

Abstracts of Memoirs

RECORDING WORK DONE AT THE PLYMOUTH LABORATORY.

On Nocturnal Colour Change in the Pea-crab (*Pinnotheres veterum*).

By D. Atkins.

Nature, Vol. 117, 1926, pp. 415-416.

Two pea-crabs, from the branchial chamber of *Ascidia mentula*, were seen to hide during the day beneath fragments of sodden paper. At night they emerged, the female at dusk, the male an hour or more later, and were very active. Activity in the dark was accompanied in the male by loss of colour; the female, in this case having no definite colour, suffered no appreciable change. The male was golden brown, shaded with dark brown, the colour being due to orange and dark brown chromatophores, now fully expanded and their pigment diffuse. In the dark it became pallid and transparent, some faint yellow diffuse pigment only being visible; the gut contents showed black, the testes white. This loss of colour is due to the retraction of the pigment in the chromatophores induced by the onset of darkness. Of the two pigments the orange had the quicker rate of flow, and is probably lodged in a smaller cell.

The crabs when put in the dark during the day sometimes reacted as at night, taking forty to sixty minutes. When uncovered the male took the same time to regain its colour.

D. A.

A Quantitative Consideration of Some Factors Concerned in Plant Growth in Water. Part I. Some Physical Factors.

By W. R. G. Atkins.

Conseil Permanent Int. Explor. Mer. Journ. du Conseil, Vol. I, Pt. 2, pp. 99-126, 5 figs., 1926.

The paper is a review of work dealing with submarine illumination and algal distribution, experimental studies on algal distribution, measurements of submarine illumination, and of total submarine radiation. The importance of thermal stratification of the water has been discussed in relation to its importance as limiting the circulation of nutrient salts. A bibliography of forty-two titles is included.

W. R. G. A.

A Quantitative Consideration of Some Factors Concerned in Plant Growth in Water. Part II. Some Chemical Factors.

By W. R. G. Atkins.

Conseil Permanent Int. Explor. Mer. Journ. du Conseil, Vol. I, Pt. 3, pp. 197-226, 19 fjs., 1926.

This paper is a review of work on the minor constituents of water, fresh and salt, in relation to plant growth. A bibliography of fifty-six titles is included. The subjects discussed include carbon dioxide assimilation and the alkalinity of sea-water, similar data for fresh water, and the seasonal changes in temperature, electrical conductivity, hydrogen ion, phosphate and silicate, concentrations. Analyses of the nitrate content of sea-water are also given, and it is shown that the deep waters of the ocean act as a reservoir for such nutrient salts, which are used up by the phytoplankton only in the well-illuminated surface layers. Though deficiency of phosphate apparently limits plant production in fresh water and in sea-water as a general rule, it appears that in the latter, nitrate is also, at times, completely used up. In its absence phosphate begins to accumulate. Estimates based on the phosphate depletion lead to the value of 1400 metric tons per sq. kilometre for the wet weight of the phytoplankton crop in the English Channel, depth, 70 metres.

W. R. G. A.

The Distribution of Red Algæ in Relation to Illumination.

By W. R. G. Atkins and H. H. Poole.

Nature (London), 118 (2961), pp. 155-156. 1926.

The reduction in the illumination in water may be considered as due to the selective absorption of the water, non-selective absorption due to gross particles in suspension, to the selective absorption or scattering due to very small particles and to the selective absorption due to tint in the water. Determinations of the coefficient of absorption were made by means of a photo-electric cell sensitive mainly to the blue, and a very great reduction in illumination due to particles in suspension became evident. Since fresh water is almost invariably more turbid than salt water it results that at the depth at which, in the sea, red algæ flourish, in fresh water the illumination is too low for plant life. There is therefore no general development of red algæ in fresh water.

W. R. G. A.

A Buffer Mixture for the Alkaline Range of Hydrogen ion Concentration.

By W. R. G. Atkins and C. F. A. Pantin.

Biochem. Journ., 1926, *Vol. XX* (1), *pp.* 102-104.

