

ABSTRACTS OF MEMOIRS

RECORDING WORK DONE AT THE PLYMOUTH LABORATORY

ATKINS, D., 1961. A note on the growth stages and structure of the adult lophophore of the brachiopod *Terebratella (Waltonia) inconspicua* (G. B. Sowerby). *Proc. zool. Soc. Lond.*, Vol. 136, pp. 255-71.

Certain of the growth stages of the lophophore of *Terebratella (Waltonia) inconspicua* (Sowerby), from a shell length of 0.55 mm, are described and figured, so as to elucidate the position of the mouth and the mode of development of the lip of the food groove. The mouth is a small aperture in front of the bases of the first formed pair of filaments. The lip of the food groove is formed by lateral growth from a small preoral lobe. The early lophophore (trocholophous and early schizolophous) is of the broad-based terebratellacean type set low on the dorsal mantle, and the filaments when extended in feeding are directed anteriorly and ventrally. The structure of the adult lophophore is described. The ciliary feeding mechanism is essentially similar to that described by the author in *Macandrevia cranium* (Müller) and other brachiopods with plectolophous lophophores.

D.A.

BATHAM, E. J., PANTIN, C. F. A. & ROBSON, E. A., 1961. The nerve-net of *Metridium senile*: artifacts and the nerve-net. *Quart. J. micr. Sci.*, Vol. 102, pp. 143-56.

Conflicting statements about the actinian nervous system in earlier literature made it necessary to repeat some of the methods of previous workers, and to compare them with present authors' results after using more specific techniques. Criteria for distinguishing nerve cells from non-nervous elements in actinians are discussed. Various structures which may be confused with nerve cells are described, and the results of several earlier authors are re-interpreted. It is concluded that the nervous system in the mesenteries and column of *Metridium* follows the epithelial layers and does not penetrate the mesogloea.

C.F.A.P.

BONE, Q., 1961. The organization of the atrial nervous system of amphioxus (*Branchiostoma lanceolatum* (Pallas)). *Phil. Trans.*, Ser. B, Vol. 243, pp. 241-69.

A detailed histological description is given of the rich, mainly sensory, peripheral atrial nervous system of amphioxus. The system contains large numbers of peripheral sensory neurons, whose function is almost entirely unknown and, in addition, contains motor fibres to the striated pterygial and trapezius muscles, and ciliary-regulator fibres to the gill apparatus. Particular attention is paid to the organization of the system upon the pterygial muscle, upon the gill apparatus and atrio-coelomic funnels, and upon the foregut and its diverticulum; in addition, the innervation of the buccal and hindgut regions (outside the atrium and atrial nervous system, but linked closely to the atrial system) are described. It is concluded that the atrial nervous system of amphioxus differs in its function, in its components, and in its anatomical relations, from the autonomic nervous systems of the craniates.

Q.B.

BOYCOTT, B. B., 1961. The functional organization of the brain of the cuttlefish *Sepia officinalis*. *Proc. roy. Soc. B*, Vol. 153, pp. 503-34.

Using electrical stimulation as the main experimental method several new divisions of the cuttlefish brain have been made and their responses described. The pedal ganglion consists of four parts: (1) anterior chromatophore lobes innervating the chromatophores of the arms and front of the head; (2) an anterior pedal lobe innervating the arms and tentacles; (3) a posterior pedal lobe innervating the funnel, collar and posterior head retractors; (4) lateral pedal lobes innervating the eye muscles. The palliovisceral ganglion consists of: (a) a magnocellular lobe; (b) a central palliovisceral lobe innervating the mantle, funnel and viscera; (c) posterior chromatophore lobes innervating chromatophores on the mantle, fin and back of the head; (d) vasomotor lobes.

Among the supraoesophageal lobes higher motor centres and silent areas are recognized. Of the higher motor centres the anterior basal lobe is concerned with the positioning of the head, arms and eyes and manœuvring of the animal by means of the fins and funnel. The posterior basal lobe consists of six main divisions of which the lateral and medial basal lobes control chromatophore and skin movements; the medial basal lobes also control swimming, breathing, fin movements and various visceral functions. The interbasal lobe controls tentacle movements.

The optic nerves and cortex of the optic lobes are electrically inexcitable. The medulla of the optic lobes evokes all the responses of which the higher motor centres are capable.

The results are discussed in terms of a physiological classification of the brain and the extent to which centres controlling behaviour can be recognized within a brain.

