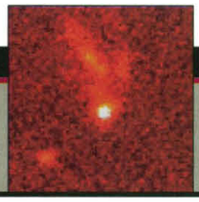

lead a review of lab security and recommend improvements. The next day, Richardson quietly shelved a planned review of the exchange program by former CIA head John Deutch because, according to one source, "there were getting to be too many reviews." Sidney Drell, deputy director of the Stanford Linear Accelerator Center (SLAC) in Palo Alto, California, and a member of the Rudman panel, says that "we need a good analysis of what helps security that recognizes the importance of the exchange of information."

Laboratory officials hope the moves will deflate Shelby's moratorium proposal. "It's a nutty idea," says John Shaner, head of Los Alamos's Center for International Security Affairs. Since 1994 the United States, Japan, and Europe have spent more than $350 million to keep former Soviet weapons scientists working on civilian projects, and an even greater sum on decommissioning Russian weapons and upgrading stockpile monitoring systems. An integral part of these programs have been scientific exchanges between the Russian and U.S. weapons labs.

Although Shaner says the exchanges—already swaddled in security regulations that require extensive advance notice and background checks—could "live with" new restrictions, an outright moratorium would weaken the trust between scientists. "Stopping the progress in collaboration between our countries will be a great mistake," warns theoretical physicist Boris Vodolaga, deputy director for international collaboration and conversion at the All-Russia Scientific Research Institute for Theoretical Physics, an elite nuclear weapons design center in Snezhinsk, Russia.

Chinese diplomats are also concerned about any moratorium. New restrictions shouldn't "go too far so that normal scientific exchanges are affected," warned He Yafei, a minister-counsel at the Chinese Embassy in Washington, at an 18 March press conference. He said some Chinese officials have questioned continued involvement in a nascent U.S.–China nonproliferation program modeled on the Russian exchange.

Such pullouts could cause the scientific community at DOE labs to become isolated and "wither," Los Alamos director John Browne told a congressional committee last October. "It is vital that the lab interacts with the best scientists in the world," he says. Whether it remains able to do so, however, is now up to Congress. **–DAVID MALAKOFF**

With reporting by Richard Stone.

PLANT SCIENCE

Data in Key Papers Cannot Be Reproduced

New findings, published last week, appear to confirm suspicions that several key papers in a hot area of plant development were fatally compromised by scientific fraud. The results, published in the March issue of *Plant Journal*, stem from an investigation at the Max Planck Institute for Plant Breeding Research in Cologne, Germany, which concluded last year that a laboratory technician falsified experiments forming the basis of 10 publications going back to 1992. The technician, Inge Czaja, and the leader of the group in which she worked, Richard Walden, resigned in early 1998 in the wake of the scandal, although Walden has never been accused of participating in the fraud.

In the *Plant Journal* article, a team of researchers at the Cologne institute, along with colleagues from other European labs, report on their attempts to repeat key experiments in eight papers published in *Science*, *EMBO Journal*, the *Proceedings of the National Academy of Sciences* (*PNAS*), *Trends in Plant Science*, and *Plant Journal*. The authors could not reproduce the most central findings. Two other papers from the institute, which had originally appeared in *Nature* and *PNAS* in 1997, were retracted last year by most of their authors after their findings also could not be reproduced.

"I can no longer believe any parts of the data in any parts of the papers," says plant biologist Alan Jones of the University of North Carolina, Chapel Hill, who adds that the new findings will have "a negative effect on the field," because "major conclusions were drawn" from the papers. The lead author of the *Plant Journal* report, plant researcher Jeff Schell—who is head of the department in which the Walden group worked and a co-author on the disputed papers—agrees that all the major findings were "subject to falsification." Nevertheless, Jones, Schell, and other researchers stress that the basic techniques used in the research—which were pioneered by Walden and other colleagues—remain valid and are being enthusiastically used by other researchers. "This technology has been very influential," says plant molecular geneticist George Coupland of the John Innes Centre in Norwich, United Kingdom.

