



## Tiny space rover to use artificial 'muscles'

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By **DEBORAH ZABARENKO**

WASHINGTON (February 18, 1999 9:58 P.M. EST <http://www.nandotimes.com>) - Artificial "muscles" which will be used as windshield wipers aboard a tiny space rover might one day be used to make "bionic" battery-powered limbs, an American space scientist said Thursday.

The plastic muscles are designed to give finger-like flexibility to the palm-sized Japanese Mu Space Engineering Spacecraft, which will blast off for an asteroid in 2002 and come back to Earth with samples.

At this point, the artificial muscles aboard Mu will be used to swish over a viewing window to keep it clear of asteroid dust.

But Yoseph Bar-Cohen, who heads a team working with the plastics at NASA's Jet Propulsion Laboratory in California, said a "hand" could be developed using ribbons of the material.

Such a hand, comprised of four strips of this bendable plastic, is able to grasp and lift a rock when an electric charge is run through it, Bar-Cohen said in a telephone interview from Pasadena, California.

"It does look like a hand with four fingers," Bar-Cohen said, referring to a laboratory model of a claw-like object. "It opens its fingers and closes them, it has 'nails' that are hooks."

There are two types of artificial muscles under development out of lightweight polymers: one type that bends like a finger when activated by electricity, and another that lengthens or contracts when activated, Bar-Cohen said.

Such lightweight, flexible materials could change the way space scientists make robots, which have been too heavy and too power-hungry for future space missions.

"There is so much incredible potential, because of the (artificial muscles') similarity to what we do with our body," Bar-Cohen said. "...It has this resilience that we have in human muscle and has a similarity in how it works. It is a simple signal that we give to make it longer or shorter, compared to the complex signals we give to move a robot."

Far in the future, artificial muscles powered by lightweight batteries could be used to create "bionic" limbs for the handicapped, the National Aeronautics and Space Administration said in a statement.

Bar-Cohen had a vision of an arm-wrestling match between a person with an artificially muscled arm and a normal person, but said such a contest is far off.

"Bionic' human limbs are likely to be preceded by much smaller-scale robots, possibly robotic insects designed to work together like ants or even a robotic butterfly.

Such notions may be discussed next month in an engineers' symposium on artificial muscles in Newport Beach, California, NASA said.

An Internet site (<http://ndea.jpl.nasa.gov>) gives more information on artificial muscles and Bar-Cohen's research.

