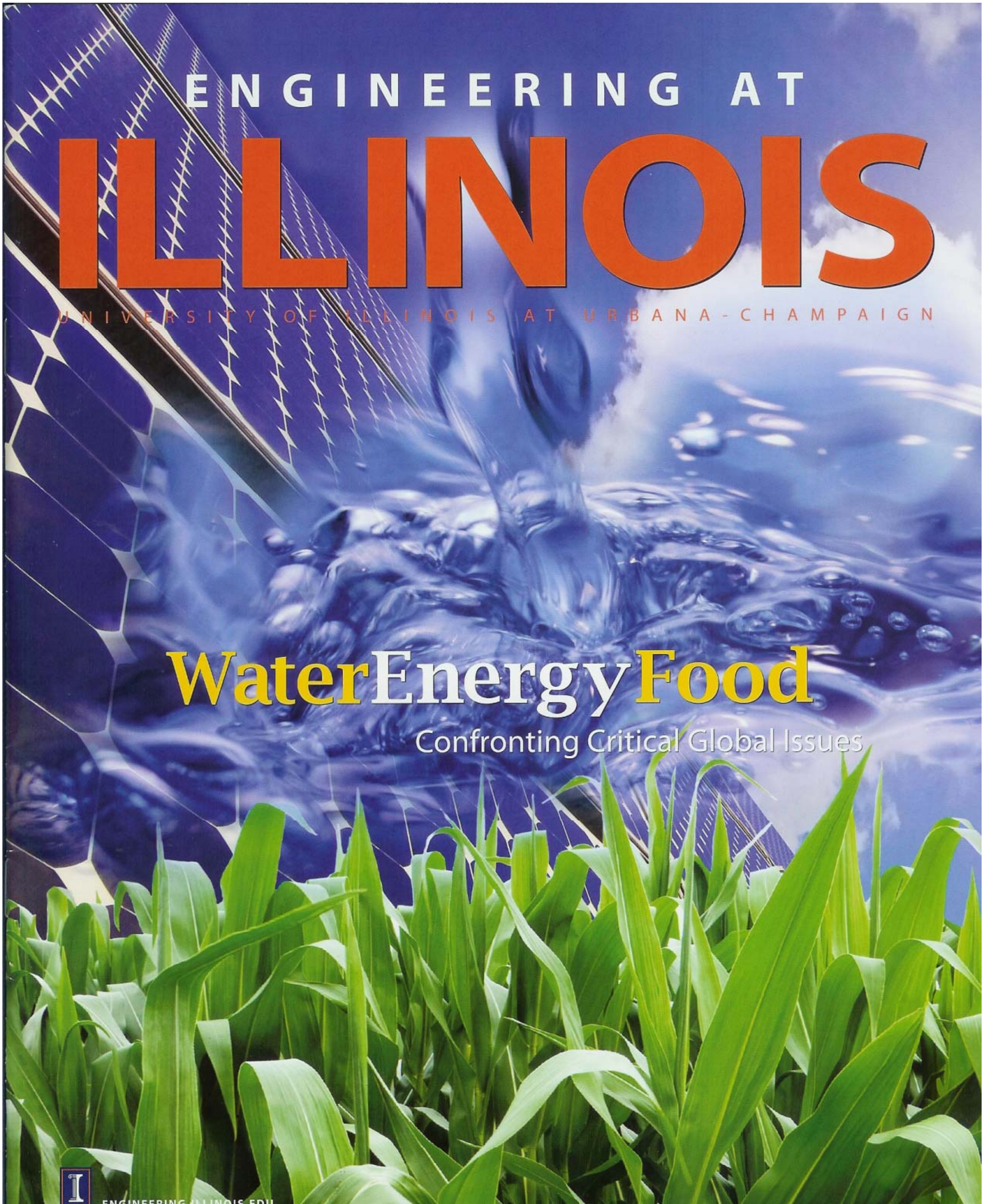
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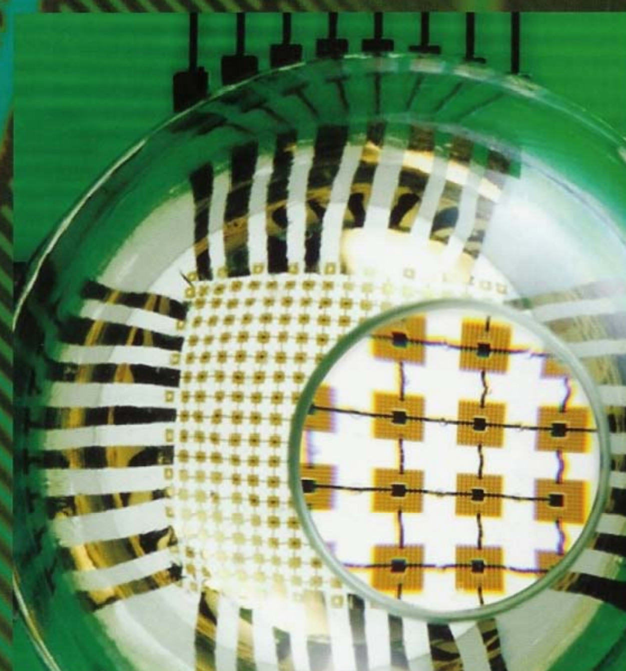
SOLAR GOES SMALL ON YOUR SLEEVE

Traditional silicon cells dominate current solar technology because they are reliable and efficient, and because silicon is abundant. But they are also rigid, heavy, and opaque, limiting widespread usage.

