

Homepage / Science / Health / Breakthroughs / Electronic Sensors That Stick to Your Skin Like Temporary Tattoos

## Electronic Sensors That Stick to Your Skin Like Temporary Tattoos

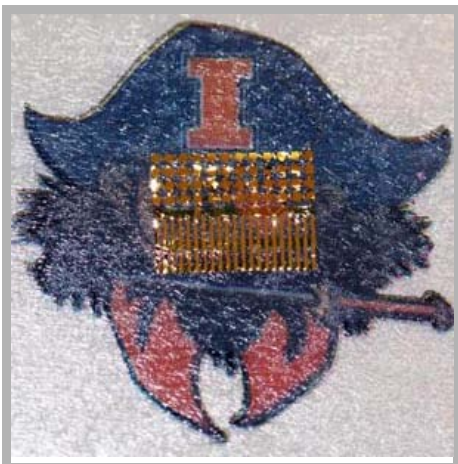
Nice tattoo. Or is it a heart-rate monitor? New research shows that thin sheets of meshlike silicon, less than half the thickness of a human hair, can be put onto the skin in the same way as a removable tattoo—and equipped with electrical components to measure biometric information.

By Douglas Main

Like Confirm Tweet 2 Comments 0 Email Print

August 11, 2011 5:00 PM

TEXT SIZE: A . A . A



J. Rogers, University of Illinois

**A study published today** in *Science* shows that ultrathin patches of electronics—less than half the width of a human hair—can be placed onto the skin to measure the electrical activity of the heart, muscles and brain. And using the same principles behind removable tattoos, these devices could be affixed to the skin with minimal or zero adhesives, staying there for hours or longer.

“We view this as the first step in blurring the distinction between an artificial, manmade system like a piece of electronics and a natural biological tissue like the skin,” John Rogers says. Rogers, a University of Illinois professor of material science, is lead author of [the study published this week in Science](#). Rogers’s technology contains a mesh of silicon-based electronics embedded into a rubbery sheet. The entire thing is 40 micrometers thick. Because the design can incorporate a virtually endless variety of electrical parts like transistors, diodes and sensors, it isn’t limited to act as any single device.

Rogers says the project started with the challenge of matching the components of a rigid silicon chip to the flexible surface of our skin. The solution: making it ultrathin. Everything bends if you slice it thin enough, Rogers says, pointing out that a sheet of paper is basically the same material as a 2 x 4, simply much thinner.

The electronic components are built into curving strands of silicon that can stretch and buckle along with the skin and are embedded in a rubbery sheet. Rogers then uses a water-soluble backing to hold those components together. Once you stick the entire thing to a person’s skin, water washes

### CONNECT WITH POPULAR MECHANICS:



ADVERTISEMENT

### FEATURED VIDEO

### GIVEAWAYS

➤ Enter for a Chance to Win the WORX Yard Care Combo Pack!

SPECIAL OFFER

SAVE UP TO 81% OFF

WHAT'S YOUR DIV? Popular Mechanics AIR STRIKE 2025

SUBSCRIBE NOW

away the backing, leaving the device held to the skin only by a weak attraction called Van der Waals forces.

Rogers shows in his study that one version of his creation, when placed on a study volunteer's chest, can measure the person's heart electrical activity just as well as an electrocardiogram (EKG). But where the EKG requires several bulky electrodes, as well as straps to hold it on and conductive pastes or gels to transmit electrical signals, Rogers's epidermal electrical system does away with all that. Igor Efimov, a biophysical engineer at Washington University in St. Louis, even goes a step further. "It's probably better than an EKG," he says. "Because it can take measurements from many different places on the skin, you gather more and lose less signal."

Though Rogers's paper just came out today, several researchers are already trying to adapt Rogers's technology. That includes Efimov: He wants to use the sensors to study the heart activity of animals and humans. "This opens endless opportunities to interface, or communicate, between the human body and computer platforms," he says, calling it a major milestone in the history of medicine.

