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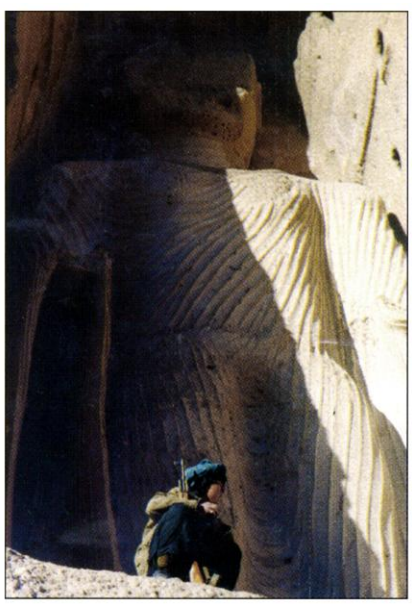
ANTIQUITIES

Global Support Grows For Afghan Restoration

As Afghanistan settles into a precarious peace after the ousting of the Taliban regime, scholars are taking stock of the most recent destruction of Afghanistan's rich cultural heritage. Initial reports are grim: Ancient murals were trucked away from the niches around the dynamited Buddhas of Bamiyan, every human statue in the national museum in Kabul was destroyed, and the museum itself may be beyond repair, say UNESCO officials. But there is growing international support for restoring and possibly even rebuilding important cultural artifacts.

The most dramatic example is a plan by a Swiss architect to rebuild the 53-meter-high standing Buddha at Bamiyan, whose 1700-year reign as the world's largest Buddha ended last March when the Taliban regime destroyed it and another similar but older sculpture (*Science*, 9 March 2001, p. 1873). Paul Bucherer-Dietschi hopes to use digital data from photographs to create a 1:10 scale model of the Buddha at a museum he founded in Bubendorf, Switzerland, as a temporary home for Afghan artifacts. The model, likely to cost about $1 million, would be the first step in recreating the original in the Afghan cliffs.

Bucherer-Dietschi, who last week returned from a 6-week tour of Afghanistan under a UNESCO contract, says that Raheen Makhdoom, Afghanistan's new minister of information and culture, told him he supports the reconstruction. A former professor of art history, Makhdoom announced recently that the government wants to sponsor an international conference in May to assess what can be done to repair the damaged site, including rebuilding the statue.



Regaining the past. Efforts have begun to recreate one of the Bamiyan Buddhas, shown being guarded by a Taliban soldier before its destruction last March.

CREDIT: ZAHEERUDDIN ABDULLAH/AP

The reconstruction would be more than a symbolic emergence from the Taliban's policies of cultural destruction. It would also be a huge boon to Afghanistan's once-thriving tourism industry. But the ambitious project poses formidable engineering as well as fund-raising challenges. "The cliffs were heavily damaged from the explosions, so stabilization is a priority," says Bucherer-Dietschi. Although some debris remained at the base of the two Buddhas when he visited the site, he says that local residents told him that much of the rubble had been hauled away in trucks to be sold. Some 150 square meters of murals in the nearby niches also vanished, he notes. The details of how to rebuild the Buddha and restore other artifacts must be left to international experts, he adds.

While Bucherer-Dietschi focuses on the destroyed Buddha, UNESCO officials are trying to assess the damage and restore order to the cultural relics that remain. Tracing the rubble and murals "is hopeless—we don't have the money or personnel," says Christian Manhart, who heads UNESCO's Asian cultural heritage division. "Our priority is to conserve what's still there." UNESCO already has distributed about $1000—"a huge sum in Kabul," Manhart says—to three Afghan archaeologists to purchase materials and put the rubble from the museum into boxes for later identification.

Sadly, little appears salvageable. Manhart says the museum's collections—undermined by 20 years of war and chaos—were "systematically destroyed" by the Taliban, whose strict reading of Islamic law made them hostile to all representational images. "It's worse than we thought," says Manhart, noting that other artifacts were likely looted. The one exception is prehistoric shards boxed in the museum basement. "They didn't touch those," adds Manhart. "There was no real market value to them." The museum itself may have to be replaced, he says.

