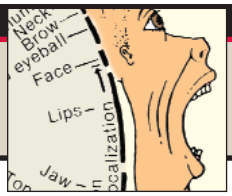

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New view of the primary motor cortex

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Next up for sequencing

BELL LABS INQUIRY

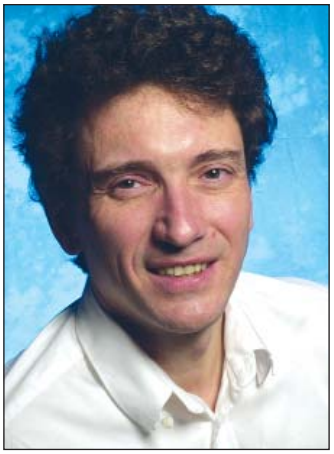
Physicists Question Safeguards, Ponder Their Next Moves

Recent revelations about questionable data in a handful of papers by Bell Laboratories physicist Jan Hendrik Schön and colleagues continued to reverberate throughout the condensed matter physics community last week. Researchers both inside and outside Bell Labs—the research arm of Lucent Technologies in Murray Hill, New Jersey—are asking whether formal peer review at journals and an informal review system at Bell Labs should have raised concerns earlier. And several teams have already begun to scale back efforts to extend the pioneering work that is now in doubt.

Chemists and physicists were talking about little else last week. "I'm trying to find an e-mail in my inbox that is not related to Hendrik Schön," says Charles Marcus, a physicist at Harvard University.

Schön, 31, has pioneered two separate fields over the last few years: using transistors to inject a high density of electric charges into organic and inorganic crystals to study new physics, and creating molecular-scale transistors. Both aspects of the work came under scrutiny 3 weeks ago when outside researchers presented Bell Labs officials with evidence of possible manipulation of data in five separate papers published over 2 years (*Science*, 24 May, p. 1376). Schön was the only co-author who was on all five papers and was the first author on each. Since then, researchers combing the literature have turned up nine more figures from eight other papers that appear to share unusual similarities.* Last week Schön, who stands by his results and says it's not surprising that similar measurements produce similar graphs, announced that he would hold off on publishing papers currently in press.

On 10 May, Bell Labs set up a five-member panel of independent researchers to investigate the concerns. That panel is expected to take months to reach its conclusions, which Bell Labs officials say will be made public. In the meantime, researchers are asking whether the troubling data should have been caught earlier. The questions are particularly acute within Bell Labs. According to Bell Labs physicist Robert Willett, researchers there typically send papers to a selection of peers before sending them to journals. Although not intended as a formal peer-review system, the practice ensures that other researchers can keep abreast of the latest work by their colleagues and can raise scientific concerns before the papers are published. But for at least two of Schön's most controversial papers last year—which appeared in the 18 October issue of *Nature* and the 7 December issue of *Science*—that standard procedure was not followed. "That was reason for concern," Willett says. Similar figures in those two papers triggered a broader look at Schön's work by outside researchers, which led to the current inquiry. Now, in the wake of that inquiry, Willett says he has been asked to serve on an internal committee to determine whether a more formal review process is needed.



New tack? Ramirez (*above*) plans to keep trying to replicate Schön's work, but Natelson (*right*) says the controversy might shift his efforts.

Whether peer reviewers for *Science*, *Nature*, and other journals should have spotted similarities in the figures is also a topic of heated debate. Arthur Hebard, a physicist at the University of Florida in Gainesville, says that the papers now under investigation were so important that they should have been given more thorough scrutiny during their review process. "This is such revolutionary physics, reviewers probably should have picked this up," Hebard says.

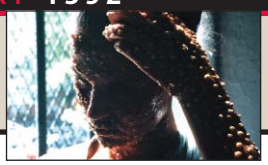
But Leo Kouwenhoven, a physicist at Delft University of Technology in the Netherlands, suggests a couple of reasons why problems of that kind would be difficult to catch. First, Kouwenhoven notes, reviewers typically look at papers one at a time, so any data duplicated from earlier papers wouldn't have been obvious. Moreover, Schön and colleagues turned out so many papers—about 90 in recent years—that their track record produced a halo effect. "I thought if I criticized too much, I would look like I am jealous. That has made everybody cautious to speak out too loud," Kouwenhoven says—a sentiment other researchers echo.