Clark's 0.2 M boric acid solution, made 0.2 M with respect to KCl also, was used with 0.2 M Na₂CO₃. The range for ninety-five of the former to five of the latter, and with the proportions reversed, is pH 7.44-10.85 at 16° C. Phenolphthalein may be used up to pH 10.5 and Sørensen's alizarine yellow R, sold as alizarine yellow G or *p*-nitrobenzene-azo-salicylic acid, from pH 10.1 to beyond the range of the mixtures given.

W. R. G. A.

Photo-Electric Measurements of Illumination in Relation to Plant Distribution. Part I.

By W. R. G. Atkins, Sc.D., F.R.S., and H. H. Poole, Sc.D.

Sci. Proc. Roy. Dub'in Soc., *Vol. XVIII*, *N.S.*, *pp.* 277-298, 1 *fig.*, 1926.

Almost simultaneous measurements were made of the illumination in a wood and in the open by means of two photo-electric photometers and apparatus previously described. The illumination in the shade may be correlated with its flora by expressing it as a percentage of the diffuse light in the open, the latter being measured with photometer horizontal or inclined to obtain the maximum reading. Data are presented concerning the distribution of various plants in terms of this daylight factor, which may be as low as 1-2 per cent on the floor of a wood of mixed deciduous trees in autumn and less than 0.06 per cent in heavy shade under rhododendron. The photo-electric cells were sensitive to the blue portion of the spectrum. Such values, 1-2 per cent, as are found in the wood are also found at depths of about 22 to 29 metres in clear water, some miles off the Cornish coast.

W. R. G. A.

The Colorimetric Estimation of Minute Amounts of Compounds of Silicon, of Phosphorus and of Arsenic.

By W. R. G. Atkins and Edith G. Wilson.

Biochem. Journ., 1926, *Vol. XX* (6), *pp.* 1223-1228.

The reagents of Diénert and Wandenbulcke for silicate give no colour with moderate amounts of phosphate, arsenate, or -ite; they may be used for the determination of silicate in natural waters. The method of Denigès for phosphate may be used for arsenate also, but not for -ite; the method is not vitiated by the presence of silicate in natural waters.

Bell and Doisy's method for phosphate is not as delicate as that of Denigès; it may be used for arsenate, but gives irregular results with arsenite. Pouget and Chouchak's reaction for phosphates is not given by arsenites, and only faintly by arsenates unless warmed. Save in so far as free phosphate is present the Denigès reaction is not given by glycerophosphate, triphenylphosphate, or tricresylphosphate. The reaction is not given by vanadates, by tungstates, or by phosphotungstates. With the last a purple tint is slowly produced, but this is not a sensitive reaction.

W. R. G. A.

Report on the Experimental Work of Drs. F. D. White and C. M. Yonge at Plymouth during July and August, 1924 (Dept. Sci. and Industrial Research.) The Deterioration of Structures in Sea Water.

By G. Barger, F.R.S.

Sixth (Interim) Rept. Comm. Inst. C.E., 1926, pp. 9-13.

The investigation was mainly concerned with the determination of the toxicity of some inorganic salts and a large number of organic substances to *Teredo* larvæ. The results for the most active inorganic salts previously found by Dr. Yonge, viz. mercuric chloride, 1 : 300,000; zinc sulphate, 1 : 30,000; potassium antimonyl tartrate, 1 : 16,000, were confirmed by Dr. White. The latter began and Dr. Yonge completed an examination of 13 chloro-, bromo-, and iodo-arsines and arsenious oxides, related to phenarsazine. D.M. (10 chloro, 5 : 10 dihydro phenarsazine) is lethal in a concentration of 1 : 750,000. A few derivatives were up to twice as active, others considerably less so. Diphenyl chloro stibine was sometimes less active (1 : 600,000), diphenyl chloro bismuthine much less so (1 : 50,000).

Of other organic compounds without arsenic some acridine derivatives were lethal at 1 : 100,000, but for the majority the limit of dilution was below 50,000.

The above figures refer to larvæ from 7 to 11 days old; Dr. Yonge found that young larvæ (3 days old) were much more sensitive, and older ones less so.

