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OBSERVATORY

A Worm Ahead of Its Time

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One promising area of physics research involves photonic crystals, tiny lattice structures that can be used to trap and manipulate light particles, or photons, much the way a semiconductor crystal manipulates electrons. Among other things, photonic crystals raise the possibility that one day light could replace electricity as the currency of computers. The crystals were first proposed in 1987, but only recently have they been created in the laboratory. Because they require techniques like drilling nanometer-scale holes in silicon, photonic crystals can be extremely difficult to fabricate.

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But not, apparently, for the sea mouse, an eight-inch long marine worm that is covered on its top surface by spectacularly iridescent spines. Researchers at the University of Sydney, writing in the journal Nature, say these spines form a photonic crystal, the first ever found in a living organism.

The spines are essentially hollow tubes, with the outer walls consisting of tiny cylinders of chitin, the same structural material found in lobster and crab shells, arranged in regular, close-packed layers. These layers - 88 of them - are what give the spine its crystalline quality, reflecting light as it passes through it.

One of the prime characteristics of a photonic crystal is that it

has a band gap - a range of light frequencies that is not propagated within the crystal, but rather reflected. A sea mouse spine exhibits this characteristic, reflecting the various colors of the spectrum depending upon the angle of the light hitting it. When the light is perpendicular to the axis of the spine, for example, the spine is deep red. But when the light is off axis, the spine could appear blue or green.

Defending the Park

What could possibly be wrong with a national park? Plenty, according to some critics, who say that in the developing world especially, parks and other protected areas that only seek to protect nature and wildlife, and not the needs of local human populations, are prone to failure. If the culture and livelihood of the indigenous people are not respected, the argument goes, then there will be no local participation in conservation - in fact, local agricultural and other practices will threaten the conservation efforts.

But a new study of 93 parks in tropical countries by Conservation International, which is based in Washington, found that by several measures these parks, all of which are under strong land-use pressure from local people, were effective in protecting the ecosystems and species within them from threats like logging and land clearing for agriculture.

The study, reported in the journal Science, found that most of the parks were in better shape than the land immediately surrounding them, with less land clearing, greater populations of game and other animals, less logging, and less burning and grazing of land. Close to 85 percent of the parks studied were holding their own against encroachment by agriculture. The researchers found that among the park practices that made them effective were the presence of guards and of deterrents like fines and other penalties for land-clearing and logging. (Deterrents were not as effective against hunting.)

The researchers say their study shows that parks should remain an important part of conservation efforts and that rather than being abandoned, they should receive increased support.

Millennium's First Eclipse

The first eclipse of the new millennium occurs tonight, and it is a lunar one, caused when the Moon passes through Earth's shadow (it is Earth that is doing the eclipsing). Unfortunately, the eclipse will only be viewable in totality in Africa, Europe,

Asia and western Australia. But observers in New England who look for the rising Moon at sunset may catch the tail end of the eclipse, when the Moon is only partly in shadow. North American viewers will have to wait until 2003 for the next total lunar eclipse.
