

New technologies harvest energy from movements, sound and more

December 31 2014, by Steve Johnson, San Jose Mercury News

Fed up with constantly having to recharge or replace batteries in your ever-expanding trove of electronic gadgets? The solution may be just a few steps away.

"Energy harvesting" promises to [power](#) innumerable consumer devices, often with nothing more than your body's movement or heat. Dozens of companies around the world already offer such products, primarily for controlling lighting and temperature-control systems, but many experts believe the market for the technology could explode thanks to [electronic gadgets](#) being developed for the Internet of Things.

"It's huge," said Graham Martin, CEO of the EnOcean Alliance, a San Ramon-based group of businesses that promotes wireless energy-harvesting technologies.

With the Internet of Things expected to incorporate billions of devices, "if they're all battery-powered, we'll have a problem because there's not enough lithium in the world," he added. "So a lot of them will have to use energy harvesting."

Among the most basic forms of the technology is body power. When certain materials are squeezed or stretched, the movement of their atoms creates an electrical charge. Automatic watches have employed the concept for decades, for example, by winding themselves when their user moves their arm. Now, the concept is being considered for a multitude of other devices.

Consumer electronics giant Philips sells a switch that wirelessly operates room lights, powered only by the tap of a finger. A similar light switch developed by EcoHarvester of Berkeley, displayed at the 2014 Consumer Electronics Show in Las Vegas, gets its energy when someone merely gives it a turn.

Leg power also has promise, according to energy consultant Christine Hertzog. By generating [electricity](#) from students walking across a floor, she has blogged, "schools could harness the pitter-patter of little feet to power some of their building needs."

In fact, some European nightclubs already supply some of their energy from people dancing on floors, which compress to generate electricity.

Apple has been mulling a slightly different approach. In a patent it obtained last year, the Cupertino company proposed using magnets beside a circuit board with printed coils to generate electricity "when a user shakes the system or when the user walks or runs while holding the device." The consumer-products leviathan said it envisions the technology being useful for video recorders, cameras, laptops and other devices.

And Bionic Power of Canada has developed a walking-powered knee brace with Canadian and U.S. military officials to recharge battery-powered devices for soldiers in the field.

Body heat can produce energy, too.

In a contest seeking visionary ideas for wearable technologies, Intel in May awarded \$5,000 for a concept to convert the temperature difference between a person's body and a special garment they'd wear into electricity for mobile gadgets. A similar body-heat [technology](#) is being developed by Perpetua of Corvallis, Oregon, to provide electricity for

devices that assist athletes, patients and emergency first responders.

Using sound to power devices is another energy-harvesting variation. Stanford University engineers are testing smart microchips that create electricity from ultrasound to power implantable devices that can analyze a person's nervous system or treat their diseases.

A textile research association in Spain is proposing to extract electricity from radio waves that flow around everyone to power sensors sewn into clothes, which can monitor a person's heartbeat or other vital signs.

Research firm IDTechEx has estimated that annual global sales of energy-harvesting products - currently around \$300 million - could hit \$2.6 billion by 2024, while WinterGreen Research predicts sales of \$4.2 billion by 2019.

Coaxing consistent energy from gadgets can be complex, however. For one thing, the motion that generates the electricity has to be constant to be useful. Moreover, the amount of power the devices produce depends on the person using them, according to a Columbia University study this year. It determined that taller people on average provide about 20 percent more power than shorter ones when walking, running or cycling.

It's also unclear how eagerly consumers might embrace energy-harvesting products. While such devices are expected to cost less than battery-powered alternatives when compared over many years, experts say, people may continue buying ones with batteries merely because those would be cheaper in the short term.

Still, Harry Zervos, an IDTechEx analyst, believes [energy harvesting](#) will catch on big eventually.

"There needs to be a way to stop all of these millions of batteries from

being created," he said. "We're choking on batteries already."

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Citation: New technologies harvest energy from movements, sound and more (2014, December 31) retrieved 26 April 2024 from <https://phys.org/news/2014-12-technologies-harvest-energy-movements.html>

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