# ABSTRACTS OF MEMOIRS

## RECORDING WORK AT THE PLYMOUTH LABORATORY

ANDERSON, P. A. V., BONE, Q., MACKIE, G. O. & SINGLA, C. L., 1979. Epithelial conduction in salps. II. The role of nervous and non-nervous conduction system interactions in the control of locomotion. *Journal of Experimental Biology*, **80**, 241–250.

The control of locomotion in *Salpa fusiformis* was studied by intracellular recordings from motor neurones and swimming muscles.

Regular, synaptically driven, volleys of action potentials were recorded from motor neurones. This pattern of activity was consistent with that expected from the waveform of the compound junctional potentials associated with contraction of the swimming muscles.

A second class of brain neurone was identified. These cells were synaptically driven. In some, their firing rate was increased while in others it was decreased by activity in an epithelial conduction system, the Outer Skin Pulse (OSP) system.

Cells of the outer epithelium were impaled and OSP's were recorded intracellularly as conventional action potentials. The records from many of these cells showed many depolarising synaptic potentials.

Numerous gap junctions were observed throughout the outer epithelial layer and several neuroepithelial synapses were found. The distribution of these synapses coincided with that of the epithelial cells from which synaptic events were recorded.

BEST, A. C. G., 1979. A stereoscopic method of viewing internal structures in resin-embedded biological specimens. *Journal of Microscopy*, **116**, 271–274.

The internal arrangement of biological specimens, embedded in resin, may be studied by the described method, which is particularly applicable to calcified structures.

BEST, A. C. G. & NICOL, J. A. C., 1979. On the eye of the goldeye *Hiodon alosoides* (Teleostei: Hiodontidae). *Journal of Zoology*, **188**, 309–332.

In the eye of the Goldeye the photoreceptors are arranged in bundles and the pigment epithelium contains a massive reflector or tapetum lucidum. Photoreceptor bundles are arranged in parallel rows, the bundles alternating in position from row to row. Each bundle contains about 60 photoreceptors, of which 30 or so are cones. Rod outer segments lie in the scleral half of the outer retinal region of the light-adapted eye. Processes of the pigment epithelium cells extend vitread almost to the external limiting membrane; they envelop the bundles of rods and cones, and a ring of four processes surrounds each bundle. A process contains two kinds of reflecting crystals (composed of uric acid). A large part of the epithelium cell is packed with small disc-shaped crystals (crystallites) enclosed in thin membranes; the tip of the process, in the region of the photoreceptor bundle, contains orderly arrays of small rod-shaped crystals (rodlets). It is suggested that the crystallites form a diffuse reflector backscattering light into the rods; and that the rodlets reflect light regularly from their surfaces into the photoreceptor bundles. In the light-adapted state, rods are enveloped by pigment and crystallites. The organization is compared with that of other fishes that have photoreceptors in bundles (grouped retinae) and tapeta lucida.

BONE, Q., 1978. Locomotor muscle. In *Fish Physiology*. Vol. VII. *Locomotion* (ed. W. S. Hoar and D. J. Randall), pp. 361–424. London: Academic Press.

This chapter reviews the structure and physiology of fish locomotor muscle, dealing chiefly with myotomal muscle fibres. 150 references up to 1978 are considered.

PAFFENHÖFER, G.-A. & HARRIS, R. P., 1979. Laboratory culture of marine holozooplankton and its contribution to studies of marine planktonic food webs. *Advances in Marine Biology*, **16**, 211–308.

The article reviews methods for the laboratory culture of those invertebrates whose entire life-histories are planktonic. Culture techniques which have been particularly successful are identified, and further future developments are suggested.

In addition to reviewing methodology, the advances in knowledge of planktonic food webs resulting from an ability to culture selected species in the laboratory are discussed. Particular emphasis is placed on experimental studies relating to secondary production. Investigations using cultures to estimate rates of feeding, growth, respiration and reproduction are reviewed. Additional sections consider taxonomic and pollution studies, and the relevance of larger multispecies enclosures in attempts to simulate components of planktonic ecosystems.

