mann says, "a few" of the time-series studies that EPA drew on to set the daily limit on fine particles "used the same S-plus approach." Agency scientists will take that into account in their latest review of $PM_{2.5}$ science, which will delay the next version of the rule. Bachmann says the standard "could" change, but "it's too soon to tell."

Scientists in other disciplines, from economics to genomics to ecology, use the S-plus GAM model. David Smith of Insightful Corp. in Seattle, which sells S-plus, says "it's really hard to say" whether many other researchers have had this problem, but his inquiries to some 2000 S-plus users on an e-mail list last week suggest not. Hastie, who co-wrote the S-plus GAM, says these pollution studies are "an unusual situation" because "they're doing very fine-scale modeling, and the effects are very small."

Biostatistician Gerald van Belle of the University of Washington, Seattle, notes that a recent journal article pointed out that defaults can also gum up results with a popular stats package called JMP. Says van Belle: "99% of people are going to be working on problems for which the default settings are appropriate." But when their problem is unusual, he says, they might need to take a look inside the box of their statistics package.

–JOCELYN KAISER

DOE WEAPONS LABS

Livermore Keeps It All in the Family

The appointment of an insider to head Lawrence Livermore National Laboratory ends a politically charged search that highlighted the sharp tensions between the lab's managers, the University of California (UC), and its boss, the Department of Energy (DOE). The new director, theoretical physicist Michael Anastasio, takes the job just as President George W. Bush has assigned the lab a more visible role in U.S. homeland defense (see p. 1944).

Anastasio, 53, was appointed 4 June to succeed Bruce Tarter, who is stepping down 30 June after 8 years as head of the $1.5 billion nuclear weapons lab. "He's the safe choice," says one Livermore researcher about the 20-year Livermore veteran, who has led the division that designs plutonium triggers in nuclear weapons as well as the effort to ensure the safety and reliability of those weapons without testing them. In a press conference, Anastasio backed the Administration's policy not to test nuclear weapons and pledged good relations with the university and Los Alamos National Laboratory in New Mexico, Livermore's longtime rival.

Final choice. Michael Anastasio prepares to lead Lawrence Livermore lab.

CREDITS: (TOP TO BOTTOM) P. BAGLA; JAY SOLMONSON/*TRI-VALLEY HERALD*

Those relationships require much mending. The university, which operates both Livermore and Los Alamos for DOE, came under withering fire this spring for attempting to appoint Ray Juzaitis, a senior administrator at Los Alamos, to head Livermore (*Science*, 3 May, p. 821). Juzaitis eventually withdrew from consideration, and last week a chastened UC president Richard Atkinson took responsibility for the episode, saying, "I failed to communicate with the key people. ... It was my fault."

Both Livermore and Los Alamos have been criticized heavily in the past 2 years for cost overruns, breaches in national security, and alleged racial profiling and discrimination. DOE has pressured the university to tighten its managerial reins and reduce the traditional rivalry between the two labs. Choosing a Los Alamos employee to head Livermore was part of a strategy directed by John McTague, a former science adviser to President Ronald Reagan who now oversees the labs for the university.

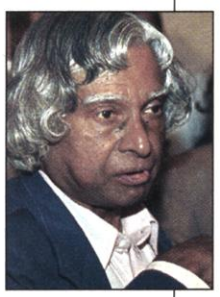
But when word leaked in April that Juzaitis was the favored candidate, Livermore's supporters went into high gear. They complained to the White House, DOE, and lawmakers that he was too junior—and that he had overseen the division that included Wen Ho Lee, a physicist accused of improperly copying classified material. On orders from DOE, Atkinson abruptly canceled a press conference at which he was to announce the new director.

The following week, Juzaitis declined what he calls a firm job offer. In a 30 April letter to Atkinson, Juzaitis says he withdrew because of "negative reactions in Washington, within the university, and at Livermore." He also decried the "unwarranted linking of my name to the Wen Ho Lee affair."

Government officials who decline to be identified complain that UC officials did not reveal Juzaitis's link with Lee in discussions with Administration managers and congressional lawmakers. "It shows a complete lack of political savvy," says one. Representative Ellen Tauscher (D–CA), who represents the Livermore area, at the time criticized UC's failure "to be sensitive to national security, the culture, and the unique qualities of the labora-

ScienceScope

Scientist-Statesman The father of India's missile program has been nominated to be president of the country. If chosen, Avul Pakir Jainulabdeen Abdul Kalam (below), an aeronautical engineer, would be the first scientist to hold the largely ceremonial position.



