

## ABSTRACTS OF MEMOIRS

### RECORDING WORK DONE AT THE PLYMOUTH LABORATORY

BATHAM, E. J., PANTIN, C. F. A. & ROBSON, E. A., 1960. The nerve-net of the sea-anemone *Metridium senile*: the mesenteries and the column. *Quart. J. micr. Sci.*, Vol. 101, pp. 487-510.

The nerve-net has been re-examined after staining with silver and with methylene blue. Methods are described. The neurites run between the epithelium and underlying muscle. Synaptic junctions between nerve-cells and between these, the muscle field and sensory neurites are illustrated. The retractor surface of the mesentery with its powerful muscle is richly innervated. The weak radial muscles are poorly innervated. The distribution of nerve-cells and sense-cells in the mesenteries and column is related to physiological evidence concerning the through-conduction pathways, facilitated and slow contractions, and other aspects of the behaviour of *Metridium*.

C.F.A.P.

BONE, Q., 1960. A note on the innervation of the integument in amphioxus, and its bearing on the mechanism of cutaneous sensibility. *Quart. J. micr. Sci.*, Vol. 101, pp. 371-9.

The dispute upon the nature of the innervation of the skin in amphioxus is reviewed, and it is shown that in addition to a system of free nerve terminals, there are in certain regions of the body, specialized sensory cells, and complex encapsulated nerve endings.

The cells of origin of the free nerve terminals in the skin are discussed, and it is shown that they fall into several morphologically different categories. In the light of this observation, it is suggested that the innervation of the skin of *Amphioxus* does not provide unequivocal evidence for the view that the different cutaneous sensations are determined by different discharge patterns in the *same* fibres of the nerve rami leading from the skin.

Q.B.

BONE, Q., 1960. The central nervous system in amphioxus. *J. comp. Neurol.*, Vol. 115, pp. 27-64.

The organization of the spinal cord of amphioxus is described in detail, and a functional analysis of the system is attempted.

Somatic- and visceromotor elements are identified, and it is shown that the somatic-motor cells occur in segmental patterns. In both somatic- and visceromotor systems, single large neurons are found in each segment and it is suggested that these represent the first-formed elements of each system. Cells which are regarded as homologous to the Rohon-Beard cells of craniate embryos are found segmentally in the somatic-sensory system. The arrangement of the whole is compared with the arrangement of the cord in the early ammocoete larva, and it is concluded that the spinal cord of adult *Amphioxus* is comparable to that of the craniate larva, but that, in some ways, it is more primitive than that of any craniate at any stage, particularly in the possession of groups of segmentally arranged somatic-motor cells.

Q.B.

CALDWELL, P. C. & KEYNES, R. D., 1960. The permeability of the squid giant axon to radioactive potassium and chloride ions. *J. Physiol.*, Vol. 154, pp. 177-89.

An appreciable amount of the radioactive potassium taken up by cleaned squid axons during short exposures to  $^{42}\text{K}$  sea water appears to be located in a superficial region, possibly the Schwann cell. On transfer to inactive sea water this part of the radioactive potassium exchanges fairly rapidly with inactive potassium, the time constant being of the order of 1 h. Values for the time constant for the remainder of the radioactive potassium, obtained after prolonged soaking, tended towards a value of about 50 h. Time constants of about 50 h were also found for  $^{42}\text{K}$  microinjected into the axoplasm and time constants of this order are therefore probably characteristic of potassium which has either penetrated into or been introduced into the axoplasm. The rate of loss of microinjected  $^{42}\text{K}$  was greatly increased by stimulation at 50 impulses/sec. The average influx of chloride obtained in studies with  $^{36}\text{Cl}$  was  $12.6 \text{ pmoles/cm}^2\text{.sec}$  and there was an extra entry on stimulation of  $0.046 \text{ pmole/cm}^2\text{.impulse}$ .  $^{36}\text{Cl}$  microinjected into the axoplasm was lost with a time constant of about 80 h.

P.C.C.

CARLISLE, D. B., 1958. Neurosecretory transport in the pituitary stalk of *Lophius piscatorius*. *Zweites internat. Symp. Neurosekretion, Lund, 1957*, pp. 18-19. Berlin: Springer-Verlag.

A preparation is described in which the long pituitary stalk of this species may be examined and photographed in the living state under the microscope. By this means transport of neurosecretory bodies down the axons from the hypothalamus to the pituitary has been observed and filmed. Action potentials have been recorded also from the stalk, implying that the axons are capable both of neurosecretory transport and of the transmission of nervous impulses.

D.B.C.

CARLISLE, D. B., 1960. Moulting cycles in Crustacea. *Symp. zool. Soc. Lond.*, No. 2, pp. 109-20.

