

## ABSTRACTS OF MEMOIRS

### RECORDING WORK DONE AT THE PLYMOUTH LABORATORY

BAKER, P. F., HODGKIN, A. L. & SHAW, T. I., 1962. Replacement of the axoplasm of giant nerve fibres with artificial solutions. *J. Physiol.*, Vol. 164, pp. 330-54.

Giant nerve fibres of *Loligo*, from which the axoplasm had been extruded, conducted impulses if the 'sheath' was refilled either with natural axoplasm or with isotonic solutions containing salts of potassium. The extruded sheath could also conduct impulses if not inflated, but in that case the conduction velocity was low and the externally recorded action potential was small. Fibres filled with isotonic solutions such as potassium sulphate, methylsulphate, isethionate or chloride, gave action potentials of 90-120 mV and resting potentials of 50-80 mV; they remained excitable for several hours and could conduct  $3 \times 10^5$  impulses. Electronmicrographs indicated that the axolemma and Schwann cell layer were still present in perfused axons but that about 95% of the axoplasm had been removed.

T. I. S.

BAKER, P. F., HODGKIN, A. L. & SHAW, T. I., 1962. The effects of changes in internal ionic concentrations on the electrical properties of perfused giant axons. *J. Physiol.*, Vol. 164, pp. 355-74.

Experiments with perfused axons showed that the resting potential was not greatly influenced by the internal anion and that it depended mainly on the potassium concentration gradient across the membrane. The potential was close to zero with similar solutions, e.g. NaCl, on either side of the membrane. As KCl replaced NaCl it increased rapidly, reaching a limiting value of -50 to -60 mV at high potassium concentrations. Reversing the normal concentration gradient reversed the potential; with isotonic KCl outside and isotonic NaCl inside the internal potential was +40 to 60 mV.

Increasing the internal sodium concentration decreased the overshoot and eventually blocked the action potential in a reversible manner.

The effects of diluting isotonic  $K_2SO_4$  with  $Na_2SO_4$  and of replacing K by Li, Rb and Cs are described.

The general conclusion is that concentration differences of K and Na provide the immediate energy for the impulse and that the action potential arises from changes in permeability of the kind deduced from previous experiments with intact axons.

T. I. S.

BONEY, A. D. & CORNER, E. D. S., 1960. A possible function of Phycoerythrin in intertidal red algae. *Nature, Lond.*, Vol. 188, pp. 1042-3.

The red pigment (phycoerythrin) extracted from the shade-loving intertidal red alga *Plumaria elegans* (Bonnem.) Schm. has a typical absorption curve (peaks at 500 and  $500 m\mu$ ). Weak solutions, used as a screen against an 'Ecko Daylight' fluorescent tube, resulted in enhanced growth of *Plumaria* sporelings with light intensities above and below the optimum values. The same result was obtained using weak solution of

eosin yellow (absorption peak at 515 m $\mu$ ). It would appear that both screening solutions protect the sporelings from some inhibitory effect of blue-green light emitted by the fluorescent tube.

A. D. B.

COWEY, C. B. & CORNER, E. D. S., 1962. The amino acid composition of *Calanus finmarchicus* (Gunner.) var. *helgolandicus* Claus in relation to that of its food. *Rapp. Cons. Explor. Mer*, Vol. 153, pp. 124–8.

Adult female *Calanus finmarchicus* var. *helgolandicus* and particulate material collected from Plymouth Sound during the spring and summer of 1960 were analysed for fourteen individual amino acids by column chromatography. The amino acid composition of *Calanus* was markedly constant throughout the period April–September: and although that of the particulate material was more variable, it nevertheless conformed to the same general pattern throughout the period under study and showed a close similarity to that of the animals. An exception, however, was taurine (2-aminoethane sulphuric acid), small amounts of which were always found in *Calanus* whereas none was ever detected in the particulate material. It seems probable that taurine is formed in *Calanus* as an end product of the metabolism of sulphur-containing amino acids, traces of which were regularly found in the particulate material.

