

SMART STUFF

The jewelry box of the future could include rings that remember your predilection for vanilla-flavored café au lait. **By Kathryn S. Brown**

ROSALIND PICARD never realized just how much she squints—until her headband told her. Brooding in Boston traffic recently, waiting for a wall of cars to grind forward, Picard could hear the insistent beeps of a tiny sensor tucked inside a band worn around her forehead—each beep a signal that she had just furrowed her brow in frustration. It's biofeedback as fashion statement. And it's coming to a store near you.

As a scientist at the Massachusetts Institute of Technology's Media Lab, Picard gets to slip on all kinds of "smart" accessories—earrings that measure blood volume pulses, sandals that gauge skin conductivity and glasses that check facial expression are just a few of the trinkets she and her colleagues have designed. Their goal is to make technology ready-to-wear.

Likewise, academic and industry labs worldwide are designing body sensors that detect changes—whether rising fever or just a glance to the right—and respond by offering the wearer useful information. Hidden inside eyeglasses, watches, rings, belts or shoes, these sensors will monitor stress and vital signs, give you a guided tour and maybe even suggest you radio a friend for a pep talk. And the beneficial baubles could hit store shelves within a decade, scientists say.

Smart accessories build off today's body sensors and mobile computers. Already joggers pound along with heart-rate monitors, and delivery boys pack pocket-size computers. At a Sun Microsystems meeting last year, attendees wore rings with a device called an iButton, which can use Java software to store all kinds of information. Loading their coffee preferences into the ring, Sun's participants could order their favorite brew from a robotic coffee machine. And this, researchers suggest, is just the first step toward a budding technology. Gone is the heyday of clutter—blood pressure cuffs, oversize atlases, instruction manuals. In the future, you'll be able to do it all immediately—and in style.

Chances are, you will see things in a whole new light. At Columbia University, computer scientist Steven K. Feiner is crafting eyeglasses that do more than just help you see. Want to try a

restaurant in a foreign city? Glance above the restaurant's doorway, and your glasses will immediately become windows to the Internet, offering you a review of the kung pao chicken or coq au vin served inside. Need some help during a presentation? Look to the right, and your glasses will flash your notes. Tired of thumbing through heavy cookbooks with soufflé on your fingers? Peek past your nose and read the recipe in midair.

A WHOLE NEW WORLD

This is "augmented reality"—a virtual world that adds useful sights, sounds and other sensations to your usual horizon. Today Feiner's eyeglass prototype is a headset that looks like ski goggles, wired to both a handheld computer, which runs an Internet Web browser, and a bulky backpack computer, which tracks the wearer's position using a refined Global Positioning System (GPS) receiver. Students who don't mind stares have tried out the *Star Trek*-like ensemble on Columbia's campus. Looking at a building, the wearer sees text labels overlaid on its surface, with a menu that offers information about the building's architecture, the departments inside or the campus location.

Like tape recorders and headphones, Feiner says, these head-worn displays will get smaller, lighter and smarter as technology improves. Already, small companies such as MicroOptical Corporation in Westwood, Mass., are developing lightweight eyeglasses connected to handheld computers about the size of a Walkman.

With funding from the U.S. Army, MicroOptical has designed glasses that display information from a notebook or wearable computer. Soldiers might use the glasses to communicate with army staff or to check their surroundings. Similarly, repair workers who fix airplanes or cars while wearing the glasses could do without notebooks full of instructions. And down the line, when the glasses have finer resolution and tracking devices, doctors might even use them during surgery.

Patients could set the trend for a line of smart accessories, in fact. At M.I.T., mechanical engineers Haruhiko Asada and Boo-Ho



These futuristic prototypes of smart accessories (left to right, top to bottom) do more than just look rad. With the flick of a wrist, a fingernail sensor can direct a robot. Earrings check stress via the body's blood volume pulse. A running bra measures respiration rate and muscle tension. His-and-hers eyeglasses record furrowed brows that can signal interest or confusion. A shoe tracks skin conductivity, another sign of stress. A glove doubles as a computer text editor. And a ring silently records the wearer's vital signs, contacting a physician by computer if necessary.



PHOTOGRAPHS BY SAM OGDEN

Yang have crafted a ring with tiny sensors that measure the wearer's pulse rate and blood oxygen levels. A wireless transmitter inside the ring sends these vital signs to a receiver and, in turn, to an Internet-linked computer in the patient's home, which reads the signs and e-mails a doctor if anything seems awry. And scientists at Sontra Medical in Cambridge, Mass., are developing an ultrasound system that might fit inside a watch to measure blood glucose quickly and painlessly in diabetic patients.

Every fashion has an avant-garde collection, and smart accessories are no exception. M.I.T. chemical engineer Robert S. Langer and his colleagues this year unveiled a new microchip that could release drugs slowly—or, if tucked inside a ring, give off different scents according to a person's mood. Rather than wear her favorite Chanel all day, a woman using this ring might send off sweet pulses of other perfumes as her body temperature and skin conductivity change. It is perfume with a purpose, if there's a love interest nearby—particularly if it contains a human pheromone [see “Nosing Out a Mate,” on page 52].

Ultimately, shoppers—not scientists—will determine which

smart accessories succeed, Feiner notes. The trinkets should be easy—and pleasant—to use. Researchers can now show off gloves that detect motion, allowing a person to change data on a computer screen, for example. “But have you ever smelled an unwashable glove that a graduate student wears every day?” Feiner asks. “This, as we say, is a nontrivial issue.”

And vanity may prevent some people from donning glasses, no matter how clever. Engineers, however, are prepared for that. Some are interested in crafting augmented-reality contact lenses and binoculars. In fact, as small computer displays get brighter and cheaper, Feiner says, the screens will quite likely pop up in many a bauble. “Remember how Dick Tracy used a wristwatch TV for conferencing?” he asks. “That’s going to happen. Soon.”

ABOUT THE AUTHOR

KATHRYN S. BROWN is a freelance writer who lives in Columbia, Mo. Her smartest accessory is a mood ring that turned permanently green seven years ago.