

RESEARCH ITEMS

Irish Fisheries

CONTINUING his researches on Irish freshwater fisheries Arthur E. J. Went has published a further study of the sea trout of the Waterville (Currane) River (*Sci. Proc. Roy. Dublin Soc.*, 23 (N.S.), No. 20; 1944), following the work of Went and Barker (1943). It was found in the latter report that the calculated smolt-length of the spring-running sea trout was exceedingly high and the question arose as to whether the later-running smolts had similar high mean lengths, and if so whether these were taken inadvertently by anglers before their descent to the sea in the belief that they were small adult sea trout. It is found by examining new material that the spring-running fish are merely part of the general stocks of sea trout in the Waterville River system and not different from the late-running fish. The rapid growth in fresh water and the large size attained by the smolts are, more or less, unique so far as sea trout have been investigated to date. A second paper by A. E. J. Went (*Proc. Irish Acad.*, 49, C, No. 5; May 1944) gives an account of the modes of fishing in the Galway Fishery. In 1942 Mr. Went gave a detailed review of the ownership of the fishery in the same publication (48, C, No. 5). In the present work the various fishery methods are described, the sites of the fishing engines and certain other data, in order to make it more or less complete.

Some Primitive Bony Fish of the Middle Coal Measures

A MONOGRAPH on the Haplolepidæ, published by T. S. Westoll (*Bull. Amer. Mus. Nat. Hist.*, 83, 1; 1944), is an important contribution to the analysis of the group of primitive bony fishes included in the Palæoniscidæ. It includes not only an exceptionally complete and detailed account of the superficial anatomy of these fish, but also a most interesting discussion of the functional significance of their peculiarities, and of their possible habitat. The family includes two genera only, one divided into two sub-genera, all being found in the "Middle Coal Measures" of Europe and North America in identical form. Dr. Westoll points out the remarkable fact that in four out of six of the localities in which Haplolepidæ are found they are accompanied by highly peculiar and specialized amphibians, Nectridia and Asistopoda, which are known from only one other "M. Coal Measure" locality, although they occur unaccompanied by Haplolepidæ in some six localities of later date. This remarkable association, taken in connexion with the very small size of the fish and Amphibia, raises very interesting consideration of Coal Measure geography. Finally, Dr. Westoll's monograph includes a series of very interesting discussions of the morphology of Actinopterygians in general and the course of evolution of their early members.

Development of Male Daphnia

D. J. SCOURFIELD has investigated the post-embryonal development of the male of *Daphnia magna* (*J. Quek. Micro. Club*, (4), 1, No. 6; 1943). Although the development of the female has long been known to a certain extent, this is not the case with the male, and these observations are new. Males are much rarer than females, but the author has obtained the first post-embryonal stage by isolating females until they give off broods of males. This

first stage, the so-called neonata, is very like that of the female except for the larger antennules, which are distinctly jointed to the head, and a rounded instead of a pointed rostrum. The changes undergone during the post-embryonal stages (usually four) are significant though small. Perhaps the most interesting point in the life-history is the fact that many species of *Daphnia* hatch while still enclosed in an embryonic cuticle in which the young may swim about for some hours, although not feeding. The shell spine is held between the ventral edges of the valves. Traces of antennæ which are free and traces of claws and setæ seem to show that this represents an embryonic stage (presumably a nauplius) usually passed through before hatching; in this it resembles the embryonic cuticle (pre-zoeal) of the decapod Crustacea, which in all probability also represents a nauplius stage.

Nutritional Physiology of the Silkworm

IN a recent review of Soviet researches on the physiology of the silkworm, S. Y. Demyanovski (*Advances in Modern Biology, Moscow*, 16, 1; 1943) summarizes some outstanding findings referring to protein metabolism in relation to silk secretion. Trypsin proved to be the chief proteolytic enzyme, while dipeptases and polypeptases are absent, and such proteases as may be introduced with plant food are inhibited by the high pH value (9.9-10.1) of the digestive juice. Studies of the digestive process established that the proteolytic activity of the digestive juice can be augmented by the addition to food of saccharose or of fructose, the first increasing that activity by 10-12 per cent and the second by 20-50 per cent. This discovery has important practical implications, since by feeding silkworms on mulberry leaves with the addition of saccharose the weight of the larvæ was increased by 38 per cent, as compared with the controls fed on untreated leaves; the weight of cocoons rose by 12 per cent; the length of silk thread increased by 4.5 per cent, its weight by 19 per cent, the thickness by 7 per cent; and the output of silk was 7.8 per cent above that of controls. These experiments were repeated for four years on a number of varieties of silkworm, with consistent results. The best results were obtained when the ratio of saccharose to fresh leaves was 1.5 per cent by fresh weight; greater amounts of saccharose produced a further increase in the weight of the larvæ and fresh cocoons, but not in the output of silk; additional saccharose appears, however, to result in an increased fertility of the moths.

Genic Action

C. STERN (*Genetics*, 28, 441; 1943) has published the first of a series of papers on the phenotypic reactions of *Cubitus interruptus* which affects the veins of *Drosophila melanogaster*. He shows that there is a dosage effect of this gene in that an increase in their number approaches the normal wing type of the wild-type allelomorph. On the other hand, the presence of a wild-type allelomorph produces an antagonistic effect when the *ci* gene is increased in number. In such cases the *ci* gene may behave as a dominant instead of as a recessive. The addition of the residue of chromosome IV may also transform *Cubitus interruptus* into a normal phenotype. The author tentatively suggests that each allelomorph has two properties, (1) a combining power, or the degree

of interaction with the substratum, and (2) an efficiency factor which measures the effectiveness of interaction to form the product which is efficient in the elaboration of a normal phenotype. This hypothesis leads to statements regarding the excess or deficiency of combining power and the amount of substratum in relation to the *ci* and wild-type allelomorph.