Dr. Yonge confirmed the chemotaxis of *Teredo* larvæ by an extract of wood, discovered by Harington, and showed that the simultaneous presence of a poison in the tubes does not repel the larvæ, but merely kills them.

Three rafts with impregnated test pieces were put out inside the Breakwater.

G. B.

Influence of Temperature on Biological Processes.**By J. Bělehrádek.***Nature*, Vol. 118, July 24th, 1926, p. 117.

The temperature coefficient Q_{10} of Van't Hoff and the thermal increment μ of Arrhenius do not hold good in the majority of biological reactions, because they vary with temperature. The effect of temperature on biological processes may be expressed—in the most cases—by the following formula :—

$$y = \frac{a}{x^b}$$

in which x is temperature in centigrade Celsius, y time which is necessary to accomplish a given reaction, a and b constants. This formula may be used for temperatures up to the optimum. The constant a indicates time at $+1^\circ$, the constant b is a temperature coefficient which does not vary with temperature. In its logarithmic form, the equation gives a straight line :—

$$\log y = \log a - b \log x.$$

It may be supposed that the constant b has a biological significance, which shall be explained in a further paper.

J. B.

Rays and Skates : A Revision of the European Species.**By R. S. Clark, M.A., D.Sc.***Fisheries, Scotland, Sci. Invest.*, 1926, 1.

The geographical range of the species treated herein extends from the Moroccan coast to Greenland and Spitsbergen. The work which was begun at Plymouth with the detailed investigations of the southern species was extended and completed by similar investigations on the northern forms at Aberdeen. Twenty-three species are described and figured, of which one Ray from the Mediterranean is new. As the nomenclature has previously given rise to considerable confusion, detailed discussions have been included, and an attempt has been made to bring some precision to bear on the synonymy of the species. For the most part, the descriptions and figures have been taken from material, the greater part of which has been obtained in a fresh condition, while due regard has been paid in the diagnoses to the differences exhibited by examples of the same species in its different growth stages from widely separated localities. The large amount of material landed at British markets from this extensive area has facilitated this study and has added greatly to our knowledge of the life-history and distribution of the species.

Within this large area there are typical northern and southern forms, but no species can be said to occupy an exclusively intermediate range. The problem of distribution, therefore, resolves itself into a determination of the factors which limit the range of these northern and southern forms. Eleven species are taken in the English Channel, and nine of these occur also in the Mediterranean. In this latter area, three species—*R. poly-stigma*, *radula*, and *melitensis*—have not been recorded elsewhere. Of the Channel species *R. microcellata* and *R. marginata* have, so far, not been recorded from the North Sea or north of the Irish coasts. Of the more northern forms, *R. radiata* alone seems to spread its range southwards, though other three species—*R. lintea*, *fyllæ*, and *nidrosiensis*—may be found with fuller knowledge to be distributed along the edge of the Atlantic slope. The species of most commercial value are *R. clavata*, the Thornback or Roker, and *R. batis*, the Blue or Grey Skate.

The text and plates are in separate volumes, and there is a useful bibliography.

R. S. C.

**On the Correlation of the Life-History of the Acephaline Gregarine,
Gonospora, with the Sexual Cycle of the Host.**

By C. C. Hentschel, M.Sc.

Parasitology, Vol. XVIII, No. 2, pp. 137-143, 1926.

The life-history of the acephaline gregarine, *Gonospora varia*, is shown to be very closely bound up with the sexual cycle of its host, *Audouinia (Cirratulus) tentaculata*. The parasites live in the cœlom among the developing genital products of the worm, and complete their life-history contemporaneously with the growth and maturation of the gametes. Thus the gregarines are small in the autumn, when the reproductive cells are only slightly developed; but grow in winter, forming in the early summer spores which are presumably shed with the worm's genital products, when reinfection probably takes place and the cycle recommences.

Occasionally, gregarines are found in segments containing no reproductive organs. In these circumstances they cannot complete their proper life-history, but remain stunted and unable to form spores, often causing, apparently, some pathological effect on the host. It would appear, then, that the gregarines cannot develop properly except in the presence of the gonads. It seems as though some substance may be formed that is essential for their growth. This substance may be closely connected with the ovaries or testes, if not actually secreted by them; in fact, we are possibly dealing here with something analogous to a hormone.

