

RESEARCH ITEMS

Obstructions to the Ascent of Salmon

INFORMATION as to obstructions in Newfoundland and Labrador rivers is summarized in a paper by A. A. Blair, Fisheries Research Laboratory, Newfoundland (Salmon Investigations. 1: Obstructions in Newfoundland and Labrador Rivers. Research Bulletin No. 12 (Fisheries). Department of Natural Resources, St. Johns. Newfoundland Government, 1943). In Labrador the type of obstruction is, in all cases, falls; in Newfoundland, mainly falls, but sometimes shoals and dams. It is suggested that improvements could be made in 9 out of 18 rivers in Labrador, and in 36 out of 81 rivers in Newfoundland. Ready accessibility to spawning grounds is a highly important factor in the maintenance of any stock of salmon, and these obstructions made ascent of salmon difficult or impossible. This collection of data is a valuable one, and will help much in the planning of improvements. Information about Labrador rivers was obtained directly from fur trappers, and about Newfoundland rivers from river wardens. Some of the more accessible obstructions were inspected personally, and of these information is given in greater detail.

A Protozoan Parasite of Freshwater Fish

A. DUNBAVIN BUTCHER has investigated the life-cycle of a ciliate parasite of the rainbow trout, brown trout and carp ("Observations on Some Phases of the Life Cycle of *Ichthyophthirius multifiliis* Fouquet, 1876, a Ciliate Protozoan Parasite of Fresh-Water Fish". *Australian Zoologist*, 10, Part 2; 1943. Royal Zoological Society of New South Wales). There was a severe outbreak of this so-called 'white spot disease' at the trout hatcheries of the Ballarat Fish Acclimatization Society in 1939 and 1940. Following this, the author has succeeded in elucidating the complete life-history of the parasite, in spite of the great difficulties incurred in bringing about natural infection of the fishes in aquaria. The total time for the completion of the life-cycle was found to be 13-16 days, which probably accounts for the periodicity of the epidemics. The parasite feeds on the whole cells of its host. The most likely hypothesis for the cause of the death of the fish is probably that the parasite is the source of a toxin which is fatal.

Heterostylysm

Linum grandiflorum exhibits the phenomenon found by Darwin that pin-flowered plants are not usually fertilized by pin-flowers, nor thrum by thrum. D. Lewis (*Ann. Bot.*, N.S. 7, 115; 1943) has discovered that differences in the osmotic pressure of styles and pollen of thrum- and pin-plants will account for the phenomenon associated with heterostyly. The stigma of *Linum* is placed on one side of the style and is permeable to water, whereas the epidermis of the style is relatively impermeable. On placing in water, the style curls with the stigmatic surface on the convex side. In 30-40 per cent cane sugar there is curling in the opposite direction. The author shows that the pin-style is isotonic with 18 per cent sucrose and the thrum-style with 12 per cent sucrose. Pin-pollen is isotonic with 3 per cent potassium nitrate and thrum-pollen with 5 per cent potassium nitrate. Thus pin-styles have high and pin-pollen low osmotic pressures relative to thrum-styles and pollen respectively. The discovery of Darwin that pin-styles

pollinated with thrum-pollen become twisted is shown to result from the abstraction of water by the germinated thrum-pollen from pin-styles. The ratio of osmotic pressures in both legitimate pollinations is 4:1, but is 5:1 and 7:1 in the two illegitimate pollinations. This disparity partly explains the differences in behaviour in illegitimate pollinations—non-germination of pin-pollen and the bursting of thrum-pollen tubes. The author suggests that non-germination of pin-pollen cannot be accounted for, however, by simple osmotic relations, but that imbibition in the early stages of pollen germination is controlled by cell colloids.

Phylogeny and Basic Number in *Crepis*

THE genus *Crepis* provides valuable material for the analysis of speciation in relation to chromosome number and morphology. One of the most difficult questions was related to the presence of species with chromosome numbers less than the basic numbers of the genus, which are generally agreed to be 6 and 5 in *Crepis*. H. A. Tobgy (*J. Genetics*, 45, 67-111; 1943) has made a thorough and valuable study of the relationships of *C. neglecta* ($n = 4$) and *C. fuliginosa* ($n = 3$). These two species are closely related and will hybridize and give some fertile hybrids. The taxonomic position indicates that *C. fuliginosa* is a derivative of *C. neglecta* or a very similar extinct form. Morphology of the chromosomes in these species, like many other *Crepis* species, enables each component arm to be identified and followed in the hybrids. Tobgy shows that the *A* and *D* chromosomes of both species form one complex, while the remaining three chromosomes, *B*, *C* from *neglecta* and *B* from *fuliginosa*, form another complex. The interrelationships of the arms of the chromosomes are fully determined, but from the point of view of the reduction in number the behaviour of the *BBC* complex is significant. The *Bn* and *Cn* chromosomes have undergone a reciprocal translocation to give *B* chromosome of *fuliginosa* and a chromosome with the *Cn* centromere. The latter has been lost, since it was genetically inert. The mechanism is somewhat similar to that which originated Dubinin's six-chromosome *D. melanogaster*, and to that suggested by Darlington for such chromosome reduction.

A Direct-Intensity Microphotometer

EXPERIENCE obtained at the Observatory of the University of Michigan in the operation of the ingenious microphotometer installed there has been described by its designers (*Astrophys. J.*, 98, 43; 1943). The instrument has two plate carriers, on one of which is placed the photograph or spectrogram under examination, and on the other, which can be moved transversely, a calibration photograph, usually an optical wedge or wedge spectrum. This latter is kept in step with the other longitudinally while being moved transversely by automatic means in such a way that the densities of the two plates are always equal. This transverse motion is transferred by means of a cam and mirror to the final trace, which then reproduces directly the relative intensities in the photograph under examination. Line contours in absorption spectra can be reproduced to better than one per cent of the continuum for plate densities between 2.0 and 0.1, while the speed of operation is such that spectrophotometric comparison of two continuous spectra can be carried out at forty wave-

lengths over a range of 2500 Å. in an hour and a half. The versatility of the instrument allows it to be used with 'standard spot' calibrations, as a transmission microphotometer, and as an isophotometer for use on faint diffuse objects. Many of these applications are illustrated by photographs and the corresponding tracings.

