One Day Your Pants May Power up Your iPod

UC Berkeley researchers are perfecting microscopic fibers that can make electricity from simple body motions. The nanofibers may soon be woven into clothing, creating the ultimate portable generator.

Researchers at UC Berkeley are perfecting microscopic fibers that can produce electricity from simple body motions such as bending, stretching and twisting. The **filaments**, which resemble tiny fishing lines, may soon be woven into clothing and sold as the ultimate portable **generators**.

It could take three years or more before it hits the store shelves, but the technology is already being hailed as a breakthrough.

The so-called nanofibers "will have very significant implications," said Mihail Roco, senior advisor for nanotechnology with the National Science Foundation, which recently gave a $350,000 grant to the project.

In addition to helping reduce electricity demands on local utilities, new industries could spring up to **manufacture** the tiny personal generators, he said. Researchers are envisioning hikers powering up their digital cameras while trekking up a mountain or a jogger charging up her cellphone in mid-run.

The Pentagon is hot for it too: Soldiers would no longer have to carry heavy batteries to power their gear. Along with the National Science Foundation, the Pentagon's secretive advanced research agency is helping fund the project.

For now, the "smart power suit" is still a lab experiment, said UC Berkeley mechanical engineering professor Liwei Lin, who is overseeing the development of the fibers.

Working in a small, two-room lab on the Berkeley campus, the researchers were able to convert energy from finger motions into electricity using fibers attached to a surgical glove. At roughly 500 nanometers thick, a strand is barely noticeable to the human eye. It's one-tenth the width of a cloth fiber and one-hundredth the width of a human hair.

It would take about 100,000 fibers to produce enough power for an electrical watch and 1 million fibers to generate enough current to power an iPod. But a bundle of 1 million fibers would be only about the size of a grain of sand.

Lin said the fibers can soak up the untapped energy produced by the human body, a remarkably efficient natural generator. The more vigorous the motion, the more power can be harvested, making knees and elbows and other joints prime spots for the strands. The strands take advantage of piezoelectricity, which produces energy through "applied stress," similar to the heat generated when rubbing hands together.

Multiple dips in the washing machine won't hurt — the fibers are flexible and **resistant** to heat and chemicals. They're also small enough to blend **unobtrusively** into most garments. And static shouldn't be a problem, Lin said.

The filaments are made from a cheap, organic plastic called polyvinylidene fluoride. The material, known as PVDF, can also be found in fishing lines, insulation for electrical wires and paint on buildings.

Generating electricity from tiny components has been a distant dream for scientists for decades, said Roco, who also leads the National Nanotechnology Initiative.

"Up until now, there were too few ways to effectively do this, too far away to really have a discussion," he said. "Now, there's finally a technical solution. Now, people may finally start to think more seriously about it."

Led by professor Zhong Lin Wang, researchers at Georgia Institute of Technology have also produced electrical currents from fingers typing on cellphones, hamsters running on exercise wheels, even vibrating vocal cords. Tiny modules could eventually be **implanted** in the human body to harvest energy from muscle movement or blood vessels, Wang said.

But the fibers from Lin's team are made with organic matter that can be spun to infinite lengths, while the Georgia strands used inorganic materials and were limited to just a few millimeters in length.

At rival Stanford University, researchers are developing fabric-based batteries, or eTextiles, that could potentially store the energy produced at UC Berkeley.

Ordinary cloth becomes rechargeable batteries and capacitors when immersed in a special ink formula and then oven-dried. A piece weighing about an ounce can retain up to three times the amount of energy that a cellphone battery can, while remaining lightweight and flexible.

If the product can be cheaply mass produced, the lack of competition would give nanofibers an easy way to conquer the market, Roco said. "It will be determined by economics — if the nanofibers cost $10,000, nobody will buy them," he said. "But if they're $2, everyone will buy. People will use nanotechnology not because it's fancy but because it's economical."

Source: Tiffany Hsu, *Los Angeles Times*, 5/20/10

Possible Journal topics:

- What is your reaction to this article?
- If this technology is perfected, how might it change our world?
- Would you use this technology? Why? Why not?

Texas man gets first full face transplant in US

Source: The Associated Press/ 3/24/11

A Texas construction worker horribly disfigured in a power line accident has undergone the nation's first full face transplant in hopes of smiling again and feeling kisses from his 3-year-old daughter. Dallas Wiens, 25, received a new nose, lips, skin, muscle and nerves from an unidentified dead person in an operation paid for by the U.S. military, which wants to use what is learned to help soldiers with severe facial wounds.

