key court victories (*Science*, 10 March, p. 1729). The Pope verdict "suggests a revitalized FSB and a danger to all researchers," says Paul Josephson, a Russian historian at Colby College in Waterville, Maine.

Pope's release would ease tensions—but only a bit. U.S. officials are on tenterhooks after Russia threatened last month to resume arms sales to Iran after a 5-year hiatus on new contracts. "The worst-case scenario," says one observer, "is that all the technology cooperation programs are halted." Others have a more hopeful attitude. "I continue to be an optimist," says Lev Sandakhchiev, director-general of the State Research Center of Virology and Biotechnology "VECTOR" in Novosibirsk, Russia, a former bioweapons lab. "Russia and the U.S.A. are bound to have good relations." **–RICHARD STONE**

ECOLOGY/PALEONTOLOGY

Colorado River Clams Provide Benchmark

When naturalist Aldo Leopold explored the Colorado River delta in 1922, he found a "milk-and-honey wilderness." But 27 years later, he wrote that "I am told the green lagoons now raise cantaloupes." Conservationists have long contended, largely in impressionistic terms, that 70 years of American dam building and water diversion have destroyed the biological richness of the delta, a key nursery of marine life at the end of the Southwest's great watercourse. Now researchers have confirmed those suspicions, using an important ecological player as a quantitative marker.

Washed up. Despite the periodic accumulation of shells (above), the Colorado River now supports 95% fewer clams than in decades past.

CREDITS: (TOP TO BOTTOM) IRIDIUM; KARL FLESSA

"Basically, we've used clam shells to quantify what things were like before the dams and found they were vastly different," says Karl Flessa, a geoscientist at the University of Arizona in Tucson who led the four-university team's work, which is reported in the December issue of *Geology*. The work, says Sally Walker, an invertebrate paleontologist at the University of Georgia, Athens, "shows paleontology can be extremely useful for solving environmental questions by establishing an ecosystem's long-term past before humans altered it. That's powerful."

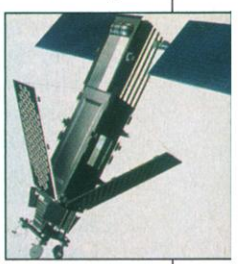
Flessa and his colleagues in Virginia and Mexico studied clams in the delta because, unlike other animals that decay and are lost to the geological record, clams leave behind hard shells to tell of past abundance. Clams furthermore stand as a "proxy" for "the whole marine ecosystem and its health," says Flessa, who notes that numerous fish, mammals, and migratory shorebirds depend directly on them for food. Flessa and his colleagues hoped that an analysis of the vast islands of gleaming white shells, using paleontological, geochemical, and geochronological methods, would allow them to estimate the delta's biological productivity both before and after the river's water was diverted.

To do so, the researchers carried out a series of simple mathematical calculations. First, they used satellite images, trenches excavated in shell-rich beaches, and field measurements of ridge density to estimate that the remains of some 2 trillion clams lay entombed in great shell ridges and islands in the delta. Then they dated 125 shells by analyzing changes in their amino acids and calibrating the results with radiocarbon dating. Virtually all those 2 trillion shells accumulated over the 1000 years from A.D. 950 to 1950, they found. Finally, they used stable isotope profiles recorded in shells to calculate the population turnover rate, which allowed them to calculate that 6 billion mollusk bivalves flourished at any given time in the area. From that number, they calculated an average density of 50 clams per square meter over the last millennium. In contrast, earlier this year seven sample areas yielded estimates of just three individuals per square meter.

Michal Kowalewski, a geobiologist at Virginia Polytechnic Institute and State University in Blacksburg and one of the project's leaders, believes that the productivity of the delta system has fallen at least 95% since the 1930s, when Hoover Dam was built. "That's a big drop, but in fact our calculations are so conservative it's probably much worse than that—maybe 10 times worse," Kowalewski says. He blames reduced fresh water and nutrient flows to the delta. About 90% of the river, or about 13.5 million acre-feet of water a year, is now diverted to support the fields and booming

ScienceScope

Back From the Dead Radio astronomers may have to cope with some unwanted static after all. The U.S. Defense Department last week announced that it will spend $72 million over the next 2 years to revive the bankrupt Iridium satellite phone network, which produces signals that interfere with radio telescopes (*Science*, 24 March, p. 2135). Last March, some astronomers quietly celebrated after Iridium and parent company Motorola announced that they would scrap the 70-spacecraft constellation after losing nearly $7 billion. Now, the Pentagon says it wants the moribund system reenergized next year for emergency communications. Says one sky watcher: "It's like a bad roommate moving back in—you just learn to live with it."



Take Your Pick The presidents of the American Physical Society (APS), the American Chemical Society, and the American Mathematical Society are offering the next U.S. president a list of recommended candidates for top science policy jobs. The names for two dozen key executive posts and four R&D–related advisory boards could go to the president-elect as early as this week.

For White House science adviser, sources say the trio favors mathematician Phillip Griffiths, director of the Institute for Advanced Study in Princeton, New Jersey; engineer and MIT president Charles Vest; or chemist Tom Meyer of Los Alamos National Laboratory in New Mexico. For defense secretary, they recommend retired aerospace executive Norm Augustine, while they hope current NASA chief Dan Goldin will stay. The groups plan to forward only the names of those candidates who express interest.

APS is coordinating the effort and has even hired Christine Niedermeier, a former congressional staffer, to direct transition-related work. The effort "could be a rallying point" for the R&D community and "a valuable service" to the president-elect, Niedermeier told *Science*, while declining to confirm specific names.

