

ABSTRACTS OF MEMOIRS

RECORDING WORK AT THE PLYMOUTH LABORATORY

BONE, Q. & RYAN, K. P., 1975. On the presence of a transverse system in tunicate muscle. *Acta zoologica*, **56**, 271–277.

Ultrastructural investigation of the caudal muscle cells in the tadpole larva of the ascidian *Dendrodoa grossularia* has shown that in this species, a transverse tubular system is present; diad and triad couplings are formed with the sarcoplasmic reticulum. Peripheral couplings of the sarcoplasmic reticulum are infrequent and have only been observed at the longitudinally apposed faces of the caudal muscle cells.

HOLLIGAN, P. M. & GOODAY, G. W., 1975. Symbiosis in *Convoluta roscoffensis*. *Symposia of the Society for Experimental Biology*, **29**, 205–227.

The energy and organic substances required by the marine flatworm, *Convoluta roscoffensis*, for growth, reproduction and movement can be totally supplied by the autotrophic symbiont, *Platymonas convolutae*, which gives the whole organism a deep green colour. Recent biochemical studies have shown that amino acids, amides, fatty acids and sterols are transferred from plant to animal, whilst uric acid, a waste product of animal tissues, is re-assimilated by the algal cells. Wild populations of *C. roscoffensis* also appear to take up organic nutrients from beach water that drains across the colonies at low tide. However, survival of the worms probably depends on efficient re-cycling of nitrogen, phosphorus and other substances between the symbionts.

MEVES, H., 1976. The effect of zinc on the late displacement current in squid giant axons. *Journal of Physiology*, **254**, 787–801.

Displacement currents produced by single depolarizing or hyperpolarizing voltage-clamp pulses (I_{depol} and I_{hyperpol}) were recorded from intracellularly perfused squid giant axons treated with tetrodotoxin and tetraethylammonium chloride. The effect of internal Zn on the slow part of the displacement current was studied at different holding potentials.

Internal Zn in a concentration of 3.3 mM markedly reduced the slow charge displacement associated with depolarizing and hyperpolarizing pulses.

At a holding potential more negative than -60 mV I_{depol} is normally larger than I_{hyperpol} if measured with pulses of equal height. The asymmetry $I_{\text{depol}} > I_{\text{hyperpol}}$ (which possibly reflects the movement of gating charges) was abolished by Zn.

The reversed asymmetry $I_{\text{hyperpol}} > I_{\text{depol}}$ which is normally seen at holding potentials less negative than -60 mV was not blocked by Zn. This suggests that the underlying mechanism is different from that of the asymmetry $I_{\text{depol}} > I_{\text{hyperpol}}$.

The Zn-sensitive slow charge displacement during single depolarizing pulses was strongly reduced by lowering the holding potential from about -90 to about -30 mV.

The observations with single clamp pulses were confirmed by averaging and summing the currents associated with an equal number of depolarizing and hyperpolarizing pulses.

The effect of internal Zn on the charge displacement is thought to be due to a reaction with mobile charges in the membrane dielectric. Internal Zn in a concentration of 0.5–1 mM did not significantly shift the Na inactivation curve, indicating that it does not react with surface charges at the inner side of the membrane.

PINGREE, R. D., PUGH, P. R., HOLLIGAN, P. M. & FORSTER, G. R., 1975. Summer phytoplankton blooms and red tides along tidal fronts in the approaches to the English Channel. *Nature, London*, **258**, 672–677.

Dense populations of phytoplankton, consisting mainly of the dinoflagellate *Gyrodinium aureolum*, were observed during late July in the Western Channel and around Ushant along frontal boundaries between warm (stratified) and cold (well-mixed) water masses and in the thermocline. The distribution of chlorophyll *a* can be related to the turbulent structure of the water column and

the way this affects the availability of inorganic nutrients and light energy and the dispersal of plant cells. Red tides, as observed in early August from the air, may develop under favourable conditions. Further work is required to determine the relative importance of well-mixed, frontal and stratified regions to primary production over the area as a whole.