C. C. H.

Studies in Colour Changes in Fish. Pt. II. An Analysis of the Colour of the Dab. Pt. III. The Action of Nicotin and Adrenalin in the Dab. Pt. IV. The Action of Caffeine in the Dab, and a Theory on the Control of Colour Changes in Fish.

By H. R. Hewer, D.I.C., B.Sc.

Phil. Trans. Roy. Soc. London, B. Vol. 215, pp. 177-200, 1926.

The markings constituting the colour pattern of the dab are analysed. The chromatophores found in these markings are mentioned together with their size and number per unit area. This leads to a discussion of the appearance of certain markings under various conditions of coloured background. It is shown that the distribution and size of the chromatophores forms a "morphological" basis for nearly all these markings, but that their appearances cannot be accounted for wholly on these grounds. Microscopical investigation shows that differential contraction and expansion occur. The origin of this reaction is then investigated. The actions of nicotin and adrenalin are examined, but the reactions evoked by the use of these drugs are characterised by complete uniformity. Caffeine is then used and it is found that differential reactions can be produced in a certain percentage of individuals. It is finally suggested that a centre for the control of colour exists in the brain, and that the fish is sensitive to certain features of the environment, and "adapts" itself to them as well as it can within the limits of its morphological pattern.

H. R. H.

The Viscous Elastic Properties of Smooth Muscle.

By A. V. Hill, F.R.S.

Proc. Roy. Soc. Ser. B. Vol. 100, 1926, pp. 108-115.

Gasser and Hill found that the sudden release, during an isometric tetanus, of the skeletal muscle of a frog is followed by an instantaneous drop of tension, and then by a gradual redevelopment along a curve identical with that of the original rise when stimulation began. This observation has been repeated, both for quick releases and for quick stretches, on the smooth muscles of *Holothuria nigra*, in which the speed of contraction is less than 1/100 of that of a frog's striated muscle. The return to the tension characteristic of the new length is precisely similar in its time relations to the initial rise of tension.

It is concluded that the development of a contraction during stimulation, and its redevelopment after release, are due to the same process, viz. the formation of an organised molecular pattern, arranged in space whether of two or three dimensions in the fibres of the muscles. Such a molecular rearrangement, either on stimulation or during actual shortening, is the basis of the "viscous-elastic" phenomena found in all contractile tissues.

A. V. H.

Observations on the Muscles of Normal and Moulting Crustacea.**By J. P. Hoet and P. M. T. Kerridge.***Proc. Roy. Soc. B.* 100, p. 116, 1926.

Glycogen was found in the muscles of normal, hard-shelled crustacea, but only small amounts in shelled specimens of the same species.

An early onset of rigor mortis, associated with alkaline reaction, was observed in crustacean muscles poor in glycogen. When glycogen was present in the muscles there was a post-mortem development of acid comparable with that in mammalian muscle.

P. M. T. K.

The Buffering Power of the Blood of *Maia squinado*.¹**By P. M. T. Kerridge.***Journ. Phys. LXII*, 65, 1927.

The hydrogen ion concentration of the blood of *Maia squinado*, oxidised and reduced and exposed to various tensions of carbon dioxide was measured.

The buffering power of the blood, and its bicarbonate content under varying CO₂ tensions, was calculated.

It was found that oxyhæmocyantin is a stronger acid than reduced hæmocyantin.

P. M. T. K.

Cytological Observations on *Haplosporidium* (Minchinia) *Chitonis*.**By S. D. King, B.A., Sc.B., Ph.D.***Quart. Journ. Micros. Sci., Vol. LXX*, 1926, pp. 147-158.

The golgi bodies of *H. chitonis* are juxtannuclear in the uninucleate stages formed by breaking up of the plasmodium, the sporoblast, spore, and probably also in the plasmodium. In the mature spore they scatter, and may give rise to fatty reserve material. In the sporoblast and young spore the portion of cytoplasm surrounded by the apparatus stains deeper than the surrounding cytoplasm. This is the "sphere" noted by previous workers. Mitochondria are difficult to demonstrate, but when visible are granular. The spore coat is formed within the cytoplasm of the sporoblast, the outer cytoplasmic envelope being apparently used up in thickening of the coat and formation of the spore tails.

