ABSTRACTS OF MEMOIRS

RECORDING WORK DONE IN THE PLYMOUTH LABORATORY

BONE, Q. & DENTON, E. J., 1971. The osmotic effects of electron microscope fixatives. *J. Cell Biol.*, Vol. 49, pp. 571–81.

The reflecting cells on the scales of sprat and herring contain ordered arrays of guanine crystals. The spacing of the crystals within these cells determines the wave bands of the light which they reflect, hence volume changes in the reflecting cells can be observed as colour changes directly. This property of the scales is used to show that (*a*) fixation with osmium tetroxide solutions destroys osmotic activity; (*b*) fixation with aldehyde solutions does not destroy osmotic activity and does not cause volume changes if the aldehydes are made up in salt or sucrose solutions whose osmolarities, discounting the aldehyde, are about 60% of those to which the cells are in equilibrium in life, and (*c*) *after* aldehyde fixation the cells are osmotically active but come to a given volume in salt and sucrose solutions of concentrations only 60% of those which give this volume before fixation. Various possible mechanisms underlying the change of osmotic equilibrium caused by aldehyde fixation are discussed.

Q.B.

BRYAN, G. W., 1971. The effects of heavy metals (other than mercury) on marine and estuarine organisms. *Proc. R. Soc.* B, Vol. 177, pp. 389–410.

Heavy metals such as copper, zinc and lead are normal constituents of marine and estuarine environments. When additional quantities are introduced from industrial wastes or sewage they enter the biogeochemical cycle and, as a result of being potentially toxic, may interfere with the ecology of a particular environment. In different marine organisms, the behaviour of heavy metals is described in terms of their absorption, storage, excretion and regulation when different concentrations are available in the environment. At higher concentrations, the detrimental effects of heavy metals become apparent and their different toxic effects and factors affecting them are also described.

G.W.B.

CHANDLER, W. K. & MEVES, H., 1970. Rate constants associated with changes in sodium conductance in axons perfused with sodium fluoride. *J. Physiol., Lond.*, Vol. 211, pp. 679–705.

Membrane currents during step depolarizations were measured in axons which were perfused with 300 mM-NaF and placed in K-free artificial sea water, −0·3 to 4 °C. The conductances were fitted by the modified Hodgkin–Huxley model, $g_{Na} = \bar{g}_{Na}m^3\ (h_1+h_2)$. Changes in h_1 and h_2 were assumed to follow

$$h_1 \underset{\alpha_{h_1}}{\overset{\beta_{h_1}}{\rightleftharpoons}} x \underset{\beta_{h_2}}{\overset{\alpha_{h_2}}{\rightleftharpoons}} h_2,$$

where x represents the inactive state. Apart from some small discrepancies, which could be explained by a resistance in series with the membrane between the voltage measuring electrodes, the rate constants for m were in agreement with the Hodgkin–Huxley equations and at 0 °C

$$\beta_{h_1} = \frac{0{\cdot}5}{\exp\left[-(V+32)/10\right]+3{\cdot}6\exp\left[-V/240\right]} \quad (\text{msec}^{-1}),$$

$$\alpha_{h_2} = 0{\cdot}08\exp\ (V/70) \quad (\text{msec}^{-1}),$$

$$\beta_{h_2} = 0{\cdot}08\exp\ (V/70-V/23{\cdot}5)+0{\cdot}39 \quad (\text{msec}^{-1}).$$

Measurements were also made at 16–17 °C as well as with 250 mM-NaF + 50 mM-KF or 300 mM-KF as the perfusion fluid.

H.M.

https://doi.org/10.1017/S0025315400018865 Published online by Cambridge University Press

CHANDLER, W. K. & MEVES, H. 1970. Slow changes in membrane permeability and long-lasting action potentials in axons perfused with fluoride solutions. *J. Physiol., Lond.*, Vol. 211, pp. 707–28.

