

## INNOVATION



**POWER PEDAL:** From elaborate systems hooked up to the power grid (left) to simple capture boxes (below), gyms are embracing pedal-powered electricity.



SARAH BETH GLICKSTEEN/THE CHRISTIAN SCIENCE MONITOR

Pedal power has been a small-time alternative-energy source for ages. Many innovators have tried to tap the simple motion to power devices – especially those engineered for developing countries, where power grids are unreliable. But few designs have stuck. People aren't willing to exert much energy just to run simple devices.

But in gyms across the country, eco-conscious patrons are asking why cardio equipment needs to drain power, when the exercisers are already eager to burn calories. Now, fitness centers are beginning to experiment with ways to put muscle strength to good use.

"The idea pretty much sold itself," says Adam Boesel, a personal trainer in Portland, Ore.

He saw a television report about a Hong Kong gym with human-powered equipment and set out to create an eco-friendly fitness center in his hometown. Mr. Boesel's Green Microgym opened in late August and has already registered more than 100 members.

The gym chose Team Dynamo stationary bikes, which harness the power of four connected bicycles to generate up to 200 watts per hour. That's enough to power a LCD television and stereo system for the duration of the ride,

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JANE LA MOTTA/GREEN REVOLUTION

# ELECTRIC WORKOUT

By **VIJAYSREE VENKATRAMAN**  
CORRESPONDENT

**GYMS HOOK UP BIKES TO DEVICES – LETTING PATRONS POWER THE PLACE.**

**CAMBRIDGE, MASS.**  
After classes, Sally Peach, a student at the Massachusetts Institute of Technology, has a long list of to-dos. She wants to hit the gym, tackle school work, and, as captain of an intramural soccer team and member of a campus health advocacy program, she has plenty of e-mail to respond to every evening.

"Though I know I am being productive, it feels like a complete waste of time to sit there and do just [e-mail replies]," says Ms. Peach.

So, once she arrives at the gym, Peach makes a beeline for a special stationary bike that has a laptop built into the front. The computer is not plugged in. There is an empty space where the battery once fit. But when Peach starts pedaling, the computer fires up. Her spinning workout powers the laptop – and lets her cross off two tasks at once.

## Young innovators learn to pitch big ideas

By **GREGORY M. LAMB**  
STAFF WRITER

**CAMDEN, MAINE**  
You've got a world-changing idea. And a passion to make it happen.

That's good. But you need a third element: The ability to "pitch" your idea to venture capitalists and others who can help turn your dream into reality.

Budding business tycoons or Hollywood script writers know the importance of marketing themselves and their projects. But those in the nonprofit world, whose goal is altruistic, may never have thought about how to put a dazzling sheen on their quick "elevator pitch."

Learning what goes into a perfect pitch

was just one of the practical skills taught to a group of up-and-coming "social innovators" last month at the 12th annual PopTech conference in Camden, Maine.

PopTech has always been a place to hear about new ideas to improve the world. But this year, greater efforts have been made to turn those ideas into a reality, says its curator and executive direc-

tor, Andrew Zolli.

"People don't want to just sit around and talk about things," he says. "They want to connect and collaborate and have a meaningful impact." The idea, Mr. Zolli says, is to "transform PopTech into a factory for making big bets on great ideas."

This year, 16 innovators were chosen from more than 100 finalists in 30 coun-

tries. They touted projects such as a way to survey the world's 1 billion "invisible" poor people, introduce distance learning over the Internet to Nigeria, and protect people in developing countries from harmful, counterfeit drugs.

Many already had put their idea to work in the field and now were looking for ways to "scale up" and help more people. "They're not Bono," says Zolli, referring to the U2 musician turned social activist. "They're not the most famous people. They represent the next generation of people."

These young innovators took part in a four-day "boot camp" before the conference with a faculty of experts. Later

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## INNOVATION

## How studying DNA from ancient bears helps humans

While on the campaign trail this fall, Senator John McCain would laugh at government-funded research on the DNA of bears. What would he think of the research on DNA from extinct cave bears that now has elucidated the bear family tree? It's the latest example of how scientists are using the increasingly sharp cutting-edge of DNA research to clarify the divergence of animal species, including humans. New techniques to rapidly analyze DNA accelerate such studies. An increasing ability to garner useful data from tiny samples of DNA enable scientists to make the most of what little DNA they extract from such ancient remains as cave-bear bones.

Scientists now are beginning to glimpse the branching of Neanderthals and humans from a common ancestor some 700,000 years ago. They are studying 50,000- to 70,000-year-old DNA from such mammals as horses, wolves, and bison.

Such research is in its early stage. But a brief overview of its potential, published in the journal *Science* in July, concluded that it has "profound implications for exploring the biology of ancient organisms."

The cave-bear studies are a down payment on that promise.

Last July, Michael Hofreiter at Germany's Max Planck Institute for Evolutionary Anthropology in Leipzig and his team reported DNA analyses from a 44,000-year-old cave-bear femur and a 22,000-year-old bone of an extinct American short-faced bear. Most DNA is in the nucleus of cells. But some also is in bodies called mitochondria. It was this mitochondrial DNA (mtDNA) that the Hofreiter team described in the journal *BCM Evolutionary Biology*.

Then, two weeks ago, the Proceedings of the National Academy of Sciences carried a description of mtDNA recovered by a team led by Jean-Marc Elalouf at the Saclay Center of France's Atomic Energy Commission. The researchers examined a 32,000-year-old cave-bear sternum bone from the famous Chauvet Cave, home to the oldest known cave art.

Putting those data together with data from modern bears gives scientists a clearer view of how bears diverged from a common ancestor.