University of Pennsylvania neurologist Brian Litt is looking at the brain. He tells PM that he's most intrigued by the system's potential to both measure electrical signals and deliver them, which could help treat debilitating diseases or injuries. "The most exciting applications will likely be for medical rehabilitation, such as reading activity from the muscles and nerves and then applying the information in some kind of device to restore balance, movement or sensation," he says.

And there's mc10, a company based in Cambridge, Mass., with 15 employees that commercializes technologies developed in Rogers's lab. Next year the company plans to release a wearable device that can monitor heart rate and muscle activity, vice president Ben Schlatka says. He says the company is also planning products to measure vital signs like hydration level. "In the near term, [it] will change how consumers interact with their electronic devices," he says. "In the long term [it] will revolutionize medical electronics."

Not all the possibilities for Rogers's device are fully realized yet. Though he built versions of the device that contained the components necessary for wireless communication, he hasn't yet used it to transmit data—though he's working on it. For now, he uses wires to physically connect the device to a computer. Finally, the time that the system could be used is limited currently by the fact that skin sweats and eventually sloughs off the device, Litt says.

Nevertheless, the creation by Rogers and colleagues allows for plenty of speculation about sci-fi becoming reality. Princeton University mechanical engineer Michael McAlpine says these kinds of devices open the door to thinking about skin-mounted computers or bionic eyes. "You could, for example, have Google maps on the surface of your eye," he says.

**TAGS:** [sensors](#), [EKG](#), [medical breakthroughs](#), [heart rate monitors](#)

ADVERTISEMENT

**Digi-Key Official Site**

2 Million+ Components In Stock. Preferred by Design Engineers.

[www.digikey.com](http://www.digikey.com)

**Electronic Course**

Year Round Classes at ITT Tech Official - ITT Tech Institute Site

[www.itt-tech.edu](http://www.itt-tech.edu)

**Circuit Simulator**

Analog, Digital, Mixed mode Circuit Simulator. Download now!

[www.tina.com](http://www.tina.com)

**Custom Temporary Tattoos**

100% Satisfaction, Safe & Fun! Free Shipping On All Orders. 500 pc min.

[www.CustomTattoosUSA.com](http://www.CustomTattoosUSA.com)



AdChoices

**Post a comment**

Facebook social sharing interface with a profile picture placeholder and a "Post to Facebook" button.

Facebook social plugin



ENTER NOW >

> See All Giveaways

**WE'RE HERE FOR YOU WHEN YOUR ROBOT IS READY FOR AN UPGRADE.**

Everyone deserves a recharge.

**Digi-Fact:** Over 565,000 products in stock.

[www.digikey.com](http://www.digikey.com)

**MORE FROM POPULAR MECHANICS**

- [Confessions of a Car Salesman](#)
- [11 Cars That Beat High Gas Prices](#)
- [Top 10 Must-Have Cars of 2011](#)
- [12 New Cars That Are Worth Waiting For](#)
- [The 13 Most Dangerous Car Interiors in History](#)

**FROM OUR PARTNERS**

- [Purolator AutoFilters: Be Car Care Aware](#)
- [Use Your Motorhead. Drive Smarter with Gumout.](#)
- [Cub Cadet's All-New Series 2000](#)

## More From Popular Mechanics

### AUTOMOTIVE

- [Using Nitrogen in Car Tires](#)
- [Is Synthetic Oil Better?](#)
- [New Electric Cars](#)
- [Best Tire Brand Comparison](#)

[> More](#)

### TECHNOLOGY

- [Best iPod FM Transmitter](#)
- [How to Make a Speaker](#)
- [Hard Drive Data Recovery](#)
- [Underwater Digital Cameras](#)

[> More](#)

### SCIENCE

- [UFO Movies](#)
- [Survival Kit Checklist](#)
- [Bomb Shelters](#)
- [Wind Turbine Design](#)

[> More](#)

### OUTDOORS

- [DIY Solar Panels](#)
- [Powerful Handguns: Smith & Wesson](#)
- [Barefoot Running](#)
- [Green Design](#)

[> More](#)