Wiens will not resemble "either what he used to be or the donor," but something in between, said plastic surgeon Dr. Bohdan Pomahac). "The tissues are really molded on a new person."

Pomahac led a team of more than 30 doctors, nurses and other staff at Brigham and Women's Hospital during the 15-hour operation last week. Wiens was listed in good condition at the Boston hospital on Monday. He did not appear at a news conference with the surgeon.

The Fort Worth man's features were all but burned away and he was left blind after hitting a power line while painting a church in November 2008. The transplant was not able to restore his sight, and some nerves were so badly damaged from his injury that he will probably have only partial sensation on his left cheek and left forehead, the surgeon said.

"When I saw Dallas for the first time I was worried that there may not be much we could do," said Pomahac.

Wiens has been able to talk to his family on the phone, said his grandfather, Del Peterson, who attended the news conference Monday.

After the accident, Wiens said "he could choose to get bitter or he could choose to get better. His choice was to get better. Thank God today he's better," Peterson said.

In an Associated Press story and a YouTube video last fall, Wiens spoke emotionally about why he wanted a transplant and how he wanted to smile again and feel kisses from his daughter, Scarlette, who turns 4 next month. Face transplants give horribly disfigured people hope of an option other than "looking in the mirror and hating what they see," he said.

He told the Associated Press that his daughter and his faith have kept him motivated.

"She says, 'Daddy has a boo boo, but God and the doctors are making Daddy's boo boo all better,'" Wiens said. "She doesn't care and she never has since day one that I was disfigured." No details about the donor were disclosed. The hospital said the match was based on gender, race, age and blood type.

Peterson said his grandson hopes to become an advocate for facial donations, and he thanked the donor family, saying, "You will forever remain in our hearts and our prayers and we are grateful for your selflessness."

The surgery was paid for by the Defense Department, which gave the hospital a $3.4 million research grant for five transplants.

The new federal health care law also helped Wiens by allowing him to get insurance coverage under his father's plan for the expensive drugs he will have to take for the rest of his life to prevent rejection of his new face. He will be covered until he turns 26 in May. He expects to be eligible soon under Medicare, which insures the disabled as well as those over 65.

Pomahac said one of the two people on the waiting list in Boston for a face transplant is Charla Nash, the Connecticut woman who was mauled and blinded by a friend's 200-pound chimpanzee. The animal ripped off Nash's hands, nose, lips and eyelids. She is also waiting for a hands transplant.

The world's first face transplant, also a partial, was done in France in 2005 on a woman mauled by her dog. Doctors in Spain performed the first full face transplant last March for a farmer who was unable to breathe or eat on his own after accidentally shooting himself in the face.

Conversation Calendar

Name: _____ **Class:** _____ **Week of:** _____

Day:	**Day:**

Tovani, C. 2011. *So what do they really know? : assessment that informs teaching and learning*. Portland, ME: Stenhouse

Firefighters	Windows
December	Our Lady of the Angels
School	Parents
Neighbors	“…grabbing ladders of all lengths from garages . . .”
Cold, sunny afternoon	“They’re jumping out the windows!”

“Tragedy hits home. Everybody’s home.”	St. Anne’s Hospital
Ambulance	Pediatrics
“. . . the nation embraced new standards for fire safety.”	Room 210
Counseling	Catholic Church
Gold chain	Sepia-toned class picture

What Makes Reading
Easier?

THE TEXT is shorter rather than longer.

THE READER has chosen the text, versus it being assigned.

THE READER has relevant background knowledge.

THE TOPIC has personal interest or importance.

THE TEXT embodies familiar settings and cultural values.

THE TEXT evokes curiosity, surprise, or puzzlement.

THE TEXT has high coherence, meaning that it explains itself (e.g., “the plesiosaur, a Mesozoic period dinosaur . . . “)

THE TEXT makes ample use of pictures, charts, and other visual and text features that support and add meaning.

THE TEACHER evokes and builds the reader’s background knowledge.

THE TEACHER teaches specific strategies for visualizing, inferring, questioning, rereading, and other techniques.

READERS CAN mark, write, or draw on texts as they read.

READERS CAN talk about the text during and after reading.

READERS CAN hear text read aloud by the teacher, by a classmate, or in small groups.

Harvey, S. & Steineke, N. (2011). *Texts and Lessons for Content-Area Reading*. Portsmouth, NH: Heinemann.