The act of moulting in arthropods must not be considered as an isolated event but as the most spectacular moment in a continuous cycle of metabolic activity. Each moulting cycle is basically like the one before it and many of the stages have now been shown to be under hormonal control. Secretion of the 'moult-inhibiting hormone' by the endocrine complex of the eyestalk promotes the formation of new tissues and prevents the Y organ from secreting more than marginal amounts of its hormone. Once this eyestalk hormone ceases to be secreted into the blood stream the Y organ releases a single 'dose' of a moult-promoting hormone which initiates the preparations for the moult, which, once under way, are co-ordinated by a moult-accelerating hormone from the X organ. The amount of water taken in at the moult itself is regulated by a further eyestalk hormone. Many other hormones act upon particular moults and modify them in some way, acting mainly upon the stage of proecdysis and making the succeeding moult in some way unique: the moult of puberty and the moult at which a female becomes furnished with the brooding characters are examples. In the same way that the originally similar segments of the vertebrate body have been progressively and uniquely modified, in for example the head, so the originally similar moults of arthropods have been modified, till we have the startling difference between the larval and imaginal moults of Lepidoptera.

D.B.C.

CLARK, R. B. & HADERLIE, E. C., 1960. The distribution of *Nephtys cirrosa* and *N. hombergi* on the south-western coasts of England and Wales. *J. Anim. Ecol.*, Vol. 29, pp. 117-47.

Around the south and south-western coasts of England and Wales, *Nephtys cirrosa* occurs in most clean sandy beaches of the open coast, except where wave action is severe and the sand very coarse, while *N. hombergi* lives in muddy sand and is generally found in the lower reaches of estuaries. The occurrence of one or the other species on a beach is correlated with the grade composition of the substratum. *N. hombergi* tolerates up to 3.8% particles larger than 0.25 mm and between 2.2 and 15.9% particles smaller than 0.125 mm. *N. cirrosa* lives in substrata containing up to 50% particles larger than 0.25 mm (or a higher proportion providing the larger grades are not composed of shell fragments), and up to 1.5% particles smaller than 0.125 mm (or more than 1.5% if there is a proportion of coarse particles in the substratum). A few poorly sorted beaches fall within the range of both species and have mixed populations. The distribution of each species, on the beaches where they occur, is largely independent of tidal level and is determined chiefly by the composition of the substratum at different levels.

R.B.C.

COOPER, L. H. N., 1958. A system for international exchange of samples for trace element analysis of ocean water. *J. mar. Res.*, Vol. 17, pp. 128-32.

For some elements in sea water concentrations reported by different analysts vary by several orders of magnitude. This variability is due at least in part to faulty sampling and storage of samples. Some sources of error are listed.

It is recommended that a few standard oceanic stations should be selected widely spaced around the world and near to laboratories devoted to chemical oceanography. Sampling at these stations should be directed on board by chemists skilled in trace analysis. Work at one such standard station in the Bay of Biscay is described. Proposals are made for a system for international exchange of samples collected in this way.

The matter was discussed informally by the Committee on Chemical Oceanography during the meeting of the International Association of Physical Oceanography in July-August 1960 at Helsinki. Some duplicated copies were made available but in spite of the nominal issue date, 28 November 1958, the printed account had been seen by no one present. No recommendations could therefore be made.

Initiative therefore now rests with analysts who would like to see the recommendations implemented.

L.H.N.C.

CURRY, DENNIS, 1960. Eocene limestones to the west of Jersey. *Geol. Mag.*, Vol. 97, pp. 289-98.

This note records the presence of Eocene marine limestones *in situ* on the bed of the English Channel along an east-west line to the west of the island of Jersey. The microfauna of samples of these limestones is analysed and is held to indicate that they are of Lutetian or Auversian age. It is noted that limestones of similar age and lithology occur near Valognes in the Cotentin. There are comments on the relevance of the above discoveries to the structural history of the area.

D.C.

HUGHES, G. M., 1960. The mechanism of gill ventilation in the dogfish and skate. *J. exp. Biol.*, Vol. 37, pp. 11–27.

The respiratory movements of *Scyliorhinus canicula* and *Raia clavata* were studied using cinematography and electrical recording methods. In both species movements of the mouth precede those of the spiracular valve and of the branchial region. In *Scyliorhinus*, expansion and contraction of the gill pouches spreads from the first to the last pouch but in *Raia* these movements are almost synchronous. Water entering one side of the mouth leaves by the three posterior gill slits of the same side. Water entering the spiracle leaves through the anterior slits of the same side. This separation of flow is less marked in *Raia* where a relatively greater volume enters through the spiracle.

