



Research *Review*

Spring 2004

About This Newsletter

Distributed quarterly, Research Review is an electronic newsletter of the University of Wisconsin-Madison College of Engineering. If you aren't a subscriber, **sign up** to receive each edition in PDF format via E-mail.

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Engineers in the News

UW-Madison engineering staff and faculty are cited worldwide. Following are a few of note.

- Several online news stories about a new MEMS device that allows researchers to study friction at the microscale quoted Engineering Physics Assistant Professor Rob Carpick. **Read more.**

- Electrical and Computer Engineering Assistant Professor Zhenqiang (Jack) Ma and his students were featured in stories about their way to reduce rising temperatures inside power amplifiers in cell phones and other devices. Reports appeared in *The Washington Times*, UPI and the Middle East North Africa Financial Network.

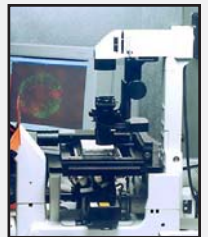
(more newsmakers on page 2)

Research News

MIGHTY MOLECULES SQUELCH VIRUSES

Introducing a harmless molecule that uses the same machinery a virus needs to grow may be a potent way to shut down the virus before it infects other cells or becomes resistant to drugs.

Read more.



STORING STEM CELLS

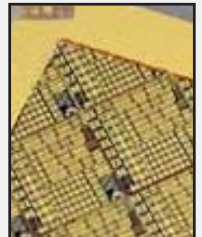
A preservation technique involving simple sugars allows researchers to revive more than 70 percent of cells in a culture after freeze-drying and 18 months of storage at room temperature. Previously, only about 5 percent of cells survived under the same conditions.

Read more.

COOL CELL PHONE

By rearranging energy cells within a cell phone's power amplifier, Electrical and Computer Engineering Assistant Professor Zhenqiang Ma can reduce overheating and power consumption and increase battery life.

Read more.



CRITICAL INFORMATION

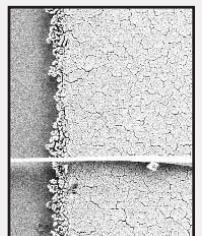
New simulation capabilities enable plasma researchers to understand more about how the spheromak fusion experiment works.

Read more.

"HANDLING" NANOWIRES

A simple solution developed by an interdisciplinary group of faculty and students will enable researchers to get a handle—literally—on manipulating nanowires.

Read more.

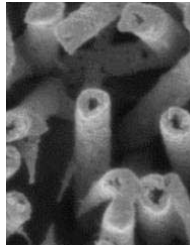


Research News (continued from front page)

“GOLDEN” OPPORTUNITY

A membrane reactor reveals the role of gold in room-temperature carbon-monoxide-to-carbon-dioxide oxidation by allowing researchers to examine it without its support.

[Read more.](#)



CARING FOR CARE WORKERS

A team-based model may increase job satisfaction, boost retention rates and improve the quality of care that nursing home staff deliver.

[Read more.](#)



Engineers in the News (continued from page 1)

• John T. and Magdalen L. Sobota Professor of Chemical and Biological Engineering Nick Abbott and his research group recently published two articles in *Science*. One presented new ways to couple the orientations of liquid crystals to chemical and electrical stimuli in electro-optical devices and chemical sensors through electrochemical control of the oxidation state of ferrocene-decorated electrodes. The other presented novel principles for label-free monitoring of aqueous streams for molecular and biomolecular species without the need for complex instrumentation.

• Nanotechnology Now, an Internet gateway to nanotechnology news, featured the work of Chemical and Biological Engineering Assistant Professor Manos Mavrikakis, graduate student Jeff Greeley and Professor Joost Winterlin (University of Munich). The group provided the first atomic-scale evidence for enhanced catalytic reactivity at stretched surfaces. The site linked to the College of Engineering story. [Read more.](#)

• Biomedical Engineering Professor Emeritus John Webster and Professor Willis Tompkins have been added to a list that names the most-cited researchers in their fields. The citation survey by Thomson ISI, which includes work published

between 1981 and 1999, is viewed as a key indicator of the influence of scholarly activity.

• April—Biomedical, Electrical and Computer and Mechanical Engineering Associate Professor David Beebe and his lab group’s paper, “Microenvironment design considerations for cellular scale studies,” was the featured article on the cover of the journal *Lab On A Chip: Miniaturization for Chemistry, Biology & Bioengineering*.

• April—*Fortune Small Business* ran an extensive story on TomoTherapy, a company started by Biomedical Engineering and Engineering Physics Professor Thomas “Rock” Mackie and researcher Paul Reckwerdt. The company builds the Hi-Art, a combination CT scan and radiation gun that is installed in eight cancer centers, with 26 more on order.