UNESCO is assembling a team of scholars, primarily Afghan researchers in Europe and the United States, to conduct a detailed assessment of ancient sites. James Williams, a UNESCO cultural heritage officer, says that there are early reports of extensive damage to the Zoroastrian complex of Surkh Kotal near the Pakistan border, to a variety of mausoleums in Herat, and to the 9th century mosque of Haji Piyada in Balkh. The unique site of Hadda near Jalalabad, which combines Hellenistic and Buddhist styles, is rumored to have been destroyed, he adds. And thousands of excavated artifacts remain unaccounted for, including a spectacular Soviet find in the late 1970s of Hellenistic-influenced gold objects at Tilya Teppe in north-central Afghanistan.

There are no plans at present to resume archaeological digs, says Roland Besenval, an archaeologist at the Guimet Museum in Paris who learned during a visit last month to Kabul that officials first want to assess the damage and clear land mines. The Italian and German governments have pledged support for rehabilitating the museum, and France, Austria, and Japan may also chip in money for cultural heritage assistance. In addition, Italy has provided $160,000 for conservation and archaeological training of Afghan workers involved in the repairs, and Japan has set aside $76,000 to track looted Afghan objects. Unfortunately, money can't mask the fact that a good deal of Afghanistan's heritage either has been wiped out or now rests in the hands of foreign collectors. **–ANDREW LAWLER**

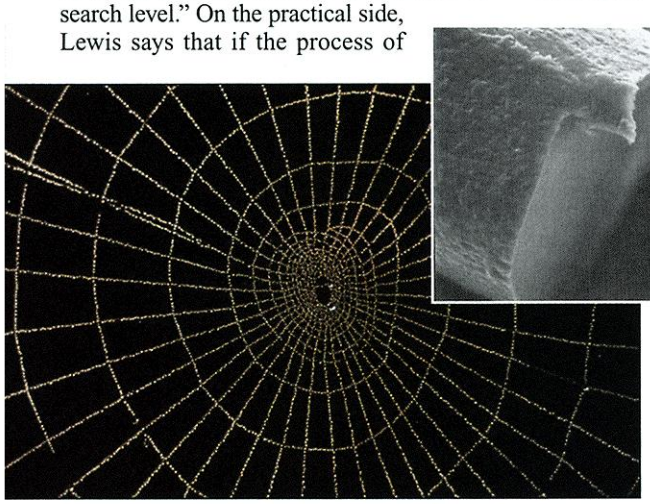
MATERIALS SCIENCE

Mammalian Cells Spin A Spidery New Yarn

Not even the priciest threads from New York's fashion district can match the wonders of a simple spider web. Spider dragline silk is stronger than Kevlar and stretches better than nylon, a combination of properties seen in no other fiber. That's had entrepreneurs and scientists scheming for more than 100 years to find a way either to farm spiders or, lately, to transfer their silk-making genes into organisms that can produce enough silk to be useful. None have succeeded—until now. On page 472, a team led by researchers at Nexia Biotechnologies near Montreal, Canada, reports splicing dragline silk genes into mammalian cells and showing for the first time that harvested recombinant proteins can be spun into

strong, lightweight fibers.

The new progress "is highly encouraging," says Randy Lewis, a molecular biologist and spider silk expert at the University of Wyoming in Laramie. "It opens up a lot of things on a practical level and on a research level." On the practical side, Lewis says that if the process of harvesting silk from cell cultures is perfected, it will lead to ultrastrong, flexible fibers for everything from artificial tendons and ligaments to lightweight body armor and high-strength composites. And on the research side, teams can now explore how changes in the silk genes and proteins affect the strength and flexibility of the fibers.



Nice threads. After years of attempts, researchers have coaxed mammalian cells into producing spider silk.

This promise is injecting new hope into a field in which progress has been "agonizingly slow," says team member Steve Arcidiacono, a fiber-spinning expert with the U.S. Army Soldier Biological Chemical Command (SBCCOM) in Natick, Massachusetts. SBCCOM and other teams have worked for more than 10 years to splice spider silk genes into other organisms in hopes of recovering enough silk to produce bolts of high-strength material. And although they've inserted the genes into bacteria, yeast, and plants, the result has always been disappointing: insoluble silk proteins that clump together inside the cells. Even when the proteins have been extracted and purified, researchers have managed to turn them only into worthless, brittle fibers at best.

