Research & Development Foundation (ARDF), which had sued USDA.

Under the settlement, USDA agreed to reverse the agency's 30-year-old policy of exempting rodents and birds—which constitute 95% of research animals—from regulation under the Animal Welfare Act. The settlement was opposed by a coalition of research groups that included the National Association of Biomedical Research (NABR), the Association of American Medical Colleges, the Federation of American Societies for Experimental Biology, and the Association of American Universities.

To achieve its ends, the coalition enlisted Wallace Conerly, dean of the University of Mississippi Medical Center in Jackson. He telephoned Cochran, the third-ranking Republican on the Senate Agriculture Committee. Cochran responded by adding language to the agriculture appropriations bill that prevents USDA from drafting the new animal-care regulations during the 2001 fiscal year, which began on 1 October. The bill faces a threatened veto by President Bill Clinton on other issues, but Cochran's provision is expected to survive.

The ban "is great news," says Conerly, who worries that new rules would "cost [his university] millions of dollars." NABR's Barbara Rich says the delay will allow policy-makers to "take full consideration of the [settlement's] consequences for research." The issue, she predicts, "isn't going away."

–DAVID MALAKOFF

RESEARCH MISCONDUCT

Texas Scientist Admits Falsifying Results

A University of Texas (UT) immunologist has admitted to federal officials that he falsified research results over at least a 5-year period, leaving a trail of retracted papers and disgruntled collaborators. The scientist, who resigned and has been barred from receiving federal research grants, was found to have repeatedly duped colleagues by spiking test tubes with doses of a radioactive marker that produced positive results, according to detailed reports by UT and federal investigators.

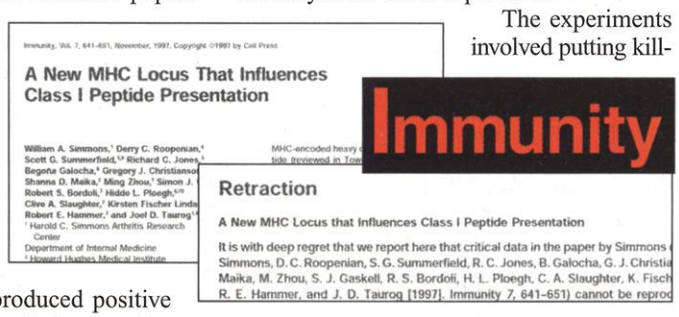
Last month, the federal Office of Research Integrity (ORI) announced that William A. Simmons of UT Southwestern Medical Center in Dallas had signed a statement admitting misconduct and accepted several penalties, including a 5-year ban on receiving federal research grants. ORI investigates misconduct allegations involving studies funded by the National Institutes of Health (NIH). Officials at the medical center, where Simmons worked under medical professor Joel Taurog, said in a statement that they are considering "further disciplinary action." This could include financial penalties and the revocation of his 1996 Ph.D.

Simmons could not be reached for comment, and Taurog declined to speak to *Science*. The following account is based on ORI and university investigation records obtained through the Freedom of Information Act.

Simmons enrolled as a graduate student at UT Southwestern in 1989. After receiving his degree in 1996, he won a postdoctoral position in Taurog's lab, which uses transgenic rats and mice to study the role of the gene *HLA-B27* in a group of autoimmune diseases, including a painful spinal arthritis known as ankylosing spondylitis. Over the next 2 years, Simmons published a series of papers, including a 1997 *Immunity* paper (see box) suggesting that an undiscovered gene—dubbed *Cim2*—influences *HLA-B27*'s behavior. Efforts to find *Cim2*, however, stalled after Simmons left Taurog's lab in 1998 for a corporate job. The postdoc who replaced Simmons "had almost no success in reproducing any of" Simmons's work, according to ORI records, and Simmons was rehired as an untenured faculty member in April 1999 "to help straighten out" the research.

Within days Simmons's work came under suspicion, however, when an unidentified coworker observed him pipetting fluid into vials used to test the activity of certain immune system cells. The procedure was not consistent with the experimental protocol. Returning later to investigate, the co-worker discovered a wash bottle and testing vials full of radioactive chromium 51—a substance that should not have been present in the vials until days later in the experiment.