• Evaluating the proliferation of microfluidics in literature and intellectual property, the European journal *Lab On A Chip: Miniaturisation for Chemistry, Biology & Bioengineering* reports that Biomedical Engineering Associate Professor David Beebe is tied for second on a list of the top-20 most published authors of microfluidics papers in 2003. A Beebe group article, “Functional Hydrogel Structures For Autonomous Flow Control Inside Microfluidic

Channels,” published in *Nature*, is one of the field’s most cited papers, with 106 citations through 2003.

• A number of Wisconsin and national media outlets reported on an agreement signed between TrafficCast Inc., a company with ties to the College of Engineering, and the Republic of China to create a traffic information nerve center to monitor traffic problems and ease gridlock in the city of Shanghai. Among the media reporting on the Chinese agreement were the *Milwaukee Journal-Sentinel* ([read more](#)), *biztimes* daily, and the *Miami Herald* ([read more](#)).

• Erwin W. Mueller Professor and Bascom Professor of Surface Science Max Lagally was quoted in the April 8 edition of the *New York Times* on the use of dopants in the fabrication of semiconductors.

A May 27 story on ScienceDaily.com featured Professor of Civil and Environmental Engineering Craig Benson and Assistant Professor Katherine (Trina) McMahon, who are examining what happens to infectious prion proteins—the cause of chronic wasting and mad cow diseases—when they enter wastewater treatment plants.

[Read more.](#)

Patent News

Faculty and staff in the College of Engineering are among the leaders in creating new intellectual property at UW-Madison. For licensing or other information, contact the [Wisconsin Alumni Research Foundation](#).

RECENT COLLEGE OF ENGINEERING PATENTS READY FOR LICENSING

- Howard Curler Distinguished Professor of Chemical and Biological Engineering Juan de Pablo is one of four inventors of a preservation and storage medium for biological materials. The invention provides a cost-effective method for freeze-drying or ambient-temperature-drying a range of biological materials.

[Read more.](#)

- Associate Professor of Electrical and Computer Engineering Dan van der Weide is one of two inventors of a microfabricated microbial growth assay method and apparatus. The invention provides a microbial growth assay that can be used to rapidly test a variety of small-scale substances for their effect on cell growth.

[Read more.](#)

- Electrical and Computer Engineering Associate Professor Akbar Sayeed is one of two inventors of a method and system for multi-carrier multiple-access reception in the presence of imperfections. The invention addresses limitations of current multi-carrier modulation schemes in wireless communications by using a universal receiver structure.

[Read more.](#)

- Civil and Environmental Engineering Professor Craig Benson is one of two inventors of an improved pressure-plate extractor for characterizing soils. The extractor is leak-free and provides for more accurate measurements at both high and low pressures.

[Read more.](#)

- Wisconsin Distinguished Professor of Mechanical Engineering Rolf Reitz is one of two inventors of a

method to reduce emissions and control combustion phasing in homogeneous-charge compression-ignition (HCCI) engines. The method uses suitably timed multiple fuel injections and, among its benefits, results in greater efficiency in gasoline and diesel two- and four-stroke, rotary HCCI and hybrid HCCI/spark-ignited engines.

[Read more.](#)

- Electrical and Computer Engineering Professor Yu Hen Hu is one of three inventors of a method and apparatus for eliminating ringing artifacts in decompressed electronic images. The invention provides an efficient post-processing algorithm and software package to significantly reduce ringing artifacts in highly compressed images.

[Read more.](#)

- Electrical and Computer Engineering Grainger Professor of Power Electronics and Electrical Machines Thomas Lipo is one of two inventors of the multi-phase electric motor with third-harmonic current injection. The invention provides a multi-phase induction motor that could increase torque output by 40 percent and could be used in heavy-duty applications such as compressors for natural gas pipeline pumps.

[Read more.](#)

- Mechanical Engineering Professor John Moskwa is one of two inventors of a method and apparatus for simulating and testing internal-combustion engines. The invention could provide inexpensive, more accurate, instantaneous simulations of multi-cylinder engine performance alone or within engine systems.

[Read more.](#)

New Funding

The National Institutes of Health has awarded Biomedical Engineering Assistant Professor Nimmi Ramanujam nearly \$1 million to design a novel optical sensor to improve the sampling accuracy of breast core-needle biopsy. The sensor potentially could survey

multiple sites without removing tissue and provide accurate, immediate information about optimal tissue sites for biopsy.

The National Library of Medicine has awarded \$2.1 million to a university-industry team led by Lillian S. Moehlman-Bascom Professor of Industrial Engineering Patti

Brennan to build and evaluate an innovative home care computer resource. The system will help visiting nurses better meet the needs of patients with congestive heart failure and increase patient participation in self-care and disease management. The study includes 40 Visiting Nurse Association care teams and 400 patients.