### HOME HOW TO

- [How to Build a Smoker](#)
- [How to Build a Shed](#)
- [How to Install Drywall](#)
- [How to Build a Fence](#)

[> More](#)

### DIY CENTRAL

- [Plans for Building a Pergola](#)
- [Bookshelf Plans](#)
- [How to Make Beer](#)
- [Suspended Ceiling](#)

[> More](#)

### MOST POPULAR

- [Tennis Serve](#)
- [World's Largest Cruise Ship](#)
- [Winterize Your Boat](#)
- [How to Hang a Picture Frame](#)
- [Ab Machines That Work](#)

### FEATURES

- [Apple TV Reviews](#)
- [Painting Tips](#)
- [Raised Garden Beds](#)
- [Home Inspection Checklist](#)
- [Automotive News](#)

ADVERTISEMENT

Get Interactive with  
**Popular Mechanics**

An iPad Exclusive:  
**CLICK HERE**  
to download this special issue!



SPECIAL OFFER

**Hot Ride**  
Sweepstakes

ENTER TO WIN



PopularMechanics

### SIGN UP

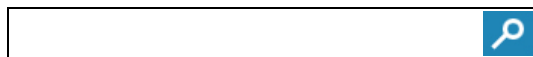
FOR POPULAR MECHANIC'S FREE NEWSLETTER

#### POPULAR MECHANICS NEWSLETTER

Don't miss out...Get our hottest stories delivered right to your inbox every week, free!

You'll get the news on the latest innovations in tech, autos, home, science and more.

[SIGN UP >](#)



TRY: [Lawn Care](#) / [Tool Reviews](#) / [DIY Car Repair](#)

#### ABOUT POPULAR MECHANICS

- [iPad App Edition](#)
- [Digital Edition](#)
- [About Us](#)
- [Press Room](#)
- [Privacy & Terms of Use](#)
- [Site Map](#)
- [Contact Us](#)
- [Community Guidelines](#)
- [Advertise Online](#)
- [About Our Ads](#)

#### POPULARMECHANICS.COM

- [Automotive](#)
- [Technology](#)
- [Science](#)
- [Home How-To](#)
- [Outdoors](#)
- [DIY Central](#)

#### STUFF MEN LIKE

- [How to Build a Car](#)
- [Home Inspection Checklist](#)
- [Diesel Truck Reviews](#)
- [DIY Solar Panels](#)
- [Science Fiction Movies](#)
- [Fuel Injector Cleaner](#)
- [Hard Drive Data Recovery](#)
- [Synthetic Oil Review](#)
- [Most Fuel Efficient Cars](#)
- [Best Men's Watches](#)
- [How to Make Pancakes from Scratch](#)

#### REVIEWS

- [Mens Shoes](#)
- [Best Restaurants in NYC](#)
- [Tuxedo Styles and Reviews](#)
- [Upcoming Movies 2011](#)
- [Zero Turn Mowers](#)
- [Raised Garden Beds](#)
- [Vizio TV Reviews](#)
- [Foods with Iron](#)
- [Mens Hairstyles](#)
- [Microsoft Surface](#)
- [Organic Foods](#)

#### HOW TO

- [How to Tie a Tie](#)
- [Refinish Floors](#)
- [How to Grow a Beard](#)
- [Pro Painting Tips](#)
- [How to Videos](#)
- [How to Build a Shed](#)
- [How to Make a Speaker](#)
- [Painting Kitchen Cabinets](#)
- [How to Make Beer](#)
- [How to Install Drywall](#)
- [How to Iron](#)

#### TRENDING

- [Mens Fashion](#)
- [Automotive News](#)
- [Super Foods](#)
- [Book Reviews & Fiction](#)
- [Japan Tsunami & Earthquake](#)
- [Libya No-Fly Zone](#)
- [Geothermal Heating](#)
- [Survival Kit Checklist](#)
- [2011 Car of the Year Awards](#)
- [Ryan Gosling Interview 2011](#)
- [9/11 10th Anniversary](#)

Connect with Us



[More Options](#)

