

[ARTICLES](#)[INNOVATION CENTER](#)[TOPICS](#)[PRODUCTS](#)[AWARDS](#)[RESOURCES](#)[FREE SUBSCRIPTIONS](#)[FIND MY COMPANY](#)[LOG IN](#)[REGISTER](#)[Home](#)[News](#)

Advertisement

## Headlines

**Nitrogen from pollution, natural sources causes growth of toxic algae**

February 8, 2013 7:56 am

**MEMS project pushes for technological revolution**

February 7, 2013 6:26 pm

**When the cell's two genomes collide**

February 6, 2013 12:17 pm

**Maplesoft project for Toyota leverages symbolic computation**

February 6, 2013 8:30 am

[View More Headlines »](#)

## New Products

**Electrostatic Dissipative Workstations**

February 7, 2013 8:36 am

**Fluorescence Spectroscopy Systems**

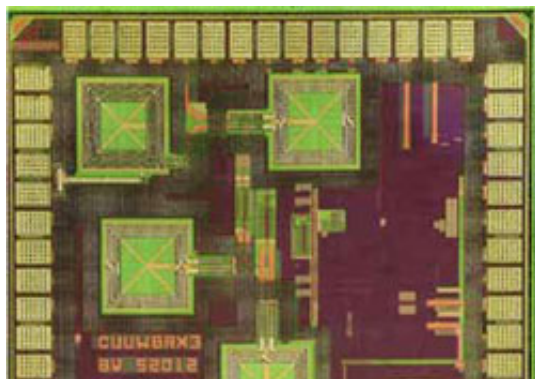
February 7, 2013 8:33 am

# Self-powered nanoscale devices never need new batteries

Mon, 02/04/2013 - 8:59am

by Adam Piore, Columbia University

Get today's R&D headlines and news - Sign up now!



An image of a nanoscale chip engineered by Peter Kinget's lab. He is attempting to build self-powered sensors that run on tiny bits of ambient solar energy, using so little power that their batteries never need replacing.

It's relatively simple to build a device capable of detecting wireless signals if you don't mind making one that consumes lots of

power. It's not so easy to design energy-efficient devices that function as well as the components

they replace, or to do it at the nanoscale.

That's what Peter Kinget, a professor of electrical engineering, works on. He and his colleagues at the Engineering School are attempting to build self-powered systems using nanoscale devices that can transmit and receive wireless signals using so little power that their batteries never need replacing.

Rather, they rely on tiny bits of ambient solar energy to recharge themselves. Such energy efficiencies could dramatically cut down on the cost to operate a variety of these devices at once, while eliminating the need for maintenance. These sensors would only need to be installed once, and could remain in place functioning autonomously—practically until they wear out or disintegrate on their own.

Kinget's work is made possible by recent advances in nanotechnology—in general, he explains, the smaller the components of the tiny devices, the less energy is required to allow them to operate.

"We are using and exploiting the fact that power consumption—and the energy you need to do things—becomes very, very low as you pack more and more functionality into smaller and smaller spaces," he says.

"The bad news," he adds, "is that as the transistors become smaller, there are also clear disadvantages—nanoscale transistors are not as reliable, they cannot sustain large signal levels. The only way to deal with them is to come up with new design concepts."

Kinget's chips—some of them 100 times more energy efficient than most standard technologies—could be deployed for many different uses in future. Embedded in clothing, they could transmit the location of victims during disasters. They could be affixed to the walls of apartments across New York City and monitor heating or energy consumption patterns, which could then be

## Miniature CCD Spectrometer

February 6, 2013 9:44 am

## UV Fiber Laser

February 6, 2013 9:41 am

[View More Product Releases »](#)

Advertisement

Strange But True

Editor's Picks

## Sensing the light, but not to see

February 7, 2013 10:54 am | by Diana Kenney,  
Marine Biology Laboratory

## Missouri researchers ID largest prime number yet

February 7, 2013 10:03 am | by Heather  
Hollingsworth, Associated Press

## Supersonic skydiver reached 844 mph in record jump

February 5, 2013 8:14 am | by Marcia Dunn, AP  
Aerospace Writer

## Beer will help power Alaska brewery

February 4, 2013 9:12 am | by Joshua Berlinger,  
Associated Press

### Trending

- [New coal technology harnesses energy without burning](#)  
2 comments · 4 days ago
- [Missouri researchers ID largest prime number yet](#)  
1 comment · 3 days ago
- [Volcano location could be](#)

analyzed to manage the heating systems or the power grid better. They could even collect and transmit data about humidity and temperature to computers designed to recognize and predict weather patterns.

