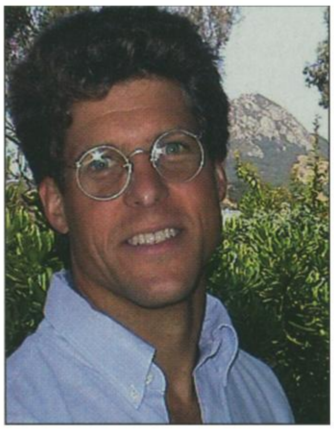
Indeed, one of the more promising recent studies using adult stem cells turned out to be less so, according to the researcher, developmental biologist Margaret Goodell of Baylor College of Medicine in Houston. In December 1999 she reported that muscle tissue contained stem cells that could become blood—raising the hope that adult tissues might harbor versatile stem cells that could, if prompted, become a variety of tissues. But in subsequent research she has found that muscle contains two distinct stem cell types, one destined to become blood and another destined to become muscle. The work has just been submitted for publication, Goodell says, but it suggests that scientists and policy-makers "can't yet leap to assumptions that we can use [adult-derived] cells for everything." **–GRETCHEN VOGEL**

SCIENCE PUBLISHING

Lab Chief, Postdoc Clash Over Nanotech Paper

Peter Schwartz says he knew he was getting into trouble when he clashed with his lab director last year over a nanotechnology problem that Schwartz claims to have solved. But he didn't realize how much trouble. Now, Schwartz says, he has been blocked from publishing his results, and he claims it's a classic example of a senior scientist clamping a lid on a junior colleague. But his former boss, Chad Mirkin, a chemistry professor at Northwestern University (NU) in Evanston, Illinois, and leader of a world-class nanotechnology group, strongly disagrees. Schwartz did some research "under my guidance," says Mirkin, then "he left the lab and tried to pass the work off as his own."



Would-be author. Authorship dispute blocks Schwartz's paper at *Langmuir.*

CREDITS: (TOP TO BOTTOM) DAVID LONGSTREATH/AP; COURTESY OF PETER SCHWARTZ

Mirkin and Schwartz do agree on this: A prestigious chemistry journal—*Langmuir*—was ready to publish Schwartz's report on a method of nanoscale DNA printing until Mirkin intervened in March. The publisher, the American Chemical Society (ACS), rejected an appeal from Schwartz on 14 June, effectively spiking the paper. This spat, which has generated several news stories, illustrates how academic differences in science increasingly involve commercial and legal battles as well.

The disagreement began more than a year ago in Mirkin's NU lab, according to Schwartz's records. The 37-year-old physicist says Mirkin hired him to work on a process developed by Mirkin and postdoc Seunghun Hong called "dip-pen" nanolithography (DPN) for printing molecular "ink" (*Science*, 29 January 1999, p. 661). Schwartz says his task was to improve the lab's method of printing DNA, which might be valuable for mass-producing DNA chips or, eventually, molecular electronic applications. Schwartz says, however, that he was unable to reproduce the lab's earlier DNA printing results. He began experimenting with a different technique called "nanografting," developed by Gang-yu Liu of Wayne State University in Detroit. Eventually, Schwartz says, he developed "meniscus-force nanografting" and used it to print lines of DNA as small as 15 nanometers wide.

Schwartz claims that relations with the lab soured after Mirkin ignored his informal critiques of DPN, prompting Schwartz to talk about the matter more publicly at a lab meeting. After that session, Schwartz received a letter from Mirkin, dated 1 July 2000, reprimanding him for "insubordinate behavior" and "belligerence" toward his colleagues. Mirkin also reminded Schwartz in the letter that his contract was about to expire and that he should turn over his notebooks to Hong, whose results Schwartz had challenged. Instead, Schwartz continued his research with the help of another lab member. Starting in July, Schwartz also had several talks with Lydia Villa-Komaroff, NU's vice president for research, explaining that he wanted to complete his own experiment, file a provisional patent, and publish the results. At the time he was looking for an academic job and is now an instructor at California Polytechnic State University in San Luis Obispo.

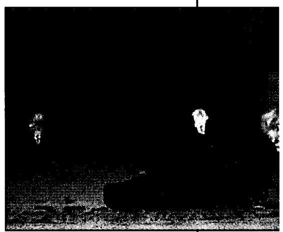
Schwartz left NU in August 2000, and, he says, after Mirkin stopped communicating with him, he submitted a manuscript on his own—first to *Nature*, which rejected it, then to *Langmuir*. Four independent reviewers vetted the manuscript for *Langmuir*, and an associate editor accepted it. Liu, who has read the paper, says it is "a very nice piece of work" that others in the field should see. She adds: "We need as many flowers as possible in the garden" of nanolithography.

