

three years before the therapy is in human trials, and up to ten years before doctors can pen a prescription.

## WIRED FOR **MOTION**

To rev up your power tool, you send juice into it through an electric cord. What if doctors could restore motion to a paralyzed arm or leg by running a wire to the brain? They're working on it. Researchers have implanted electrodes into the brains of rhesus monkeys—our close biological cousins—and trained them to work a computer with their minds. One set of monkeys managed to bat 3-D images of balls back and forth while their hands were immobilized.

It works like this: Hair-width electrodes are attached to the motor cortex, the part of the brain that controls movement. Whenever the monkey thinks of moving his arms, these electrodes transmit impulses to a computer. It runs the signals through a mathematical program that either moves a cursor on a screen (an experiment at Brown University), or bats 3-D images of balls (a project at Arizona State University). The computer program is based on decades of work mapping the brain-wave patterns that control the arm movements of monkeys, which are thought to be similar to those of humans.

A Georgia researcher, Dr. Philip R. Kennedy, has implanted similar devices in five human patients who were "locked in," the most extreme form of paralysis that eliminates both speech and movement. This "brain commu-

nicator," as Dr. Kennedy calls the equipment, allows patients to move a cursor on a computer screen and type out messages. To someone in the end stages of Lou Gehrig's disease—as was the case with three of the five patients in this experiment—the gift of communication is priceless.

More sophisticated gadgetry could someday improve the lives of paralyzed people even more dramatically. Eventually, electrodes could pick up signals from the motor cortex and bypass spinal cord injuries to actually move arms and legs.

Dr. Andrew Schwartz thinks another goal may be closer at hand. Recently, the researcher at Arizona State began experimenting with a Chinese-made prosthetic arm that is crammed with motors and sensors and has a full range of motion from wrist to shoulder. Now when he puts his monkeys to work, they transmit signals to a computer that moves the robotic arm. By the time such prosthetic limbs are tried on people, thumbnail-sized computer chips will be implanted in the brain, so patients won't need to drag a computer around with them. When that day comes, amputees may suddenly have the dexterity to write with a pen—or use a power tool.

## FROM SWINE TO **HUMAN**

It's the stuff of ancient lore: Satyrs, sphinxes and other imaginary creatures mingled human and animal parts. Another idea that has crossed over from fiction to fact. Already cardiologists implant pig heart valves in hu-