S. D. K.

The Young of *Stylocheiron Suhmii* G. O. Sars and *Stylocheiron abbreviatum* G. O. Sars (Crustacea), from Mediterranean Plankton collected by Mr. F. S. Russell, in the neighbourhood of Alexandria, Egypt.

By Marie V. Lebour, D.Sc., F.Z.S.

Proc. Zool. Soc., London. Part I, 1926, pp. 203-211.

The larval stages of *Stylocheiron Suhmii* and *S. abbreviatum* are described. The life-history from early Furcilia is nearly complete for both species. These larvæ are very characteristic, and bear generic characters unlike any other euphausiid. Both are deep water forms, and probably come near the coast to breed.

M. V. L.

On Some Larval Euphausiids from the Mediterranean in the Neighbourhood of Alexandria, Egypt, collected by Mr. F. S. Russell.

By Marie V. Lebour, D.Sc., F.Z.S.

Proc. Zool. Soc., London, Part III, 1926, pp. 765-776.

This paper is supplementary to one on the larvæ of *Stylocheiron* published in the same publication. In it are described the larvæ of *Nematoscelis microps*, *Thysanopoda æqualis*, *Euphausia Krohni*, and some *Euphausia* species not identified, besides the calyptopis stages of *Stylocheiron Suhmii*. The numbers of larvæ taken close to the shore seem to indicate that these species come from the open sea to spawn. A list of all specimens taken is given with data.

M. V. L.

The Chromosome Complex of *Gammarus chevreuxi* Sexton.

I. Spermatogenesis.

By Richard Palmer, B.Sc.

Quart. Jour. Micr. Sci., Vol. LXX, Pt. III, 1926, pp. 541-551.

1. The chromosomes of *Gammarus chevreuxi*, as shown in spermatogenesis, are described. They are small, ovoid, and minutely heteromorphic, and have a diploid number in the male of twenty-six, including an X- and a Y-chromosome.
2. The spermatogonia fall into two distinct classes as regards chromosome size, the large plates being the later stages in the spermatogonial series.
3. While *Gammarus* does not provide favourable material for the detailed study of synapsis, the chromosomes appear to spin out in the typical way in the early synaptic stages.
4. Huxley's conclusions regarding cross-over values and chromosome configuration in *Gammarus* are discussed in the light of these facts.

R. P.

On the Physiology of Amœboid Movement. III. The Action of Calcium.**By C. F. A. Pantin.***Brit. Journ. Exper. Biol., Vol. III, No. 4, 1926, pp. 275-295.*

The action of certain ions on a marine amœba has been studied. Movement takes place between the limits pH 6 and pH 10: it is reversibly inhibited at the acid limit, but alkaline inhibition is reversible only after a brief immersion. Of the four chief cations of sea-water Ca alone is essential for movement. Movement takes place in balanced solutions of Ca with any alkali metal, with no other cation present. NH_4 is toxic. The optimum alkali-metal /Ca ratio for movement, and the velocity attained, increase with the atomic weight of the alkali metal. Viability in these solutions follows a different law: $\text{Na} > \text{K} > \text{Cs} > \text{Li}$ and Rb. Ca can be replaced by Sr, but not by Mg or Ba. For the optimum movement, $\text{Na}/\text{Sr} < \text{Na}/\text{Ca}$. Although movement occurs in either NaCl or KCl alone if Ca is present, yet it is maintained much longer when K is added to a $(\text{NaCl} + \text{CaCl}_2)$ solution. The effect is most marked where $\text{Na}/\text{K} \doteq 50$, as in sea-water. This specific action of K on viability is shared by Rb. In a solution of $(\text{NaCl} + \text{CaCl}_2)$ with excess Ca, movement is immediately inhibited, apparently owing to an increased ectoplasmic viscosity. The inhibition is reversible, and resembles that caused by acid. Inhibition from lack of Ca differs from that caused by excess. Movement is at first normal, but sooner or later falls to zero: the time required for this is less the lower the Ca concentration. This inhibition is not readily reversible. In the effect of Ca deficiency amœba resembles contractile tissues. In both cases the effect is counteracted by increased alkalinity. In amœba the action is complicated, because above pH 8 alkali tends to inhibit all movement if Mg is absent. There is a general similarity between the action of ions on amœba and on contractile tissues. The differences observed seem to be related to the long time required for effects to occur in amœba. This is probably connected with adaptation to the variable external environment, in-shore sea-water.