PIENAAR, R. N. & NORRIS, R. E., 1979. The ultrastructure of the flagellate *Chrysochromulina spinifera* (Fournier) comb.nov. (Prymnesiophyceae) with special reference to scale production. *Phycologia*, **18**, 99–108.

An investigation into the ultrastructure of *Chrysocampanula spinifera* Fournier is reported. Attention is drawn to the unusual method of production of the long spine scales and the marked similarity in cell structure between *Chrysocampanula* Fournier and *Chrysochromulina* Lackey. In view of their smilarities *Chrysocampanula spinifera* Fournier has been transferred to *Chrysochromulina spinifera* (Fournier) comb.nov.

SPOONER, M. F. & CORKETT, C. J., 1979. Effects of Kuwait oils on feeding rates of copepods. *Marine Pollution Bulletin*, **10**, 197–202.

Sub-lethal toxicity and recovery tests were made on feeding rates of four species of copepods using Kuwait oils kept in suspension on a slowly rotating wheel. Counts of faecal pellets from individuals fed on standard algal suspension were made after 20 h at 12 °C. This exposure produced only marginal effects at 1 and 2 p.p.m., but 10 p.p.m. produced definite effects on planktonic species. Recoveries were generally quite good from 'weathered' oil treatments. Oils emulsified alone did not produce significantly different effects in these experiments from oils emulsified with dispersants.

STOREY, K. B. & STOREY, J. M., 1979. Octopine metabolism in the cuttlefish, *Sepia officinalis:* octopine production by muscle and its role as an aerobic substrate for non-muscular tissues. *Journal of Comparative Physiology*, **131**, 311–319.

The metabolism of the glycolytic end product, octopine, was investigated in vivo in the cuttlefish, *Sepia officinalis*. Octopine was the major mantle muscle end product produced during hypoxia, exhaustive swimming, or exhaustive swimming followed by hypoxia (muscle octopine rose from 0·2 to 3·7, 8·6 and 13·4 μmol/g wet wt. respectively). Octopine concentration was inversely correlated with muscle glycogen and arginine phosphate concentrations and these substrates were almost completely depleted after swimming to exhaustion. Alanine, α-glycerophosphate, pyruvate, and malate were other, minor end products.

Blood octopine (0·02 μmol/ml at rest), pyruvate, and alanine concentrations were elevated during hypoxia and during recovery from hypoxia or exercise but not during exercise itself. Maximal blood octopine concentrations were 8-fold higher than resting levels and blood octopine appeared to be derived from the release of muscle octopine into the bloodstream.

$^{14}$C-A-octopine (radiolabelled in the arginine moiety: $N^2$-(1-carboxyethyl)[U-$^{14}$C]L-arginine) was administered intravenously and tissue uptake patterns showed that mantle muscle was relatively poor at the uptake of blood $^{14}$C-A-octopine while brain and ventricle rapidly concentrated the compound. Parallel experiments in which [U-$^{14}$C]D-glucose or [U-$^{14}$C]L-arginine were administered showed that there are distinct tissue specific uptake patterns for each of the three radiolabelled compounds.

The tissue breakdown of $^{14}$C-A-octopine taken up from the blood to form $^{14}$C-arginine was found to be 0, 6, 32 and 20% respectively for mantle muscle, gill, ventricle, and brain. When delivered by specific injection into mantle muscle or brain, $^{14}$C-A-octopine oxidation was 5% and 40% respectively after 20 min under resting, aerobic conditions.

The data indicate that while mantle muscle readily produces octopine as a glycolytic end product, the tissue has little capacity for the oxidation of octopine. Muscle octopine appears to be released into the bloodstream and can be readily taken up by other tissues. The pyruvate moiety of octopine could be oxidized as an aerobic substrate by the Krebs cycle in tissues such as brain and ventricle with the arginine moiety being recycled to the muscle. The possible existence of a modified Cori cycle, to make use of octopine as a gluconeogenic substrate, is discussed.