B.B.B.

CARLISLE, D. B., 1961. Locomotory powers of adult ascidians. *Proc. zool. Soc. Lond.*, Vol. 136, pp. 141-6.

Adults of several species of both solitary and colonial ascidians are capable of slow crawling, involving the progressive formation of new attachments and tearing or dissolving the old ones. The ampullae play a leading part. A moving colony may divide into two, or two adjacent colonies may fuse; true fusion has been observed only once, in *Trididemnum tenerum*. Both *Ciona intestinalis* and *Diplosoma listerianum* may metamorphose by attachment to the surface film for a prolonged period and are capable of post-metamorphic attachment to a solid surface. In such attachment the ampullae play a leading role. A free-swimming, unattached colony of *Diplosoma* takes on the form of a *Pyrosoma* colony, and such colonies have been reared in the laboratory, forming cigar-shaped, jet-propelled bodies up to 1 cm long, with as many as fifty zooids.

D.B.C.

CARLISLE, D. B., 1961. Intertidal territory in fish. *Anim. Behaviour*, Vol. 9, pp. 106-7.

Bass (*Morone labrax*) and grey mullet (*Mugil labrosus*) were observed on an intertidal reef on the coast of south Devon. The same individual fish were seen to arrive each day as soon as the water was deep enough and to stay until just after high tide. Each fish occupied a definite territory on the reef and defended it against others of its own species. The method of defence is described, together with notes on the feeding habits.

D.B.C.

CARLISLE, D. B. & PITMAN, W. J., 1961. Diapause, neurosecretion and hormones in Copepoda. *Nature, Lond.*, Vol. 190, pp. 827-8.

Neurosecretory cells in the cerebral region of *Calanus* were found to be inactive in overwintering fifth copepodid larvae. It is concluded that the activity of these cells is needed for continued moulting and development, so that this 'diapause' is a result of the cessation of their secretory activity and is terminated by a recrudescence of this activity. A chromactivating substance active upon *Leander* has been extracted from the same region.

D.B.C.

HINKE, J. A. M., 1961. The measurement of sodium and potassium activities in the squid axon by means of cation-selective glass micro-electrodes. *J. Physiol.*, Vol. 156, pp. 314-35.

Intracellular measurements were made on isolated axons of *Loligo forbesi* in sea water. At 18° C, $(a_{Na})_i = 0.037$, $(a_K)_i = 0.203$. The sum of $(a_{Na})_i$ and $(a_K)_i$ was always constant. The calculated equilibrium potential for Na equalled or exceeded the reversal potential observed from the axon spike. The calculated equilibrium potential for K was about 20 mV higher than the observed resting potential. The activity coefficient of axoplasm was calculated as 0.605. When K⁺ was assumed to be 100% free, Na⁺ was 76% free in the axoplasm. Following electrical stimulation, the net inward and outward fluxes were 3.9 and 5.8 pmoles/cm²/impulse for Na⁺ and K⁺ respectively

J.A.M.H.

NICHOLS, D., 1961. A comparative histological study of the tube-feet of two regular echinoids. *Quart. J. micr. Sci.*, Vol. 102, pp. 157-80.

The principal tube-feet of regular sea-urchins have terminal suckers supported by a skeleton; sensory cells, mucous glands and muscles are so arranged that there is both an efficient discharge of slime and an effective suction under the disk during adhesion. The common British urchin *Echinus*, which uses its tube-feet for locomotion, is shown to have advanced in respect of these features over the more primitive *Cidaris*, which uses its tube-feet mainly for support. The peristomial tube-feet of both urchins are not suckered; the disk levator muscles are absent and the disk itself, supported by a less complex calcareous skeleton, contains mainly sensory cells and mucous glands. The tube-foot pattern of the more advanced irregular urchins, the clypeasteroids and spatangoids, is shown to be derivable from the basic cidaroid type.

Differences in the ornamentation of the regions of the test which bear the tube-feet are shown to be related to the differences in activity.

A respiratory function for Stewart's organs in the Cidaroida is suggested.

D.N.

ROBINSON, A. H. W., 1961. The hydrography of Start Bay and its relationship to beach changes at Hallsands. *Geogr. J.*, Vol. 127, pp. 63-77.