Chromosome Numbers in Guayule and Mariola

Parthenium argentatum, guayule and *P. incanum*, mariola, have come into prominence as sources of rubber. G. L. Stebbins and M. Kodani (*J. Hered.*, 35, 163; 1944) have made a cytological examination of strains of these shrubs from various wild sources and of their progenies. There is a large variation in chromosome number; *P. argentatum* had chromosome numbers of 36, 38, 54, 72, 74 and 108–111; *P. incanum* had 54, 72 and 90 chromosomes in the somatic tissue. This large range in polyploidy appears to have a basic chromosome of nine. Plants with 72 chromosomes in *P. argentatum* produce both pseudo haploids (36 chromosomes) and autotriploids (108–111). The fertility and seed fertility bear a relationship to the meiotic irregularities seen in the different polyploid plants. The evolution and relationships of the forms are discussed.

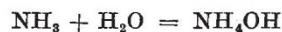
Combustion Mechanisms and Continuous Spectra in Flames

IN following the details of combustion mechanisms, little information can be got from line spectra. Whereas band spectra are of value in telling us what molecules and radicals are present under flame conditions, still more information about *processes* such as dissociation, ionization and association can be got from studying continuous spectra. The causes and types of continuous spectra emitted by flames have been discussed by A. G. Gaydon (*Proc. Roy. Soc., A*, 183, 111; 1944). It is shown that the yellow-green continuous spectrum emitted by some flames containing oxides of nitrogen is probably identical with the spectrum of the air afterglow and is therefore due to a reaction between nitric oxide and atomic oxygen. The presence of atomic oxygen in a flame can therefore be tested by admitting nitric oxide and observing if a yellow-green emission results. For the carbon monoxide flame there appears to be a high concentration of atomic oxygen, both for the dry and moist flame. The combustion mechanism is discussed in detail using this knowledge. For the hydrogen flame a little atomic oxygen is present, but results do not permit of definite conclusions. For hydrocarbon flames there is no sign of atomic oxygen in the inner cone, and this is taken as strong evidence in favour of a peroxide rather than a hydroxylation mechanism.

Existence of Ammonium Hydroxide

THE question whether ammonium hydroxide really is present in aqueous solutions of ammonia has frequently been raised and some chemists hold that its existence has never been definitely proved. Both Walker in 1903 and Blackman in 1907 adduced evidence, based upon conductivity measurements, in support of the view that ammonium hydroxide was present in relatively small concentrations, and the matter has again been investigated by Briegleb (*Naturwiss.*, 30, 506; 1942), who sought to discover (1) how ammonia is bound with water in solution, and (2) whether ammonium hydroxide does exist

and, if so, whether it is a strong or weak base. In the gas phase the heat of reaction



was found from proton affinity and polarization methods to be -49 kcal., if the intramolar distance is 2.5 Å. If it is 3 Å. then the heat absorbed is 74 kcal. This strongly endothermic reaction is taken to prove that ammonium hydroxide does not exist in the gaseous state. The heat of formation of aqueous ammonium hydroxide is calculated at -30 (or -50) kcal., while the heat of reaction



was found to be between -1.5 to -2.0 kcal. The experimental evidence also points to the existence of the hydrates $\text{NH}_3 \cdot \text{H}_2\text{O}$ and $2\text{NH}_3 \cdot \text{H}_2\text{O}$ with but little formation of NH_4OH , which would therefore be almost completely dissociated into ammonium and hydroxyl ions. The thermochemical data are said to accord with observed Raman effects and it is equally evident that ammonium hydroxide is a strong base. The evolution of ammonia from ammonium salts by stronger bases, the neutralization of acids by solutions of ammonia and the hydrolysis of ammonium salts are all explicable, according to Briegleb, in terms of proton affinity.

Peculiar Stars

GEORGE H. HERBIG has an article with the above title in Leaflet No. 182, April 1944, of the Astronomical Society of the Pacific. He deals with a number of abnormal stars such as ϵ Aurigae, ζ Aurigae, β Lyrae, etc., and gives a brief outline of the most recent theories advanced to explain these freakish stars. In the case of ϵ Aurigae we now regard it as a hot, yellowish-white giant accompanied by a huge dim star which is invisible, and which has a diameter 2,700 times that of the sun. Its surface temperature is about 2,000° F., and hence most of its radiation must lie in the infra-red. The β Lyrae system is composed of two giant stars distorted by their mutual gravitation into egg-shaped bodies, their period of revolution around their common centre of gravity being 12 days. An incandescent torrent of gas pours from the larger star, and passing round the smaller one, is ejected into space, where it forms a gigantic expanding pin-wheel about the system. The variable star RW Tauri is a most remarkable system. The smaller white component is hotter and brighter than the larger, cooler, orange companion, and owing to the inclination of their orbit to our line of sight, the principal eclipse is total. Using the 100-in. telescope at Mount Wilson, A. H. Joy has obtained results which indicate the presence of an extended gaseous ring above the equatorial regions of the smaller, brighter star. This suggests an analogy with the rings of Saturn, though a difference arises from the fact that the ring of the RW system is gaseous. The diameter of the ring is about four times that of the sun and its orbital velocity is two hundred miles a second. When the larger star has just covered the disk of the smaller one an edge of the glowing ring is visible for a short time. The question of the existence of such appendages in other stars arises, and it is owing to the relative sizes of the components of RW Tauri and the orbital tilt that the ring has been detected. It is very probable that other stars have similar rings, and if so, some new and interesting problems confront the astronomer.