The results in general provide biochemical evidence consistent with the view that *Calanus* can obtain the amino acids it requires by feeding exclusively on particulate material in the sea and has no need to make use of any dissolved amino acids which may be present. In addition, the amino acid compositions of *Calanus* and particulate material show a close similarity to that of fish muscle, a finding which suggests that protein of a certain amino acid composition may be typical of food chains in the sea.

E. D. S. C.

CURRY, D., 1962. A Lower Tertiary outlier in the Central English Channel, with notes on the beds surrounding it. *Quart. J. geol. Soc. Lond.*, Vol. 118, pp. 177–205.

This note records the results of an examination of rock samples collected at stations in the Central English Channel by drop-coring from R.V. 'Sarsia' and other research vessels. Some seventy samples in all were collected from strata *in situ* within an area of about 500 square miles about halfway between the Isle of Wight and Cherbourg. In the north of this area Kimmeridge Clay has been proved; farther south, chalk appears to surround an elongated outlier of Lower Tertiary beds, which include representatives of the Reading Beds, London Clay, and Bracklesham Beds. Analysis of the microfaunas of the Cretaceous samples reveals the presence of beds of Santonian, Campanian, and Maestrichtian age; including some which are younger than any recorded from the mainland of Britain. The microfauna of the Bracklesham Beds contains indigenous and derived elements. The indigenous fauna compares most closely with that of the Sables de Cuise. The sources of the derived fauna are of Campanian, Maestrichtian and Danian ages.

D. C.

CURRY, D., MARTINI, E., SMITH, A. J. & WHITTARD, W. F., 1962. The geology of the western approaches of the English Channel. I. Chalky rocks from the upper reaches of the continental slope. *Phil. Trans.*, B, Vol. 245, pp. 267–90.

Dredged samples of Tertiary chalks are described from five stations distributed over a distance of about 200 miles along the continental slope. The Foraminifera and

nanoplankton indicate a range in age from Middle Eocene to Upper Miocene. The conclusions are reached that: (i) the continental slope appears not to have received and retained much clastic sediment of recent geological time; (ii) the facies of the chalks is quite different from that recorded in western Europe; (iii) the chalks crop out at least in the upper reaches of the slope and form terraces; (iv) a structural explanation, probably faulting, is required to account for the conflicting topographical and stratigraphical levels of some samples; and (v) there is no support for the existence before Pleistocene times of the continental shelf of the Western Approaches in physiographical form similar to that known today.

W. F. W.

CURTIS, A. S. G., 1962. Pattern and mechanism in the re-aggregation of sponges. *Nature, Lond.*, Vol. 196, pp. 245–8.

Disaggregated cells of the sponges *Microciona sanguinea*, *Halichondria panicea*, *Hymeniacidon perleve* and *Suberites ficus* were allowed to re-aggregate in sterile sea water. At 16–17° C *Microciona sanguinea* re-aggregated most rapidly, *Suberites ficus* and *Hymeniacidon perleve* most slowly and *Halichondria panicea* at an intermediate rate. If the cells of two species were combined simultaneously at the start of re-aggregation they separated out into re-aggregate bodies each of which was composed solely of the cells of one species, provided that the re-aggregation rates of the two species differed. Combinations of two species which re-aggregated at the same rate did not separate out, e.g. mixtures of the cells of *Suberites ficus* and *Hymeniacidon perleve*. If the cells of the more slowly re-aggregating species were allowed to start re-aggregation some while before the cells of the more rapidly re-aggregating species were added the sorting out process became confused. With successively greater time intervals before the addition of the second species four patterns of sorting out could be recognized: (i) no interval—complete separation of the re-aggregate bodies, (ii) small interval—separation of cell types but re-aggregate bodies of each type adhere to one another, (iii) medium interval—more rapidly re-aggregating cell type surrounds masses of the slow type, (iv) a long interval so that both types finish re-aggregation at about the same time—complete intermingling of cells of each species. It was suggested that these results indicate that the pattern of separation of cell types, or even its occurrence at all in re-aggregates of mixtures of two species of sponges, is controlled by a mechanism involving the timing of certain types of cell behaviour and that there is no evidence for the action of a specific permanent adhesiveness controlling sorting out mechanisms.

