

# C2ST continues with epidermal electronic demonstration

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Imagine for a moment that you receive a text message on your phone: a common occurrence. You open up your phone to see your brand new BodyBandage app saying “Your wound is at fifty percent completion. Estimated time until complete healing is ten hours.”

The message came from a thin bandage on your arm. This isn’t a normal bandage, but one fitted with electronics that monitor skin temperature, muscle movement, and cardiovascular activity. This isn’t science fiction. It isn’t just around the corner. This technology is now, and all that’s missing is the app.

Last semester on November 12, the Chicago Council on Science and Technology presented “Body & Machine: Epidermal Electronics,” a scientific event featuring the research being conducted by Dr. John Rogers and his colleagues at University of Illinois Urbana-Champaign.

Their research focuses on the development of epidermal electronics: electronic devices that possess the same mechanical properties as human skin, meaning they can stretch, flex, contort, bend, just as our skin does.

Although wearable electronics such as pedometers have existed for decades, only now are seamless connections to the skin’s surface possible. The issue with normal electronics is that they are composed of a base layer, or substrate of silicon. Silicon is hard, and rigid, unlike skin. Rogers’ solution was to stop using silicon substrate and try a different method.

His team tried several different materials, such as electrical polymers, before discovering an interesting phenomenon. Using silicon but making it extremely thin helps maintain its properties, while allowing increased flexibility. It isn’t stretchable though. To make it stretch like skin, you have to stretch your own mind a little.

Placing the silicon wires on top of a piece of pre-stretched rubber makes the silicon coil up like an accordion as the rubber relaxes, and allows it to handle being stretched. Giving the wires a snake-like structure allows them to be contorted and bent like pinched skin. The resulting product produces a strange effect.

It requires no adhesive as it connects to the skin using Van der Waals forces, just as a gecko can stick to a wall. There is no adhesive to discomfort the skin, and the electronics peel off with little pain or effort. But how do they stay secure and in one piece before they’re

applied? The team turned to a common concept: temporary tattoos.

Using a temporary tattoo, or its backing, allows the electronics to be placed, wetted, and bonded cleanly to the surface. It also provides another nice effect. A temporary tattoo can be placed over the electronics, hiding and protecting them. Who doesn’t want a tattoo of a pirate that’s also monitoring blood pressure?

Rogers was wearing several versions of the device during the presentation.

The devices have numerous applications, as a sensor adhered directly to the body can monitor many important factors. Sensors can pick anything up from muscle movement to brain activity to pulse rate. They can also detect signals that normal methods, like a medical electrode, can’t easily detect.

Placing a sensor on the neck could help detect speech. Rogers showed, through several methods, that they are as effective as conventional methods of monitoring currently in use, but more comfortable, and at a fraction of the cost.

Other possibilities were also demonstrated, including monitoring body temperature for sports and health, observation of babies in neonatal intensive care, and movement recording to control robotics. A

student of Rogers’ tested this concept, flying a remote controlled helicopter around using only his hands and forearms.

The uses of this technology are clear, and it is quickly entering the market. Reebok has started to integrate it into headgear and clothing to detect trauma.

Reebok’s new Checklight system is being used by both little league teams and the Indianapolis Colts quarterbacks Matt Hasselbeck and Andrew Luck. Other companies are quickly getting involved as well. Perhaps we’ll soon be seeing bandages that monitor wounds, and inform patients about infections.

C2ST is a major promoter of these and other scientific topics. They help develop events all around the city with the hope of promoting scientific education and involvement. Their topics include energy, technology, astronomy, and many others.

Becoming a member, especially as a student, has notable perks. Being informed on current movements in science as well as attending events provides networking options, and news on technological innovations can help inform students of new interests and focuses.

Visit [c2st.org/membership](http://c2st.org/membership) for more information, and [c2st.org/media](http://c2st.org/media) for video coverage of their events.

# Cold, dreary winter weather here to stay



Photos by Nick Caldwell