The affair dates from the early 1990s, when Walden and his co-workers pioneered a new way to study the actions of plant genes. The technique, called activation T-DNA tagging, creates mutations by inserting DNA from the soil bacterium *Agrobacterium tumefaciens*, which induces plant tumors, into the genome of plants they wish to study. They found that genes flanking this inserted foreign DNA were "overexpressed"; that is, they produced much higher levels of proteins than normal, allowing

COLOGNE INSTITUTE'S DISPUTED PAPERS

Irreproducible in the *Plant Journal* study:

Hayashi *et al.*, Activation of a plant gene by T-DNA tagging: Auxin-independent growth in vitro, *Science* **258**, 1350 (1992).

Walden *et al.*, Auxin inducibility and developmental expression of *axl1*: A gene directing auxin-independent growth in tobacco protoplasts, *EMBO Journal* **13**, 4729 (1994).

Röhrig *et al.*, Growth of tobacco protoplasts stimulated by synthetic lipo-chitooligosaccharides, *Science* **269**, 841 (1995).

Miklashevichs *et al.*, Do peptides control plant growth and development?, *Trends in Plant Science* **1**, 411 (1996).

Van de Sande *et al.*, Modification of phytohormone response by a peptide encoded by *ENOD40* of legumes and a nonlegume, *Science* **273**, 370 (1996).

Röhrig *et al.*, Convergent pathways for lipochitooligosaccharide and auxin signaling in tobacco cells, *Proceedings of the National Academy of Sciences* **93**, 13389 (1996).

Harling *et al.*, A plant cation-chloride co-transporter promoting cytokinin- and auxin-independent protoplast division, *EMBO Journal* **16**, 5855 (1997).

Miklashevichs *et al.*, T-DNA tagging reveals a novel cDNA triggering cytokinin- and auxin-independent protoplast division, *Plant Journal* **12**, 489 (1997).

Retracted last year:

Ichikawa *et al.*, Identification and role of adenylylcyclase in auxin signaling in higher plants, *Nature* **390**, 698 (1997). [retracted: Ichikawa *et al.*, *Nature* **396**, 390 (1998).]

John *et al.*, Lipochitooligosaccharide-induced tobacco cells release a peptide as mediator of the glycolipid signal, *Proceedings of the National Academy of Sciences* **94**, 10178 (1997). [retracted: John *et al.*, *PNAS* **95** (17), 10344a (1998).]

those genes and their protein products to be studied much more easily.

With this method, Walden and his co-workers began trying to decipher the poorly understood mechanisms of action of two plant hormones—auxin and cytokinin—that control plant cell division and growth. To do this, the team produced numerous mutants of tobacco plants which they thought were capable of growing independently of the presence of these two hormones. Using these mutants, the team isolated a number of genes, proteins, and other factors that appeared to stimulate plant growth "downstream" of the hormones—and thus were implicated in the hormones' mechanism of action.

It now appears, however, that these mutants were not capable of independent growth after all. The investigation carried out at the institute concluded that Czaja added plant growth factors to culture media used in the experiments and manipulated the experiments to make it appear that cultured plant cells were capable of auxin- and cytokinin-independent cell division. (Czaja, who was also a co-author on the papers, declined to comment when contacted by *Science*.) Serious suspicions had been raised by early 1998, when researchers at the institute were unable to repeat results stemming from the technician's work. Walden and his co-workers began investigating and soon concluded that at least some of the results had been faked.

In March 1998, Walden informally let other plant researchers know that there were potential problems with the work, and the following month he, Schell, and another co-worker published an initial warning about the data in *Trends in Plant Science*. Nevertheless, under strict new rules on scientific misconduct adopted by the Max Planck Society in November 1997, institute officials sought, and received, Walden's resignation. "There were ample signs that [Walden] did not exercise proper responsibility for his group," says Heinz Saedler, a co-director of the Cologne institute. (Walden, who now works at a research institute in the United Kingdom, told *Science* he preferred not to comment on the affair.)

