

## Abstracts of Memoirs.

RECORDING WORK DONE AT THE PLYMOUTH LABORATORY.

### The Photo-electric Recording of Daylight.

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

*Nature*, 1930, **125**, 305.

A Burt vacuum sodium photo-electric cell was mounted in a heavy gun-metal case, such as used in submarine photometry. A sheet of opal glass was placed above the window. This acts as an efficient diffusing surface and is set horizontally so as to measure vertical illumination. High-tension ignition cables lead from this to the laboratory where the high-tension batteries are stored together with a Cambridge Instrument Co. "thread-recorder." In this manner continuous records of daylight have been obtained.

W. R. G. A.

### Some Geochemical Applications of Measurements of Hydrogen Ion Concentration.

By **W. R. G. Atkins.**

*Sci. Proc. Roy. Dublin Soc.*, 1930, **19**, 455-460.

The reaction of natural waters may vary between pH 1.5 and pH 10.0. Obviously the reaction has an important influence upon the solution of rock and upon precipitation of metallic hydroxides already in solution. It is found that ferric salts are precipitated when the solution is still markedly acid. Ferrous salts remain in solution at a much lesser degree of acidity. The presence of organic matter, owing to its reducing action, favours the solution of iron ore. The problem of the formation of dolomite may also be regarded from this point of view. There are certain marked differences between the behaviour of the carbonates, bicarbonates and hydroxides of calcium and magnesium. The weathering of basalt has also been studied. Strongly weathered basalt is acid in reaction. Basalt which has only been slightly weathered gives a reaction which is neutral or only slightly acid, whereas a freshly exposed basaltic surface may be quite alkaline. It is obvious that considerations such as these must enter into a large number of geological problems.

W. R. G. A.

### On the Photo-electric Measurement of Daylight.

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

*In the Photo-electric Cells and their Applications, published by the Physical and Optical Societies. Discussion on June 4th and 5th, 1930, 128-137.*

Previous work on daylight and submarine photometry is reviewed. Details are given of the standardisation of the photo-electric photometers against a carbon arc. Measurements are described with the General Electric Co. new caesium monatomic vacuum cell, type CMV 6. This is sensitive throughout the whole spectrum. A method was evolved for comparing light of different colours by obtaining the ratio of the blue to red, blue to yellow and blue to green readings, using colour filters. These are obtained in white light, and again in light of different composition. The method has been described at greater length in a subsequent paper.

W. R. G. A.

### Photo-electric Measurements of Illumination in Relation to Plant Distribution. Part 3. Certain Spruce, Larch, Oak and Holm Oak Woods.

By W. R. G. Atkins and Florence A. Stanbury.

*Sci. Proc. Roy. Dublin Soc., 1930, 19, 517-531.*

A portable photo-electric outfit with micro-ammeters for measuring current has been found serviceable over rough ground. Under shade from *Picea excelsa* the daylight factor was reduced to 1-2 per cent. There was little or no growth on the ground save occasional seedlings of *Hedera helix*. Under shade from a narrow wood of *Larix europaea* the value of the daylight factor was about 15 per cent. There was a good under-growth of *Rubus fruticosus*, a belt of *Pteris aquilinum* and a woodland flora.

In a wood of *Quercus ilex* on level ground the daylight factor was found to be 1-2 or 3 per cent. In many sites there were pure carpets of *Hedera*. The deepest shade found was under *Ilex aquifolium* where the daylight factor was only 0.6 per cent.

W. R. G. A.

### The Distribution of Pasture Plants in Relation to Soil Acidity and other Factors.

By W. R. G. Atkins and E. Wyllie Fenton.

*Sci. Proc. Roy. Dublin Soc., 1930, 19, 533-547.*

Many British grasses are distributed over pastures varying from the most alkaline to almost the most acid found. Some have a range which is limited on the acid side, viz. *Cynosurus cristatus*, *Lolium perenne* and

*Dactylis glomerata*, but *Nardus stricta*, *Aira flexuosa* and *A. cæspitosa* are only found on acid soil. Of leguminous plants *Ulex europæa* extends throughout the whole range. *Trifolium repens* is the most important leguminous constituent of acid pastures, in which, however, it is not found in soil more acid than pH 5. *Trifolium pratense* is rare beyond pH 6, as are most of the other leguminous plants. In a well-drained alkaline soil *Medicago sativa* was found to persist, when sown, for six years. It was found that when allowed to roam freely sheep and cows grazed closely on herbage growing in soil at pH 6 and on most sites less acid than pH 5; in more acid sites grazing did not take place, or if it did, only slightly. The use of a neutral solution of potassium chloride in making soil extracts leads to large errors through base exchange.

W. R. G. A.

**Photo-electric Measurements of Illumination in Relation to Plant Distribution. Part 4. Changes in the Colour Composition of Daylight in the open and in shaded situations.**

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

*Sci. Proc. Roy. Dublin Soc.*, 1931, 20, 13-48.