In October 2000, Schwartz filed a provisional patent application, he says, listing NU and Mirkin as co-inventors. He claims he did this to protect the university's interests before he began giving public talks in labs where he was seeking employment. Schwartz says he notified Villa-Komaroff and separately wrote

ScienceScope

Environmental Reparations Five Middle Eastern countries will soon get unprecedented payments to conduct studies of the environmental damage caused by the 1990–91 Persian Gulf War, when Iraqi troops set fire to hundreds of Kuwaiti oil wells, shrouding the region in smoke for months. The money is part of reparations being drawn from the Iraq "oil for food" fund run by the United Nations (U.N.).

Last week, the U.N. Compensation Commission (UNCC) council approved distributing $243 million from the fund for environmental impact research, with the lion's share going to Saudi Arabia and Kuwait and smaller amounts to Iran, Jordan, and Syria. The nations have UNCC approval for 107 studies, including surveying coastlines for spilled oil, studying smoke damage to archaeological sites, and following health effects in people who inhaled the smoke.



Julia Klee of UNCC says "as far as we're aware, this is the first time" a country has paid environmental damages after a war. The money should be disbursed within a month.

Channeling Science China Central Television (CCTV), China's leading TV network, is starting a channel devoted to science. It debuts on 10 July and will air programs on nature, history, geography, ecology and environment, hot issues in science and education, and interviews with prominent scientists.

The channel is part of the government's strategy to "rejuvenate China by relying on science and education," says Gao Feng, director of CCTV's Department of Society and Education, which is spending $12.5 million to get the channel off the ground. Programs from National Geographic and the Discovery Channel imported by local TV stations "have cultivated an audience for our new channel," he says. Some 300 people are involved in the effort, which will include 7 hours of new programming as part of every 18-hour broadcast day.

The scientific community welcomes the new outlet, which will be broadcast via satellite on Channel 10. "It may serve as a bridge between the scientists and the public," says Yang Linzhang, deputy director of the Nanjing Institute of Soil Science under the Chinese Academy of Sciences. "But it will be a challenge for the TV workers to make their programs appealing to different kinds of audiences."

to Mirkin offering to include him as a co-author on the paper. Schwartz says he received no response from Mirkin; Villa-Komaroff responded that he should not try to publish without Mirkin's input. She says Schwartz's decision to seek patents was "premature" and may have compromised Mirkin's intellectual property. The university "has a responsibility to help mediate" disputes such as this, she says, but not to resolve them.

After *Langmuir* accepted the paper in early March, Mirkin wrote to the journal's editor, David Whitten, arguing strongly against publication. Members of the Mirkin lab also sent letters backing Mirkin. Among other things, Mirkin wrote, publishing the paper would be unethical if it didn't include other lab members as co-authors. But, he added, simply including their names wouldn't solve what he considered the main problem with the paper: Mirkin and other lab members say they need more information to reproduce the results. Finally, Mirkin raised a legal issue: *Langmuir* "has tarnished my reputation by willfully sending this manuscript out to review … with only Schwartz's perspective," Mirkin wrote. Premature publication would also affect the group's intellectual property, said Mirkin, who urged *Langmuir* not to go ahead, "knowing that there is a significant and documented authorship issue as well as a major scientific problem."

Langmuir cancelled plans to publish the paper. After getting legal advice, ACS's director of publishing operations, Mary Scanlan, wrote to Whitten that the society "cannot publish the manuscript … until the matter of authorship is resolved," and that "it is not the function of the ACS to act to resolve authorship disputes." Whitten could not be reached for comment.

Schwartz says he doesn't want to withdraw the paper: "I just want it to be published." Mirkin says he's defending the authorship rights of his team: "It's really unusual to have a situation like this. I have never experienced it before, and I don't know anyone else who has." If his team at NU can reproduce Schwartz's work, Mirkin says, he will try to publish a paper that includes Schwartz as a co-author. **–ELIOT MARSHALL**

