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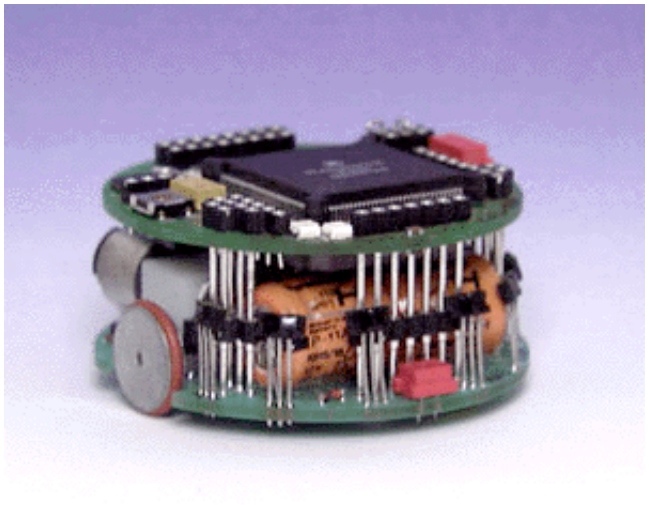
Lamprey Brain Drives Robot

NEW ORLEANS--Like some monster out of a B-grade horror movie, the detached **brain** of a lamprey can command a **robot** to careen through a lab. The scientists who designed the project aren't mad, however; they are using this so-called neuro-**robot**ic interface to study how the **brain**stem and spinal cord work. Someday, they hope, the research will aid the development of **robot**ic prostheses for humans.



It's alive! The Khepera **robot** sends light signals to the lamprey **brain**stem, which fires back motor commands to the **robot**'s wheels.
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The star of this show is the lamprey, a jawless fish that looks and acts like an eel. Lampreys tell up from down and keep their balance while swimming with part of the nervous system called the vestibular system. If injured on one side of its body, a lamprey might swim off-kilter for a while, but the vestibular system soon detects this drift and orders the muscles to compensate.

This feedback circuit seemed simple enough to translate into **robot**ic commands, says biomedical engineer Karen Fleming of Northwestern University Medical School in Chicago. She and her colleagues dissected the **brain** and spinal cord out of a lamprey and wired it up to a standard-issue lab research **robot** called a Khepera equipped with light sensors and wheels. First, the researchers patched signals from these sensors into the lamprey's **brain**stem. Second, the team directed nerve impulses from the spinal cord, which normally transmits signals from the **brain** to muscles, to the **robot**'s wheels.

Through trial and error, the lamprey **brain** learned to send signals that guided the **robot** toward a light source, the researchers reported here 9 November at the Society for Neuroscience annual meeting. The nervous-system-in-a-dish is also able to direct the **robot** to move in spiral or circle patterns, Fleming says. Although the work is in its early stages, she says the team hopes to use this model to guide the development of **robot**ic prostheses for people with missing limbs.

The system is "exceedingly novel," in the words of bioengineer Robert Scheidt of Marquette University in Milwaukee, Wisconsin. Hooking up an electromechanical device to a nervous system, he says, "provides a whole new avenue of approach" for research on the nervous system and how it might be integrated with **robot**ic systems.

--LAURA HELMUTH

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