Data are presented concerning the transmission of various colour filters. For work in shaded situations J. H. J. Poole's neon lamp device was found to be the most convenient measuring instrument. The caesium vacuum cell CMV 6 was satisfactory for such work. Its infra-red sensitivity may be suppressed by a Corning heat-absorbing filter so that it gives a wave-length sensitivity curve which is approximately horizontal between 440 and 640  $m\mu$ . By means of the above cell with a diffusing opal glass and colour filters it is possible to obtain a measure of the colour of the light under different conditions and in woods, taking daylight of some definite type as standard. In woods the light is very poor in blue, relatively rich in green, is close to sunlight in orange-red, and very much richer than either skylight, daylight or sunlight in the deep red. The source of light in woods is predominantly blue sky or grey sky rather than normal daylight with sunshine. Measurements have been made of the relative intensities of direct sunlight and diffuse skylight. Sunlight being relatively much richer in the light towards the red end of the spectrum, the value of this ratio at any given time depends on the type of photo-electric cell used to measure it, and is greatly altered by the use of colour filters.

W. R. G. A.

**Observations on the Photo-electric Measurement of the Radiation from Mercury Vapour Lamps and from the Sun, and on the effects of such Radiation upon the Skin.**

**By W. R. G. Atkins.**

*Sci. Proc. Roy. Dublin Soc.*, 1931, **20**, 49–65.

A glass vacuum sodium photo-electric cell was used with a micro-ammeter to show that it is advisable to run a mercury vapour arc continuously, exposure being made six minutes after switching on. After thirty-five minutes it should be switched off to allow of cooling. Five minutes later its initial potency has been recovered; the loss due to overheating is a real phenomenon. The aluminium reflector used, when adjusted to its position of maximum efficiency, increases the total radiation about 2·7 times and the ultra-violet radiation about 2·0. This more than counter-balances any loss of efficiency in the lamp due to overheating occasioned by the reflector. When the reflector is used the decrease in intensity is considerably less than that calculated according to the inverse square law. J. H. J. Poole's neon lamp is very convenient for the study of the mercury vapour arc. Data are given concerning the times required for the arc to produce slight erythema. These times are compared with those required for sunlight of different intensities reckoned in thousand metre candles. Approximate photo-electric determinations of the ratio of total to diffuse ultra-violet show that even at midsummer noon the sunlight is not very much more potent than the diffuse light from the whole sky and the direct light must be relatively less intense at other times.

W. R. G. A.

**Some Experiments on the Accuracy obtainable with Gas-filled Photo electric Cells.**

**By W. R. G. Atkins.**

*Sci. Proc. Roy. Dublin Soc.*, 1931, **20**, 67–73.

Gas-filled cells were tested for constancy of emission immediately after the glow-discharge had been passed momentarily. The caesium hydride cell behaved irregularly. The potassium hydride cell is more constant, and readings could be obtained to within 2 per cent with anode potential 60 volts. No tests were made as to the constancy or otherwise of the cell over prolonged periods. The rate of decrease of sensitivity after the glow amounts to about 2 per cent per minute. It is therefore advisable to make measurements immediately after the discharge which should be of momentary duration only. From this it follows that, if Poole's neon lamp method be used to integrate the current, such integration should be over equal periods of time in each case rather than for an equal number of flashes of the lamp.

W. R. G. A.

**The Penetration of Light through successive Layers of Tissue-paper.****By W. R. G. Atkins.***Nature*, 1931, **128**, 545.

A sodium photo-electric cell was used to measure the light transmitted and it was found, when allowance has been made for the extra loss at the first surface, that the succeeding layers from numbers 2 to 10 transmitted fairly regularly, the transmission factor being 79 per cent. It was found that 8.4 per cent of the original light remained after passing through ten layers of paper. The results bear on previous letters to *Nature*.

W. R. G. A.

**The Treatment of Gapes in Chicken.****By W. R. G. Atkins.***Nature*, 1931, **128**, 585.

Between February and May fourteen chicken affected with gapes were treated with a dilute solution of carbon tetrachloride in medicinal paraffin. Only one died, whereas all untreated chicken died in the same period. The chicken were about one month or six weeks old. At the end of May, however, the treatment broke down completely when applied to chicken only a fortnight old. None of these recovered. One, however, never contracted gapes though freely exposed. The treatment appears to be worth careful investigation.

W. R. G. A.

**The Adductor Mechanism of Pecten.****By L. E. Bayliss, E. Boyland and A. D. Ritchie.***Proc. Roy. Soc.*, 1930, *B.*, Vol. 106, p. 363.

A study has been made of physiological behaviour of the adductor muscle of Pecten. The slow part of this muscle can be isolated from the nervous system in a completely relaxed state in *P. magellanicus*. Stimulated electrically, it gives twitches about 100 times as slow as frog's skeletal muscle, which can be fused to form a tetanus. The difference in time scale is determined by the viscosity of the tissue, which in this muscle is about the same in the excited and unexcited states. The tensions developed are large. In *P. maximus* and *P. opercularis*, on the other hand, different nervous connections make it difficult to isolate the muscle without some "contracture"; apart from this, however, the muscles of these animals behave in the same manner as those of *P. magellanicus*.

