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

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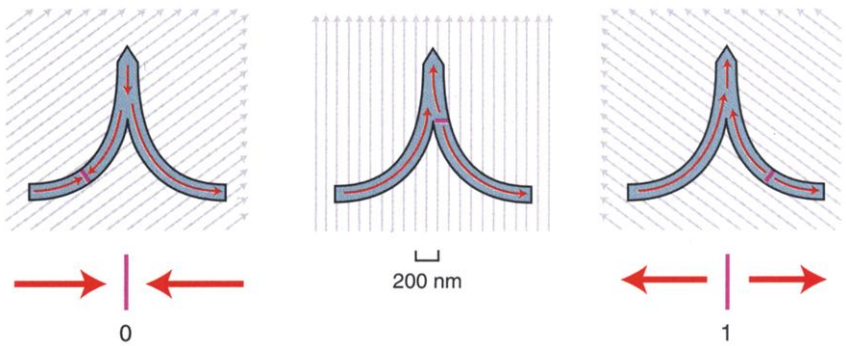

Why not? In spintronic NOT gate, a rotating magnetic field (gray arrows) changes the value of a bit by moving and then flipping the boundary between regions of magnetized wire.

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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-