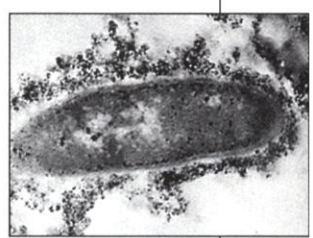
The experiments involved putting killer T cells and radioactive target cells together in the vials, then assessing the activity of the killer cells by measuring the radioactivity released by the target cells. By adding predetermined quantities of the radioactive chemical to the vials, investiga-



Taking it back. Misconduct case leads to retraction of 1997 paper in the journal *Immunology*.

ScienceScope

In the Zone Earth science chiefs at the National Science Foundation will need to think harder about how to take advantage of new technologies and findings. That's the conclusion of a National Research Council panel that is urging a two-thirds boost in the program's $100 million annual budget.



The committee's report (www.nap.edu/books/030907133X/html), released last week, points to research on the "Critical Zone"—where water, air, rock, soil, and life come together—and in the emerging field of geobiology, among others, as worthy of investment. The panel suggests cooperative planetary efforts with NASA and natural laboratories, such as turning deep-drilling sites into long-term observatories.

The committee, chaired by geophysicist Thomas Jordan of the University of California, Los Angeles, says that increased spending must not ignore "the single most important mechanism" for keeping earth science strong—research by individuals and small groups of investigators. It also "strongly endorses" the proposed EarthScope (*Science*, 26 November 1999, p. 1655).

A Thirst for Science An apocalyptic advertisement last week in Slovenia's largest daily newspaper warns of the dire effects of federal budget cuts to research and rallies support for a national walkout.

The ad, paid for with $5 contributions by hundreds of scientists, warns that research budgets are so thin that some institutes may be forced to close. Per capita spending has fallen to $60 per person, it declares—"enough for a dozen pizzas—without beer." The ad, which proclaims "the end of science," is part of a protest that was to culminate in a 2-hour walkout by researchers and professors on 13 October.

Slovenia, an ex–Yugoslav republic the size of New Jersey, is far from an economic basket case, and its science has been considered among the best funded in formerly communist European states. But the pedestal beneath Slovenian science is crumbling, say researchers. "The government has to act quickly, or this decline will be irreversible," complains Vito Turk, the biochemist who heads the country's biggest research center, the Jožef Stefan Institute. The ad and work stoppage are also aimed at candidates running for parliament on 15 October.

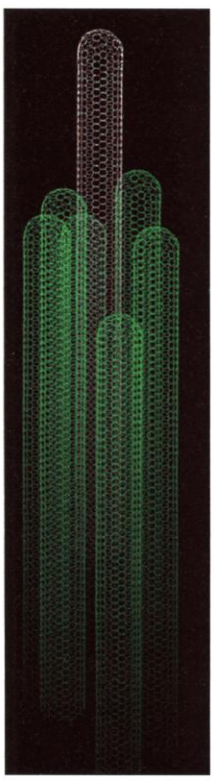
Texas, reported a new chemical process for making single-walled nanotubes (SWNTs), potentially by the kilogram. The scheme combines simple and abundant gaseous precursors that react to form iron-based catalyst particles, which then promote the growth of the nanotubes. And because that type of gas-phase synthesis is akin to the way bulk plastics are made today, the new scheme has clear potential to be scaled up to make industrial quantities. "Within the next year we should easily be able to produce 10 kilograms of this stuff [in the lab]," says Richard Smalley, the leader of the Rice team, who shared the 1996 Nobel Prize in chemistry for his part in the discovery of fullerenes, a class of three-dimensional carbon molecules that includes nanotubes.

"It's a very important development that nanotubes can be made in big quantities," says Walt de Heer, a nanotube expert at the Georgia Institute of Technology in Atlanta. "It implies that the price [of nanotubes] will come down, and this could allow their use as large-scale construction materials." Still, de Heer cautions that inexpensive ingredients don't guarantee low costs. The round fullerenes known as buckyballs can be made from cheap starting materials, he points out, yet they remain more expensive than gold.

Smalley's new scheme isn't the first to use catalysts to create nanotubes. In 1995, his team at Rice came up with a method that blasts a graphite target with lasers in the presence of catalytic metal particles. The intense heat generated by the lasers blasts the graphite into a vapor of carbon atoms, which the metal particles then help to coalesce into nanotubes. But the laser apparatus is expensive and has yielded only about 300 grams of SWNTs in the past 2 years. What's more, the tangle of SWNTs that the process creates is contaminated with about 10% carbon soot, which must then be removed in another step to yield the pure nanotubes.