The state of "contracture" is a result of reflex excitation which survives isolation, but may be partly or completely abolished by direct faradic stimulation. The "contracture" is not accompanied by increased viscosity, and it is uncertain whether it results from a continued state of excitation; the tensions in "contracture" are much less than the maximum tensions obtainable. Reflex movements of intact animals suggest that for the most part the muscle is contracting tetanically and is not in a state of "contracture."

The quick muscle gives a rapid twitch with single induction shocks that resemble the normal reflex contraction (swimming movement or flap). Complete fusion of twitches is not readily obtained, and the maximum number of contractions obtained by stimulation is not large, although varying in different species according to the animal's normal activity.

L. E. B.

### Studies in Tunicate Development. Part I. General Physiology of Simple Ascidians.

By N. J. Berrill.

*Phil. Trans. Roy. Soc. B., Vol. 218, 1929, pp. 37-78.*

The following species were investigated: *Tethyum pyriforme*, *Boltenia hirsuta*, *Styelopsis grossularia*, *Phallusia mammillata*, *Ascidiaella aspersa*, *A. scabra*, *Ascidia conchilega*, *A. mentula*, *A. prunum*, and *Ciona intestinalis*.

In the egg the perivitelline space is due to colloids exerting an osmotic pressure equivalent to 0.8 per cent gum-arabic in sea-water. In the oviduct this is counterbalanced by substances in the oviducal fluid. "Organ-forming" substances similar to those in the egg of *Styela partita* but much more striking occur in the egg of *Boltenia hirsuta*.

In the Ascidiidæ, Cionidæ, and probably in all ascidians with small eggs, the tadpole larva hatches through the digestion of the egg-membrane by a proteolytic enzyme active within the limits pH7-10. An alternative method which is only possible later in development is by rupture of the membrane, usually by ectodermal ampullæ. These ampullæ combine the functions of respiration and fixation.

The onset and rapidity of metamorphosis may be controlled by varying the hydrogen-ion concentration of the water. Hyper-alkalinity tends to inhibit metamorphosis, in particular tail-absorption, altogether; increased acidity tends to induce metamorphosis. The total salt concentration of sea-water has little effect upon development other than that of retardation.

The great variability of eggs and larvæ is due primarily to the length of time an egg has lain within the oviduct and to the degree of toxicity of the oviducal fluid during that time.

N. J. B.

**Studies in Tunicate Development. Part. II. Abbreviation  
of Development in the Molgulidæ.**

**By N. J. Berrill.**

*Phil. Trans. Roy. Soc. B., Vol. 219, 1931, pp. 281-346.*

The development of 16 species of *Molgula* and 2 of *Eugyra* is described. Ten are viviparous. Viviparity is due to reduction in adult size (in this family) in turn due to precocious sexual maturity resulting from the colonisation of exposed rocks by sand-adapted types. Increase in egg-size is a result of viviparity. Nine species develop without forming tailed tadpoles. Two species said to be anural were found to produce tadpoles. Cleavage is identical in anural and urodele development. Hatching in anural development is always by membrane rupture and never by digestion. An aggregation of cells is always seen near the larval stomach in both types of development; in the urodele it is known to be the absorbed tail. Failure of tail development is due to the absence of swelling on the part of the notochord cells, which, however, are present in normal number. Failure to extend on the part of the notochord results in a delay in closure of the blastopore. Imbibition by notochord cells is to some extent dependent upon the alkalinity or acidity of the surrounding medium.

Out of 139 species of the Ascidiacea anural development is confined to 9 molgulids. Within the Molgulidæ the origin of anural development is polyphyletic. The otolith (the only sense organ) is present in all urodele larvæ, absent in all anural larvæ. Anural development is to be correlated with large size, oviparity, and a free, unattached sand life; urodele more with small, viviparous, attached forms. The first type is considered to be primitive, and to have secondarily colonised the rocks.

It is concluded that anural development is a direct response to the sand-embedded habitat, that the hatching enzyme is lost when tail development is disturbed, and that anural development is compatible with race-survival only when there is an efficient alternative method of hatching.

N. J. B.

**Regeneration in *Sabella pavonina* (Sav.) and other Sabellid Worms.**

**By N. J. Berrill.**

*Journ. Exp. Zool., Vol. LVIII, 1931, pp. 405-523.*

The account represents a preliminary investigation into the phenomena of regeneration and metamorphosis typical of this group of annelids. In a normal worm the body is divided into three regions, a head and collar, a thoracic, and an abdominal region. The thoracic and abdominal segments differ in that the setæ and uncini in the first are respectively ventral and

dorsal, while in the second they are dorsal and ventral, as though the anterior part of the worm is twisted through 180 degrees. In development thoracic segments are first formed and then abdominal segments added behind.