Pressure curves recorded by fine hypodermic needles placed inside the mouth, spiracle and gill slits all show phases which are positive and negative with respect to the external medium. The precise form of these curves indicates that the passage of water across the gill filaments is because (i) contraction of the oral-branchial cavity forces it through and (ii) it is also sucked through by the expansion of the cavities (parabranchial) external to the gills.

The flaps over the gill slits prevent the entry of water to the latter. These valves are passive in the dogfish but it seems probable that they are actively controlled in *Raia*. Observations have also been made which suggest that dogfish and sharks do not make respiratory movements during fast swimming although they immediately commence active ventilation on coming to rest.

G.M.H.

HUGHES, G. M., 1960. A comparative study of gill ventilation in marine teleosts. *J. exp. Biol.*, Vol. 37, pp. 28–45.

Movements of the lower jaw and operculum were recorded simultaneously with the associated pressure changes in the buccal and opercular cavities during breathing of the following species—*Trachurus trachurus* (L.), *Clupea harengus* L., *Gadus merlangus* L., *Onos mustela* (L.), *Crenilabrus melops* (L.), *Cottus bubalis* Euphrasen, *Blennius ocellaris* L., *Trigla gurnardus* L., *Callionymus lyra* L., *Pleuronectes platessa* L., *Microstomus kitt* (Walbaum), *Conger conger* (L.), *Syngnathus acus* L.

In all species ventilation is achieved by the action of a buccal pressure pump and opercular suction pumps, but there are differences in the relative importance of these two pumps which are related to the habitat of the fish. The suction pump is of greater importance in those fishes which spend most of their lives on the sea bottom. In several species the differential pressure curve does not include a brief period of reversal in pressure gradient which has been found in most fishes so far investigated. Notable among these species are the two flat fishes investigated, and in these there is some evidence for active control of the opercular valves.

G.M.H.

KENNEDY, G. Y. & NICOL, J. A. C., 1959. Pigments of *Chaetopterus variopedatus* (Polychaeta). *Proc. roy. Soc.*, Ser. B, Vol. 150, pp. 509–38.

The intestine in the middle and posterior regions of *Chaetopterus variopedatus* is green. The coloration is produced by phaeophorbides *a* and *b*, the former predominating. Other pigments present in the gut are the chlorophyll-derivatives isophaeophorbide *d*, dioxymesophyllochlorin, copper phaeophorbide chelation compounds, coproporphyrin III, bile-pigment type compounds, turbo-glucobilin and helioporobilin, and carotenoids,  $\beta$ -carotene and xanthophyll. The body wall contains

$\beta$ -carotene. Melanin occurs in the black chaetae, and a reddish melanoid pigment in the head. Phaeophorbides *a* and *b* are derived from chlorophylls *a* and *b* in the animal's food. Phaeophorbides are contained within green spherules in cells of the gut wall. These spherules are not symbionts. They are a constant feature of the animal, even during prolonged starvation, and appear to play some essential biochemical role.

J.A.C.N.

LEBOUR, M. V., 1959. The larval decapod Crustacea of Tropical West Africa. *Atlantide Rep.*, Vol. 5, pp. 119-43.

This is a brief survey of the decapod larvae obtained by the Danish Atlantide Expedition. Although a large number of the species cannot be determined, the more important are placed, as nearly as possible, in their genera. There are many interesting deep water forms—sergestids, penaeids and carids. Among the Caridea are many *Eretmocarid* larvae, one of which is almost certainly *Lysmata moorei*, common in the district but whose larva was not known. The larva of *Latreutes parvula* is also described for the first time.

The Hippidae are well represented and there is a new form of *Albunea* larva, unlike any so far known. *Hippia cubensis* larva is common and not previously recognized. A number of *Dorippe* larvae occur amongst which is *Dorippe armata*, identified from a number of megalopae emerging from the larvae.

The report is illustrated by twenty-one line drawings and a list of larvae and the various stations is given.

M.V.L.

MURRAY, R. W. & POTTS, W. T. W., 1961. The composition of the endolymph, perilymph and other body fluids of elasmobranchs. *Comp. Biochem. Physiol.*, Vol. 2, pp. 65-75.

Serum, cranial fluid, perilymph, endolymph and jelly from the ampullae of Lorenzini of *Raja* have been analysed for Na, K, Cl and urea. The concentrations in mM/kg water are: perilymph Na 281, K 3.54, Cl 321, urea 447; endolymph Na 295, K 63.4, Cl 391, urea 381; Lorenzini jelly Na 443, K 12.5, Cl 581, urea 74.8. Serum and cranial fluid are similar to perilymph. The endolymph has 19 times as much potassium as the perilymph. The composition of the Lorenzini jelly is unlike that of any other fluid. Freezing-point depressions show that the Lorenzini jelly is 5% hypertonic to sea water, and the other fluids are all approximately 2% hypertonic.

