

A Slug with a Sting!

Among the myriad created life-forms are animals which have built-in tools, and others with built-in weapons. There is an order of marine gastropod molluscs called the Nudibranch, which is also called the sea slug. Unlike other molluscs, Nudibranchs characteristically lack a shell, gills, and mantle cavity, but are brightly coloured and of fantastic form. Growing from their backs is a defensive weapon of no mean order. It consists of a group of brightly coloured appendages, or papillae, armed with explosive stinging cells. While inactive, these cells are folded within themselves, but at the slightest touch they extend as a long whip which flies out and stings anything within reach. This is remarkable enough, although there is nothing unique in lowly creatures possessing deadly weapons of defence. There are jelly-fish and sea-anemones, sting-rays and wasps, ants and mosquitoes, all of which can deliver a sting to assist in defense or attack.

The existence of stinging cells in the sea-slug, however, has raised questions among biologists. There must be some relationship between the sea-anemones and the sea-slugs, because their stinging cells are similar and sometimes identical. Surely it would be possible to show how one kind evolved from the other! But their careful study of these creatures ended with an amazing result. Briefly the story is this: the slug eats the anemone (which most sea creatures avoid because of their stings) and takes possession of the stinging cells for his own defensive uses. How does the sea slug accomplish it without setting off the stings?

The biologists noted that the sensitive stinging cells in the anemone appeared to become paralysed at the onslaught of the slug. Only occasionally did they explode in defence of the owner. Even then the slug was unperturbed, and appeared unaffected by the poison. The best they could do was to note that he seems to know how to put a safety-catch on the whip-lash stings, which remain coiled up and therefore harmless.

The slug is no delicate eater. It tears its food to pieces by means of a saw-like tool, the radula. This tool is not borrowed - he grew this one himself. But how is it that the sensitive capsule of the stinger, so easily ruptured at the slightest touch, is able to pass safely down into the stomach of the slug? And by what means does it escape digestion by the juices there present? By what twist of intelligence or instinct can we explain the selection from the varied contents of the stomach of only those cells which are unexploded? This selection has a very definite end in view. The chosen cells are passed through the stomach wall and gathered into the blood stream into narrow channels lined with minute hair-like filaments known as cilia. These channels lead up from the stomach to pouches positioned at the base of those brightly coloured appendages, or papillae on his back. The cilia by their motion sweep the stinging cells along these narrow ducts into the pouches, where they are arranged **the right way up**. Whatever the secret safety-catch may have been, and now that the sting is safely positioned, he removes it and it is ready to discharge immediately if the slug is attacked.

From the moment that the slug tears the stinging cell from the anemone, it would appear that forces are set in motion expressly to prevent the premature explosion of the cell. Everything happens as if the end of that strange journey were known from the beginning. Does chance act like that? We know that it does not. It cannot. Nor can we suggest that the slug knowingly seeks for additions to its armament, or that the sea anemone accepts its fate with resignation and consequently does not discharge its weapons. Once again we are confronted with some incredibly complex mechanisms that could not possibly have evolved - unless nature knew what it was setting out to accomplish and made its long-term plans accordingly. The first sea slug to decide on being a sting-swallower

would have had a very short career.