C. F. A. P.

On the Physiology of Amœboid Movement. IV. The Action of Magnesium.**By C. F. A. Pantin.***Brit. Journ. Exper. Biol., Vol. III, No. 4, 1926, pp. 297-312.*

Although movement only occurs if Ca or Sr is present in the medium, yet Mg and Ba as well are able to prevent the increased permeability and cytolysis seen in pure NaCl. Cerium also has a similar action at very low concentration, but it is very much less effective than Mg. Excess of Mg never causes the marked increase in viscosity seen in the ectoplasm

when Ca is in excess. For this and other reasons it seems that inhibition of movement in excess Ca is due to direct action on the contractile mechanism, and is not simply the result of decreased permeability. This is borne out by the fact that good movement occurs in mixtures of ($\text{MgCl}_2 + \text{CaCl}_2$) alone, and over a far greater range of concentrations than occurs in mixtures of ($\text{NaCl} + \text{CaCl}_2$). This can be readily explained by assuming that Mg reduces the permeability of the cell so far that Ca can neither penetrate nor leave the cell and thereby derange the contractile mechanism. Even in any mixture of ($\text{NaCl} + \text{CaCl}_2$), or of ($\text{MgCl}_2 + \text{CaCl}_2$), movement gradually falls off. Only when all four cations of sea-water are present is movement normal indefinitely: fully normal permeability is maintained only under these circumstances. Since the addition of Mg and K to a solution of ($\text{NaCl} + \text{CaCl}_2$) not only establishes the normal degree of impermeability, but also enormously increases the absolute velocity of movement, it seems probable that the same mechanism which controls permeability is also a part of the whole mechanism of amœboid movement.

The relation of the action of ions to the chemical structure of protoplasm is discussed.

C. F. A. P.

Choreocolax Polysiphoniae, P. F. Reinsch.

By **H. H. Sturch.**

Annals of Botany, Vol. XL, No. 159, pp. 585-605.

This description of another of the small, sub-spherical, parasitic Florideæ, all formerly included by Reinsch in his genus *Choreocolax*, shows that the three species now examined, although very similar in size, external appearance and parasitic habit, belong to three distinct genera, differing markedly in the development of their carposporophytes. *Choreocolax* is shown to produce a sub-spherical cystocarp, bearing tufts of carposporangia in the enclosed cavity; a structure much resembling the cystocarp of *Galaxaura*.

The development of the sporophyte is described in minute detail. The distal portion of the peripheral filament upon which the carpogonium is laterally borne, becomes modified to a cœnocytic mass, forming a food store for the developing sporophyte.

It is suggested that the name *Holmsella pachyderma* should be substituted for the name *Harveyella pachyderma*, as this plant is not a *Harveyella*.

The three genera, *Choreocolax*, *Harveyella*, and *Holmsella*, of each of which only one species has yet been described, have now been shown to have an auxiliary cell development resembling that of the *Ceramiales*,

or of an allied group, while their mature cystocarps resemble very closely those of members of the Gelidiales. The three parasitic genera have therefore been placed in a provisional group, the Choreocolaceæ, whose position has, for the present, been left indefinite.

The situation of *Choreocolax* is interesting as a fully parasitic Floridean with very reduced soma, living on *Polysiphonia nigrescens*, which is hemiparasitic, but with a fully developed soma, on *Ascophyllum nodosum*. *Choreocolax* represents the limit, *Polysiphonia* the commencement, of parasitism in the Florideæ.