In search of better results, Smalley and his postdocs Michael Bronikowski and Peter Willis took a hint from the bulk-plastics industry. They looked for ways to make both the catalyst and nanotube starting materials gaseous. The key turned out to be a molecule called iron pentacarbonele, which has an iron atom surrounded by five carbon monoxide (CO) groups. They spray this compound along with additional CO into a chamber heated to about 1000°C. The heat rips the CO arms off the iron atoms, leaving the lone atoms energetically unhappy and eager to bond with one another to form more stable clusters. And—as in the laser SWNT scheme—those metal clusters excel at producing SWNTs. Meanwhile, the high temperature also causes CO molecules to react with one another to form the more stable CO_2, leaving behind lone carbon atoms, which quickly find the iron nanoparticles and begin to grow a SWNT. "The SWNTs just fall out of the chamber in an essentially pure form," Smalley says.

Still, Smalley cautions, "this isn't the ultimate" when it comes to making SWNTs. The tubes, he says, wind up as a tangled mat rather than perfectly aligned fibers. They also vary slightly in diameter, a drawback that can create tubes with a range of electronic properties. But Smalley and colleagues are confident that they can iron out the glitches. Last week, they announced that they were forming a new company—Carbon Nanotechnologies Inc.—to commercialize their SWNT production process. If their scale-up plans pay off, they may finally turn nanotubes from a research curiosity into the technological successor to plastics. **–ROBERT F. SERVICE**



CREDITS: (LEFT TO RIGHT) CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY/RICE UNIVERSITY; THE COULSTON FOUNDATION

High hopes. Gas-phase process might yield nanotubes at nanoprices.

NEUROSCIENCE

Video Game Images Persist Despite Amnesia

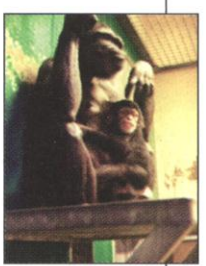
The video game Tetris can be found on computers in almost any lab; grad students need their entertainment, after all. But few researchers have put the game to more explicitly scientific use than Robert Stickgold and his colleagues at Harvard Medical School in Boston. On page 350, they report the results of new work in which they used the game—which involves spatial reasoning to slot falling blocks strategically into place (see diagram)—to study how the brain reviews what it has learned.

The researchers found that people who have just learned to play Tetris have vivid images of the game pieces floating before their eyes as they fall asleep, a phenomenon the researchers say is critical for building memories. Neuroscientists have long known that memory consolidation goes on during sleep. But much more surprisingly, the team also found that the images appear to people with amnesia who have played the game—even though they have no recollection of having done so. Apparently, Stickgold says, the am-

ScienceScope

O Give Me a Home The fate of 288 chimpanzees used for research remains uncertain after the National Institutes of Health (NIH) rejected a proposal from their current caretakers to continue housing them.

The NIH assumed ownership of the chimpanzees in May after a settlement with the U.S. Department of Agriculture's office of animal welfare required the Coulston Foundation of Alamogordo, New Mexico, to give up ownership of the animals (*Science*, 12 May, p. 943). NIH then announced a competition for their care, to which Coulston applied. But on 5 October NIH sent a letter to Coulston, saying that an outside review committee had found its proposal unacceptable. The decision leaves Coulston temporarily in charge of the animals.



The latest decision is "an extension of NIH's mismanagement and irresponsibility," says Suzanne Roy, program officer of In Defense of Animals (IDA), a California-based animal-rights group. "We're working as fast as we can" to recruit another caretaker for the animals, counters John Stranberg, NIH's director of comparative medicine.

Sausagemakers The White House and Congress reached a tentative deal late last week on a 2001 spending bill that contains good news for NASA and the National Science Foundation (NSF). But at press time officials at both agencies were still waiting to learn what strings had been attached and how legislators planned to finish their work.

The bill would give NSF a 13.5% increase, to $4.4 billion, from its current $3.9 billion budget. That's close to the Administration's 17.3% request and much higher than the versions passed earlier this year by the House and a key Senate committee.

The $14.3 billion for NASA would be $250 million above the request and a sharp improvement over earlier bills, which were below what the agency had proposed (*Science*, 22 September, p. 2018). The additional funding would take care of most—although not all—of the pork-barrel projects larded into the conference bill by lawmakers. But it's not expected to rescue a Pluto mission or other moribund space science efforts.

Contributors: Richard Kerr, Robert Koenig, Gretchen Vogel, Andrew Lawler and Jeffrey Mervis