According to a report of this work in *Science* two weeks ago, it looks as though the giant panda split from the line that leads to today's eight living species of bears. Also, the cave bear and today's brown bears and polar bears had a common ancestor.

In the *Science* report, Hervé Bocherens, an evolutionary biologist at Germany's University of Tübingen, said the larger significance of this research is that it "opens the field of complete mitochondrial [DNA] sequencing to a very wide range of extinct species."

Knowing the DNA lineage of animals can also have potential economic benefits. Purdue University reports that professor Bill Muir has taken a good look at the DNA of commercial strains of chickens and found it literally to be lacking. He finds they lack about half the genetic diversity, including genes linked to disease resistance, of the native species from which the breeds are derived. He says that it's important to preserve noncommercial breeds and wild birds to ensure a pool of genetic diversity from which useful genes could be bred back into commercial chickens.

Given the potential payoffs in scientific – and even economically useful – knowledge, studying the DNA of wild animals hardly seems a waste of money.



**onscience**  
BY ROBERT C. COWEN

## Pedal: Run devices while you ride

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according to Team Dynamo inventor Mike Taggett. "And you don't have to be cycling champ Lance Armstrong to do this because it is a team effort," he says, referring to how four bikers help charge the batteries.

At Green Microgym, electricity generated by the bikes flows into a bank of batteries, which, in turn, powers devices. Boesel plans to install a "grid-tie" inverter, which allows the generated energy to stream directly into the power grid. This device allows creators of alternative energy, such as solar and wind, to "spin the meter backward" and sell power to their local utility company.

The idea is to meet the gym's power requirements – kept low by a prudent use of plugged-in devices – with solar panels and an array of energy-producing equipment, says Boesel.

### Power bike setups of all sizes

David Butcher, a California Web manager, gets his daily workout on a generator-bike he built three years ago. Pedaling at a steady pace, he charges many appliances at once: the robotic vacuum cleaner, a set of lights, and his laptop. Mr. Butcher webcasts live from his Los Gatos, Calif.

basement during these 40-minute sessions. Thanks to the energizing workout, "I feel like a rocket now," he says, a little breathless from his morning exercise.

Elsewhere, others are testing retrofitted equipment in well-trafficked commercial gyms. A group spinning class can produce a monthly output of 300 kilowatt-hours – enough energy to light six homes for a month and cut 420 pounds of carbon emission, according to Jay Whelan, founder of Green Revolution.

"There is no use it or lose it, or battery maintenance, because the power goes right back to the grid," says Mr. Whelan, a clean-energy entrepreneur who recently retrofitted bikes for the spin class at the 1,200-member Ridgefield Fitness Club in Connecticut.

Elliptical trainers, another popular piece of cardio equipment, are a good source of human power.

"They are even better than bikes since they involve both arm and leg muscles," says Hudson Harr, founder of ReRev.com in St. Petersburg, Fla. In April, his start-up company installed an array of retrofitted ellipticals at the 28,000-member Gainesville (Fla.) Health & Fitness Center. A student gym at the University of Florida in Gainesville was next on his list. "Not doing this would be such a waste of energy," says David Bowles, the school's director of recreational sports.

### How to balance the workout

The idea of using human energy to power appliances – instead of using batteries – is catching on for two reasons: fun and environment-consciousness, says Arjen Jansen, a researcher in human-powered energy systems at Delft University of Technology in the Netherlands.

"Laptops and televisions have evolved and the designs are very energy-efficient, says Jason Moore, a Fulbright scholar studying bicycle design at the Dutch university. Now that these rigs are better at capturing energy, gyms are can put them to use – powering little perks such as TVs, laptops, and lights.

Still, few people go to a fitness center in order to

generate electricity.

"People go the gym primarily to get a good workout," says Whelan from Green Revolution. The workout equipment should feel just like it did before the retrofitting, he emphasizes. Raising the resistance level on these machines will increase the output exponentially, but it might ruin the experience for his customers. He opts to let the rider have complete control over the settings, same as before.



SARAH BETH GLICKSTEEN/THE CHRISTIAN SCIENCE MONITOR

**USER GENERATED:** Kendra Johnson demonstrates the pedal-powered laptop that she designed with seven other MIT students as a class assignment for the school's alumni gym.

### What's next for ecogyms?

"What we are doing now is taking baby steps in the right direction," says Boesel of Green Microgym.

All aerobic equipment, including Stairmasters and rowing machines, can be retrofitted to generate power. Each device, however, comes with its own set of engineering challenges. And while the industry is most driven by retrofitting companies, "in the future, manufacturers may offer power-generation as an option on cardio equipment," says Joe Cirulli, owner of the Gainesville Health & Fitness Center.

Some energy savings could be incidental. "As the exerciser's output exceeds the display needs, the extra power is 'shunted' to resistors, which then heat up simply to shed the energy that is created," says Mr. Taggett of Team Dynamo. The cardio room warms up and requires extra air-conditioning in warmer climates. With these new machines, however, the excess energy is channeled into creating power.

As exercisers become aware of the metrics of human power-production, it could push them to work harder.

"What we have been finding is that people challenge themselves to work a little bit harder because now they can measure how much energy they create," says Whelan. "It seems like there is a personal goal to try and create just a little bit more than the last time they worked out."

When they gravitate to these innovative systems, gym-goers could also move away from power-hogging equipment. Once people figure out that the average treadmill takes 1,500-2,000 watts to run, they may switch to power-producing machines, says Taggett.

"Right now, it would take nine Lance Armstrongs or 15 nonathletes to keep one treadmill chugging along," he says.

**>>> ONLINE: VIDEO**  
To see the MIT power-generating bike in action, go to:  
[CSMonitor.com/innovation](http://CSMonitor.com/innovation)