Voltage clamp experiments were carried out on squid giant axons which were perfused internally with 300 mM-NaF + sucrose and placed in K-free artificial sea water at 16–17 °C. On stepwise depolarization the sodium conductance g_{Na} rapidly reached a peak value and then declined to a new level; this 'maintained' level was slowly inactivated in an exponential manner with a rate constant which varied from 0·3 to 1·1 sec^{-1}. On repolarization to a potential which varied between −73 and −101 mV the slow inactivation was removed with a rate constant of 0·11 to 0·73 sec^{-1}. In experiments on fibres perfused with 300 mM-KF, after internal NaF had removed the usual delayed rectifier currents, depolarization resulted in an outward current which developed in an exponential manner with a time constant of a fraction of a second. The equilibrium potential for this component was more negative than −50 mV. Long-lasting action potentials were computed on the basis of the slow changes and, except for the period of final repolarization, were found to be in satisfactory agreement with experimental records. H.M.

DANDO, P. R., 1971. Lactate dehydrogenase polymorphism in the flatfish (Heterosomata). *Rapp. P.-v. Réun. Cons. perm. int. Explor. Mer*, Vol. 161, pp. 130–3.

Many flatfishes have been shown to possess only a single isoenzyme of LDH in the majority of their tissues. Studies on flatfishes from the English Channel, using starch-gel electrophoresis, have shown that this is not true for all species. In particular the soles appear to have at least two catalytically distinct isoenzymes in heart and muscle which show tissue-specific patterns.

Individual variations in the zymogram patterns were found for several species, in particular the four species in the Soleidae. Several of these variants are probably the result of multiple alleles at a single LDH locus. LDH polymorphism may be of use in stock identification studies on *Lepidorhombus whiff-iagonis*, *Pegusa lascaris* and possibly *Buglossidium luteum* and *Microchirus variegatus*. P.R.D.

DENTON, E. J., 1971. Examples of the use of active transport of salts and water to give buoyancy in the sea. *Phil. Trans. R. Soc.* B, Vol. 262, pp. 277–87.

(1) To give themselves buoyancy several families of squid and crustaceans accumulate large amounts of NH_4^+ ions in special compartments within their bodies. This is often in high concentration, approximately 0·5 mol/l., and very acid; sometimes two-thirds of the body weight consists of such strong ammoniacal solutions. Possible mechanisms for the accumulation of NH_4^+ are discussed.

(2) Cephalopods using chambered shells for buoyancy once dominated the seas; they included the nautiloids, ammonites and belemnites. Three types of such shells can still be found in living *Sepia*, *Spirula* and *Nautilus*. They differ greatly in morphology but all function in the same way. While being formed a chamber is full of a liquid isosmotic with sea water, later this liquid is pumped out against the hydrostatic pressure of the sea. It is shown that gases play no role in this pumping of salts and water and an account of our knowledge of the processes involved in the pumping is given. E.J.D.

DENTON, E. J. & LAND, M. F., 1971. Mechanism of reflexion in silvery layers of fish and cephalopods. *Proc. R. Soc.* B, Vol. 178, pp. 43–61.

The highly reflecting structures found in the integuments and eyes of fish and cephalopods were studied. They consist of alternate layers of high and low refractive index (n) material (in fish, guanine and cytoplasm) and the high refractive index material is in the form of discrete plates. The highest reflectivity at a given wavelength λ_0, together with the widest waveband of high reflectivity, would be given if these alternate layers all had an optical thickness of $\frac{1}{4}\lambda_0$. The possibility that fish and cephalopods can make 'ideal' reflectors of this kind was examined.

With one exception the optical thicknesses (nt) of the plates found in all the structures studied were between 100 and 200 nm, i.e. approximately $\frac{1}{4}\lambda_0$ for light in the visible spectrum.

Many of the reflecting structures are highly coloured and in these there was almost always a good correlation between the wavebands best reflected and four times the optical thicknesses of the plates which they contained.