In regeneration from anterior cut-surfaces, only a head and collar segment is formed from any segment of the body; from posterior cut-surfaces regeneration is continuous as in normal growth. Up to two or three thoracic segments can be formed from the posterior surface of thoracic segments. In isolated abdominal pieces thoracic segments are always formed through the metamorphosis of originally abdominal segments. The usual number is 5-12, but under certain imperfectly known conditions it may be from 0-80. Metamorphosis never extends into abdominal segments newly regenerated posteriorly. There is always a gradient in degree of metamorphosis, the process being completed anteriorly while but just starting posteriorly. Contact with thoracic structure is unnecessary for abdominal metamorphosis, and every abdominal segment in the body is potentially thoracic. Temperature has merely an indirect influence, actual and physiological age being of greater importance in determining the extent of transformation. The reorganizing stimulus resides in the anterior regenerated head and collar segments. A hormonal control is precluded, while there is some evidence that it may be neuroid or electrical.

N. J. B.

### **Untersuchungen zur Physiologie der Tonusmuskeln.**

**By E. Bozler.**

*Zeitschr. f. vergl. Physiol.* 12, pp. 579-602.

Two preparations of nonstriated muscle, suitable for quantitative experiments, are described, the retractor of the pharynx of the edible snail and the nonstriated part of the adductor muscle of Pecten. They respond easily to electrical stimuli, also to weak single induction shocks. The isometric twitch is very asymmetric, the rise of tension is as rapid as in most striated muscles, the relaxation is relatively slow. The resting muscle behaves like a plastic body; stretching produces tension. This, however, disappears completely, if the length remains constant. The time relations of this process are exactly the same as those of relaxation in an isometric twitch. In the Pecten muscle the quickness of the relaxation may change within wide limits in the same muscle preparation. After stimulating with a series of shocks, the muscle relaxes more quickly than if single shocks be applied in long intervals. In the discussion of the nature of this change it is important that the mechanical properties



of the muscle change at the same time in a definite manner. This change seems to be of great importance for the energetics of the muscle and explains some of the peculiarities of nonstriated muscle. E. B.

**Notes on the Hydrogen Ion Concentration Excess Base and Carbon Dioxide Pressure of Marine Aquarium Waters.**

By E. M. Brown.

*Proc. Zool. Soc.*, 1929, Pt. 4, pp. 601-613.

A comparison of tank-water from the Aquarium of the Zoological Society of London with that of Plymouth showed that, while both deviate from the normal in certain respects, the former shows a greater variation in different tanks and at different times.

Plymouth maintains a nearly constant pH, as a result of liming, but is supersaturated with carbon dioxide. The Zoo Aquarium water shows a relatively low varying pH, low excess base and high carbon dioxide pressure, but a large variety of fish and invertebrates adapt themselves successfully to these conditions.

The diminution of the excess base in untreated Aquarium water was examined and the advantages of liming were discussed. E. M. B.

**The Action of Potassium Cyanide and Potassium Ferricyanide on certain Respiratory Pigments.**

By S. F. Cook.

*Journ. Gen. Physiol.*, Vol. XI, No. 4, 1928.

Measurements with the Barcroft differential manometer show that different types of respiratory pigments are affected differently by  $K_3Fe(CN_6)$  and KCN. The oxygen in hemoglobin is liberated by the former and not the latter, that in hemocyanin by the latter and not the former, that in echinochrome by the former and not the latter, and that in hemerythrin by both. S. F. C.

**The Anatomy and the Histology of Bud-Formation in the Serpulid *Filograna implexa*, together with some Cytological Observations on the Nuclei of the Neoblasts.**

By G. H. Faulkner.

*Journ. Linn. Soc. Zool.*, Vol. XXXVII, 1930, pp. 109-190.

In the anatomy of *Filograna implexa* the chief points of interest are : the nephridia and their homology with other Polychaet nephridia : the

nerve supply to the branchial filaments: the circulatory system and the support this gives to the theory of a blastocoelic origin of the Annelid blood spaces.

During summer *Filograna* reproduces sexually, and during spring asexually, by a process of transverse fission. Posterior to the future plane of fission a new anterior region consisting of a head and two setigerous segments is inserted, and anterior to it a new growing point for the stock. The position of the abdomen of the plane of fission is variable.

The segments which are destined to be separated as the bud undergo prior to fission a complete histolysis. The old tissues break down, partly independently and partly by phagocytosis and are replaced by new embryonic tissues. A similar rejuvenation of tissues occurs to some extent on the stock. The cells which lay down the new tissue arise by the proliferation of neoblasts in the ventral body wall. These neoblasts are identical with the definitive germ cells of the sexual season. They are distinguishable from other cells by the fact that during resting stages their chromosomes persist as condensed bodies lying in pairs in a clear nuclear cavity.