A. S. G. C.

DALES, R. P., 1962. The polychaete stomodeum and the inter-relationships of the families of Polychaeta. *Proc. zool. Soc. Lond.*, Vol. 139, pp. 289–328.

The structure of the proboscis in different polychaetes is described and compared with structures derived from the stomodeum in those polychaetes in which no proboscis is to be found. It is suggested that the structures which arise from the stomodeum are of phylogenetic value; that those worms with a ventral proboscis represent several lines of evolution from a primitive stock provided with a buccal organ similar to that found today in archannelids, and retained with relatively little modification in some deposit feeders such as ampharetids and terebellids. It is also suggested that an axial proboscis was evolved at an early period and diverged into two main kinds, one with, the other without a gizzard-like pharynx: the former in sand and mud eaters in which the proboscis tends to be lost on transition to suspension feeding, the latter in worms

of predominantly predatory or scavenging habit. After description of the morphology and functioning of the different kinds of proboscis, suggestions are made for a different arrangement of the families of Polychaeta in which the old divisions 'Errantia' and 'Sedentaria' are discarded and the families arranged in a sequence of superfamilial groups.

R. P. D.

WICKSTEAD, J. [H.], 1962. Plankton from the East African area of the Indian Ocean. *Nature, Lond.*, Vol. 196, pp. 1224-5.

The dry weights of daylight plankton samples taken from both 200 and 50 m to the surface were related to the water transparency as measured by a 50 cm Secchi disc. In both cases the regression was significant,  $P = < 0.001$ , and the difference between the regression lines was not significant. The conclusion was that there were no significant differences in the plankton from the topmost 200 m of the area surveyed, such differences which occurred being due to variations in water transparency. Results indicate that quantitative plankton estimations based on daylight samples from the topmost 200 m can be misleading unless the samples are considered in relation to the water transparency.

The variation of the plankton dry weight from the topmost 200 m throughout a 24 h period, expressed as three hourly means, is shown. Maximum figure was in the 3 h period immediately after sunset, that is from 18-30 to 21-30 h. The relationship with the water transparency is indicated.

J. H. W.

WICKSTEAD, J. H., 1962. Food and feeding in pelagic copepods. *Proc. zool. Soc. Lond.*, Vol. 139, pp. 545-55.

It is suggested that pelagic copepods can be divided into the following three groups on the basis of their feeding behaviour: (1) herbivorous or mainly herbivorous forms, (a) selective herbivores, (b) random herbivores; (2) mixed feeders, (a) true mixed feeders (when both plant and animal food are present together), (b) facultative mixed feeders (feeding on one type of food in the absence of the other); (3) carnivorous or mainly carnivorous forms, (a) selective carnivores, (b) random carnivores.

Aspects of feeding are discussed in the Oncaeidae, Corycaeidae and Sapphirinidae and in deep-sea copepods.

A tentative conclusion is that in the Oncaeidae and Corycaeidae feeding is by attachment to a host with the maxillipedes and feeding on particulate matter on the host, on the body-wall of the host or, as is thought more likely, piercing the body-wall and feeding on body fluids. There is some evidence that a species of *Corycella* feeds on small eggs by piercing and sucking.

All deep-water copepods are assumed to be exclusively non-herbivorous; a theory is put forward to explain how the plant community enters into the food cycle. Food is secured by the first and second maxillipedes which, when extended, form a net beneath the body. Probably in the, say, Megacalanidae, feeding is by a steady forward movement, filtering the water of organisms as it passes through the setae of the maxillipedes; but in the, say, Euchaetidae, the maxillipedes are stronger and have a predatory aspect. As observed in a living *Paraeuchaeta*, food is actively seized.

J. H. W.