ULTRAFAST LASERS

Lighting the Way to a Quantum Computer

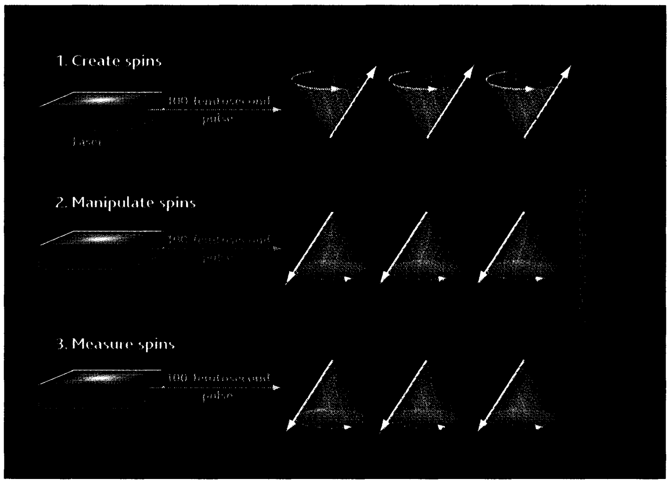
For researchers working to build a quantum computer, speed is of the essence. The bits of quantum data that scientists create last just billionths of a second, or nanoseconds. That's too short to allow researchers to do any meaningful computation. But a group of California and Pennsylvania researchers may have found a way to beat the time crunch. Their work takes a small but important step toward creating a machine that can carry out in seconds calculations that would take eons on even the most sophisticated supercomputer.

On page 2458, physicist David Awschalom and his colleagues at the University of California, Santa Barbara (UCSB), and Pennsylvania State University, University Park, report a new ultrafast way to manipulate bits of quantum data. Using a trio of vanishingly brief laser pulses, the team managed to tweak bits of quantum data in as little as 100 quadrillionths of a second, or femtoseconds. At that rate, they could theoretically carry out 1 million such manipulations before the quantum information falls apart. The group hasn't demonstrated any computation power yet. Nevertheless, the ability to manipulate quantum information so quickly "is a very important milestone," says Stuart Wolf, a quantum-computer expert at the Pentagon's Defense Advanced Research Projects Agency in Arlington, Virginia.

In both conventional and quantum computers, data are represented by bits that reside in one of two states, a 0 or 1. But quantum computers have an extra trick. They take advantage of the fuzzy notion of a superposition of states from quantum mechanics, which says that a quantum system—such as the orientation of an electron's spin—exists as a superposition of all its possible states at once until it is measured or observed. Instead of being a simple 0 or 1, a quantum bit, or qubit, can be 63% 0 and 37% 1, or 51% 0 and 49% 1. When this fuzzy qubit is plugged into a logical operation, the computer essentially computes all possible outcomes simultaneously. String just 300 qubits together, and a quantum computer would instantly calculate all 2^{300} possible results, a number roughly equivalent to all the elementary particles in the universe.

Although still far from that goal, quantum-computation experts have made some headway. The most promising approach creates qubits by using magnets to manipulate the spins of atomic nuclei in molecules in solution. Such liquid qubits maintain their information up to seconds at a time before they "decohere," or fall apart. That gives researchers ample time to coax them into carrying out rudimentary logical operations. The downside is that it's difficult to scale the technique up by coupling many qubits together.

Two years ago, a team of Japanese researchers made a qubit in a tiny solid state device, which carried the potential to be scaled up readily (*Science*, 30 April 1999, p. 722). But qubits in solid state devices tend to decohere in just 10 or so nanoseconds. It's this problem that Awschalom's group set out to solve by finding a way to manipulate quantum information more quickly. For this early-stage study, however, the team didn't make qubits, which switch between two states only. Rather, they chose a simpler task of manipulating electrons that can sit in many states.



Spin control. Laser pulses make electrons spin in unison around the axis of a magnetic field, tip the spins, and measure the result.

The team—which included UCSB grad student Jay Gupta and Penn State professor Nitin Samarth and postdoc Rob Knobel—started with a semiconducting material called zinc cadmium selenide (ZnCdSe) and a laser setup designed to jockey electrons in the material. Like all electrons, those in ZnCdSe have spin, a quantum-mechanical property associated with magnetism. The spin of an electron can point in various directions, and those pointing in different directions have slightly different amounts of energy. If researchers could control the movement, they might use the different spin directions to represent bits of information.

Normally, the spins on different electrons in ZnCdSe tend to make them wander their own way. So the group's first task was to coax them all to share the same spin, giving them a common starting point. To do that, they blasted the semiconductor with an initial 100-femtosecond pulse of circularly polarized blue light. Circularly polarized photons spiral like corkscrews as they travel. When the spiraling photons smacked electrons in the semiconductor, they gave up both their energy and their spins. The photonic barrage kicked a group of electrons in the semiconductor so that they all carried the same spin (see diagram).

ILLUSTRATION: A. STONEBRAKER