The role of the offshore zone in relation to the changes taking place on a shingle beach is discussed with reference to Start Bay in Devon. The hydrography of the Bay is examined from the standpoint of bottom form, sediments, marine processes and the changes which have occurred in the Skerries Bank during the past century. A record of beach changes at Hallsands on the shores of the Bay indicates a paucity of material

available for beach building. The beach is best regarded as an inheritance from the past, with little or no material arriving on the shore from the adjacent sea bed. The reason for this negative role of the offshore zone is discussed, the available evidence pointing to a movement of sediment parallel to the shore under the action of tidal streams rather than towards the shore in the direction of the dominant wave.

A.H.W.R.

Ross, D. M., 1960. The effects of ions and drugs on neuro-muscular preparations of sea anemones. I. On preparations of the column of *Calliactis* and *Metridium*. *J. exp. Biol.*, Vol. 37, 732-52.

Drugs and ions affect isolated rings of the columns of *Calliactis* and *Metridium* as follows: (1) direct contractions and higher background tonus occur with excess K^+ , Mg^{2+} -free sea water, adrenaline (1×10^{-5}) and tryptamine (1×10^{-4}); (2) marked acceleration of slow periodic activity accompanies Mg^{2+} -free sea water and adrenaline (1×10^{-5}); (3) enhancement of slow responses to stimulation occurs with excess $-Ca^{2+}$ and tryptamine (1×10^{-5}), (4) depression of activity and abolition of responses is seen only with excess $-Mg^{2+}$ and Ca^{2+} -free sea water. K^+ -free and Na^+ -free sea water have slight effects only.

No drugs with depressant effects were discovered. Most other drugs are ineffective (e.g. acetylcholine and its associates, noradrenaline, tyramine; and adrenergic blocking-agents; histamine; and 5-hydroxytryptamine). The observed effects with K^+ , adrenaline, and tryptamine are due to a direct action on or near the muscle. Comparisons with other animals and preparations show: (1) the actinian neuromuscular system resembles a number of marine animals in its responses to ions; (2) except for the sensitivity to adrenaline, no parallels exist with drug effects on any other system, so that no suggestions about the mechanism of neuromuscular transmission can be made on the basis of these results.

D.M.R.

Ross, D. M., 1960. The effects of ions and drugs on neuro-muscular preparations of sea anemones. II. On sphincter preparations of *Calliactis* and *Metridium*. *J. exp. Biol.*, Vol. 37, 753-74.

Isolated marginal sphincters of *Calliactis* and *Metridium* show little inherent activity, but with appropriate frequencies and numbers of stimuli, they give quick facilitated contractions and/or slow contractions with long latent periods. Excess K^+ causes spontaneous quick contractions, and responses to single stimuli; excess Ca^{2+} has no direct excitatory effects but causes an immense enhancement of the quick response without affecting the slow response to stimulation; excess Mg^{2+} abolishes both quick and slow contractions. Most drugs, including acetylcholine and its associates, histamine and 5-hydroxytryptamine, have no effects on either quick or slow contractions. No drug with inhibitory properties was discovered.

Important effects occur only with the following: (1) tyramine (1×10^{-4}) has no direct excitatory effects, but it greatly enhances the quick responses without enhancing (and in some cases depressing) the slow responses to stimuli; (2) tryptamine (1×10^{-4}) causes direct quick contractions of the sphincter, gives quick responses to single stimuli and somewhat enhances both quick and slow responses to stimuli; (3) adrenaline (1×10^{-5}) has no effect on quick facilitated responses, but causes direct slow responses and some enhancement of slow responses to stimuli.

The effects of ions and drugs are obtained only when they are applied directly on or near the sphincter region. It is noted that on the column and sphincter preparations K^+ and tryptamine act alike, as do Ca^{2+} and tyramine, whereas adrenaline has a general slow excitor action that has no counterpart amongst the ion effects. The results suggest that the quick and slow contractions of the sphincters share common excitability factors but differ in the mechanism of contraction. The process of facilitation in the quick response is apparently not functionally related to the mode of excitation of the slow response.

D.M.R.

SOUTHWARD, E. C., 1961. Pogonophora from South Africa. *Ann. S. Afr. Mus.*, Vol. 46, pp. 47-52.

The first member of the Pogonophora to be described from the south Atlantic is *Heptabrachia talboti* n.sp., collected off the west coast of South Africa in depths between 1097 and 2890 m. Empty tubes of two other, unidentified, pogonophores are also described.

E.C.S.