John A. Rogers, the Flory-Founder Chair and Professor of Materials Science and Engineering, and his team have developed a way to print ultrathin, semi-transparent, and flexible cells on plastic, cloth, and other materials. They can create solar cells that are a tenth the thickness of conventional semiconductor cells—so flexible that dense arrays of cells can be rolled tightly around a pencil. The resulting devices offer high degrees of mechanical flexibility, user-definable transparency, and ultrathin-form-factor microconcentrator designs.

Rogers is quick to note that this work involved robust collaborations among a number of faculty at Illinois—Ralph Nuzzo, chemistry; Placid Ferreira, mechanical engineering; Jennifer Lewis and Angus Rockett, materials science—and Younggang Huang of Northwestern University. Some day soon, this technology may become part of the "fabric" of society—with solar cells printed on plastic rolls for wrapping around objects, or stamped onto fabric for clothes that collect energy while worn. In addition to their inherent "flexibility," the technology can be used to produce less expensive solar cells. "Thinner allows cheaper," Rogers said.



The same technology that creates "flexible" solar cells is being applied to other devices, such as a high-performance, hemispherical "eye" camera using an array of single-crystalline silicon detectors and electronics, configured in a stretchable, interconnected mesh.

Flexible neck in cell-receptor DC-SIGN targets more pathogens

New findings from a research team led by Deborah Leckband, chemical and biomolecular engineering, show that flexibility in the region near the binding sites of DC-SIGN plays a significant role in pathogen targeting and binding.

Smart Grid program established at Illinois

The Information Trust Institute (ITI) at the University of Illinois at Urbana-Champaign and its partner institutions are contributing toward the ongoing development of a resilient, secure Smart Grid in the United States. Their work is supported by an $18.8 million award from the U.S. Department of Energy with contributions from the U.S. Department of Homeland Security.

Nanospheres on a silver platter

Illinois researchers in the Department of Materials Science and Engineering—post-doctoral fellow Lin-Lin Wang and professor Duane Johnson—and their collaborators, have made an important breakthrough in understanding how "buckyballs" modify metal surfaces to create their own attachment points and self-assemble into perfect single layers, opening the way to applications in nanoscale electronic devices.

Interdisciplinary team to develop next-generation energy models

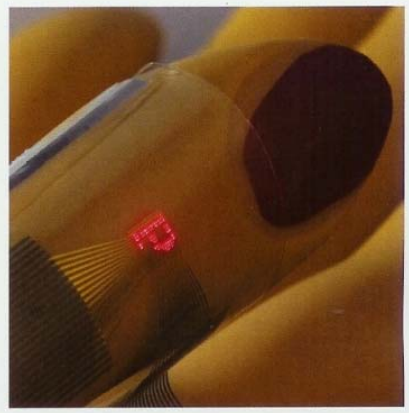
A team of researchers, led by Uday Shanbhag, a professor of industrial and enterprise systems engineering, will use a three-year, $1.03 million grant from the U.S. Department of Energy to tackle complex questions regarding energy markets. The research will allow for a deeper understanding of the competitive interplay between firms, power marketers, and consumers in the face of uncertainty in both demand and resource availability. While the Illinois team—which also includes faculty from electrical and computer engineering and mechanical science and engineering—will focus primarily on electricity markets, their work could apply to many complex economic systems, including communication networks, health care, air and ground transportation, and more.

Self-assembled nanowires could make chips smaller, faster

A new planar growth process developed by Xiuling Li, an assistant professor of electrical and computer engineering, creates self-aligned, defect-free gallium-arsenide nanowires that could readily be scaled up for manufacturing purposes.

Controlled rocking system resists earthquake damage

Professor Jerry Hajjar of the Department of Civil and Environmental Engineering and colleagues from Stanford University, the Tokyo Institute of Technology, Hokkaido University, and E-Defense in Japan, successfully tested a new structural system that will make steel-framed buildings more resilient in earthquakes. The seismic lateral resisting system includes three major components—a stiff, steel-braced frame that remains virtually elastic, but is not tied down to the foundation and thus allowed to rock; vertical post-tensioning strands that anchor the top of each frame down to the foundation and bring the frame back to plumb; and replaceable structural fuses that absorb seismic energy as the frames rock, fabricated from steel plates with water-cut, diamond-shaped slits.



Ultrathin LEDs create new classes of lighting and display systems

A new process for creating ultrathin, ultrasmall inorganic light-emitting diodes and assembling them into large arrays offers new classes of lighting and display systems with interesting properties, such as see-through construction and mechanical flexibility that would be impossible to achieve with existing technologies. Developed by John Rogers, the Flory-Founder Chair and Professor of Materials Science and Engineering, the arrays can be printed onto flat or flexible substrates ranging from glass to plastic and rubber. Potential applications include general illumination, high-resolution home theater displays, wearable health monitors, and biomedical imaging devices.

Rogers was named a 2009 MacArthur Fellow by the John D. and Catherine T. MacArthur Foundation for the "creativity, originality, and potential" of his work on new materials for classes of electronics that overcome design limitations associated with conventional systems.

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