

# WILL WE MERGE WITH MACHINES?

Advances in medical science may well lead to more-than-human abilities

The pattern is familiar: Researchers develop a technology or drug to aid the ailing. Soon thereafter, healthy people co-opt it to make themselves stronger, faster or smarter. Follow this trend far enough, and we reach the augmented human. POPULAR SCIENCE has scoured the most promising research under way in bioengineering laboratories worldwide to take an informed look at how technology will enter and alter our bodies over the coming decades. Below, a glimpse at the man of the future.

## WHEN?

- ⌚ 0-5 years
- ⌚⌚ 6-10 years
- ⌚⌚⌚ 11-15 years
- ⌚⌚⌚⌚ 16+ years

### TELEKINESIS TECH ⌚⌚⌚

Researchers at Brown University and Cyberkinetics in Foxborough, Massachusetts, are devising **brain implants that will enable us to communicate with machines**. A microchip implanted in the motor cortex just beneath your skull will intercept nerve signals and reroute them to a computer, which will then wirelessly send the command to any of various electronic devices, including computers, stereos and electric wheelchairs.

### LASER-SCANNED EYES ⌚

Researchers at Smart Holograms in Cambridge, England, have made **contact lenses that tell diabetics when their blood sugar is awry**. Changes in tear sugars deform an insert in the lens, altering the refractions from imperceptible dots on the surface. Next: a lens that detects blood pressure.

### CELLPHONE BY DENTIST ⌚⌚⌚

Imagine never forgetting your cellphone. A German design team has designed a **microvibration device and a wireless low-frequency receiver that can be implanted in the tooth**. The vibrator acts as microphone and speaker, sending sound waves along the jawbone to your eardrum.

### HEART OF TITANIUM ⌚

Today's state-of-the-art artificial heart is the Abiocoar. Unfortunately, the device fits just 50 percent of the male population. It also quits working after a year or two. The Abiocoar II, due out in 2008, will be 30 percent smaller, fitting most men and 50 percent of women, and will last up to five years.

### DRUG PUSHER ⌚⌚

ChipRx in Lexington, Kentucky, is developing a system that automatically delivers the medication you need, when you need it. The **matchstick-size device is loaded with your prescription and inserted into the chest**. When its sensor notices changes in body chemistry or temperature, the device pumps meds from its reservoir.



### MICROCHIP MEMORY ⌚⌚⌚

Neural engineer Ted Berger of the University of Southern California is developing a way to enhance memory. **A microchip will send signals from one healthy brain cell to another**, bypassing damaged tissue that would otherwise block the message. His artificial hippocampus will first help Alzheimer's patients regain the ability to form memories, then aid the merely forgetful.



The artificial neuron is programmed to mimic the responses of brain cells, forming a bridge across damaged tissue.

### NERVE-ZAPPING HEARING AID ⌚⌚

The Bionic Ear Institute in Australia is building an implant for the inner ear that will **shock damaged nerves back to health**. A small pump showers the nerves with stimulating chemicals while electrodes excite the cells to keep them alive.

### FOUR-DIMENSIONAL VISION ⌚⌚⌚⌚

Humans have three color-producing cones in our eyes—red, green and blue. What if we had four? Scientists at the Medical College of Wisconsin hope to give us genes for a **fourth cone to enable us to see new hues that we can't even imagine right now**.

MIT's living patch beats along with your heart.



### BEATING BAND-AID ⌚⌚⌚⌚

Researchers at MIT are devising a **bandage made with living heart cells**. After a heart attack, it will contract along with the rest of the heart, replacing damaged tissue.

### SHOCK THERAPY FOR THE GUT ⌚

A pacemaker created by Transneuronic in New Jersey is **helping test subjects lose 25 to 40 percent of their body fat**. Its mild shocks relax and expand the upper part of the stomach, and the brain interprets the distended stomach as feeling full.

### HIGH-FIBER LUNG ⌚⌚

University of Pittsburgh researchers are working on the **world's first implantable lung**. The tube-shaped device will be made of gas-permeable microfibers. Carbon dioxide diffuses across the fibers and moves toward a compact pump at the hip. The pump expels the carbon dioxide and pulls in oxygen, which diffuses back through the fibers into the blood.