R.W.M.

RUSSELL, F. E. & EMERY, J. A., 1960. Venom of the weevers *Trachinus draco* and *Trachinus vipera*. *Ann. N.Y. Acad. Sci.*, Vol. 90, pp. 805-19.

The venom apparatus of these fishes consist of two opercular spines, five to eight dorsal spines, and the tissues contained within the integumentary sheaths surrounding the spines. Some of the physical and chemical properties of the venom are discussed. The venom has no remarkable effect on the neuromuscular junction, but does exert a deleterious effect on the cardiovascular system. It produces a precipitous fall in systemic arterial pressure concomitant with changes in the pulse pressure, cardiac rate, pulmonary arterial pressure, pulmonary artery flow, venous and cisternal pressures, respiration, and provokes changes in the electrocardiogram and electroencephalogram. The principal action of the venom appears to be on the heart muscle.

F.E.R.

SUTTON, M. F., 1960. The sexual development of *Salpa fusiformis* (Cuvier). Part I. *J. Embryol. exp. Morphol.*, Vol. 8, pp. 268–90.

The early sexual development of *Salpa fusiformis* (Cuvier) is described. The fertilized egg begins to develop in the single ovarian follicle, dorsolaterally, close to the atrial epithelium. At the eight-cell stage the follicle cells (calymmocytes) proliferate rapidly and insinuate themselves between the blastomeres. Each blastomere at this point buds endogenously and the resultant seven daughter cells rapidly degenerate; a large residual cell persists. The calymmocytes continue to increase in number but their degeneration also is initiated. The follicle perforates the atrial epithelium, and is now known as the blastophore. A normal blastomere division occurs and is followed by a second phase of budding and daughter-cell degeneration. A structure, the placental knob, develops ventrally; one of its functions is to proliferate calymmocytes. The blastomeres begin to move around regularly in irregularly occurring spaces produced by calymmocyte degeneration, and, on gaining contact with each other, normal division is resumed. A medio-dorsal, neuro-chordal cell mass becomes recognizable and subsequently it moves antero-dorsally. Three regularly occurring cavities begin to develop during the neuro-chordal cell movement. They are centrally and laterally placed and will ultimately fuse and form, in part, the oozoid pharynx. The remaining blastomeres aggregate in groups which will give rise to the cloacal epithelium, remaining ectoderm, and endoderm. Mesodermal cells are not yet to be discerned with certainty. During the early stages of development of the three cavities an incubation fold develops from the adjacent atrial epithelium. It grows up around the blastophore. The aggregation of the cloacal, ectodermal, and endodermal blastomeres and the fusion of the central and lateral cavities occur after the closure of the fold.

The significance of certain phenomena, in particular of endogenous budding, is discussed.

M.F.S.

WILLIAMS, H. HARFORD, 1960. A list of parasitic worms, including twenty-two new records, from marine fishes caught off the British Isles. *Ann. Mag. nat. Hist.*, Ser. 13, Vol. 2, pp. 705–15.

In a list of 84 species of helminth parasites 14 cestodes of the order Tetrphyllidea and one of the Tetrarhynchidea were recorded from elasmobranchs caught in the Plymouth area. *Crossobothrium angustum*, *Anthobothrium laciniatum*, *Prosobothrium armigerum* and *Platybothrium auriculatum* were new records for the British Isles.

H.H.W.

WILLIAMS, H. HARFORD, 1960. The intestine in members of the genus *Raja* and host-specificity in the Tetrphyllidea. *Nature, Lond.*, Vol. 188, pp. 514–16.

Differences in the structure of the mucosa of the intestine in some species of the genus *Raja* were described. In *R. montagui* the mucosa is composed of variously arranged and folded ridges which join to form a complicated network giving the surface of the intestine a corrugated and an irregular appearance. In *R. clavata* the mucosa is made up of a fine regular network of ridges the intervening spaces leading into tubular crypts and the surface is relatively smooth. In *R. naevus* well developed villi are present. In their general appearance the intestines of *R. brachyura* and *R. microcellata* resemble those of *R. montagui* and *R. clavata* respectively, but there are

differences in their detailed structure. It was suggested that the above differences may be of taxonomic value, that rays may be more selective in their feeding habits than hitherto believed and that a correlation may occur between their feeding habits and the structure of the intestine. It was stated that since a correlation occurs between the morphology of the intestine in elasmobranchs and the structure of the scolex of their cestodes this should be considered in studies on the host-specificity of the Tetracophyllidea.

H.H.W.