SOUTHWARD, A. J., 1975. On the evolutionary significance of the mode of feeding of Pogonophora. *Zeitschrift für zoologische Systematik und Evolutionsforschung*, Sonderheft 1975, 77–85.

Pogonophora have no internal digestive system, and food must therefore enter the body via the epidermal surface. Experiments show that the small unitentaculate species are capable of existing by epidermal uptake of dissolved organic compounds from the mud in which they live.

Other groups of Eumetazoa can absorb dissolved organic compounds but only the Pogonophora depend entirely on epidermal uptake. Theoretically such a mode of feeding could have arisen by reduction from animals which originally possessed a functioning alimentary canal, and might have involved delay in gut-formation and segmentation in a lecithotrophic larva of an annelid-like ancestor in which the adult had some capacity for epidermal absorption. Alternatively the group could be derived from lowly-organized or unicellular ancestors, though this would involve belief in a polyphyletic origin of the Metazoa. The first theory best fits present knowledge, but reliance on epidermal feeding justifies separation of Pogonophora in a Phylum distinct from Annelida.

SOUTHWARD, E. C., 1975. A study of the structure of the opisthosoma of *Siboglinum fiordicum*. *Zeitschrift für zoologische Systematik und Evolutionsforschung*, Sonderheft 1975, 64–76.

The opisthosoma of *S. fiordicum*, studied with the help of the electron microscope, is bilaterally symmetrical with regularly repeated organs. There are four setae on each segment, secreted in epidermal pouches. The nervous system is intraepidermal, with the main concentration of axons in three longitudinal trunks on one side of the body and concentrations of nerve cells in paired segmented 'ganglia' which project into the body cavity. Probable sensory cells are grouped laterally on each segment. Epidermal mucus cells and tubeforming cells are present. The separate segmental coeloms are lined with musculoepithelial cells providing both circular and longitudinal muscle fibres and thick muscular septa. There are no coelomoducts. The early development of segmentation in the opisthosoma of the embryo is briefly described. The anatomy of the opisthosoma is consistent with the theory of fairly close relationship between annelids and pogonophores but has some features common to several groups of Metazoa.

WHITFIELD, M., 1975. The effects of temperature and pressure on speciation. In *The Nature of Seawater: Report of the Dahlem Workshop on the Nature of Seawater*, Berlin, March 10–15, 1975 (ed. E. D. Goldberg), pp. 137–164. Berlin: Dahlem Konferenzen.

The influence of temperature and pressure on chemical speciation can be determined either by the direct measurement of the appropriate stability constants or by the measurement of the relevant standard partial molal thermodynamic functions. The experimental techniques are reviewed with particular emphasis on recent developments. Consideration is then given to theoretical correlations that can guide the interpretation of the experimental data and assist in estimating temperature and pressure effects where experimental values are not available.

WHITFIELD, M., 1975. The electroanalytical chemistry of sea water. In *Chemical Oceanography*, 2nd edition, vol. 4, (ed. J. P. Riley and G. Skirrow), pp. 1–154. London: Academic Press.

Electrochemical techniques are classified according to the presence or absence of current flow in the cell, the charge and mass transfer processes within the cell and the current or voltage excitation applied. The following analytical processes are then considered in some detail.

- (i) Zero current flow – potentiometry
- (ii) Net current flow in quiescent solutions – polarography
- (iii) Net current flow in quiescent solutions following electrolytic preconcentration – stripping analysis
- (iv) Amperometric titrations
- (v) Net current flow in stirred solutions – electrodeposition
- (vi) Net current flow in stirred solutions – the determination of oxygen
- (vii) Net current flow in stirred solutions – coulometry

Applications of these techniques to marine chemistry are considered critically and the discussion is documented by more than 500 references.