Wednesday, 3 January, 2001, 19:17 GMT

Sea mouse promises bright future

Shiny spines hide useful optical secrets

A humble marine worm with a talent for optical engineering may hold the clue to new communication technologies.

Researchers in the UK and Australia said the technical wizardry of the lowly sea mouse could be copied to develop hi-tech photonic systems.

Little is known about the sea mouse but its spines are exciting physicists

The sea mouse, or *Aphrodita*, has spines that normally appear deep red in colour. But when light falls on a spine perpendicular to its axis, stripes of different colours appear - strong blues and greens.

Writing in the journal Nature, the scientists, led by Ross McPhedran, from the University of Sydney in Australia, said: "The simple structure responsible for this effect is a remarkable example of photonic engineering by a living organism."

Hexagonal cylinders

Photonics is a branch of optics technology concerned with the control of photons, the elementary "packages" of light.

The researchers investigated the sea

Search BBC News Online

GO

Advanced search options

Launch console for latest audio/video

BBC ONE TV NEWS
WORLD NEWS SUMMARY
BBC NEWS 24 BULLETIN
PROGRAMMES GUIDE

See also:

07 Apr 00 | Scotland
Lasers point to faster internet
14 Nov 99 | Sci/Tech
Optic fibre world records broken
26 Nov 99 | Scotland
Lighting a laser lifeline

Internet links:

Nature
Sea Mouse

The BBC is not responsible for the content of external internet sites

Top Sci/Tech stories now:

Gas clouds disappear into 'nothing'
New fears for planet's welfare
Virtual lab brings science to life
Endangered animal clone dies
GM monkeys will 'not replace mice'
The end for free SMS?
The military get mightier
No sequel to Seahenge

Links to more Sci/Tech stories are at the foot of the page.

investigated the sea mouse’s photonic skills by mounting a spine in resin, slicing it into sections and examining it under an electron microscope.

This effect is a remarkable example of photonic engineering by a living organism ”

They found that the spine was made up of numerous hexagonal cylinders, stacked in layers to form a crystal-like structure.

Each cylinder is just a fraction of the wavelength of light in diameter. The precise arrangement of the cylinders maximised reflectance around a narrow wave bandwidth, giving rise to the red colour.

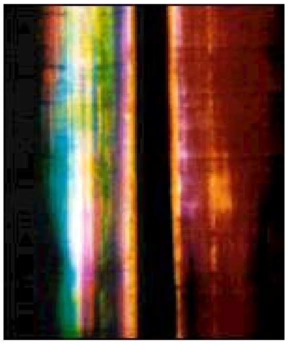
Remarkably, the spines handle light with almost 100% efficiency.

Sea-floor life

The spines are made of protein and have a defensive role. Their colour acts as a warning to predators.

The high reflectance of the spines appears to be a product of habitat. The sea mouse exists from the ocean shallows to the abyssal depths, having been found at over 2,000 metres (6,560 feet) down.

"Below a few hundred metres little light reaches the ocean floor, so for the spines to be effective they must make best use of every scrap of light available," said co-researcher Dr Andrew Parker of the University of Oxford. .


The off-axis colours of blue and green replace the brilliant red

"Although the photonics of the spines are elegant and sophisticated, the spines themselves are simple.

"The mouse extrudes the spine material in the easiest way possible, much as a silk worm produces silk."

Because of their size and design, the hexagonal cylinders in the sea mouse spines perform much more efficiently than man-made optical fibres.

The researchers suggested that growing similar optical filters by molecular self-assembly might be possible:

"These structures may have application in photonic communications, where there is much interest in fabricating photonic crystal fibres with similar morphology."

Images courtesy of the University of Sydney, Australia

Links to more Sci/Tech stories