Despite the dramatic findings in this month's *Plant Journal* report, Schell says the group has no immediate plans to publish retractions of the eight papers in the journals in which they originally appeared. "This article is about the only thing we were planning to do. The main thing is to get our science going again." On the other hand, Schell adds, if the journals themselves asked for retractions, "I would consider it very seriously." But some editors of the journals involved say they believe the co-authors should submit letters stating that the results could not be reproduced. John Tooze, co–executive editor of *EMBO Journal*, says that although the journal has no hard-and-fast policy about retractions, it would be "common sense" for the authors to contact the journals involved. "A statement in each of the journals from the authors would be an appropriate thing to do," he says. And Floyd Bloom, editor-in-chief of *Science*—where three of the eight papers appeared—says that "we would have expected Dr. Schell or his institution to contact us when the results that had been published in *Science* were conclusively identified as suspect. We will be discussing the possible need for retractions of the papers that Dr. Schell and his collaborators published in *Science* with him, and will act accordingly."

Jones says that, in retrospect, flaws in some of these papers might have been spotted with closer review. For example, in the *Plant Journal* study the researchers used a second assay technique—incorporation of the DNA building block thymidine into plant cells—in addition to a cell-counting method used in the original work to determine whether cell division had occurred. "In hindsight, why wasn't the thymidine incorporation done originally; why didn't the reviewers call for that?" Jones asks. On the other hand, he says, "hindsight isn't fair. ... When the papers came out I was extremely enthusiastic." —MICHAEL BALTER

PALEONTOLOGY

Fossil Offers a Glimpse Into Mammals' Past

Last year Ji Qiang made paleontological history when he reported that he had found fossils of feathered dinosaurs in the Liaoning Formation, about 400 kilometers northeast of Beijing. Now Ji, a paleontologist from the National Geological Museum of China, has done it again: He has unearthed the world's oldest complete mammal fossil, dating back at least 120 million years. And he found it in the same fossil-laden hills that surrendered the feathered dinosaurs (*Science*, 26 June 1998, p. 2051).

Most mammal fossils older than 65 million years are nothing but teeth and scattered bones, but this one is an exception. "When I saw it, I freaked out—it's an incredibly complete fossil," says mammalogist John Wible of the Carnegie Museum of Natural History in Pittsburgh. In this week's issue of *Nature*, Ji and his colleagues conclude that the fossil is a close relative to the common ancestor of all mammals alive today, from humans to opossums to platypus. "This thing gives us the closest look at what the last common ancestor of modern mammals was like," says Tim Rowe, a paleontologist at the University of Texas, Austin. If Rowe is right, that ancient creature was truly bizarre: a rat-sized chimera that walked on mammalian front legs and splayed reptil-

ScienceScope

Betting on Research More Americans than ever are wrecking their lives by gambling away their money on everything from state lotteries to Internet virtual casinos, according to a National Research Council (NRC) report set for release next week.

Gamblers now wager more than half a trillion dollars a year in the United States, according to the study, which was led by Charles F. Wellford of the University of Maryland, College Park. It concludes that the number of U.S. adults whose gaming is "pathological"—out of control and damaging to jobs, finances, and family—has grown to an estimated 1.8 million.

The federal government, however, devotes "next to nothing" to research on gambling, says John Shosky, deputy director of the president's National Gambling Impact Study Commission (NGISC). So the NRC is calling for more research and better diagnostic approaches. For example, because compulsive gambling often shows up in tandem with other compulsive behaviors, the report recommends that physicians treating people for substance abuse also be on the lookout for gambling tendencies. The NRC review is part of a larger NGISC report due 18 June.

Diet Conscious Japan's life scientists are looking forward to greater political support—thanks to a new life sciences study group in Japan's parliament, the Diet. Similar to a caucus in the U.S. Congress, the group consists of some 70 members of the ruling Liberal Democratic Party (LDP). It is chaired by Koichi Kato, a contender to be Japan's next prime minister.

A spokesperson for Hiroyuki Hosoda, an LDP member instrumental in setting up the group, says legislators have become increasingly concerned that Japan is falling behind in genomics and biotechnology, and that the Diet has no regular legislative committee to address the problem. The study group, formed last week, hopes its organizing efforts will bolster a move by five ministries to foster the growth of biotech businesses and also boost life science spending in the 2000 budget, which will be debated through the fall and go into effect 1 April 2000.

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