

# Bionic Muscles

**Material designed for NASA's asteroid explorer may one day aid motion of human patients**

MOST OF US KNOW bionics as the instrument that propelled Lee Majors over vast ravines and fences on a television show roughly two decades ago. Majors, playing Col. Steve Austin, was an astronaut "rebuilt" after a crash. With bionic muscles, the character was capable of terrific feats of strength and speed.

In a stunning real-life application, a group of NASA scientists in a laboratory in Pasadena, Calif., is working with artificial muscles that could revolutionize the lives of millions of handicapped people and enable many to walk again.

Scientists at the Jet Propulsion Laboratory are developing artificial muscles for a space rover, scheduled for launch in 2002. The palm-sized rover, to be dispatched to an asteroid, will be equipped with lightweight plastic wipers that operate much like human muscles. The wipers, which are extremely flexible and sinewy,

operate on electronic impulses and will wipe dust from the rover's screen.

Dr. Yoseph Bar-Cohen, one of several scientists working on the project, said the wipers should have human medical applications within 20 years.

At a recent conference on electroactive polymers, Bar-Cohen set a challenge to about 150 scientists to reach that goal.

Surgery could one day be used to implant the artificial muscles to replace those that no longer are useful because of disease or injury.

The first challenge the scientists face is to coordinate strength with flexibility. Right now, the wipers at JPL can move only about 17 grams of weight, but they are able to operate quickly and over a full range of motion. Scientists working on similar technology at the University of Arizona are able to generate a force equivalent to human muscle, but the motion is neither fluid nor fast.

"It's just a matter of time before we connect all of those possibilities," Bar-Cohen said. "It's like the PC. It keeps improving. That's what we want to see in



While the artificial muscles are still at a rudimentary stage, NASA scientists are challenging researchers to aim for medical applications.

this . . . It's like a snowball that's picking up speed."

In the immediate future, scientists will use the material to create simple, insect-like robots whose "muscles" operate together to make them move more smoothly and to traverse great distances. The robots could be employed to collect data on other planets. Still, the long-term goal is closer in application to the popular television show.

"My hope is someday to see a handicapped person jogging to the grocery store using this technology," Bar-Cohen said. "All we need is to march in this direction. There's light at the end of the tunnel."