No life scientists made the cut for science adviser. "Our parochialism is showing," acknowledges one person involved in the effort. Others say biology groups were invited to join but could not respond in time. Meanwhile, other groups, including the American Association for the Advancement of Science (which publishes *Science*) and the National Academy of Sciences, may also assemble wish lists in coming weeks.

cities of the Sun Belt.

The new work could have both local and global implications. In the Southwest, the clam counts could help environmentalists secure greater water flows to the delta to restore its species. "You need numbers to negotiate with and litigate with, and [Flessa's work] gives us numbers," says environmentalist David Hogan of the Tucson-based Southwest Center for Biological Diversity, which has been active on the issue.

The clam research also offers a dramatic example of how the methods of paleontology can be used to address environmental problems elsewhere, suggests Walker. Techniques like Flessa's and Kowalewski's can provide quantitative historical baselines even when long-term ecological monitoring cannot, she says. "Applying methods like these can give you a numerical sense of the scale of what has happened and then a metric, or benchmark, for attempting remediation," says Walker.

To Flessa, the numbers provide mute testimony on "what has been lost" during 70 years of aggressive water management in the region. He says that the federal dam builders in the Southwest too often ignored the costs of irrigating fields and slaking the thirst of sprawling desert cities. "Now," he says, "we're providing some quantitative assessments of those impacts. That they're huge will help, I hope, to sharpen future policy."

–MARK MURO

Mark Muro writes from Tucson, Arizona.

PLANT BIOTECHNOLOGY

Italian Scientists Blast GMO Restrictions

COPENHAGEN—While plant scientists around the world celebrate the complete sequence of the genome of the mustardlike plant *Arabidopsis thaliana* (see p. 2054), embattled colleagues in Italy are protesting new rules that bar all field trials involving genetically modified organisms (GMOs). The researchers hope to turn the prevailing tide by bringing their plight to the attention of colleagues around the world and exerting pressure on their government through a petition drive. "It makes no sense to do research related to agriculture if field tests are forbidden," says molecular biologist Angelo Spena of the University of Verona.

Biotech critics have had a field day in Europe, where resistance to transgenic crops has influenced policy and crimped research funding (*Science*, 4 February, p. 790). But "only in Italy [are individual scientists] being penalized as a consequence of public concerns," says biologist Roberto Defez of the National Research Council in Naples. Plant researchers aren't the only ones crying foul. "The issue reaches far beyond biotechnology," claims physicist Giorgio Benedek of the University of Milan–Bicocca, who cites "a general concern in Italy about this antiscience attitude within the government."

At the center of the controversy is Agriculture Minister Alfonso Pecoraro Scanio, a Green Party member who took office last April. A longtime critic of transgenic crops, Pecoraro Scanio claims that GMOs pose a threat to human health and the environment. His first strike at research came in July, when he informed the ministry's chief research coordinator, Francesco Salamini, that funding for projects at 23 institutes under the ministry—which carry out the bulk of the country's ag-biotech research—would only flow after a written declaration from researchers pledging that they would not conduct field trials of GMOs.

Lying fallow? Agriculture Minister Pecoraro Scanio *(right)* is clamping down on GMO field trials.

The next blow came in September, when Pecoraro Scanio issued a new requirement for long-term projects approved since 1996, many involving ongoing or planned field trials of GMOs. According to Defez, the minister "asked individual scientists to modify their original research proposal to remove every aspect concerning use of GMOs." Only those who complied had their funding renewed. One victim, the first-ever field trial on grapes engineered to taste better, has been halted in Sicily. Such a policy appears to conflict with European Union law, which permits field trials of genetically modified crops that meet restrictions such as adequate safeguards against the spread of transgenes to wild relatives and unaltered crops.

The ministry has also put the kibosh on new research involving GMOs, having declined to approve any proposals since July. According to Defez, a commission composed of representatives from several ministries, including Agriculture, that is responsible for approving field trials "simply postpones applications until it's too late for planting." Many plant biotech lab studies are in vain if not followed up with fieldwork, claims Spena, who says it would be ridiculous to spend years and considerable funds on creating transgenic plant varieties, only to abandon them because of a flawed policy.

Defez and two colleagues have drafted a petition highlighting their plight. Published on 5 November in the financial journal *Il Sole 24 Ore*, the petition has garnered more than 1000 signatures so far, including all major Italian scientific societies and notables such as Nobel Prize winner Renato Dulbecco of the Institute for Biomedical Technologies in Milan. Late last month, the American Phytopathological Society became the first international society to sign on.

The Agriculture Ministry insists that scientists are blowing the situation out of proportion. "GMO research is supported in Italy, except in open field trials," says ministry spokesperson Triantafillos Loukarelis. Scientists, however, assert that Pecoraro Scanio is using the Greens' political leverage to force other government ministers to back his anti-GMO policies. "As a Green fundamentalist, he is blackmailing the rest of the government who depend on the Green vote," contends Spena, who says any politicians who cross Pecoraro Scanio risk bringing down the government if the Greens were to pull out. "An open society cannot allow science to become subject to the whims of individual ministers," Spena says. The fight could continue until the next Italian election, expected in summer 2001. "If the minister retains his position," predicts Defez, "we would see a regular exodus of scientists in biotechnology to other countries or other fields of research."

–LONE FRANK

Lone Frank is a freelance writer in Copenhagen, Denmark.

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