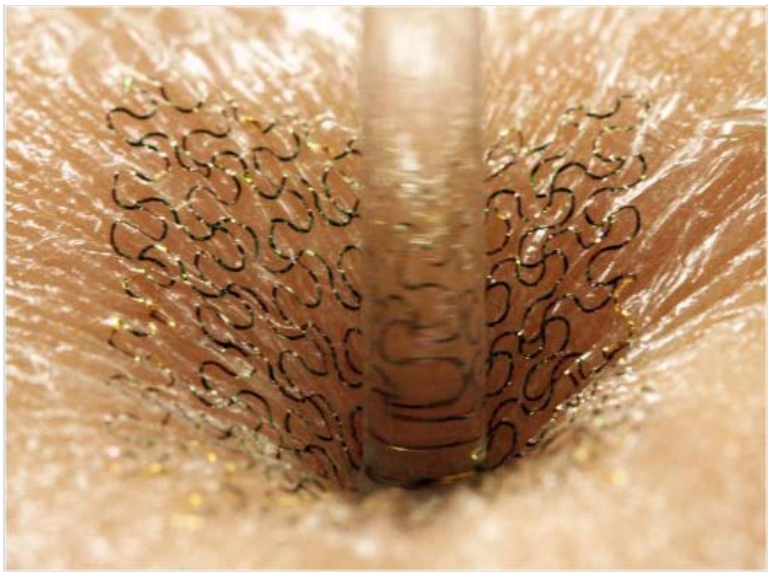
'Epidermal Electronics' Paste Peelable Circuitry On Your Skin, Just Like A Temporary Tattoo

By Rebecca Boyle Posted 08.11.2011 at 2:00 pm



Smart Skin Researchers have built an electronic device with physical properties that match human skin. Such 'epidermal' electronic systems seamlessly integrate and conform to the surface of the skin in a way that is mechanically invisible to the user. *Image courtesy of John A. Rogers*

Someday soon, hospital patients won't be hooked up to wires and monitors -- instead, electronic patches will be temporarily tattooed onto their bodies. Doctors will be able to monitor their vital signs without poking and prodding, and patients wearing neck patches will even be able to communicate with robots, who will translate throat muscle movements into simple speech.

A new **electronic skin patch**, no more invasive than a temporary tattoo, marks a major breakthrough in human-machine interfaces. Tiny semiconductor circuits that stretch with the skin could be rubbed onto a person's skin to monitor muscle activity, heart activity or even brain waves in real time without using bulky medical equipment.

The epidermal electronic circuit is initially mounted on a super-thin sheet of soluble plastic and laminated onto the skin with water, just like a temporary tattoo. Once it's on, it can bend, wrinkle and stretch along with a wearer's skin — it doesn't pop off or snap, which is no small feat considering this is a high-performance semiconductor. When it's no longer needed, it peels off like a layer of sunburned skin. Check out the video below to see this in action.

The devices adhere to the skin not with glue or static electricity, but close-contact atomic forces called van der Waals interactions, which are essentially invisible to the user. Adhesion lasts up to 24 hours, the researchers report.

Researchers at the University of Illinois who came up with this device made circuits with a wide array of components, to prove it could work: sensors, LEDs, transistors, radio frequency capacitors and wireless antennas, **according to UI**. The devices can draw power from induction or even from mini solar cells.

Inventors say they could be used for various medical applications, especially sensors that monitor heart and muscle activity, which currently require conductive gels, tape and wires. To prove it, they measured electrical activity produced by the heart, brain, and skeletal muscles, they report in this week's issue of the journal *Science*.

Studying brain function in a normal environment is impossible now — to use an EEG, a patient would have to be in a lab setting or wear some type of complicated helmet — but the patch could make it possible. Or imagine a patient with a degenerative disease who cannot communicate, but could use the patches to connect with a computer.

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TAGS

Science, Rebecca Boyle, artificial skin, digital skin, electronic sensors, epidermal layer, health monitor, skins, synthetic biology, thin skin, Video

In a throat patch experiment, the patch was precise enough for the research team to differentiate several words, according to the **National Science Foundation**. They were even able to control a voice-activated video game with better than 90 percent accuracy.

Peels Right Off: *[Image courtesy of John A. Rogers*

"The technology can connect you to the physical world and the cyberworld in a very natural way that feels very comfortable," said UI electrical and computer engineering professor Todd Coleman, who co-led the research team.

The circuits are made possible through novel fabrication methods that allow bendable versions of semiconductors that are brittle when in bulk form. The research team, which also included engineering researchers at Northwestern University, developed a new device geometry they call "filamentary serpentine," according to a UI news release. The circuits of the various devices are fabricated as tiny, squiggled wires, as shown in the photo above. The circuits' wavy shape allows them to bend, twist, scrunch and stretch while maintaining functionality.

