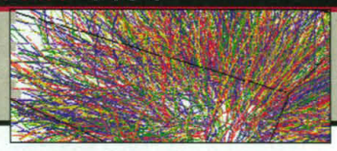

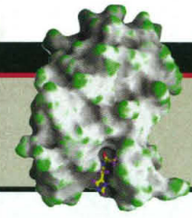

legislators are talking about a constitutional amendment to bring the education board—which ironically was set up as an elected body to insulate it from politics—back under the control of the legislature. What's more, Case says educators have formed a group called Citizens for Science, which plans to supply local school districts with good standards. And, says Matsumura, "Each event like this makes more scientists become actively concerned. ... There are more concerned scientists now than there were before Wednesday."

–CONSTANCE HOLDEN

ENVIRONMENT

Sharp Drop Seen in Soil Erosion Rates

CHICAGO—As any fan of detective thrillers knows, if there is a murder, there must be a body. For soil environmentalists, the "crime" is the use of farming practices that lead to massive amounts of erosion. According to some studies, the bodies—countless tons of precious topsoil—have been washing into rivers and streams at a rate that has changed little in the United States since the Dust Bowl days of the 1930s. But when Stanley W. Trimble went looking for those bodies, like a Lieutenant Columbo in coveralls, the plot took a surprising twist: Most of the expected corpses simply weren't there. Trimble's findings suggest that erosion rates are running much lower than generally estimated. Indeed, over the past few decades they appear to have been a tiny fraction of their historical peaks.

Trimble, a professor in the department of geography and the Institute of the Environment at the University of California, Los Angeles—who also happens to be a Tennessee farmer—based his conclusions on 140 years of data on sedimentation in the heavily farmed Coon Creek Basin, which drains into the Mississippi River 25 kilometers south of La Crosse, Wisconsin. The study, reported on page 1244 of this issue, is being hailed for its scope, but it is also generating controversy. "Trimble's work suggests that rates of erosion in that region are much less than a lot of people seem to have thought," says Pierre Crosson, an agricultural economist at Resources for the Future in Washington, D.C. But some critics question the study's methods, and others argue that the Coon Creek rates may not be typical even of the humid Midwest and eastern United States, let alone other areas. Trimble responds that "the burden of proof is on those who have been making these pronouncements about big erosion numbers. ... They owe us physical evidence. For one big basin, I've measured the sediment and I'm saying, I don't see it."

The detail with which Trimble looked at the basin, which sprawls over 360 square kilometers around Coon Creek and its tributaries, is virtually unheard of in large erosion studies. The research benefited from a combination of lucky historical factors and what Trimble describes as scholarly "perspiration"—years of fieldwork. During the erosion crisis of the 1930s, the basin was chosen for intensive study by the Soil Conservation Service (now the Natural Resources Conservation Service) of the U.S. Department of Agriculture (USDA). Trimble tracked down the old monuments and markers—ranging from steel pipes set in concrete to nails pounded in trees—and used them, just as USDA did, as benchmarks for measuring how much sediment has accumulated in the basin from erosion of the rolling fields around it.

Digging the dirt on erosion. Sediments cover old mill dam *(top)*. Strip cropping slows soil loss.

CREDITS: (LEFT TO RIGHT) BOB LLEWELLYN/UNIPHOTO; S. W. TRIMBLE

Records from many such studies were scattered and lost during the confusion of World War II, but Trimble ran across the Coon Creek data in the National Archives in the 1970s. He also enlisted the help of geologist Stafford Happ, who had led some of the original USDA work. "He had a memory like an elephant," says Trimble. "He'd say, 'Yeah, I remember this elm over here. I'm sure we drove a nail in the west side.' " Trimble then resurveyed the soil profiles in dozens of sections across the basin's valley in the 1970s and again in the 1990s to see changes.

To trace erosion rates further back in time, he dug down to find other markers—old roads, railroad beds, concrete dams, and house foundations—that marked soil levels all the way back to the turn of the century. At greater depths, he found the dark, richly organic soil of the original prairie, a benchmark for the soil level when European farmers arrived in the 1850s and eroded sediment first started to accumulate in the basin.

The measured rates jumped in the late 19th century, skyrocketed in the 1920s and 1930s, and then dropped again as USDA pressed farmers there to stop using the traditional moldboard plow and adopt conservation practices like strip-cropping and leaving plant residue and stubble in the fields year-round to inhibit runoff. From the 1970s to the 1990s, sedimentation rates dropped to just 6% of their peak.

Official USDA national averages for the last 2 decades have suggested a slight decline in soil loss, but the decline that Trimble reports is so precipitous that some experts find it hard to believe. Among them is David Pimentel, a Cornell University entomologist who claimed huge, continuing erosion losses in a paper in *Science* (24 February 1995, pp. 1088 and 1117) that has been criticized for including what he now concedes were outdated and erroneous data. Pimentel says he distrusts routine soil-science methods such as locating and dating the original prairie surface. Trimble has "got a good imagination," he says, adding, in reference to the 19th century soil levels:

"He wasn't there, and these are guesstimates at best."

Others, while accepting the Coon Creek study, caution against extrapolating the numbers too far. "I could not support that as a national average," says Marty Bender, a research associate at the Land Institute in Salina, Kansas. "I think it helps confirm, in an indirect manner, that soil erosion has been decreasing to some extent." "I think [this] is probably a really good study," says John Reganold, a soil scientist at Washington State University in Pullman. "But the problem is, it's just one area." In the wheat-farming Palouse area of the Pacific Northwest, Reganold points out, the soil and climate are not only entirely different, but farmers have been much slower to adopt conservation practices on their fields.

