THE WALL STREET JOURNAL.

http://www.wsj.com/articles/scientists-generate-power-from-walking-1456329420

LIFE | IDEAS | RAND D

Scientists Generate Power From Walking

Footwear to capture the energy of walkers

By DANIEL AKST
Feb. 24, 2016 10:57 a.m. ET

Human beings are living power generators, but we've never been able to capture most of that energy and put it to work. That may soon change.

University of Wisconsin scientists have developed a system to harvest some of the power generated by walking humans. The system fits into the sole of a sneaker, includes a battery for power storage and even has a USB port to charge a smartphone.

The scientists' vision doesn't stop there. Smartphones expend a lot of energy merely communicating with the cellular network, but the Wisconsin research could be used to make shoes that double as Wi-Fi routers. That would let a smartphone save power by communicating with the shoe, leaving the continuously powered footwear to communicate with the cell network.

User-powered shoes would also permit much more precise location positioning, resulting in more accurate measurements of activity for people who like to track their steps. Soldiers, firefighters, hikers and anyone in a far-flung locale could also benefit from more accurate location sensing.

For millennia, of course, water-wheels and windmills have been capturing mechanical energy for power. The Wisconsin scientists had to find a way to use human locomotion to produce a considerable amount of electrical power in a small space, taking into account the high impact of each footfall and the small

MORE R AND D

- **The Super Bowl Can Make You Sick (http://www.wsj.com/articles/the-super-bowl-can-make-you-sick-1455291754)** Feb. 12, 2016
- **How to Speed Read Without Skimming (http://www.wsj.com/articles/how-to-speed-read-without-skimming-1453998782)** Jan. 28, 2016
- **The Tiny Motors That Could Solve a Male Fertility Problem (http://www.wsj.com/articles/the-tiny-motors-that-could-solve-a-male-fertility-problem-1453479660)** Jan. 22, 2016
- **Heavier Waiters Make for Heavier Eating (http://www.wsj.com/articles/heavier-waiters-make-for-heavier-eating-1452700075)** Jan. 13, 2016
- **Your Moods Change the Way You Move Your Mouse (http://www.wsj.com/articles/your-moods-change-the-way-you-move-your-mouse-1452268410)** Jan. 8, 2016

amount of shoe-material compression that it produces. The techniques used in motion-powered wristwatches wouldn't produce enough power, according to J. Ashley Taylor, one of the scientists.

The scientists relied on "reverse electrowetting," which Dr. Taylor and colleague Tom Krupenkin pioneered—a technique that needs a very frequent input of energy to work well. Unfortunately, walking is low in frequency, so the scientists compensated for it with a sandwich of materials chosen for their electrical properties.

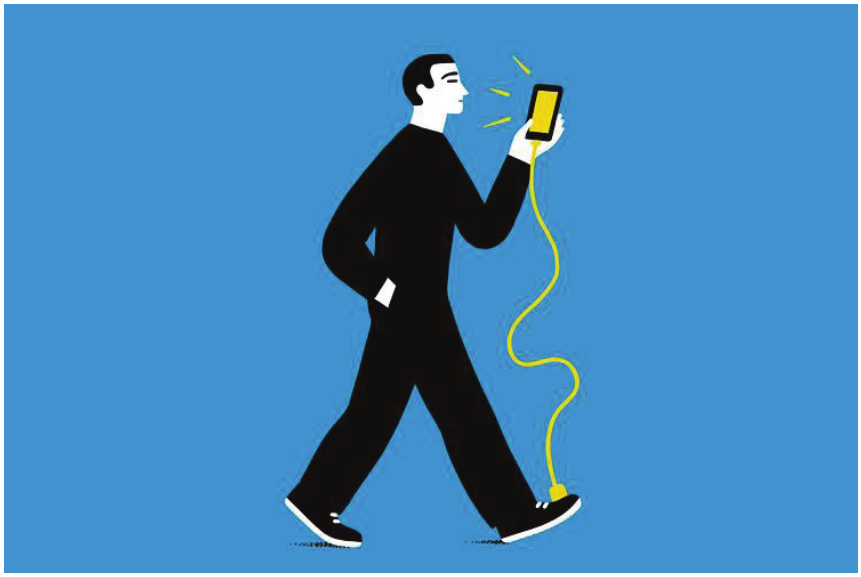

ILLUSTRATION: LUCI GUTIÉRREZ

At the center is a conductive liquid. The force of each heel strike drives compressed air into the system, forcing liquid droplets to bubble and burst again and again in rapid sequence—a high-frequency process that yields an electrical current sufficient for a variety of uses. Dr. Krupenkin says that walking can produce several watts of electricity, enough to power many devices, including flashlights and phones. A standard smartphone,

he says, requires less than two watts. Considerably higher output is theoretically possible, he adds.

Dr. Krupenkin says that his team has developed a similar system that converts the energy of walking into heat, which can be stored for use in warming feet during cold weather.

"Bubbler: A Novel Ultra-High Power Density Energy Harvesting Method Based on Reverse Electrowetting," Tsung-Hsing Hsu, Supone Manakasettharn, J. Ashley Taylor and Tom Krupenkin (Scientific Reports, Nov. 16)