G. H. F.

### **A Spectrographic Analysis of Animal Tissues.**

**By H. M. Fox and H. Ramage.**

*Proc. Roy. Soc., B., Vol. 108, 1931.*

The present paper is the first report on a quantitative spectrographic analysis of animal tissues. It deals largely, but not exclusively, with annelids and molluscs. Iron and copper were present in all tissues analysed. Manganese was widely distributed. The manganese content of tissues varies with locality. Its function is discussed. Nickel and cobalt occurred spasmodically, the former being more frequent. Except in one case, all high concentrations of nickel were accompanied by cobalt. In one tissue only did cobalt occur without detectable nickel. Lead and silver both exhibit an irregular distribution. Certain tissues have a disposition to accumulate one or other of these elements. One man had silver in all organs, two others had none. Lead accumulates in different tissues of different individual men. Cadmium occurred in the livers of *Pecten maximus* from different situations. Lithium is very widespread in animal tissues, rubidium is much less so, while cæsium was not found. Strontium was found in numerous cases. Barium was not detected. Calcium fluoride was found in one case only, namely, the body-wall of *Archidoris tuberculata*.

H. M. F. AND H. R.

**Notes on Protodrilus.****By E. S. Goodrich.***Quart. Journ. Micr. Sci.*, Vol. LXXIV, 1931, pp. 303-319.

The nephridium of *Protodrilus flavocapitatus* is described in detail. With its long-coiled canal and small projecting nephridiostome it is shown to be more complicated than hitherto supposed.

The sperm-duct of the male has a ridged ciliated cœlomostome and represents a cœlomoduct or possibly a nephromixium. It is argued that the "brachynephridia" and sperm-ducts of all Protodrilids are of the same morphological nature.

The fate of the cœlomoduct is related to the mode of emission of the genital products. In the female of *Pr. flavocapitatus*, which sheds the ripe ova by dropping off posterior segments, the cœlomoducts have been lost in all the segments, and in the male in all the segments excepting the eleventh. Remains of the cœlomostomes are perhaps represented by the ciliation of the cœlomic epithelium in the genital segments of the female.

It is maintained that *Protodrilus* is dioecious, that the female may be early inseminated by the male, that copulation must take place, and that the dorsal glands are perhaps concerned in the process. Ripe spermatozoa only are found in the female, and the so-called stages in "cystospermatogenesis" are probably stages in the phagocytosis of superfluous spermatozoa.

E. S. G.

**On the Morphology, Feeding Mechanisms, and Digestion of *Ensis siliqua* (Schumacher).****By A. Graham.***Trans. Roy. Soc. Edinburgh*, Vol. LVI, pp. 725-752, 1931.

The structure of the razor shellfish *Ensis siliqua* is briefly described. A description of the byssus gland, which is only found in very young specimens, is given, while the structure of the nervous system is described in detail. The four principal ganglion pairs of the Lamellibranch are present, the cerebral and pleural ganglia on each side being fused, while the two pedal ganglia have fused to form a median ganglion; the two visceral ganglia lie closely approximated. The peripheral portions of the nervous system are remarkable for the large number of pallial anastomoses, there being four main circumpallial loops in each mantle fold in addition to minor connections. An asymmetrical stomatogastric system

supplying the anterior parts of the alimentary canal and in connection with vestiges of the buccal ganglia, is represented.

An account is given of the pallial ciliary currents: these appear to be in essentials similar to those described for other genera, save that the rejection tracts on the mantle are more powerful. The mode of functioning of the selective mechanisms on the palps is discussed.

The place of secretion of the style is described as two longitudinal tracts in the style sac of granular, darkly staining (iron hæmatoxylin) cells; these are held to be homologous with the major and minor typhlosoles of those forms where the style sac and the mid gut are confluent.

The style diastase has an optimum temperature of 35° C. at pH 6.0 and an optimum pH of 6.0 at 22° C. The style also contains an oxidase.

The protease of the digestive diverticula has an optimum temperature of 32° C. and optimum pH values of 4.2 and 8.2 at 30° C. The diverticula also contain a lipase, a diastase and a glyco-genase.

A. G.

### On the Optimum Hydrogen Ion Concentration and Temperature of the Style Enzyme of *Pecten maximus*.

By A. Graham.

*Proc. Roy. Soc., B., Vol. 108, pp. 84-95, 1931.*

The diastase of the crystalline style of *Pecten maximus* was studied in order to investigate:—

- (a) The effect of time on the pH optimum.
- (b) The effect of pH on the temperature optimum.
- (c) The effect of time and temperature on the pH optimum.

The principal results were as follows:—

- (a) There is no variation in the pH optimum with variation in the duration of the experiment.
- (b) There is a fall in the optimum temperature accompanying a fall in the pH of the medium.
- (c) When two out of the three factors under the control of the animal—time, pH, and temperature—are made equal to those found in natural conditions, and the optimum for the third is determined, it also is found to be the actual condition encountered in the living animal.

A. G.

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

**II. *Gonospora (Kalpidorhynchus) arenicolae*.**

**By C. C. Hentschel.**

*Parasitology*, XXII, 4, 505-509, November, 1930.