The Coronal Line Spectrum

A NOTE by P. Swings (*Astrophys. J.*, 98, 116; 1943) gives an account of a paper by Edlén (*Z. Astrophys.*, 22, 30; 1942) in which the Swedish spectroscopist publishes fuller details of his recent discovery of the origin of the emission lines in the solar corona. New identifications have been added to those already given (*NATURE*, 150, 756; 1942): a line occasionally observed at 5536 Å. is attributed to A X, and the line at 4359 Å. is given, though not with certainty, as due to A XIV; while λ 7059 is identified as due to Fe XV and λ 5694 as perhaps due to Ca XV. The cosmic abundance of argon is not known, but neon is known to be of frequent occurrence, and the ground-term splitting in A X is accurately enough determined to make the identification of λ 5536 very probable. As regards the theory as a whole, the experimental evidence adduced by Edlén from his investigation of the extreme ultra-violet spectra of Fe X, Fe XI, Ca XII and Ca XIII, from his extrapolation of the ground-term splittings in iso-electronic sequences, and from his comparison of transition probabilities with observed intensities, is entirely convincing. There can remain no doubt that the problem of the origin of the coronal lines is now solved. Only four lines ($\lambda\lambda$ 3454, 4567, 3801 and 4311) remain unidentified, the last two being very faint; all the rest belong to forbidden transitions in the highly ionized atoms of iron, nickel, calcium and argon.

Magnetochemistry

IN the ninth Liversidge Lecture (*J. Chem. Soc.*, 328; 1943) S. Sugden discusses some recent applications of measurements of magnetic susceptibilities to the elucidation of structure. The modern quantum theory has greatly clarified the interpretation of magnetic data, but difficulties arise when quantitative comparisons are made between theory and experiment. In considering molecules the contribution of resonance to the susceptibility becomes significant, and for more complex molecules only semi-empirical methods are available. Prof. Sugden discussed several examples. The effect of temperature and the significance of orbital moments were dealt with, some cases in which the latter cannot be neglected being mentioned. The applications to co-ordination compounds were treated and some difficulties in the present state of the theory which are outstanding were pointed out. The lecture gives an interesting and balanced survey of the subject with which it deals.

Polymorphism of Arsenious Oxide

THE common crystalline form of arsenious oxide (As_2O_3) is octahedral, but a monoclinic form was discovered by Wöhler in 1832 and there is also a glassy amorphous form. The system was investigated by Rushton and Daniels in 1926 by measuring the vapour pressures of the two crystalline forms, estimating the melting points as 275° for the octahedral and 315° for the monoclinic. J. H. Schulman and

W. C. Schumb (*J. Amer. Chem. Soc.*, 65, 878; 1943) have made a further investigation of the system, including solubility, heats of transformation and X-ray and crystallographic measurements. They conclude that the monoclinic form is thermodynamically stable with respect to the more common octahedral form at temperatures as low as 2°, the transition temperature being approximately -13°. Water vapour is effective in accelerating the transformation of octahedral to monoclinic As_2O_3 at 180°, whereas vapours of many other substances were found to be ineffective. The preparation of three new forms assumed by Smits and Beljaars (1931) was attempted without success.

Autoxidation of Ascorbic Acid

THE availability of ascorbic acid (vitamin C) is diminished through destruction by autoxidation. R. W. Peterson and J. H. Walton (*J. Amer. Chem. Soc.*, 65, 1212; 1943) have shown that in the absence of copper very slow autoxidation occurs below $\text{pH} = 8.0$; it increases above this value, and in highly alkaline solution the rate is extremely high. In presence of copper the reaction occurs readily in both acid and alkaline solution. A marked autocatalysis was observed in the presence of copper. Hydrogen peroxide is among the products of the reaction. The inhibiting effects of many substances were determined. Except sodium citrate, all the appreciably effective substances contained one or more amino groups and one or more acid groups. In general, an increase in the number of acid groups or the number of amino groups increased the inhibiting effect. None of the compounds inhibited the reaction in the absence of copper.

Spectra of New Stars

AN important publication by Dean McLaughlin (*Pub. Obs. Univ. Mich.*, 8, No. 12; 1942) draws a generalized picture of the spectroscopic development of a typical nova, and suggests a physical interpretation of the observations which is new in some respects. A thorough survey of the course of seven bright novæ enables the author to compare the corresponding stages in their development in a way hitherto impossible to the reader of the many previous descriptive papers, owing to the absence of an agreed terminology. Five systems of absorption lines and seven of emission lines are distinguished, many of them existing concurrently. Fluctuations in the light curve are correlated with spectral changes and with velocity changes; and an attempt is made to reconcile the various temperature determinations. It is significant that the variations of temperature found are almost exactly the opposite of what would be expected were the outburst due to a simple heating and subsequent cooling of the surface of a star. The changes are interpreted as due to a continuous emission of stellar material from a thin superficial layer at a rate which varies much as the light emission does, reaching a maximum just before light-maximum and dropping sharply soon after. The velocity of the ejection is not necessarily related to this rate, and indeed reaches its maximum long afterwards. The older theory of the successive emission of discrete shells is abandoned in favour of one in better accord with present ideas of what constitutes the photosphere of a nova. The question of the source of the energy released below the surface of the star is left open.