

Squid 'sight': Not just through eyes

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It's hard to miss the huge eye of a squid. But now it appears that certain squids can detect light through an organ other than their eyes as well.

That's what researchers at the University of Wisconsin-Madison report in the current issue (June 2) of the [Proceedings of the National Academy of Sciences](#).

The study shows that the light-emitting organ some squids use to camouflage themselves to avoid being seen by predators — usually fish sitting on the ocean floor — also detects light.

The findings may lead to future studies that provide insight into the mechanisms of controlling and perceiving light.

"Evolution has a 'toolkit' and when it needs to do a particular job, such as see light, it uses the same toolkit again and again," explains lead author Margaret McFall-Ngai, a professor of medical microbiology and immunology at the UW-Madison School of Medicine and Public Health (SMPH). "In this case, the light organ, which comes from different tissues than the eye during development, uses the same proteins as the eye to see light."

In studying the [squid](#) for the past 20 years, McFall-Ngai and her colleagues have been drawn to the fact that the squid-light organ is a natural model of symbiosis — an interdependent relationship between two different species in which each benefits from the other.

In this case, the light organ is filled with luminous bacteria that emit light and provide the squid protection against predators. In turn, the squid provides housing and nourishment for the bacteria.

The UW-Madison researchers have been intrigued by the light organ's "counterillumination" ability — this capacity to give off light to make squids as bright as the ocean surface above them, so that predators below can't see them.

"Until now, scientists thought that illuminating tissues in the light organ functioned exclusively for the control of the intensity and direction of light output from the organ, with no role in light perception," says McFall-Ngai. "Now we show that the E. scolopes squid has additional light-detecting tissue that is an integral component of the light organ."

The researchers demonstrated that the squid light organ has the molecular machinery to respond to light cues. Molecular analysis showed that genes that produce key visual proteins are expressed in light-organ tissues, including genes similar to those that occur in the retina. They also showed that, as in the retina, these visual proteins respond to light, producing a physiological response.

"We found that the light organ in the squid is capable of sensing light as well as emitting and controlling the intensity of luminescence," says co-author Nansi Jo Colley, SMPH professor of ophthalmology and visual sciences and of genetics.

Adds McFall-Ngai, "The tissues may perceive environmental light, providing the animal with a mechanism to compare this light with its own light emission."

McFall-Ngai's large research program into the relatively simple squid-light organ symbiosis aims to shed [light](#) on symbiosis affecting humans.

"We know that humans house trillions of bacteria associated with components of eight of their 10 organ systems," she says. "These communities of bacteria are stable partners that make us healthy."

Source: University of Wisconsin-Madison ([news](#) : [web](#))

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