Trimble acknowledges that the comparison probably works only for the humid Midwest and eastern United States, and concedes that even in those regions there are probably exceptions where poor farming practices or higher intrinsic erodability come into play. And a second major conclusion from the study suggests that some of the benefits of slower erosion may be slow in coming. Trimble found that no matter what happens to erosion rates, the basin tends to store and release sediment in such a way that the amount delivered to the Mississippi River remains roughly constant over the decades. Sediment eroded from upland areas is in effect stored around Coon Creek tributaries and other geographic features and released later. Trimble mapped out in detail, for example, how the cutbanks and floodplains around the oxbows of the tributaries could change in shape and size over time and be transformed from sediment sources to sinks and back again.

The constancy "is a big surprise," says Olav Slaymaker, president of the International Association of Geomorphologists, who is at the University of British Columbia in Vancouver. And it could have major implications for controlling off-site damage by sediments and the pollutants that cling to them, says M. Gordon Wolman of the department of geography and environmental engineering at Johns Hopkins University. "It means that if I control the materials coming off a field or group of fields," says Wolman, "it may be some time before I see the results of that—if I do within decades." From a policy standpoint, he says, "this could be, to some people, very disturbing." Environmentalists will long be debating the significance of that finding.

Whatever the outcome of that debate, Slaymaker says that the scientific significance of the new study is clear: "It's the most comprehensive study of its kind anywhere in the world." —JAMES GLANZ

MISCONDUCT

Fraud Finding Triggers Payback Demand

Officials at Lawrence Berkeley National Laboratory (LBNL) in California thought they were setting a positive example when they exposed allegedly fraudulent research conducted by one of their scientists on the effect of electromagnetic fields (EMFs) on living cells. Now they feel they are being punished for their forthrightness: The National Cancer Institute (NCI) has demanded that the lab repay more than $800,000 in grant money that was awarded to the researcher.

"We think that to require us to pay back the money would set a very dangerous precedent," says LBNL spokesperson Ron Kolb. "It discourages institutions from behaving responsibly." But Marvin Kalt, director of NCI's Division of Extramural Activities, argues that the agency is only doing its job: "We're obligated to review whether we should recover" misused funds. Indeed, LBNL is not the first institution that funding agencies have dunned for repayment after a misconduct finding, although such cases seem to be relatively rare.

The accused biologist, Robert P. Liburdy, published a pair of papers in 1992 that appeared to provide evidence that EMFs at the low strengths found in homes could have a physiological effect on cells by increasing the influx of calcium. His findings were taken as support for the hypothesis that EMFs could cause cancer. But a co-worker questioned the work, and in 1995, after a yearlong investigation, LBNL concluded that Liburdy had deliberately published fraudulent findings. The federal Office of Research Integrity (ORI) agreed in June that Liburdy's data did not support the claims in his papers (*Science*, 2 July, p. 23). Liburdy has denied wrongdoing (*Science*, 16 July, p. 337).

ORI's conclusions apparently triggered NCI's demand that the lab return $804,000 in grants for Liburdy's research from 1991 until March 1994. The letter from NCI, dated 3 August 1999, says that "the rationale for this decision is that the misconduct that occurred affected the validity of the entire grant project." All costs incurred by Liburdy "are unallowable," the letter says, because the funds "were expended to support falsified research or obtained on the basis of falsified research."

The NCI demand has angered Mina Bissell, chair of the LBNL Life Sciences Division in which Liburdy worked. Bissell notes that the lab is returning the unspent portion of the funds, but to demand repayment of money that has been spent, she says, is punitive. "We have shown a lot of courage, more than most universities," says Bissell of LBNL's handling of the case. "We did all the right

ScienceScope

Freedom! Pledging to work in "a legal way," South Korean mathematician and political activist Ahn Jae-Ku is savoring his release after 5 years of solitary confinement in Taegu prison (*Science*, 30 July, p. 649). The 65-year-old former professor at Kyoungbuk University was convicted in 1994 of violating the country's notorious National Security Law after forming a discussion group that allegedly was helping North Korea. He was also jailed in the 1980s for criticizing the then-military government.

Ahn was pardoned with 1742 other prisoners as part of the country's annual Liberation Day on 15 August. He says he won't return to his work on differential geometry because it would take him too long to catch up with new developments after being denied scientific literature in prison. But he plans to continue talking with like-minded people on issues of national reunification and says that he is looking forward "to another chance to work for Korean society." He also expressed his gratitude to the scientific and human rights groups around the world who lobbied Korean President Kim Dae Jung for his release.

Data Rule, Round Two Scientific groups seem to be pleased with the White House's latest version of a proposal that would require researchers to give the public access to raw data that federal agencies use to develop regulations. This second attempt (www.whitehouse.gov/OMB/fedreg/2ndnotice-a110.html) is similar to but more detailed than a July draft (*Science*, 23 July, p. 511), defining data in a way that rules out, for instance, public access to lab samples. It also says the rule applies only to studies published in a "scientific or technical" journal or cited in a regulation.

But even this proposal may not be the final word. Louis Renjel of the U.S. Chamber of Commerce says his group is unhappy that researchers—and not just government officials—could withhold information that they think threatens privacy, and that the law would apply only to regulations with an economic impact of at least $100 million. "Completely unacceptable," Renjel says about the new version, which is open for comments until 10 September. To counter the critics, George Leventhal of the Association of American Universities says it's "very important that the academic community weigh in" on the proposal. The final rule is expected to be out by 1 October.