"The blurring of electronics and biology is really the key point here," said Northwestern engineering professor Yonggang Huang. "All established forms of electronics are hard, rigid. Biology is soft, elastic. It's two different worlds. This is a way to truly integrate them."

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14 COMMENTS

BubbaGump

08/11/11 at 2:18 pm

When I saw the very first picture I thought how pretty and at the same time I also thought ouch! Ok, I guess I read the article now. lol.

Link to this comment

BubbaGump

08/11/11 at 2:22 pm

This is awesome technology for all patients and diabetics and others that have to poked, pin and stabbed. I hope this really gets develop further.

Link to this comment

drchuck1

08/11/11 at 2:29 pm

moving closer to merging biology and harware for our cyborg future, very cool

Link to this comment

Chris71689

08/11/11 at 2:57 pm

Correct me if i'm wrong, but they failed to mention how exactly they monitor these signs with the skin patch. Is it hooked up or transmitted wirelessly?

Link to this comment

drchuck1

08/11/11 at 3:11 pm

click on the links and read on

Link to this comment

dorin

08/11/11 at 4:56 pm

i wish the had this technology when i was a young kid going thought all those Srgs .

Link to this comment

sacridias

08/11/11 at 5:26 pm

@Chris71689,
If you read the article closely you would note, (Quote from article) Researchers at the University of Illinois who came up with this device made circuits with a wide array of components, to prove it could work: sensors, LEDs, transistors, radio frequency capacitors and wireless antennas.

This gives several methods of communication. LED for view display, and the radio stuff for computer interfaces.

Some of these components being able to flex is no big deal nor that new, but some of the more major ones are ground breaking.

Yet again medicine of the future is going to be awesome. Hopefully I can live to see a lot of it. Still, I wanna see ftl drives.

Link to this comment

macmansa

08/11/11 at 6:13 pm

@drchuck1
Why make machines to be embedded into the human body when you can use genetical enhancement to improve a person that way it will feel natural and be WAY better than reagular body parts.We could give ourselves falcon vision with out eye implants. the speed of a cheeta without the mechanical legs.A longer life span without life support. sure robotics would be a useful advantage but genetics cant be hacked,cant shortout and cant be controlled by an outside source with malicous intentions

Link to this comment

08/11/11 at 8:03 pm

haha Nice Idea Macmansa, basicly create Gene-boosted super humans. I like the idea, always thought It'd be kinda cool to perfect myself, but

zunigadragon

from Chula Vista, CA

unfortunetly there's several disadvantages, as we were evolved to be suited in our current form, if we modify it, then we could put a say failed experament through some unnessisary suffering (Humanitists would argue that) then theres those that fear the better more advanced gene-boosted humans would take over the world and yeah, pretty much get away with it, honestly the closest to your idea that I'd go for is the "Bioroids" from Appleseed
(bioroids are explained on the 2nd paragraph below Plot)
http://www.en.wikipedia.org/wiki/Appleseed_(film)
-Your Friend Zunigadragon

Link to this comment

logical_atheist

08/11/11 at 10:12 pm

Macmansa:

I personally have little doubt that technology will be able to achieve the ability's of the animals you mention in more efficient ways. The problem of hacking could be solved with some clever quantum encryption. And, (as of now at least) mechanical parts are much easier to replace than biological ones. Not to mention that i don't think there are many biological materials that can be stronger than carbon nano-tubes for example. Imagine having a skeleton of that stuff.

I guess it'll depend on which tech evolves faster. We'll see. ;)

Link to this comment

JediMindset

08/11/11 at 10:18 pm

@macmansa
i like your ideas. but it would be a lot easier and safer to accomplish all that with nano technology/machines like logical_atheist said.

Link to this comment

drchuck1

08/12/11 at 1:59 am

@macmansa...they will probably be combined

Link to this comment

boka

08/12/11 at 1:43 pm

yeah, i agree. the future of humans will be a combo of genetic enhancement, nanotechnology and synthetic enhancements. Live long enough to live forever.

Link to this comment

ProtestantChristian

08/12/11 at 9:02 pm

Any one remember the cloak able fiber article that popular

science did its been a while back any way think about

creating a embedded skin suit that combines the skin

technology and the transparent cloak able fibers think about

a whole new era of warfare invisible marines seals delta they

could also make parachutes that apply these same concepts

that's rite invisible warriors from above wiping out enemies

before they could even conceptualize what hit them

Link to this comment

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