OF NOTE

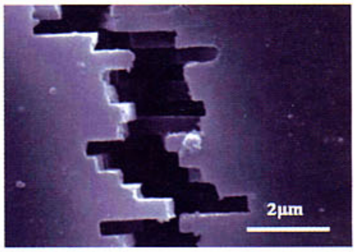
ganese, form in the bombarded silicon, LaBella says. Such structural irregularities often spell bad news in microelectronic devices. —P.W.

MATERIALS SCIENCE

Tiles stack for shell strength in abalone

Jewelers may prize abalone shells for their mother-of-pearl, but scientists have long been equally enchanted by the shell's strength. Researchers at the University of California, San Diego have used a novel technique to uncover more of the mollusk's shell-making secrets.

Reporting in the Jan. 15 *Materials Science and Engineering A*, Marc André Meyers and Albert Lin examined two species of abalone growing in saltwater tanks. The researchers placed thin glass slides on top of the organisms' growing shells, which are made of calcium carbonate. Over time, the abalones accepted the glass as part of their shells and deposited new calcium carbonate on top of it. After different time intervals, the researchers removed some of the slides from each organism and examined the newly deposited material with a transmission electron microscope.



NATURAL ARMOR When an abalone shell receives a blow, its stacked tiles slide sideways instead of shattering.

As have others, the San Diego scientists observed thousands of calcium carbonate tiles stacked on each other in a bricklike fashion. Each hexagonal-shaped tile is about 10 micrometers across and half a micrometer thick. Lin says that this arrangement of tiles makes the abalone shell far stronger than the calcium carbonate shells of other organisms.

He and his colleagues also found that the sticky protein the mollusks secrete between the layers of tiles isn't present on the tiles' edges. This way, if struck by a heavy blow from a predator, the tiles can move sideways instead of shattering. Meanwhile, the glue between layers absorbs the blow's energy by stretching, says Meyers.

The researchers say that they hope their findings will guide ceramics makers toward stronger materials for products such as body armor. —A.G.

ASTRONOMY

Swift detection of a gamma-ray burst

For the first time, a telescope has directly detected X rays from a gamma-ray burst, the most powerful type of explosion in the universe. Gamma-ray bursts, which may be generated by the sudden collapse of extremely massive stars, also are the likely birth cries of black holes.

The Swift spacecraft, launched by NASA late last November to study gamma-ray bursts and their afterglows, recorded the X rays on Jan. 17, during a relatively long-lived burst dubbed GRB050117. Three minutes and 12 seconds after Swift's gamma-ray telescope found the burst, the craft automatically turned its X-ray telescope to the same point in the sky.

CAUGHT IN THE ACT Artist's depiction of the Swift spacecraft with a gamma-ray burst in the background.

Previous X-ray images had captured a burst's afterglow, but not the burst itself, notes Swift principal investigator Neil Gehrels of NASA's Goddard Space Flight Center in Greenbelt, Md. The new images are the first to track the transition of a gamma-ray burst from its brilliant, initial flash to its slowly fading afterglow, which can last for weeks. Swift's third instrument, a combination ultraviolet-and visible-light detector, has just completed final testing and wasn't yet recording data when the burst erupted.

Other telescopes, both in space and on the ground, are now studying the burst's afterglow and the region surrounding the burst. —R.C.

ENVIRONMENT

Long-winded benefits

The best wind-energy facilities can generate electricity at costs comparable to those of large coal- and nuclear-powered plants. However, compared with these old workhorse plants, wind-powered generators are less reliable because they depend on, well, the wind.

According to a team of energy analysts led by Paul Denholm of the National Renewable Energy Laboratory in Golden, Colo., wind systems' reliability could be boosted if they saved up excess energy during strong breezes. Such energy-storage systems could deliver full electric power about 80 percent of the time, which is comparable to the performance of conventional power plants, the researchers say. The challenge is how to store the energy economically.

One solution that's just about good to go: Save surplus wind energy as compressed air in an underground cave, then use it later to run an electric generator. Such a system would need an occasional boost of fossil fuel, but not enough to seriously undermine wind energy's environmental benefits, the scientists argue in an upcoming *Environmental Science & Technology*.

The researchers calculate that energy-storing wind systems could be far more efficient at generating electricity and would produce, per kilowatt of electricity generated, only a third of the nitrogen-oxide emissions and less than a fifth of the greenhouse-gas pollution emitted by even the cleanest coal plant. —J.R.

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