Kalam, 71, is the former head of the Defence Research and Development Organisation, where he spearheaded India's guided missile program and played an important role in preparing for the country's 1998 nuclear tests. A civil servant with no known political affiliations, Kalam is also a member of India's Muslim minority, which the Hindu-led government has been working to win over. An election will be held next month if an opposition candidate is put forward.

Kalam is a "remarkable team person, full of humility," says Martanda Varma Sankaran Valiathan, president of the Indian National Science Academy in New Delhi, adding that his selection shows the importance of technology development to the country. Last year, Kalam stepped down from a 2-year stint as the government's principal scientific adviser to work with students considering careers in science.

Nanocoordination? A bigger effort is needed to coordinate science on the smallest scale, according to a report released this week by the U.S. National Academy of Sciences. Fifteen federal agencies and departments currently participate in the U.S. government's National Nanotechnology Initiative, which has spent some $1 billion over the last 2 years to promote science at the atomic scale. Although the agencies meet regularly to mesh their programs, the report concludes that they could use more help.

Samuel Stupp, a materials scientist at Northwestern University in Evanston, Illinois, who chaired the 16-member panel that wrote the report, says the biggest problem is that there is "no advice from outside" or straightforward way "to seek opinions from the community at large."

To build those bridges, the panel recommends that the White House Office of Science and Technology Policy (OSTP) set up a new advisory board of outside scientists to coordinate nanoscience strategy. It also suggests that the office manage a special grant fund for interdisciplinary research. OSTP currently does not hand out any money. OSTP officials say they are studying the recommendations.

tory as it selects a new director."

McTague, through a spokesperson, declined to comment on the selection process, although he praised Anastasio as "extremely impressive." The appointment appears to have mollified Tauscher and other Livermore supporters. UC "made the right choice with Anastasio," Tauscher said last week, adding that he "has always been the best choice for lab director."

Anastasio will have his work cut out for him. One key issue involves the allocation of time on the National Ignition Facility (NIF)—a $3.5 billion laser facility. NIF is being built to conduct tests to ensure the efficacy of existing nuclear weapons, but it also offers a platform for basic researchers. The new director must also deal with several suits charging the lab with racial discrimination in hiring and promotion. But the president's homeland security proposals no doubt will be on the front burner as Livermore charts an uncertain new course in protecting the United States from terrorists wielding chemical, biological, or nuclear weapons. **–ANDREW LAWLER**

SPINTRONICS

Magnetic Gate Opens New Computing Path

A tiny device that answers "no" when it's told "yes" and vice versa could mark the first step toward microchips that calculate magnetically, a team of physicists reports. The "NOT gate," described on page 2003, uses a trick of geometry to manipulate magnetism as conventional devices do electric charge. "It's just very clever," says Craig Lent, an electrical engineer at the University of Notre Dame in Indiana. "They're on the road to nanomagnetics."

Electronic microchips crunch numbers by shuffling dollops of charge. But physicists and electrical engineers are striving to harness a more subtle property of electrons: the fact that the particles behave like spinning tops and are magnetized along their spin axes. Burgeoning "spintronics" technologies aim to use magnetic materials and magnetically polarized currents to store bits of information and perform calculations more efficiently (*Science*, 16 November 2001, p. 1488). So far researchers have developed devices that use layers of magnetic materials to read data from densely encoded disk drives or to store data in memory chips even when they're turned off (*Science*, 12 April, p. 246). They've also begun to manipulate magnetically polarized electrical currents flowing within nonmagnetic semiconductors, an approach that might lead to more efficient calculations and even to superfast "quantum computing."

But researchers have yet to perform calculations with just changes in magnetization and no flow of electric charge. The new device, developed by Russell Cowburn and colleagues at the University of Durham, U.K., is a step in that direction.

