American freshwater fishes, he summarizes the evidence supplied by the best-known freshwater group, and suggests lines of further investigation. These are included under four heads. (1) The compilation of up-to-date revisions of the groups of fish involved, together with the presentation of phylogenies of these groups based on palaeontological, anatomical and physiological data. These would show the relationship of the fishes between areas as compared with those within areas. (2) The demonstration from various sources of evidence that certain groups have originated and evolved in fresh water, and that salt water has always formed a complete barrier to their dispersal. (3) The determination, so far as is possible, of the geographical distribution—past and present—of these groups, together with their ecological limitations. (4) The correlation of all material from the above lines of investigation, special account being taken of the environmental needs affecting fish dispersal, with the derived data for other animal and plant groups and with geological and climatic history.

Growth Hormones in Tetraploids

F. G. GUSTAFSON (*J. Hered.*, 35, 269; 1944) has shown that tetraploid marigolds have 58 per cent and 76 per cent as much growth hormone as their related diploid, while the autotetraploid *Lycopersicon pimpinellifolium* has 56.8 per cent of that of the diploid. This reduction in amount of growth hormone may be related to the well-known time differences in growth between diploid and tetraploid plants.

Mitosis and Cell Differentiation in the Blood

L. F. LA COUR (*Proc. Roy. Soc. Edin.*, 62, 73; 1944) has used new technical methods to investigate the chromosome behaviour and nuclear cycle in the origin of blood cells in man, mice, rats, cats and dogs. There is a unique difference between the precursors of myelocytes and erythrocytes in respect of the nucleic acid content of the nucleus. The pre-erythrocyte cells stain an intense red by the Pappenheim stain, whereas the pre-myelocytes stain pink. Similarly the chromosomes of the first type show a greater desoxyribose nucleic acid charge. In man with pernicious anaemia, the differences are accentuated. This leads on one hand to over-spiralization and abnormal division in the overcharged erythrocytes, and long thin chromosomes, incompletely spiraled in the myelocytes. As a result of the abnormal divisions with multiple spindles and chromosome bridges, the daughter cells often contain irregular chromosome numbers. Hypoploid cells have been found in the normal field mouse. Nucleoli are present in all precursor cells in the marrow and are later replaced by heterochromatin. Their presence is correlated with cell proliferation. The matured myelocytes in the mouse and the rat are tetraploid as a result of an abortive anaphase of the last division. White tetraploid cells occur in association with a

shortage and red tetraploid cells with an excess of both nucleic acids in pernicious anaemia. Evidence is given which suggests that the enucleate condition of mature erythrocytes is due to the extrusion of nucleic acid and not of the nucleus.

Pre-harvest Drop of Apple Fruit

PRE-HARVEST drop of apple fruits which have reached or almost reached picking maturity is a serious problem confronting apple growers in America and, to a lesser extent, in Great Britain. Innumerable trials carried out in recent years have indicated that some control of this trouble may be effected by spraying the trees, shortly before picking maturity is reached, with growth-substance solutions. The standard spray used contains ten parts of growth substance per million of spray; but L. Southwick reports (*Proc. Amer. Soc. Hort. Sci.*, 42, 199; 1943) that stronger sprays may be more effective and that, while dusts which can be applied more easily are as effective as solutions with some varieties, they are less effective with others. Southwick, like M. B. Hoffman, A. V. Doren and L. J. Edgerton, finds dusts as effective as sprays with McIntosh apples. The addition of spreaders to the sprays is not necessary, but the sprays are ineffective if their application is followed by a spraying with water (or presumably rain) within two hours (E. L. Overholser, F. L. Overley and D. L. Allmendinger, pp. 211–219). Sprays given near midday are most effective, and the period of effectiveness may be as much as twenty-eight days, but is less if temperatures are high. The hormone sprays are without any direct effect on the firmness of the fruit or development of decay, breakdown and scald in store (M. H. Haller, pp. 207–210), but by delaying picking they may improve colour and taste and increase the size of the fruit as harvested by permitting the attainment of greater maturity (E. P. Christopher and S. A. Pienizek, *ibid.*, 43, 29; 1943).

Mercury for Grain-Pest Control

THE method of grain-pest control as practised by the raiyats in certain parts of India involves the use of mercury. It concerns the protection of stored pulses against the bean beetle, and for this purpose a drop of mercury is placed in an excavated soap nut and lodged in the storage container. D. W. Wright, of the School of Agriculture, Cambridge, has made an attempt to assess the efficacy of mercury for the control of several of the commoner grain pests (*Bull. Entom. Research*, 35, 143; 1944). Experiments showed that the vapour of mercury was fully effective in preventing reproduction of the grain weevil (*Calandra granaria*), the saw-toothed grain beetle (*Oryzophilus surinamensis*), the lesser grain borer (*Rhizopertha dominica*), and the Angoumois grain moth (*Sitotroga cerealella*). Zinc and tin amalgams and calomel were less effective than metallic mercury. The efficacy of a given weight of mercury is increased by subdivision, a process which increases its total surface area. The substances used were found to emit a vapour which contained free mercury. Storage of insects in mercury vapour was found to have no effect on the viability of grain weevils, neither did it influence their subsequent reproductive capacity. The action of the mercury was on the eggs, which failed to hatch. Germination and spectroscopic tests on grain that had been stored for several months with mercury gave no indication

that any contamination had occurred. The grain weevil was able to breed vigorously in grain so treated.

