

What's the Big Idea?

The iPod Is Connected To the Knee Bone. . . .



This occasional feature, written by researchers around the world, highlights new discoveries in the sciences and what they mean for your outlook.

THE BIG IDEA: What if people could generate enough electricity to charge iPods and laptops or even artificial limbs simply by walking? Our new invention, called a biomechanical energy harvester, does just that. The knee-mounted device captures energy at the end of a walker's stride in the same way that hybrid electric cars harness and reuse the power generated by braking. Walking at a normal pace with the device on each leg, users can generate enough electricity to run 10 cellphones at the same time and twice the energy needed to power a basic computer.

HOW WE DISCOVERED IT: In the past, researchers tapped "people power" with shoe-mounted devices, which capture energy through the force of compression, and mechanical backpacks, which bounce up and down to generate electricity. But even the best shoe generators produce only small amounts of energy — about enough to power an iPod — and the backpacks can be heavy and unwieldy.

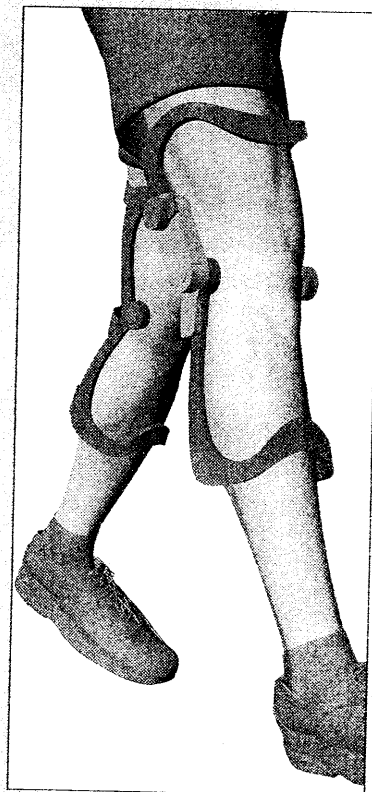
My colleagues and I figured we could harness energy more efficiently from the motion of knee joints. So we attached a three-pound electrical generator to a knee brace. Six volunteers then wore the devices while walking on treadmills at a comfortable pace.

WHAT WE FOUND: Volunteers easily generated five watts of electricity. Walking more quickly, one volunteer generated as much as 13 watts — enough electricity to run a basic water-filtration system.

WHY IT MATTERS: A half-billion children live without electricity, so imagine the impact of an invention that allows students in remote villages to run computers by, say, jumping rope. The device could even lighten the load for soldiers who now have to lug heavy batteries into battle. And picture your teenager powering her iPod on her power walk. Plus, keeping our cellphones charged would be nothing more than a stroll in the park.

— **Max Donelan is an assistant professor at Simon Fraser University and chief science officer at the company Bionic Power.**

In cooperation with Science magazine and the American Association for the Advancement of Science. For more information, visit www.sciencemag.org/wpoutlook.



COURTESY OF SCIENCE MAGAZINE

Made for walkin': The biomechanical energy harvester is made of an aluminum frame and generator mounted on a knee brace.