thought I could again detect the change from blue to colourless, but could not be certain due to the obscuring effect of precipitated sulphur. The tube was therefore connected to a Barcroft–Verzar respirometer immediately after allowing the air to rush in. The control tube contained an equal amount of gastropod Ringer of *p*H 7·8, which had been treated in the same way. The blood absorbed over six times as much oxygen as the control. On repeating the experiment with fresh hæmolymph the ratio was 7·5. Thus contact with sulphide does not appear to interfere permanently with the oxygen-carrying ability of *Bullia* hæmocyanin. On the other hand, I have not found any evidence to suggest that the animal is protected by the enzymatic oxidation of sulphide. When hydrogen sulphide is allowed to interact with *Bullia* hæmolymph, using the methods described by Patel and Spencer[1], a large amount of oxidation does, in fact, take place, but I find that this is not greater than occurs in controls consisting of gastropod Ringer of *p*H 7·8.

A final observation which may well be of some considerable ecological significance is that *Bullia* can detect quite small quantities of hydrogen sulphide and tends to avoid such pollution. When ten individuals of *B. digitalis* were placed in a tank, half of which had a substratum composed of sand which had had hydrogen sulphide bubbled through it while wet, all buried themselves in the other half of the tank, where the substratum had not been treated. This was repeated four times (with the same snails) with the identical result. If the entire substratum was treated or if hydrogen sulphide had been briefly bubbled through the water itself, the snails refused to burrow and eventually turned on to their backs and spread their feet, a position which, in the field, encourages transport by waves and water-currents[5]. Such behaviour might well account for the absence of *Bullia* on the beaches mentioned. The detection of hydrogen sulphide is not confined to the osphradium or some other specific chemoreceptory organ, for if a piece of cotton-wool is soaked in sea-water through which hydrogen sulphide has been bubbled, and then applied to any part of the head or foot of a snail which has been removed from the water, violent brushing-off movements are initiated and the proboscis is often everted and extended towards the affected region. The same reactions are used as a defence mechanism against would-be predators, but do not occur if cotton-wool soaked in unadulterated sea-water is applied to the foot.

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Adhesive Disk of *Echeneis naucrates*

Recently, Raghbir Singh*, director of fisheries, Madras, sent me a specimen of *Echeneis naucrates* for study. Having suggested[1,2] the presence of a pump at the hind end of the sucker, I dissected it under the binocular microscope and discovered two pairs of longitudinal pigmented canals one of which is broader and overlaps the basal plates on their ventral side towards their outer margins. The other is still further towards the outside, closely bordering the outer tips of the lamellar bars. Having no other specimens for study, I recently re-examined the two specimens sent to me by Dr. Mees, of the Western Australian Museum, Perth, and found that they had not been transferred to the preservative fluid after I had examined them last, so that they had become dried up. But on examining them now I noticed that grooves had formed on the disk in the position in which the outer pigmented canals are present internally.

Some time ago I gave a specimen to a local biological model maker to prepare a plaster of Paris impression of the sucker. He found that it adhered to the plaster and therefore tugged at the tail to get it off. While doing so the lamellar plates were partially opened, just as it happens when a live fish which is attached to a glass plate is pulled by the tail. I noticed no other change at the time in the specimen, which had dried up as the result of the heat produced in the plaster of Paris.

On further scrutiny of the Australian specimens the lateral grooves were intercepted at the hind-end by the presence of the pear-shaped pyriboss, but in the third the groove was continuous posteriorly without any interception. On trying to find out the cause of the difference I noticed that the pyriboss had shifted forwards and was fully accommodated in the posterior chamber exactly as I had pictured, ref. 2.

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Pigmentary System of *Diadema antillarum* Philippi

The echinoid *Diadema antillarum* Philippi shows both morphological and physiological (reversible) changes in colour[1,2]; the former is far more complex than previously supposed and the intimate mechanism of the latter may be, in part at least, of a type hitherto unsuspected.

Several kinds of pigment are involved, reddish or purplish hydroxynaphthaquinone[3] and pigment ranging in colour from golden yellow to black. The latter is chemically heterogeneous. Some shows the properties claimed to be characteristic of melanin[4–6], some appears to be chromolipoid, part is a newly discovered, iron-containing pigment of nuclear origin and part may be derived from the naphthaquinone[3].

Pigment accumulates, but not in a simple way. In the skin, the proportion of the various kinds alters: naphthaquinone becomes relatively more conspicuous. There is a turnover of melanin, some of which is discharged directly from effete pigment cells, some is excreted by amœbocytes[5] and much disappears in an unknown fashion. Such pigment is replaced, but not necessarily by the same kind; moreover, not all the melanin has the same origin. It appears in the young in finely granular form in the cytoplasm of epidermal chromatophores, but the melanin, which accumulates later, arises in association with characteristic spheroids, in the cytoplasm of amœbocytes containing phenolases[7], tyrosine[8] (the presumed substrate) as well as 3-indolyl compounds[8]. The existence of the last hints at the presence of ommachromes, but none was found.

Amœbocytes distribute the pigments widely. Much is egested, or left behind by their disintegration, as interstitial pigment in the connective tissue of the test, spines and viscera[3], as well as in the hæmal vessels of the axial organ[8].

Most of the skin pigment is contained in an extensive network of intercellular channels, with walls pervaded by a well-developed system of fibrils which appear elastic in living preparations. Such pigment is aggregated in chromatophores, apparently of the conventional type, which assume appearances varying from punctate to stellate, according to the prevailing lighting[1]. In reality the situation is very different. Only in the very young is cutaneous melanin wholly contained in cells (chromatocytes). They are located at the intersections (nodes) of the channels, along which their processes extend. Most of