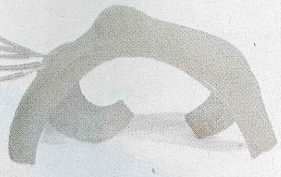
By Joshua A. Krisch

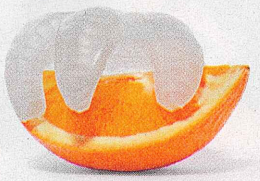
The Softer Side of Robots

Robots as we know them are made out of hard parts so that engineers can precisely calculate and program how they move. But they can also be clunky, costly, and dangerous. One of the most sophisticated automatons, the $400 million Mars Spirit rover, got stuck in a sand trap when its wheels couldn't grip the dirt. Now the emerging field of soft robotics aims to mitigate the shortcomings of hard robots. Its goal: build autonomous machines out of malleable materials that work better in sensitive sites such as disaster areas and emergency rooms. The softer, lighter machines could make surgeries safer and less painful, enhance search-and-rescue operations, and improve factory safety. The rise of the robots is looking surprisingly human. Or at least fishlike.



SEARCH AND RESCUE

A perfect robot in a disaster would wriggle effortlessly over rubble, carry sensors, and cost so little that rescue teams could leave it behind. Soft prototypes from the Whitesides Research Group at Harvard that walk on four legs and can also undulate like a worm show promise.



COLLABORATIVE ROBOTS

"Factory robots are dangerous to work around," says Carl Vause, CEO of Soft Robotics, a company focused on commercializing soft-robotics technology. One example of a soft robot that could safely work alongside humans is this dexterous, starfish-shaped gripper, also out of Harvard's Whitesides Research Group.

MEDICAL APPLICATIONS

The Harvard Biodesign Lab's soft-robotic glove can assist the disabled and let patients replicate physical therapy exercises at home. Conor Walsh, founder of the lab, says such wearable uses suit soft robots well. His group also designs surgical devices, such as retractors, that manipulate tissue while minimizing trauma.

BIOMIMETICS

MIT's soft-robotic fish mimics its living counterpart. "We often take our cues from biology," says Barry Trimmer, editor in chief of the new *Soft Robotics* journal. "Animals are living prototypes of what we want to build." That's because most animals are already adapted to a wide range of environments.

PHOTOGRAPHS BY DEVON JARVIS