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Featured Story

Beyond Batteries: Storing Power in a Sheet of Paper



Researchers at Rensselaer Polytechnic Institute have developed a new energy storage device that easily could be mistaken for a simple sheet of black paper.

The nanoengineered battery is lightweight, ultra thin, completely flexible, and geared toward meeting the trickiest design and energy requirements of tomorrow's gadgets, implantable medical equipment, and transportation vehicles.

Along with its ability to function in temperatures up to 300 degrees Fahrenheit and down to 100 below zero, the device is completely integrated and can be printed like paper.

The device is also unique in that it can function as both a high-energy battery and a high-power supercapacitor, which are generally separate components in most electrical systems. Another key feature is the capability to use human blood or sweat to help power the battery.

Details of the project are outlined in the paper "Flexible Energy Storage Devices Based on Nanocomposite Paper" published Aug. 13 in the Proceedings of the National Academy of Sciences.

"It's essentially a regular piece of paper, but it's made in a very intelligent way," said paper co-author Robert Linhardt, the Ann and John H. Broadbent Senior Constellation Professor of Biocatalysis and Metabolic Engineering at Rensselaer. [Read more.](#)

Honors and Awards

- **Jonathan Dordick** (Howard P. Isermann Professor, Chemical and Biological Engineering, Biology) received two awards at the American Chemical Society. These were the Marvin J. Johnson Award and the Elmer Gaden Award, both from the Division of Biochemical Technology.
- **Ana Milanova** (Assistant Professor, Computer Science) received a CAREER award from the National Science Foundation. The award is titled, "A Framework for Customizable Program Flow Analysis" and initial year funding is \$80,000. The work focuses on building technology to specify and develop customized flow analyses that support software tasks on large and complex software systems.

Research Accomplishments

- **Curt Breneman** (Professor, Chemistry and Chemical Biology; Director, Rensselaer Exploratory Center for Cheminformatics Research) was recently awarded an additional \$400K from NIH for the center in recognition of its progress and development in novel areas of cheminformatics research and applications. The center has been in operation for approximately two years and started with a budget of slightly less than \$1M. Fourteen RPI research groups are currently involved in the center, as well as three off-campus groups. See: <http://reccr.chem.rpi.edu> for additional details.
- **Steven M. Cramer** (Professor, Chemical Engineering) and **James Moore** (Professor, Chemistry and Chemical Biology) received a three-year grant from the National Science Foundation, titled "Chemically Selective Displacers for Protein Purification." The amount of the grant is \$270,000.
- **Volkan Isler** (Assistant Professor, Computer Science), **Jeff Trinkle** (Professor and Head, Computer Science) and **Petros Drineas** (Assistant Professor, Computer Science) were awarded a Computing Re-

search Infrastructure grant from the National Science Foundation. The grant is \$133,000 for one year. The researchers will collaborate with University of Minnesota researchers to develop a research and education infrastructure based on modular miniature robot teams. As a part of the project, the RPI faculty and students will help establish a mobile robotics lab at Smith College.

