bind the semiconductor.

Thus far, Belcher reported, the technique has worked beautifully. Her team has identified proteins that can discriminate between similar semiconductor alloys, such as gallium-arsenide versus aluminum-gallium-arsenide, and can even discriminate between different faces of the same semiconductor crystal, which have different arrangements of the atoms on the crystal surface. Down the road, she says, her team is planning to pattern the semiconductor-binding proteins on surfaces and use them to nucleate the growth of tiny semiconductor crystals in controlled arrangements. That's just what researchers around the globe are trying to do, in an effort to create ultrasmall transistors and other computing devices. And if Belcher and Sarikaya have their way, proteins may be just the handle they need to get there.

–ROBERT F. SERVICE

TAIWAN

# Science Staggers Along After Deadly Earthquake

**Chung Hsing University sustained heavy damage in the 21 September earthquake that left 100,000 homeless and caused massive disruptions to Taiwan's economy**

**TAICHUNG, TAIWAN**—Working in the Food Science Building at Taiwan's National Chung Hsing University here is not for the faint of heart. The cracks and spalls in the building's concrete beams and columns are a constant reminder of the devastating earthquake that struck on 21 September, claiming 2300 lives and leaving more than 100,000 homeless. The toll included two students at Chung Hsing, one of Taiwan's major research universities. But 3 months later science goes on, as researchers and grad students step around scaffolds and reach over braces as they struggle to make up for the deadly interruption. "I don't feel safe," says grad student Lai Li-An. But with her master's thesis due this spring, she says, "we have to keep working."

Chung Hsing has so far received from the government only about one-fourth of the estimated $12.5 million needed for emergency repairs, and its request for another $34 million to replace the most heavily damaged buildings is pending. And it is far from the only supplicant. The quake wreaked havoc on educational facilities of all types, and drove students and faculty at National Chi Nan University, a small, relatively new university in Nantou, into borrowed classrooms in Taipei. The Ministry of Education estimates that it will cost $800 million to replace and repair more than 800 school buildings throughout the damaged area.

The toll on university equipment and instruments has not even been calculated. Some things may be impossible to replace, such as biological culture collections. Yet it could have been worse. The campus, 40 kilometers from the epicenter, was spared the full brunt of the magnitude 7.6 earthquake that struck near the central mountain town of Puli, 160 kilometers south of Taipei. More than 50,000 structures in the region were destroyed, and downed power lines led to outages and rationing that lasted for several weeks. Total economic losses have been estimated at $9 billion, or about 3.3% of gross domestic product.

At Chung Hsing, the 30-year-old Food Science Building and the library, now closed for repairs, sustained the most damage. But most buildings "performed as expected," says Lin Chi-Chang, chair of the Department of Civil Engineering, despite the fact that the lateral seismic loads imposed on the buildings were much greater than they were designed to withstand. The cracks that run through interior walls in many buildings, he adds, do not threaten their structural integrity.

Equipment is another matter, however. The quake destroyed the magnet in the chemistry department's prized 400-megahertz nuclear magnetic resonance (NMR) spectrometer, and the department doesn't have the $100,000 it would cost to buy a replacement. Instead, researchers are using older NMRs, which are less powerful and therefore slower. "People are having to wait for machine time," says department chair Gau Han-Mou. A key component in a high-performance liquid chromatograph was also knocked out of kilter in the quake and sent off for repairs. "We keep calling, but they haven't yet figured out what's wrong," says Gau, who was using it to study the chirality, or handedness, of molecules. That work has been suspended until the instrument can be fixed.

**Settling down.** Chung Hsing's Tseng Yi-Hsiung, left, and Chen Liang-Jwu have learned to live with the cracks in the Life Sciences Building.

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The Institute of Molecular Biology's entire collection of culture samples was lost when a weeklong power outage shut down freezers. "We had emergency generators, but they were thrown off their supports in the earthquake," says Tseng Yi-Hsiung, an institute professor. The lost samples represent years of efforts to identify and isolate agriculturally important strains of bacteria and enzymes. "I can't even estimate the loss," Tseng says. Fortunately, his own work on a bacterium that damages vegetable crops has continued thanks to samples from other labs.

Officials have also tried to ease the pain of those who suffered the greatest losses. The parents of one of the fallen students, a popular senior in the horticulture department, added their own funds to a collection taken up for their daughter and gave it back to the school for repairs. But university officials instead have combined it with other contributions and created a scholarship fund for students from families that lost a breadwinner in the earthquake.

Some of those survivors say it has been hard to return to work. "The experts are more optimistic than we are," says Tseng. Nights are particularly bad. "People used to work here until very late," Tseng says. "Now we're all afraid to be in the building after dark." For a long time, however, going home wasn't much comfort, either. Tsen Hau-Yang, a professor of food science, says that he and his family worried for weeks about the safety of their two-story house. "So I slept in my car for the first month after the quake," he says.

Although Tsen is back to sleeping in his bed, many faculty members expect repercussions from the quake for years. Tseng is particularly worried that the uncertain state of repairs will drive away top-quality applicants to the university and its graduate schools. "That could be the most serious problem of all," he says.

–DENNIS NORMILE