

The Scientist: NewsBlog:

Visual system surprise

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The soil-dwelling model organism *C. elegans*, long assumed to lack any visual system whatsoever, in fact appears to be strongly responsive to light, according to a [paper](#) published online yesterday (July 6) in *Nature Neuroscience*. The study identifies four sensory neurons that act as photoreceptor cells driving this phototactic behavior, and suggests a conservation of phototransduction between vertebrates and worms.

"The research is very compelling," said [Aravinthan Samuel](#), who studies sensory inputs and navigational behaviors in *C. elegans* at Harvard. "It's the strongest evidence so far that phototaxis is a bona fide modality in worms."



C. elegans live in the darkness of soil and lack eyes, so the tiny roundworms were never chosen as a candidate to study sensory response to light stimulus. But [Shawn Xu](#), a biologist at the University of Michigan, reasoned differently. "There must be some reason they want to stay in soil," he proposed. "They could be avoiding light."

Xu's team conducted simple behavioral tests to show that *C. elegans* exhibited negative phototaxis, movement away from light. The worms' avoidance response proved to be dose-dependent and strongest when exposed to UV and blue light. Prolonged light exposure paralyzes and kills the organism, the paper notes, so the behavior is likely a protective mechanism.

"But behavior doesn't hold final proof," said Xu. The researchers then used a laser to ablate selected neurons to determine which were responsible for the behavior. Four ciliated neurons, cells including rod and cone cells whose modified cilia capture sensory inputs, were implicated. Their simultaneous death led to a severe defect in the worm's light avoidance behavior.

To show that the proposed cells could sense light, the team recorded their activity when struck by photons, and found that light invokes an electrical response similar to that observed in vertebrate photoreceptors. The team also found that worms with mutant alleles for homologues of the receptors which mediate phototransduction in vertebrates, cyclic nucleotide-gated (CNG) channels, showed phototaxis defects, providing further evidence that the proposed neurons act as photoreceptor cells.

"We showed that the photoreceptor cells are truly light sensitive on their own," said Xu, but he noted that the paper is just a start. The team now plans to use genetic screening to further define the worms' phototransduction pathway.

The next step, said Samuel, is to identify a receptor for photoreception in *C. elegans*. "That would be the real proof," he says, "but that's going to be a lot of work."