- **Lee Ligon** (Assistant Professor, Biology) had a paper selected by the Faculty of 1000 as a recommended paper. The paper is "Target and Delivery: Dynein Tethers Microtubules at Cell-Cell Contacts to Facilitate Adherens Junction Assembly," *Traffic*, 8(7) 808-19, July 2007. The paper is co-authored with E.L.F. Holzbaur (University of Pennsylvania).
- **Robert Linhardt**, (Ann and John H. Broadbent Senior Constellation Professor of Biocatalysis and Metabolic Engineering, Chemistry and Chemical Biology), **Pulickel M. Ajayan** (Professor, Materials Science and Engineering), **Omkaram Nalamasu** (Professor, Chemistry and Chemical Biology, Materials Science and Engineering), **Victor Pushparaj** (Senior Research Specialist), **Shaijumon M. Manikoth** (Postdoctoral Research Associate), **Ashavani Kumar** (Postdoctoral Research Associate), **Saravanababu Murugesan** (Postdoctoral Research Associate), **Lijie Ci** (Research Associate), and **Robert Vajtai** (Laboratory Manager, Nanotechnology Center) were co-authors of the paper "Flexible Energy Storage Devices Based on Nanocomposite Paper" published August 13, 2007 in the *Proceedings of the National Academy of Sciences*. See the featured story above.
- **Deborah McGuinness** (Professor, Computer Science; Constellation Professor, Tetherless World) has been selected to give the opening keynote address at the International Conference on Spatial Information Theory (COSIT), in Melbourne, Australia, September 19-23, 2007 (<http://www.cosit.info/>).
- **James Moore** (Professor, Chemistry and Chemical Biology) presented two invited lectures on his research on polymers from renewable resources this summer: (1) "Dead Leaves & Lawn Clippings: Waste or Opportunity?", *Abstracts of Papers, IUMACRO 2007, 2nd Strategic Polymer Symposium*, and (2) "Mother Nature as a Source of New Materials: Everything Old is New Again", *Abstracts of Papers, 234th ACS National Meeting*, Division of Polymer Chemistry. He is also completing his term as Chairman of the Polymer Division of the American Chemical Society this year.
- **Sandra Nierzwicki-Bauer** (Professor, Biology; Director, Darrin Fresh Water Institute) is quoted in an online article titled "Networking the Hudson River," by Brittany Sauser, in the August 29, 2007 issue of *Technology Review*, published by MIT (<http://www.technologyreview.com/Infotech/19309/?a=f>). The article is about the Beacon Institute and its plans to develop an environmental monitoring system for the Hudson River. **Art Sanderson** (Professor, Electrical, Computer and Systems Engineering) is quoted in a related story in the New York Times on August 16, 2007.
- **Steve Roecker** (Professor, Earth and Environmental Science) returned in late August from three months of field work in Asia (mainly Kyrgyzstan) where he has been setting up seismic arrays and performing 'active source' seismic surveys. Undergraduate students **Aric Mine** and **Riley Gannon** accompanied him in Kyrgyzstan for several weeks of field research.
- **Chang Ryu** (Associate Professor, Chemistry and Chemical Biology), **Toh-Ming Lu** (R. P. Baker Distinguished Professor, Physics, Applied Physics, and Astronomy), **Richard Siegel** (Professor and Center Director, Nanotechnology Center), and **Robert Linhardt** (Ann and John H. Broadbent Senior Constellation Professor of Biocatalysis and Metabolic Engineering, Chemistry and Chemical Biology) received a Major Research Instrumentation grant from the National Science Foundation for nearly half a million dollars. The grant is titled "MRI: Acquisition of Surface-Enhanced Confocal Raman-AFM"
- **Chunyu Wang** (Assistant Professor, Biology) received a new R01 grant from NIH. The title of the grant is "Testing novel mechanistic hypothesis in Mtu RecA intein splicing" and it is funded 9/1/07-8/31/12, with annual total funding of \$294,426.
- **Bruce Watson** (Institute Professor and Acting Head, Earth and Environmental Science) will receive a new grant from DOE starting in November. The grant is \$605K for three years and will be used to explore the diffusion behavior of incompatible elements— including rare earths and uranium—in grain boundaries of Earth materials.
- **Mark Wentland** (Professor, Chemistry and Chemical Biology) received a new NIH award of \$1.2M for a three year period to continue his drug discovery work to identify new treatments for substance abuse.

Other News

- Miriam Katz, formerly of Rutgers University, joined the Earth & Environmental Science Department as a Visiting Assistant Professor. Dr. Katz is a paleontologist whose interests focus upon Cenozoic foraminifera (oceanic protozoa, generally having carbonate shells) as keys to understanding global climate change and carbon cycling.
- Earth and Environmental Science undergraduate Jill Burrows is working to reactivate the student Geology Club. Bruce Watson, Institute Professor and Acting Head of the department has agreed to serve as faculty advisor.

Upcoming Events

- Colloquy: The Future of Computationally Enabled Discovery and Innovation, September 7, 10:30 AM, Center for Biotechnology and Interdisciplinary Studies Auditorium (Faculty are encouraged to attend)
- CCNI Ribbon-Cutting Ceremony, September 7, Noon, Center for Biotechnology and Interdisciplinary Studies Auditorium (Faculty are encouraged to attend)
- Medalist Day Open House, September 8 (All department should plan to participate)

This newsletter is prepared monthly and distributed to faculty, staff and students in the School of Science to keep everyone informed of accomplishments and events within the school. Corrections and items for the next newsletter should be sent to spond@rpi.edu.

