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Breakthrough technology makes charging batteries a walk in the park

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High resolution video available here - RIGHT click and save to your computerEnergy Harvester
h264 mov file (67 megabytes)

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Simon Fraser University researchers have developed a new wearable technology that generates electricity from the natural motion of walking and promises to revolutionize the way we charge portable battery-powered devices.

The Biomechanical Energy Harvester, which will be featured in the Feb. 8, 2008 issue of the U.S. journal, *Science*, resembles a lightweight orthopedic knee brace. The device harvests energy from the end of a walker's step, when the muscles are working to slow the movement of the leg, in much the same way that hybrid-electric cars recycle power from braking.

Wearing a device on each leg, an individual can generate up to five watts of electricity with little additional physical effort. Walking more quickly generates as much as 13 watts of electricity: at that rate, one minute of walking provides enough electricity to sustain 30 minutes of talk time on a mobile phone.

'This technology promises to have significant medical, military and consumer applications,' says lead author Max Donelan, an assistant professor of kinesiology and associate member of engineering science at SFU.

'A fully charged battery pack represents more than just a mere convenience. It allows a soldier to get back home safely. It benefits stroke victims, amputees and others who rely on power-assisted medical devices for mobility. It means a better quality of life for the developing world, where a half-billion children live without easy access to electricity. And of course it is a necessity to anyone in the developed world who has come to rely on portable electronics for work or play.

'Donelan plans to have a working prototype available within 18 months through his spin-off company, Bionic Power Inc.

How it works, why it's differentThe Biomechanical Energy Harvester is rigged with a generator, clutch, gears and a real-time control system to selectively engage and disengage power generation. It works in much the same way that regenerative brakes charge batteries in hybrid vehicles.

Regenerative brakes collect the kinetic energy that would otherwise be dissipated as heat when the car slows down. Similarly, the Harvester collects the energy typically lost when the muscles of the body slow the knee after swinging the leg forward to take a step.

The new device significantly differs from existing energy-harvesting technologies. Those devices focus on either the compression of the heel or the shifting of a mass carried on the back, but shoe generators deliver only small amounts of energy, and the backpack method requires a heavy load.

The Harvester also includes a number of built-in mechanical and electrical innovations that condition the raw power generated by walking, and adjust each stride to extract the maximum amount of power with the minimum amount of effort.

Donelan's research team is supported by funding from the Michael Smith Foundation for Health Research, the Natural Sciences and Engineering Research Council of Canada, and the Canadian Institutes for Health Research.