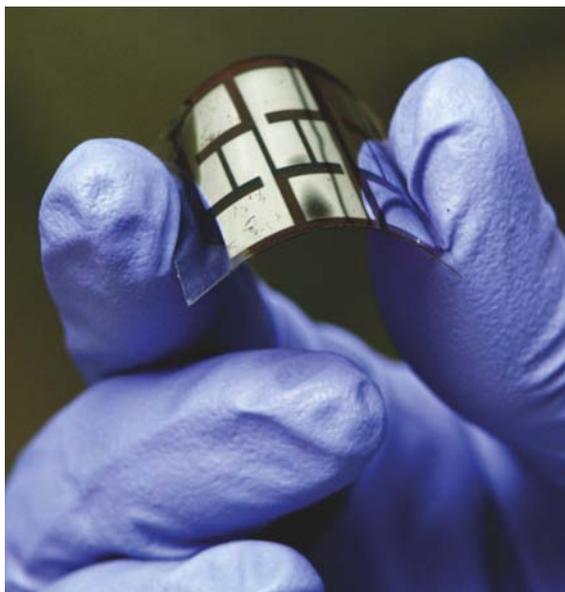


BREAKING GROUND

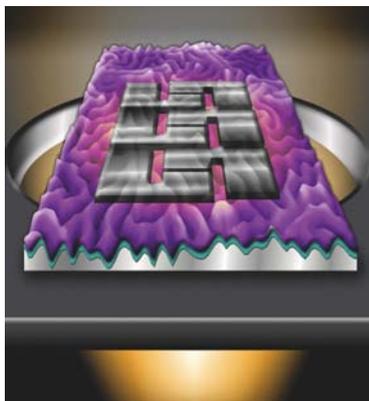
Nooks, crannies boost solar cells

INSPIRED BY NATURE Wrinkles are not always bad, and folds are even better. By introducing microscopic wrinkles and folds to plastic surfaces and applying polymer solar cells on top, Yueh-Lin (Lynn) Loo, professor of chemical and biological engineering, and her colleagues have demonstrated a 47 percent increase in the efficiency of light absorption compared to a plastic solar cell on a flat surface. The nooks and crannies in the surface even extend absorption beyond the visible light spectrum and into the near-infrared spectrum.

The patterns of folds in the surface are similar to those found on leaves, the ultimate example of a miniature solar-energy powerhouse. “If you look carefully at leaves, the surfaces are not flat — there is a lot of structure,” said Loo. Scientists believe that the structure of leaves creates a more effective way to guide light to cells where photosynthesis takes place. “Photosynthesis itself is efficient, but you need to harness as much light as possible,” Loo explained. Her lab applied the same rationale to solar cells.



A new photovoltaic cell developed by Professor Lynn Loo's research team is more efficient and tougher than traditional cells. Folds on the cell's surface, shown in the rendering, right, increase efficiency by guiding light waves.



WHAT'S AHEAD Solar panels currently are made from silicon — a rigid, brittle material that requires an energy-intensive process to make. Loo's research focuses on making solar panels from plastics, a lightweight material easy to manipulate and make at low cost. Solar panels can be printed on these surfaces using a process analogous to printing newspapers and magazines on paper.



“We think that [our approach] is a simple process that you can extend to large surfaces,” said Loo, deputy director of the Andlinger Center for Energy and the Environment. The ultimate goal is to translate the discoveries into techniques that manufacturers can incorporate into the design of better, more efficient solar cells.

HOW CAN WE USE IT? In the future, durable and flexible plastic solar panels could power your cellphone with small panels on your backpack, or let you charge your tablet computer on a camping trip via panels integrated on your tent. “The big goal is to have building-integrated [plastic] solar panels,” said Loo.

Loo and her team also are applying the wrinkled-surface approach to other plastic polymers that already absorb light in the near-infrared range. Low-cost, large-scale plastic solar panels may be just around the corner — at your house or your neighbor's. **P** *By Anna Azvolinsky '09*

FYI: FINDINGS



A study of Pakistanis has found stronger **SUPPORT FOR MILITANT GROUPS** among the middle class than among the poor, challenging conventional wisdom. The research team, which included Princeton graduate student Graeme Blair and politics professor Jacob Shapiro, analyzed surveys from 6,000 Pakistani adults. The researchers' conclusion that the poor in Pakistan were substantially more negative toward militant groups undercuts the assumptions of American policies that have focused on using aid to reduce poverty as a way to combat militant violence. The results were published in July by the American Journal of Political Science.

The arrival of rock fragments from distant planets — as well as microorganisms along for the ride — may have introduced **LIFE ON EARTH**. A team that includes visiting researchers Edward Belbruno and Amaya Moro-Martin suggests that planetary fragments have escaped one system's gravitational pull and drifted through space until pulled into another planetary system, where they might have collided with a planet like Earth. The research was published in *Astrobiology* in September.

So clichéd is the lumbering figure of **FRANKENSTEIN'S MONSTER**, we forget the 1818 novel by Mary Wollstonecraft Shelley that hatched the myth. In “The Annotated Frankenstein” (Belknap Press of Harvard University Press), English professor Susan Wolfson and a colleague at Rutgers, Ronald Levaio, find the novel brimming with allusions to “Paradise Lost” and “The Rime of the Ancient Mariner” as well as to Shelley's own tumultuous life.

By W. Barksdale Maynard '88 and Nora Taranto '13