THE FIRST BLACK FIRST LADY
By Allison Samuels

AMERICA'S LAST CREDITOR
By Fareed Zakaria

THE MOST VULNERABLE NATION
By George Wehrfritz

Newsweek

THE MEDVEDEV DOCTRINE

MAKING SENSE OF THE RUSSIAN PRESIDENT'S NEW STAND: TOUGH ABROAD, LIBERAL AT HOME

PHOTOGRAPH BY DMITRY ASTAKHOV—AFP—GETTY IMAGES

newsweek.com DECEMBER 1, 2008

Albania	Lek 600	Finland	€4.40	Israel	NIS 20.00	Netherlands	€4.40	Slovenia	€3.40
Austria	€4.40	France	€4.40	Italy	€4.40	Norway	Kr 41.00	Spain	€4.40
Belgium	€4.40	Germany	€4.40	Kazakhstan	$4.40	Poland (incl.tax)	PLN 12.30	Sweden	SKr 34.00
Bulgaria	BGL 4.50	Gibraltar	£2.90	Latvia	$4.40	Portugal Cont	€4.40	Switzerland	SF 7.70
Croatia	KN 22.00	Greece	€4.40	Lithuania	$4.40	Romania	Lei 11.00	Turkey	YTL 4.00
Cyprus	c£2.58/€4.40	Hungary	Ft. 700.00	Luxembourg	€4.40	Russia	$4.40	Ukraine	$4.40
Czech Republic	CZK 115.00	Iceland	IKR 390.00	Malta	Lm 1.70/€3.95	Serbia	DIN 240	United Kingdom	£2.60
Denmark	Kr 38.00	Ireland (incl tax)	€4.40	Montenegro	DIN 240	Slovakia	SK 120.00/€3.98	U.S. Forces	$3.25

48

9 770163 705128

Sophie Grove

Good Vibrations

ANYONE WHO THINKS RUNNING ON A TREADMILL IN THE GYM IS A FUTILE EXERCISE should talk to Steve Beeby. The British scientist, a microsystems expert at the Engineering and Sciences Research Council, hates to see all those potential watts go to waste. For nine years he has been working on ways of tapping kinetic energy—the energy from moving objects—to power electronic gadgets. His research team at the University of Southampton has developed a device that converts surplus vibrations from industrial machinery into electrical power. Now Beeby and other scientists think the world is humming (literally) with possibilities: shuddering railway cars, flexing joints and even the stomp of London's rush-hour commuters could all be tiny, renewable sources of power.

The principle of energy harvesting is nothing new. Remember that clunky bicycle dynamo, which connected pedals and gears to a generator? The first kinetic (self-winding) clock was invented in the 1770s. In the past few years, however, the need to power a proliferation of digital gadgets such as wireless sensor networks —mobile data-collection devices—has triggered a new look into this science. The idea is simple: each time an object vibrates, the energy from the motion can be harnessed to generate electricity, extracting energy from vibrations that currently goes to waste. Vibrations cause magnets to quiver, generating a current in a copper coil; about 30 percent of the kinetic energy gets converted into electrical power. Such opportunistic energy-catching usually yields mere microwatts of power but has big potential to supply juice to small devices—such as environmental sensors and accelerometers that monitor bridge stress and traffic-tracking systems—that are turning up everywhere, and for which batteries are costly, cumbersome and difficult to replace. In the last few years the technology has gained ground in the medical, military and mechanical industries. "These are parasitic devices," says Beeby. "We're using vibrations already there in the environment."

Researchers at Imperial College in London are working on a bionic-powered pacemaker that harnesses energy from the beating of the heart. The contraption keeps a tiny battery charged, which kicks in when the heartbeat falters—"rather like a solar-powered flashlight that uses the sunshine to power itself and then works in the dark when you need it," says Paul Mitcheson, who leads the study. The new-style pacemaker is still just a prototype and has yet to be inserted into a human body, but Mitcheson hopes that the device "could prevent the need for replacing pacemakers every six or seven years, which at the moment involves complex heart surgery."

Kinetic energy usually yields mere microwatts of power but has big potential to supply juice to small devices.

Some eco-savvy consumer-oriented companies are now embracing the technology, too. In London's up-and-coming Kings Cross area, the trendy Bar Surya has put springs of a sort in its dance floor to capture the energy of clubbers: a crystalline "piezoelectric" material under the flooring generates a small electrical current each time a dancer steps on it, helping reduce the club's electricity bills. The material is currently too expensive to pay for itself, experts say, but as prices come down it holds some promise for crowded train stations and airports. "Think about it—millions of commuters pass through the Underground at rush hour; every one has energy potential," says Steven Fitzwilliam of the architectural practice The Facility. The firm has received grants from the French energy giant EDF to research the technology. Recently the firm won a design competition organized by Network Rail, which owns Britain's rails, with a plan that would use piezoelectric power devices in the railway viaducts near London Bridge to turn vibrations from passing trains into electrical current for lighting. The material would also muffle the rattling noise of the rails.

Even the human stride has scope for energy harvesting. After years of research into the biomechanics of walking, a team at Simon Fraser University in British Columbia has created a bionic harvester that extracts power from the human knee joint. It looks like an orthopedic knee brace, but it can produce power without the user noticing. "It's very similar to braking a hybrid car. We engage a generator in the swing phase of walking—when the hamstrings are active and slowing down the knee extension," says Max Donelan, a kinesiologist who developed the device with the spinoff company Bionic Power. "It's very economical. In some modes we can extract 13 watts of electricity walking for a minute." That's enough to power a cell phone for half an hour's talk time. The immediate motivation for Donelan's team, however, is to benefit people who wear battery-powered prostheses and other medical devices, and also soldiers, who rely on batteries to power some field equipment. "Some soldiers need to carry batteries in excess of 30 pounds," he says. "To them batteries are as important as food and water."

In a few years harvesting may provide a handy way to recharge iPods, phones and other gadgets. Experts don't expect the technology will ever contribute much to the electrical grid, but so far it hasn't paid to underestimate the desire of people to go green. It may not be long until every gym is also a microenergy-harvesting plant, or Hollywood stars are seen sporting little generators on their knees.

ILLUSTRATION BY LUCI GUTIERREZ FOR NEWSWEEK