The gate consists of a simple track of naturally magnetic nickel-iron wire, shaped like an upside-down Y. The magnetism of the alloy naturally runs parallel to the track, but it can be made to flip direction within a short length of the wire. In that case, the two opposing magnetizations meet at a region called a "domain wall." There they either both point toward the domain wall (head to head) or both point away from it (toe to toe). Those two magnetic configurations can be used to encode 0 and 1 values for bits of information.

Cowburn and colleagues found a way to switch between the two arrangements by using a magnetic field to force the domain wall through a kink—the stem of the inverted Y. When a magnetic field points along a branch of the device, it pushes the domain wall along the track so that more of the wire is magnetized in the same direction as the field (see figure). If the track made a smooth curve, a rotating magnetic field would simply ease the domain wall around the bend. In the Y-shaped device, however, something else happens. As the domain wall moves up into the stem of the Y and down again, it flips from the head-to-head configuration to the tail-to-tail configuration or vice versa, something like a car backing into a driveway to turn around. By swapping domain-wall configurations, the device exchanges 0 for 1 and 1 for 0—the hallmark of a logical NOT gate.

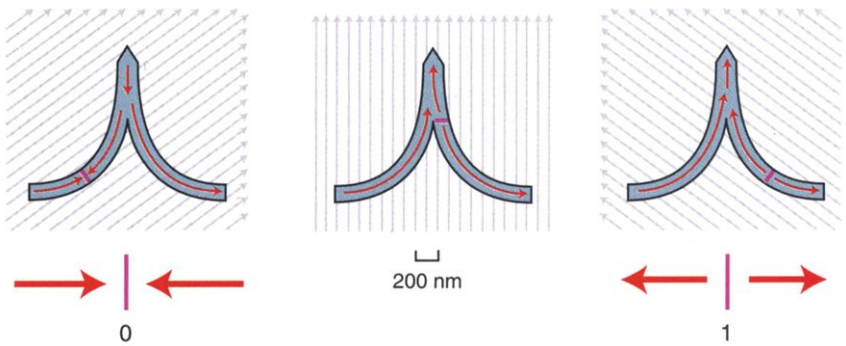
Cowburn and colleagues have strung as many as 11 NOT gates together in a closed loop. The devices kept flipping bits faithfully while a domain wall went around as many as 100,000 times. Unlike some other budding technologies, the device also works at room temperature. Arrays of NOT gates can do little by themselves, the researchers acknowledge, but they hope to develop other devices, such as an "AND gate" that can compare two inputs, that will enable them to perform full-scale calculations. "We think we'll have a fully functioning logic [system] within a year," Cowburn says.

Chips that manipulate magnetism should resist damage from radiation and retain information if they inadvertently lose power, so they might be useful in spacecraft and other harsh environments, says Russell Beech, an electrical engineer at NVE Corp. in Eden Prairie, Minnesota. However, Cowburn and colleagues must address some basic questions if they're to turn their promising idea into a useful technology, Beech says. For example, they must find ways to reliably feed domain walls into a circuit and to generate the rotating magnetic field from wires embedded in the chip itself.

But even if the new device does not blossom into a new technology, it could give researchers an important tool for probing the basic physics of magnetic materials, says David Awschalom, a physicist at the University of California, Santa Barbara: "It's a wonderful laboratory for studying domain wall motion." Such studies should prove fruitful however the story of spintronics unwinds.

–ADRIAN CHO

Adrian Cho is a freelance writer in Boone, North Carolina.



Why not? In spintronic NOT gate, a rotating magnetic field (gray arrows) changes the value of a bit by moving and then flipping the boundary between regions of magnetized wire.

CREDIT: ADAPTED FROM D.A. ALLWOOD *ET AL.*

GENETICALLY MODIFIED FOOD

TV Drama Sparks Scientific Backlash

Intending to discredit a biotech company, a farmer opposed to genetically modified (GM) foods slips a gene conferring resistance to the powerful antibiotic vancomycin into wheat. The protest goes horribly wrong, however, when the resistance gene moves from the wheat into the bacterium *Staphylococcus aureus*, provoking a deadly and uncontrollable outbreak of staph infections.

Sounds incredible? The plot of the BBC thriller "Fields of Gold," which aired 8 and 9 June in the United Kingdom, is indeed farfetched, many experts say. Some scientists, concerned that the alarming story line will erode already low public confidence over the safety of GM crops, mounted a high-