Some scales in the sprat were studied in detail. The changes in colour with angle of viewing, and with osmotic concentration of the medium in which the scales were placed, supported the idea that the spaces between the plates were $\frac{1}{4}\lambda_0$. Similar conclusions were reached for the coloured surfaces found in a number of fish and squid. In cephalopods the high-refractive-index plates are lozenge-shaped, flexible and of refractive index about 1·56.

The paper also discusses some special cases in which the reflecting systems are not simple $\frac{1}{4}\lambda_0$ stacks.

E.J.D.

GIBBS, P. E., 1971. The polychaete fauna of the Solomon Islands. *Bull. Br. Mus. nat. Hist. (Zool.)*, Vol. 21, pp. 99–211.

An account of the polychaete fauna of the Solomon Islands (western Pacific Ocean) is given, based on a large collection which was obtained during the Royal Society Expedition in 1965. A total of 220 species are recorded. Two new genera (Family Nereidae), 13 new species and 3 new subspecies are described. The zoogeographical affinities of the fauna are analysed and certain ecological aspects discussed.

P.E.G.

MOULDER, D. S. & VARLEY, A. (COMPILERS), 1971. *A Bibliography on Marine and Estuarine Oil Pollution*, vii + 129 pp. Plymouth: Marine Biological Association of the United Kingdom.

The bibliography contains references to almost 1100 papers published over the past 100 years, the arrangement being by subject in 15 main sections, further classified into 32 subdivisions. Included are: sources of oil pollution and their control; properties, detection, analysis and identification of oil; reports on particular spills; biological effects; methods of containment and treatment. All aspects of the subject are covered with the exception of the effects of oils and detergents on seabirds.

D.S.M.

ROBERTS, B. L. & RYAN, K. P., 1971. The fine structure of the lateral-line sense organs of dogfish. *Proc. R. Soc.* B, Vol. 179, pp. 157–69.

The sense organs of the body lateral-line of *Scyliorhinus* were examined with the electron microscope and shown to consist of supporting cells and two kinds of sensory cell. One type of sensory cell has the well-known structure of hair cells, bearing on its apical surface a group of stereocilia (6–25) associated with a single kinocilium. Each hair cell is innervated by a sensory nerve fibre and some also receive an efferent nerve supply. The second kind of sensory cell is similar in appearance, but differs at the apex in containing many vacuoles and in lacking stereocilia. There are many long microvilli and a single cilium which arises from a shallow pit. The internal structure of this cilium is variable, with the number of tubules in the outer ring ranging between 7 and 9 and with the inner pair consisting of double elements. This type of sensory cell is innervated by sensory nerve fibres and possibly by efferent fibres. The situation of the kinocilium of a hair cell in relation to the stereocilia is more variable than has been described in other hair cells while the cilium of the second sensory cell appears to bear no special relation to the microvilli. The accessory cells of the neuromast include basal and peripheral supporting cells, many of which produce a secretion, and a large secretory cell which is found at intervals at the edge of the organ. This cell has a convoluted surface and is full of vesicles.

B.L.R.

RUSSELL, F. S., 1971. On the female of the medusa *Australomedusa baylii*. *J. Zool.*, Vol. 164, pp. 133–5.

The female of the medusa *Australomedusa baylii* Russell is described. The specimens, all of which were females, were collected from a salt water lagoon in Victoria, Australia. F.S.R.

SOUTHWARD, E. C., 1971. Pogonophora of the Northwest Atlantic: Nova Scotia to Florida. *Smithson. Contr. Zool.*, No. 88, 29 pp.

Benthic samples from 259 stations along the continental margin of North America have yielded eight genera and 24 species of Pogonophora. A key to the genera and species is provided. Three new species are described. After consideration of the geographical and depth distribution it is concluded that these are three main zoogeographical groups: Florida Current; northern shallow-water species; and widespread deep-water species. E.C.S.