While the tiny size of the components allows them to operate on far less energy, they are so fragile that they can tolerate only low voltages.

One solution is to create a device that is less accurate at detecting individual signals but far better at detecting more of them in parallel or more of them per second—"oversampling" the signals and then averaging them out.

To save power, Kinget's chips also are designed to network. Instead of passing wireless signals from their origin to destination in one giant leap, the chips use a relay system, passing signaling information from one chip to the next, like a line of citizens in a flood zone "bucket brigade" passing sandbags down a human chain to a river bank. This network relay system means that each chip only has to transmit short distances, consuming less power than large chips transmitting over a far longer range.

The chips also have a learning phase when they go online, in which they detect the intervals at which the chips in their vicinity are transmitting data and then "self-synchronize." This allows them to remain idle—consuming no power—when they are unlikely to receive transmissions from neighboring chips and switch on when they are.

"It's much simpler to build something that listens all the time," Kinget says. "But nanotechnology allows us to integrate much more sophisticated systems in tiny chips, so we can save energy." Kinget grew up and studied in Belgium. After completing his electrical engineering Ph.D. in 1996, he worked at the famed Bell Laboratories in Murray Hill, N.J. He joined the faculty of Columbia's Department of Electrical Engineering in 2002.

[greenhouse-icehouse key](#)

1 comment · 3 days ago

- [Does probability come from quantum physics?](#)

1 comment · 3 days ago

- [New waterjets could propel combat ship to greater speeds](#)

1 comment · 4 days ago

Advertisement

Advertisement

Advertisement

Advertisement

Kinget and his team don't fabricate chips themselves. After designing their chips, they send their specifications to industrial factories known as silicon foundries, and then install the factory-made chips in their systems when they arrive.

Source: [Columbia University](#)

**TOPICS** R & D DAILY BATTERIES & ENERGY STORAGE

SOLAR ENERGY COMPUTER TECHNOLOGY

ELECTRICAL ENGINEERING ELECTRONICS

MICROPROCESSORS

SEMICONDUCTOR MANUFACTURING

#### SHARE THIS STORY



#### COMMENTS

ALSO ON R&D MAGAZINE

New coal technology harnesses energy without burning

2 comments

Missouri researchers ID largest prime number yet

1 comment

Study: Major cuts to surging carbon dioxide emissions needed now

2 comments

How scientists are using silicon to produce hydrogen on demand

1 comment

RECOMMENDED [What's this?](#)  
CONTENT

'Star Wars' Spinoff Films Confirmed By Disney

MTV

Tacos, Tragedy, Testosterone: Watch Episode 1 of Comedy Central's New Show

Comedy Central

How To Invest If You're Broke

Investopedia

How to Tell When You Need a Day Off Work

Citi Women & Co.

0 comments



Leave a message...

Discussion ▾

Share ▾

No one has commented yet.

R&D  
MAGAZINE

- About Us
- Advertising Info
- Contact Us
- Contribute
- Subscriptions
- Privacy Policy
- Supplier

RESOURCES

- Articles
- Blogs
- Digital Editions
- Events
- Calendar
- News
- Videos
- White Papers

TOPICS

- Energy
- Environment
- General
- Sciences
- Information
- Technologies
- Lab Operations
- Life Sciences

CONNECT  
WITH US

- Facebook
- Twitter
- YouTube
- RSS

NEWSLETTERS

[Directory FAQ](#)[Terms &  
Conditions](#)[Manufacturing](#)[Materials](#)[Policy/Regulation](#)*All fields are required.*☐ **The R&D Daily A.M. Edition**

News, features and valuable information pertinent to the research and development industry.

☐ **The R&D Daily P.M. Edition**

Top technologies and new products that shape the world of research and development.

☐ **R&D Product Showcase**

The latest products, services, and technologies for R&D professionals.

## OUR PARTNER SITES

Advantage Business Media © Copyright 2013 Advantage Business Media