H. H. S.

Ciliary Feeding Mechanisms in the Thecosomatous Pteropods.

By C. M. Yonge, B.Sc., Ph.D.

Journ. Linn. Soc., Zool., Vol. XXXVI, 1926, pp. 417-429.

The Thecosomatous Pteropods obtain their food by means of ciliary currents on the middle and two side lobes of the foot. The ciliary mechanisms of the four species, *Cavolinia inflexa*, *Creseis acicula*, *Cymbulia peronii*, and *Gleba cordata* (all examined at the Station Zoologique Russe, Villefranche-sur-Mer), in the order named show a progressive reduction in area. Excess material is rejected by a ciliated tract anterior to the mouth. Correlated with the increased specialisation and efficiency of the ciliary mechanisms there is a reduction and final disappearance (in *Gleba*) of the buccal mass and its associated structures, which were probably handed down from carnivorous ancestors. There is both ciliary and peristaltic activity in the gut which possesses a triturating gizzard, a "digestive gland" into which food passes, and, at the junction of the two, a ciliated diverticulum which contains a hyaline secretion strongly reminiscent of the crystalline style of the Lamellibranchs. As in the latter, it may contain a starch-splitting ferment, and be correlated with the presence of ciliary feeding mechanisms which collect food largely of a vegetable nature.

C. M. Y.

Protandry in *Teredo Norvegica*.

By C. M. Yonge, B.Sc., Ph.D.

Quart. Journ. Micr. Sci., Vol. LXX, Pt. III, 1926, pp. 391-394.

Sections of the gonads of two specimens of *Teredo norvegica* undergoing change of sex are described. Histological evidence appears to point to a change of sex from male to female, and this agrees with the macroscopic examination of two to three hundred specimens of all sizes, the males being on the average only three-quarters the size of the females.

C. M. Y.

The Disappearance of the Crystalline Style.

By C. M. Yonge.

Nature, Vol. CXVII, 1926, pp. 691-692.

The style dissolves not "as a direct response to the lack of oxygen" (Berkeley), but under adverse conditions which cause a lowering of metabolism, and so a reduction in the rate of secretion of the style. Since the head of the style is always being dissolved by the less acid fluid in the stomach, the style is only maintained as a result of a balance between the rate of secretion and the rate of dissolution. It is never completely dissolved in those animals in which it lies in a separate cæcum; and there is no correlation between the size of the style and the habitat of the animal as would be expected if it were concerned with anærobic respiration.

C. M. Y.

The Digestive Diverticula in the Lamellibranchs.

By C. M. Yonge, B.Sc., Ph.D.

Trans. Roy. Soc. Edin., Vol. LIV, Pt. III (No. 15), 1926, pp. 703-718.

The structure of the digestive diverticula (so-called liver or hepatopancreas) was studied in 34 spp. of marine Lamellibranchs. They consist of blind tubules, which open into the stomach by ciliated ducts. There is only one type of cell in the tubules, but there are crypts of smaller, darkly staining cells whose nuclei divide mitotically; the older cells are very vacuolated, and contain many coloured granules. In the Teredinidæ there are also tubules specialised for the digestion of wood. A border cuticle was seen in sections of *Nucula* and the Filibranchs, but not in the Eulamellibranchs. In fresh material, long retractile cilia were seen in a number of species and probably occur in all. Iron saccharate was taken into large vacuoles in the cells of the tubules, being later passed on to amœbocytes. Blood corpuscles from dogfish are ingested by phagocytes before they reach the tubules, except in the case of *Teredo*, where they are ingested by the cells of the unspecialised tubules. The presence of intracellular digestion is indicated by the manner in which particles are ingested, and by the presence of digestive enzymes in extracts of the diverticula. There is no evidence, histological or physiological, that the cells of the tubules secrete. The diverticula provide the extensive surface characteristic of animals which possess intracellular digestion, while, as a result of the action of the various sorting mechanisms, only the very smallest particles are presented to the ingesting surface. The digestive diverticula possess none of the functions of a liver or pancreas, but are organs of absorption and intracellular digestion.

C. M. Y.