It is shown that there is a correlation between the life-history of the acephaline gregarine, *Gonospora arenicolae*, and the sexual cycle of its host, *Arenicola ecaudata*. This correlation exhibits certain points of similarity with that between the allied species *G. varia* and its host *Audouinia (Cirratulus) tentaculata*, described in a previous paper. The correlation is, however, not so definite, for the life-history of a generation of parasites does not necessarily coincide with the sexual cycle of the host. The ejection of the sporocysts together with the worm's gametes was observed. A brief description of the spawning behaviour of *Arenicola ecaudata* is also given.

C. C. H.

**Regeneration of the Spines in Sea-Urchins.**

**By A. D. Hobson.**

*Nature*, Vol. 125, p. 168, 1930.

Specimens of *Psammechinus miliaris* exposed to direct sunlight in the laboratory threw off all their spines except those on the oral surface. Regenerated spines were visible in a week and were fully developed in two months.

A. D. H.

**Carbohydrates of Crab Nerve.**

**By E. G. Holmes.**

*Biochem. Journ.*, Vol. XXIII, 1929, pp. 1182-1186.

The peripheral nerves and nerve ganglia of Maia and Cancer are extremely rich in carbohydrate, which is present as glycogen and as "free carbohydrate." In the case of the ganglia, some, at least, of the carbohydrate is present as di- or poly-saccharide, soluble in 60 per cent alcohol, and in Schenk's reagent. In nitrogen there is hydrolysis of glycogen, and in the case of the ganglion, of the soluble di- or poly-saccharide; there is also formation of lactic acid. In oxygen, the formation of lactic acid is inhibited; the breakdown of glycogen is less than occurs in nitrogen.

E. G. H.

**Observations on Dicystid Gregarines from Marine Worms.**

**By D. L. Mackinnon and H. N. Ray.**

*Q.J.M.S.*, Vol. LXXIV, 1931, pp. 439–466.

The detailed classification of dicystid gregarines is in a very confused state, and some attempt was made to correlate and correct the observations by earlier workers.

Dicystids in polychæte worms were studied, and notes made on the structure of two species of *Polyrhabdina*, occurring in *Scololepis fuliginosa* and in *Polydora flava* respectively.

Two new dicystids, for which the generic names *Hentschelis* and *Lecythion* were proposed by us, were described from the intestine of the echiurid worm, *Thalassema neptuni*. Spore-formation, after evacuation of the associated gametocytes into sea-water, was observed, and flagellated male gametes were seen to develop; but it was not possible to decide certainly to which species of gregarine in *Thalassema* these should be referred.

D. L. M.

**A New Protozoon, *Hyperidion thalassemae* n. gen., n. sp., from the Intestine of *Thalassema neptuni* Gaertner.**

**By D. L. Mackinnon and H. N. Ray.**

*Q.J.M.S.*, Vol. LXXIV, 1931, pp. 467–475.

A new sporozoan, for which we propose the name *Hyperidion thalassemae*, was observed in the gut of *Thalassema neptuni*. This is an acephaline, pestle-shaped gregarine, which lives within modified epithelial cells while it is young; but which later on protrudes a contractile, club-like portion of its body into the lumen of the intestine. Its possible relationship with *Zygosoma gibbosum* (Greeff) from *Echiurus pallassii* were considered.

D. L. M.

**The Feeding Mechanism, Formation of the Tube and Physiology of Digestion in *Sabella pavonina*.**

**By E. A. T. Nicol.**

*Trans. Roy. Soc. Edin.* III, LVI, pp. 537–598, 1930.

The branchial crown of *Sabella pavonina* is a specialised ciliary filtering organ which collects small particles of detritus, diatoms, flagellates and similar organisms, as well as fine sand, from the water. The ciliation of the pinnules causes water to flow between the filaments into the branchial funnel. Particles in suspension are caught by cilia and carried down the filaments to the basal folds, where they are sorted into three grades, the

criterion being size not weight. The largest particles are rejected, the medium are stored in the ventral sacs (to be used later for tube building), while the smallest are carried to the mouth. The distribution of mucus cells on the branchial crown shows clearly that they are associated with the rejecting, and not with the collecting tracts of the ciliary apparatus.

The enzymes present in the gut are an amylase, protease and lipase. The optimum hydrogen ion concentrations at which these enzymes work are 6.8, 7.8, and 7.4 respectively, all of which fall within the limits of the hydrogen ion concentration of the gut, 6.0-8.4.

E. A. T. N.

### Giant English Oysters.

By J. H. Orton.

*Nature*, Vol. CXXVI, August 30, 1930.

Details are given of size, weight and sex of two giant oysters, *O. edulis*, taken by E. A. T. Nicol and W. Searle near the Salstone, Salcombe Estuary, September 20th, 1929. It is of some economic importance that both the oysters were females, one mature which extruded a few ripe ova, and one maturing. Evidence is thus obtained that old oysters breed as females. From the volume of the gonad in the larger specimen (the shell of which was 17.6 cm. long by 19.8 cm. broad and 5.9 cm. wide) it is estimated that this individual had the capacity to produce 10 to 20 cm. of eggs—the equivalent of three to six million larvae—in one batch; hence the value of such oysters for repopulating old or new beds may be inferred.