The Nexia researchers thought they might get better results by transferring silk genes into certain mammalian cells that more closely mimic those used by the spider itself. In spiders, specialized epithelial cells produce and secrete a pair of proteins in a water-based solution in a spider's silk gland. As these proteins are pushed out of the gland, they self-assemble into fibers, although the details of this process remain unclear.

The Nexia team, led by molecular biologists Anthoula Lazaris and Costas Karatzas, spliced the silk genes into two different cell lines: bovine mammary cells, epithelial cells that excel at secreting proteins outside the cell; and hamster kidney cells, which are adept at producing large volumes of recombinant proteins. Both cell lines worked, each secreting soluble silk proteins outside the cells, where they could easily be collected.

The Nexia researchers then teamed up with Arcidiacono's group to spin the proteins into fibers. For this first study they spun fibers from just one of the proteins, dubbed MaSpI. The army researchers first concentrated the MaSpI proteins in water, then extruded them through a tiny hole at the end of a syringe and into another solution containing methanol, a change of environment that prompted the proteins to assemble into continuous fibers. And impressive fibers they were: threads that are lighter yet tougher than Kevlar and nearly as elastic as nylon.

That's still not quite as good as native dragline silk, which has even more flex. That difference may be because the fibers are made from only one of the two proteins spiders use to spin their fibers. Karatzas says his team will soon try to spin fibers from both proteins to see if this improves the fibers' properties.

Making bigger proteins may also help. Native silk proteins are heavyweights, each weighing some 150 kilodaltons, whereas those produced by the recombinant method are about 60 kilodaltons. Karatzas says his team has already produced heavier proteins by splicing three copies of the gene next to one another. The Nexia researchers plan to test these to see whether they make better fibers as well.

If either scheme works, it may help propel recombinant spider silk into early applications that require little material, such as biocompatible artificial tendons and ligaments, thin, biodegradable sutures for eye surgery and other delicate operations, and high-strength fishing line. Down the road, Nexia plans to transfer the genes to the mammary cells in goats, in hopes that the proteins can be harvested from the milk. That, in turn, could produce silk proteins in plentiful quantities for applications such as high-strength composites and soft, flexible bulletproof clothing for soldiers and police—all without the chore of figuring out how to raise spiders on a farm.

–ROBERT F. SERVICE

CREDITS: (LEFT TO RIGHT) RALPH CLEVENGER/CORBIS; A. LAZARIS *ET AL.*

ScienceScope

Closer to the Edge The viability of the Coulston Foundation in Alamogordo, New Mexico, once the nation's largest chimpanzee research and housing facility, is in question after a local bank filed suit to recover $1.2 million in defaulted loans. The U.S. Food and Drug Administration (FDA) has also said it will reject six product-testing studies carried out at the troubled facility since 1999. Coulston and FDA declined to comment. But animal activists who have followed the foundation's sinking fortunes say they would like the U.S. Department of Agriculture to take custody of the 250 to 260 chimps believed to still live there. Last summer the National Institutes of Health relocated 285 Coulston chimpanzees to Charles River Laboratories, ended Coulston's funding, and let lapse the foundation's permit to experiment on federally owned animals (*Science*, 24 August 2001, p. 1415).

Super Agency The British government plans to overhaul its health bureaucracy to focus on emerging diseases and the heightened bioterror threat. Over the next year, four agencies will be combined into a new National Infection Control and Health Protection Agency, according to a report last week from the U.K. Department of Health. It targets many areas for improvement—from registering research projects that involve dangerous pathogens to beefing up disease surveillance. "When we get outbreaks of disease, we often don't know what's caused them," says the U.K.'s chief medical officer, Liam Donaldson. The health department intends to pool the $50 million a year in research funds and devise a new strategy for spending the money.

Mine Disaster? Executives and politicians involved in an effort to convert a South Dakota gold mine into the world's deepest underground laboratory say the plan could collapse unless Congress alters a new law that would transfer part of the site to government ownership. Homestake Mine officials last week said the law, crafted last month by Senator Tom Daschle (D–SD) and Representative John Thune (R–SD), doesn't do enough to reduce the company's liability for potential pollution and safety problems associated with the proposed $300 million lab. Thune is organizing a meeting later this month to discuss solutions and ways to prevent the company from permanently flooding the mine in March. Earlier this month, ScienceScope (4 January, p. 27) failed to note that the new law requires the National Science Foundation, which is reviewing the proposal, to approve the project before the land transfer can take place.