Crocidolite Asbestos in Western Australia

BLUE amphibole (riebeckite) asbestos occurs in seams interbedded with banded ironstones of Nullagine age in the Hamersley Ranges of Western Australia. The petrology of the deposits and the associated rocks has been described by K. R. Miles (Geol. Sur. W. Aust. Bull. 100; 1942), and there is also a report on the economic importance of the occurrences by J. S. Foxall. The banded ironstones include sideritic cherts, magnetite- and hematite-bearing cherts and banded jaspers associated, as usual, with quartzites. The ironstones are interpreted as chemical sediments in which the bulk of the iron was originally precipitated as ferrous carbonate. Under conditions of low-grade metamorphism, riebeckite has developed in these beds as (a) scattered needles; (b) massed aggregates of needles (potential crocidolite); and (c) seams of uniformly parallel cross fibres (crocidolite proper). In their geological setting, structure, composition and optical properties the riebeckite and asbestos occurrences are closely similar to those of the better-known South African deposits. The chief problem in both areas is the source of the soda required for crocidolitization. Riebeckite contains six per cent or more, whereas only traces of soda appear to be present in the adjacent formations. The current hypothesis that crocidolite occupies the place of pre-existing soda-rich layers in siliceous ironstones is therefore far from satisfactory. Another possibility is that soda may have been introduced (as in albite-schists) by emanations from plutonic sources, but the absence of igneous rocks and of regional metamorphism would seem to be inconsistent with this alternative. Both in Australia and South Africa the origin of crocidolite remains a geochemical enigma.

Viscosity of Compressed Gases

The viscosity η of a non-ideal gas was considered in 1922 by Enskog, whose formula was checked for carbon dioxide and (by Michels and Gibson) nitrogen: $\eta = \eta_0 (1 + 0.175b\rho + 0.86b^2\rho^2)$, where η_0 is the ideal gas viscosity, ρ is density, and b is van der Waals' constant. O. Leipunsky (*Acta Physicochim. U.R.S.S.*, 18, 172; 1943) has shown that the formula gives quite satisfactory results for a number of gases, with a tendency at high densities to show rather higher values than the experimental, due to the change of b with pressure. The formula is thus of service in technical calculations where compressed gases are concerned. With a suitable value of b the formula also applies to mixtures, where the mathematical theory is extraordinarily clumsy and incomplete.

Absorption Spectra of Substituted Benzene Sulphonamides

ALTHOUGH several publications have dealt with the ultra-violet absorption spectra of sulphanilamide derivatives, little has been done towards identification and characterization of the individual absorption bands. J. M. Vandenbelt and L. Doub (*J. Amer. Chem. Soc.*, 66, 1633; 1944) have made a study of simple sulphanilamide derivatives and find that they have one single band of strong absorption (ϵ , about 17×10^3) in the accessible ultra-violet region, about 260 $m\mu$ in neutral solution, which shifts to shorter

wave-length when the solution is made alkaline, and decreases in intensity with acidity. Simple substitution which does not change the basic ionization properties of the molecule has little effect on the wave-length of the band. With more complicated substitution, other bands appear. Sulphathiazole has a band at 257–259 $m\mu$ with the properties of the sulphanilamide band; and a band at 280–283 $m\mu$ which shifts to shorter wave-length in alkali and is not destroyed in 2*N* hydrochloric acid, and is probably due to the thiazole portion of the molecule. With sulphapyridine three bands are found, at 242, 261 and 311 $m\mu$, the third being due to the pyridine portion. In alkaline solution the maximum at 311 $m\mu$ shifts to shorter wave-length and the peaks at 242 and 261 $m\mu$ apparently fuse to a single broad band of increased intensity at 245 $m\mu$. With sulphadiazine a 257 $m\mu$ band is due to the *p*-aminobenzene sulphonamide absorption and a 241 $m\mu$ band to the pyrimidine ring. Such comparisons with simpler analogous compounds make it possible to associate the bands with absorbing groups in the molecules.

Pulsation Theory of Cepheid Variables

P. L. Bhatnagar and D. S. Kothari, Department of Physics, University of Delhi, in a paper "A Note on the Pulsation Theory of Cepheid Variables" (*Mon. Not. Roy. Astro. Soc.*, 104, 292; 1945), deal with certain points raised in Prof. Svein Rosseland's George Darwin Lecture (see *Nature*, 153, 261; 1943). Rosseland developed his theory of 'anharmonic pulsations' and found that the semi-amplitude of oscillation would have to be a quarter of the star's radius—a value which is four or five times too great for most of the Cepheids. The authors of the present paper point out that this and other results obtained by Rosseland are not inherent in the model, but arise because of an approximation introduced in the investigation. They treat the matter in a simpler way than Rosseland, assuming γ , the ratio of the specific heats, to be 5/3, and avoiding the approximation introduced by Rosseland. The conclusion is that the theory of anharmonic oscillations for the above ratio cannot account for the observed skewness in the velocity-time curve of the Cepheid variables. The observed skewness demands a semi-amplitude almost equal to R , whereas the observed value is about 0.1 R , unless the value of γ is assumed to be much greater than 5/3. A rough calculation shows that if the observed skewness is to arise for a semi-amplitude of 0.1 R , γ is comparable to 10.

Van Biesbroeck's Star

It is announced (*Harv. Obs. Card* 697) that W. J. Luyten and P. D. Jose have found the colour index of Van Biesbroeck's faint companion to BD +4°4048 to be 1.4 and the photographic magnitude 19.5, giving a photovisual magnitude of 18.1. The colour index was derived from blue and yellow plates taken with the 36-in. reflector of the Stewart Observatory. It is surprisingly low for so faint a star (absolute magnitude 19.3 photovisually) and in addition there are several stars in the vicinity which are as red as, or even redder than, the proper motion star. This suggests the possibility that this star, which has the lowest known luminosity, is a degenerate star and approaches a black dwarf. It is remarked that it might be a star the surface temperature of which corresponds to that of an early *M* dwarf, but the luminosity of which is several thousand times lower.