J. H. O.

### On the Oyster Drills in the Essex Estuaries.

By J. H. Orton.

*Essex Naturalist*, Vol. XXII, 1930.

Three oyster drills are recorded from the oyster beds of the Essex Estuaries, namely, *Ocenebra erinacea* (L.), *Nucella* (= *Purpura*) *lapillus* (L.) and *Urosalpinx cinerea* (Say). Figures of the shells and egg-capsules of each species are shown and their habits discussed. Experiments are cited showing that *Urosalpinx* and *Ocenebra* eat small (brood) oysters in about three days, and larger (half-ware) oysters in five or six days. It is shown that the habits of *Ocenebra* and *Nucella* vary in different habitats. *Nucella* attacks oysters, but probably much less frequently than the two other tangles. The introduction of the American oyster tangle, *Urosalpinx*, into English waters is discussed; the earliest record of its occurrence is 1920, though the date of introduction is undoubtedly much earlier.

Incidentally a record is given of an observation on the introduction of living *Crepidula* and *Anomia* into English waters on American oysters in 1908. The importance of the suppression of the tingle pests for successful oyster-culture is emphasised, as well as the economic value of knowledge of the habits of these animals.

J. H. O.

### Oysters and Oyster Culture.

By J. H. Orton.

*Encyclopædia Britannica*, 14th Edition, 1929.

The article consists of a much condensed account of oysters and oyster culture. The chief economic species are noted. The incubatory and external modes of development are described briefly, with paragraphs on food and mode of feeding, oyster beds, fattening, shell growth, enemies and parasites, diseases, the oyster industry, oyster culture and breeding. In the latter paragraph are brought together the records published to that date of the spawning seasons of *O. edulis* and *O. virginica*. The arrangement of the records in localities of increasing latitude, as follows, shows earlier spawning in the warmer situations.

<i>Species.</i>	<i>Locality.</i>	<i>Range of spawning period.</i>	<i>Reference.</i>
<i>O. edulis</i>	Taranto Gulf (Italy)	March – April to October	Proprietors (Dean)
	Arcachon (France)	May to September	De Bon
	Thames Estuary (England)	End of May to September	Anson and Willett
	Fal Estuary (England)	End of June to Sep- tember–October	Orton
	Norway (fatten- ing ponds)	August to Septem- ber	Helland-Hansen
	Norway (off- shore)	Little or rare	Do.
<i>O. virginica</i>	Chesapeake Bay* (Md.)	May – June to August	Winslow-Brooks
	Barnegat Bay (N.J.)	End of June to ?	J. Nelson
	Malpeque (Canada)	June–July to ?	Stafford

J. H. O.

\* Recently Hopkins (*Bull. Bur. of Fisheries*, U.S. Dept. of Commerce, Bull. No. 3, 1931, Washington) records spawning in Galveston Bay (Gulf of Mexico) from end of March to at least August in 1929.—J. H. O.



**The Adaptation of *Gunda ulvae* to Salinity. I. The Environment.****By C. F. A. Pantin.***Journ. Exp. Biol., Vol. VIII, 1931, pp. 63-72.*

The environment of the triclad *Gunda ulvae* has been studied. This organism lives on the seashore in the estuaries of very small streams. The components of the external medium are (a) stream water, which is rich in Ca and CO<sub>3</sub>, and (b) Atlantic sea-water. These are mixed in different proportions in different parts of the estuary. An analysis of the stream-water is given. The habitat of the organism is described. This extends roughly from high-water neap tides to low-water neap tides. A faunistic survey is given. The conditions which control the limits of the habitat of *Gunda* are discussed. Between the upper limit of occurrence of *Gunda* and the place of occurrence of fresh-water forms there is a region devoid of fauna. This region corresponds roughly with the span between high-water neap tides and high-water spring tides. Salinity determinations have been made on samples taken from the actual places where *Gunda* occurred. It is shown that *Gunda* has to withstand changes from completely fresh to undiluted sea-water. It may normally be exposed to either extreme for several hours. Salinity determinations made continually throughout the range of *Gunda* show that its environment may vary from one in which it is subjected to the action of sea-water for only about one hour at high tide to one in which the sea-water is only diluted to about 10 per cent of its normal strength for a few hours during low tide.

C. F. A. P.

**The Adaptation of *Gunda ulvae* to Salinity. II. The Water Exchange.****By E. Weil and C. F. A. Pantin.***Journ. Exp. Biol., Vol. VIII, 1931, pp. 73-81.*

The effect of fresh waters and dilute solutions on the behaviour and water exchange of the estuarine flatworm, *Gunda ulvae*, has been studied. In Plymouth tap-water, which contains little dissolved substances, the majority of the worms die within 48 hours. While immersed in this water the worms swell rapidly during the first hour to about double their volume in sea-water, the volume falling slightly after this. The effect is reversible. In dilute sea-water the worms swell to a greater extent the greater the dilution. At great dilutions the swelling is much less than would be expected if the worm behaved as though it were covered with a perfectly semi-permeable membrane. In water from the stream which normally flows over the *Gunda* at low tide, the swelling of

the worms is much less than in Plymouth tap-water or in distilled water. This stream-water is rich in  $\text{CaCO}_3$ . The effects of distilled water and of solutions of  $\text{NaCl}$ ,  $\text{NaHCO}_3$ , glycerol,  $\text{CaCl}_2$  and of Cambridge tap-water are compared with the effects of Plymouth tap-water and the stream-water. It is found that the beneficial effects of the stream-water can be imitated only by the solutions containing calcium. The mode of action of calcium is discussed. It is suggested that it acts primarily by lowering the permeability of the worms to water.

