

# TURBO-POWERED PHYSICAL THERAPY



**ARMS OF STEEL** Engineer Jacob Rosen invented these robot limbs to rehabilitate stroke victims.

**WHAT** An exoskeleton that dramatically speeds up recovery times from stroke

**WHERE** Santa Cruz, Calif.

**WHY** An estimated 780,000 Americans will suffer a debilitating stroke this year.

**WOW** The robot can simulate 95 percent of the motions of a healthy human arm.

**THESE RUGGED** robotic arms look as if they could toss a truck, but they're more like gentle training wheels for stroke victims who have lost movement in their arms. The exoskeleton is designed to train healthy regions of the brain to slowly pick up the slack for damaged areas and quickly restore control over muscles. A user straps into the powered arms and repeats exercises meant to stimulate new connections between brain cells. "It can do things a physical therapist can't," says computer engineer Jacob Rosen of the University of California at Santa Cruz, who invented the exoskeleton with grants from the National Science Foundation and the U.S. Army. Sensors assess a patient's performance, telling therapists about his range of motion, muscle strength and brain activity, while virtual-reality goggles play scenes of everyday tasks to make the exercises more engaging. Rosen is currently rehabilitating five patients at the University of California at San Francisco.

## OUT-OF-BODY EXPERIENCE

**WHAT** Brain-Machine Interface by Honda, which lets you control a humanoid with your mind

**WHERE** Tokyo

**HONDA'S NEW** Brain-Machine Interface helmet gives you the power to communicate telepathically with humanoids. It reads your thoughts by measuring changes in electrical current and blood flow in the brain. Say you imagine moving your right hand toward the sky, but you can't actually move your right hand. Electrodes inside the skullcap detect your intention and transmit the mental data to Honda's Asimo robot, which makes the movement for you. For people confined to a wheelchair or bed, the technology could offer real independence. According to Honda spokesman David Iida,

**WHY** Disability affects one in five Americans.

**WOW** Requires no surgical implants and boasts a 90 percent accuracy rate

it's the only mind-machine interface in the world that uses electroencephalography (EEG) and near-infrared spectroscopy sensors instead of surgically implanted electrodes. This is both less invasive and more accurate: The company says that Asimo follows instructions from the skullcap wearer 90 percent of the time.

The next design goal is to make the headgear less obtrusive.

**MIND CONTROL** A sensor-equipped skullcap detects electrical signals to let a patient control a robot by thought alone.

