
Sea creatures light the way to new technology

A marine worm with a talent for optical engineering could hold the clue to new communication technologies, according to research published last month in *Nature*. The study, by Dr Ross McPhedran from the University of Sydney, and Dr Andrew Parker of Oxford's Department of Zoology, focuses on the sea mouse, whose spines could be used as the model for new hi-tech photonic systems.

The sea mouse has spines that normally appear deep red in colour, and are designed to warn off predators. However, when light falls on a spine perpendicular to its axis, stripes of blue and green appear. This is because the spine is made up of hexagonal cylinders, stacked in layers to form a crystal-like structure. Each cylinder is just a fraction of the wavelength of light in diameter, with the precise arrangement of the cylinders giving maximised reflectance in the red region of the spectrum, resulting in the overall colour.

Dr Parker explains: 'Sea mice have been found at depths of over 200 metres in the ocean, and at these depths there is very little light available. The spines of the sea mice therefore have to be capable of collecting every scrap of light possible, so some of the cylinders in the spine will collect light from the blue and green regions of the spectrum and channel them to produce the red colour. These spines can handle light with almost 100 per cent efficiency, which is much greater than that of any man made optical fibres.'

The researchers are suggesting that it may be possible to grow similar optical filters using molecular self-assembly, as the actual structure of the spines is simple, although their overall effect is highly sophisticated. Utilising this research to improve communications technology could result in more efficient telecommunications, cable TV and computing systems.