C. F. A. P.

### **The Adaptation of *Gunda ulvae* to Salinity. III. The Electrolyte Exchange.**

**By C. F. A. Pantin.**

*Journ. Exp. Biol., Vol. VIII, 1931, pp. 82-94.*

The rate of loss of salts by the estuarine worm, *Gunda ulvae*, on transference from sea-water to various dilute solutions has been studied by measurement of the electric conductivity of the surrounding solution. Salts are lost by the worms from the moment of immersion in dilute solutions. Conditions affecting the rate of loss of salts are discussed. The relation between the amount of salts lost and the total electrolyte content of the worm was determined. It is shown that the worms only lose 25 per cent of their salts during the time that they imbibe a volume of water from the dilute solution equal to their initial volume. The limiting internal salt concentration of worms surviving in waters containing calcium is about 6-10 per cent of the normal concentration in sea-water. No such limiting value can be found for distilled water, since salts are lost continuously till cytolysis occurs. The significance of the limiting concentration is discussed. The effect of osmotic pressure, pH, dilute solutions of  $\text{NaCl}$ ,  $\text{NaHCO}_3$ , glycerol,  $\text{CaCl}_2$  and  $\text{CaCO}_3$  are studied. The presence of calcium reduces the rate of loss of salts. Other factors do not seem to influence this rate. The relation of calcium to the maintenance of normal permeability to water and salts in the worm, and the significance of this to the problem of migration into fresh water are discussed.

C. F. A. P.

### **Do Oceanic Plankton Animals lose themselves ?**

**By F. S. Russell.**

*Nature, January 4th, 1930.*

The suggestion is made that there are threshold light intensities below which some plankton animals cease to be stimulated to move upwards. In the open ocean certain plankton animals which live in light of moderate

intensities near the surface may move downwards out of their normal light zone, perhaps at night, and reach layers at which the intensity is below the threshold. There will be no longer any light stimulus to bring them up, and there they may roam until random movement brings them once more into their threshold intensity zone.

F. S. R.

### **Vitamin Content of Marine Plankton.**

**By F. S. Russell.**

*Nature, September 27th, 1930.*

Mention is made of the possible connection between the habit of plankton animals in the Plymouth area of living nearer the surface in July and August than in the previous months, and Belloc, Fabre and Simonnet's record that sterols collected from plankton animals in July were found to be biologically active, whereas those collected in April only acquired biological activity after irradiation.

F. S. R.

### **The Swimming of Cuttlefish.**

**By F. S. Russell and G. A. Steven.**

*Nature, June 14th, 1930.*

Attention is called to the use made by the cuttlefish of its siphon for slow swimming in all directions, a fact not mentioned in zoological textbooks, in which the siphon is only recorded as being used for backward swimming.

F. S. R. AND G. A. S.

### **Digestive Processes in Marine Invertebrates and Fishes.**

**By C. M. Yonge.**

*Jour. du Conseil, VI, 1931, pp. 175-212.*

This paper contains a summary of recent work on the subject, particular emphasis being laid on the specialization of digestive enzymes characteristic of many groups of Invertebrates, and the gradual development of extracellular digestion in the animal kingdom from the primitive intracellular digestion.

C. M. Y.

**The Significance of the Relationship between Corals and Zooxanthellae.****By C. M. Yonge.***Nature, CXXVIII, 1931, pp. 309-311.*

This is a short summary of the author's papers on this subject published in the Scientific Reports of the Great Barrier Reef Expedition 1928-29 (British Museum (Nat. Hist.)). The conclusion is reached that the association between corals and zooxanthellae is essential to the plants, certainly not to *individual* coral colonies, but probably an indispensable factor in the necessarily exceptional powers of growth and repair possessed by the marine communities known as coral reefs.

C. M. Y.

**The Crystalline Style of the Mollusca and a Carnivorous Habit cannot normally co-exist.****By C. M. Yonge.***Nature, Vol. CXXV, 1930, pp. 444-445.*

Evidence is produced demonstrating that the presence of a crystalline style in any mollusc (Lamellibranch or Gastropod) is a certain indication that the animal in question possesses *no extracellular proteoclastic enzymes* and so cannot digest any but the very minute particles of protein matter which can be digested intracellularly. Such an animal is, therefore, except where a powerful crushing gizzard is present as in the Septibranchs, a specialized herbivore, feeding on phytoplankton or finely divided algal material.

C. M. Y.