

ily to remove nutrients from wastewater. So these systems will have a nice double benefit," she states.

Meanwhile Pruden is working with her colleagues on experimental water treatment systems that degrade genes using ultraviolet

light, perhaps in combination with peroxide. They plan to test pilot systems within the year. "Those should almost certainly disrupt DNA sequences," Stinson says.

Charles Q. Choi is a frequent contributor.

TELESCOPES

Seeing Stars in Iraq

RESTORING WRECKED OBSERVATORY MAY BOOST IRAQI SCIENCE BY MIKE SIMMONS

Erbil, Iraq—High in the mountains of northern Iraq's Kurdistan Autonomous Region stands the empty shell of what would have been a world-class astronomical observatory. In 1973 President Ahmed Hassan al-Bakr ordered the construction of the \$160-million observatory of three telescopes. Once completed, it would have been the only major observatory in the Middle East. But positioned on a strategic mountaintop less than 50 kilometers from the border with Iran, the observatory's radio telescope dish and optical telescope domes became targets, first in 1985 by Iranian missiles and then in 1991 by U.S.-led forces in the Persian Gulf War.

Atop the 2,127-meter-high Mount Korek, the observatory elicits a mix of emotions. The setting is spectacular, with expansive vistas of mountains and valleys. The facilities, however, show the effects of battle and 20 years of neglect. Debris and the detritus of war litter the buildings; several mortar rounds lie unused in the smaller telescope's dome. Still, the structures appear to be readily repairable.

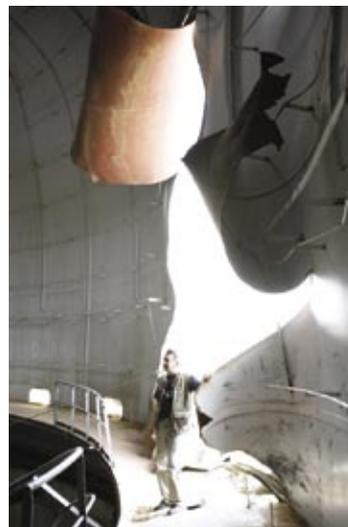
Unlike the ruins of ancient observatories that dot this region—reminders of an era when Islamic science led the world—the Iraqi National Astronomical Observatory may have a second chance. Isolated from the war-ravaged areas to the south—and with international sanctions, internal strife and the constant threat of Saddam Hussein's army now in the past—the three peaceful provinces in the Kurdistan region are enjoying something of a renaissance.

Cognizant of the importance of science and education in rebuilding their society—

and of the prestige a respected scientific institution could bring—Kurdistan's leaders are considering proposals aimed at rebuilding the observatory. Nawzad Hadi Mawlood, the governor of Erbil province, worked on Mount Korek as a broadcast engineer before entering politics. (Broadcasters take advantage of Mount Korek's lofty position to transmit radio and television signals.) Mawlood sees restoration of the observatory as a priority. "It will be a famous place," he says, adding that "as an engineer it's very important for me to renovate it." Athem Alsabti, who was charged with founding the observatory by al-Bakr, is now at the University of London Observatory and has worked toward the Iraqi facility's renovation since the fall of Saddam's government. Alsabti believes a renewed facility will be "a center for the whole Middle East."

As originally conceived, the observatory would have consisted of a 30-meter-diameter radio telescope for millimeter-wave observations and 1.25- and 3.5-meter-diameter optical telescopes. At the time of the first attack, the radio telescope and the 1.25-meter optical telescope were installed and undergoing tests. Three missile strikes heavily damaged the radio telescope's dish and concrete supporting structure. Little of the 1.25-meter telescope remains because of looting.

The 3.5-meter telescope lay packed in shipping crates elsewhere on the mountain when missiles ripped through the huge dome's skin. Hurriedly moved to Baghdad for safekeeping, the telescope—among the



SHELLED: Observatory dome shows the effects of war and 20 years of neglect inside and out. A plan could restore the telescopes and revive science in Iraq.

world's largest at the time—has probably escaped harm, but a survey of the crates' contents is considered too dangerous within the beleaguered city. Trucking the crates to Erbil along the treacherous highway may be the only way to determine its condition.

An alternative could be an entirely new instrument. Peter Wehinger, an astronomer at Steward Observatory at the University of Arizona, notes that current technologies can construct far wider telescopes in more compact packages; he recommends placing a 6.5-meter telescope in the existing large dome. This instrument would collect three times the light of its predecessor, and if based on designs of existing telescopes of similar size, it would have a relatively modest cost, estimated at \$30 million. A repaired observatory "could excite people in the Middle East to support such projects," Wehinger says.

Alsabti expects that such a facility

could lure back Iraqi astronomers from abroad—no more than a dozen remain in the country. Wehinger agrees and anticipates enthusiasm from neighboring countries as well. "It just builds a much greater sense of ownership and purpose" than traveling to distant facilities, he says.

The Kurdistan region could also couple the observatory to a proposed center for astrophysics and space science at Salahaddin University in Erbil, which would most likely draw astronomers from throughout the area and function as a regional scientific facility. The observatory's fate might well foreshadow the future of Iraq's reemerging scientific community as it struggles to regain its place within a country in transition.

Mike Simmons, an astronomy writer based near Los Angeles, visited Iraq for the second time in October 2006.

GENETICS

Here Come the X-Mice

A MUTANT MOUSE ARMY TO BATTLE DISEASE BY CHRISTINE SOARES

Wanted for long-term occupancy: clean, secure home, must have ample freezer space, 20,000 bedrooms, starting July 2007. An ambitious plan getting under way to learn the function of every gene in the classic lab mouse *Mus musculus* will require the manufacture of a large living "database" of mutant mice over the next five years, with the ultimate goal of under-

standing comparable genes in humans.

The U.S. component of the multinational effort, the Knockout Mouse Project (KOMP), will target some 10,000 mouse genes, half the rodent's estimated complement. (Canadian and European researchers will tackle most of the rest.) Project investigators will have to make a lot of mice—or, more precisely, a lot of mouse embryos. Those will be used to derive embryonic stem cell lines, which can be turned back into embryos to make litters of live mice when they are needed for study. Grants issued last summer totaling nearly \$50 million will go toward producing the first 8,500 or so of the cell lines, each carrying one disabled, or "knocked out," gene.

Realistically, litters of pups representing every mouse gene will probably never reside in the same place at the same time, according to Colin Fletcher,



MUTANT MOUSE (left) has a gene affecting hair growth knocked out, giving it a thinner coat than a normal mouse (right).

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