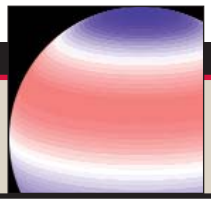
Although most researchers doubt that this case will prompt drastic changes in the peer-review system, it is already having an impact on some of the estimated 100 groups worldwide believed to be working on projects related to the Bell Labs results. In most cases, those results have not been reproduced. "The question is, what do we do now?" says Douglas Natelson, a physicist at Rice University in Houston, Texas, who has had a Ph.D. student working for the last year trying to replicate some of Schön's work using high-field transistors. "It's really tricky. I'm reluctant to spend any more money on the high-field work until I know more."

Allen Goldman, a physicist at the University of Minnesota, Twin Cities, who has had a postdoc working about half time to replicate some of Schön's results for the past year, agrees. "We've sort of changed directions to hedge our bets a little bit. In the next months, we won't pursue that quite as intensively as we had because of these questions," Goldman says. "As a mentor, I have an obligation to make sure people [in my group] are productive."

CREDIT: (LEFT) LEROY SANCHEZ/LANL

* *Applied Physics Letters* **73**, 3574 (1998), Fig. 3 (top).
Physical Review B **63**, 245201 (2001), Fig. 2.
Physical Review B **58**, 12952 (1998), Fig. 2 (top).
Synthetic Metals **122**, 195 (2001), Fig. 2 and Fig. 3.
Applied Physics Letters **79**, 4043 (2001), Fig. 2.
Thin Solid Films **385**, 271 (2001), Fig. 5.
Science **288**, 2338 (2000), Fig. 2.
Physica Status Solidi B **226**, 257 (2001), Fig. 4.





Others, meanwhile, say they're staying the course. Art Ramirez, a physicist at Los Alamos National Laboratory in New Mexico, for example, says his group isn't planning any drastic shifts. Ramirez has about five people working directly on extending Schön's results using high electric fields produced by transistors to explore new physics in organic materials. Ramirez created a buzz at the American Physical Society meeting in March when he reported that his team had used the transistor setup to trigger a normally insulating crystal of C_{60} to behave like a metal. Schön and colleagues had previously reported using the same setup to coax C_{60} to go one step further and superconduct. Ramirez's team hasn't duplicated that result. But he believes he's close and therefore is reluctant to alter his focus. "Things will just change overnight if we can duplicate this," Ramirez says. Perhaps no one is pulling for him to succeed more than Hendrik Schön. **–ROBERT F. SERVICE**

SPACE SCIENCE

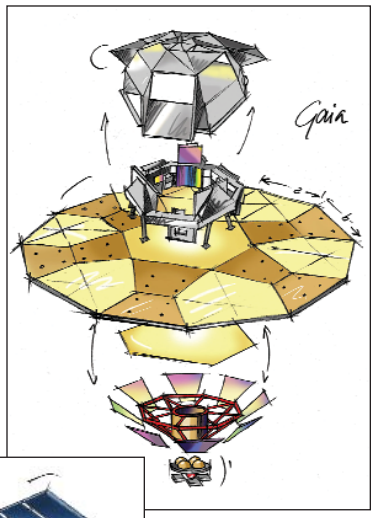
Europe Does More With Less

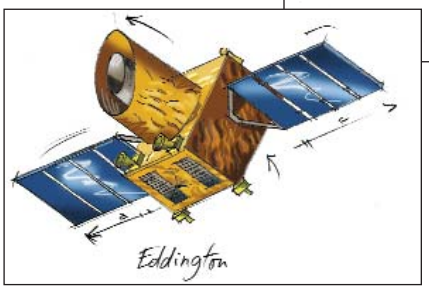
PARIS—Last November, Europe's space scientists faced a grim future. Ministers meeting in Edinburgh had capped the European Space Agency's (ESA's) science budget over 3 years, forcing about $460 million in savings in the next decade. It seemed certain that one large mission would have to be scrapped, most likely a galaxy-charting satellite called Gaia. It was, according to David Southwood, ESA's science director, "a rather dismal picture."

At a press conference here on 27 May, Southwood and his team emerged from a 6-month huddle to unveil an ambitiously revised slate of missions. By reshuffling schedules, squeezing money from existing programs, and weaving together the development of missions as tightly as possible, they have transformed a program of 12 launches in 11 years into one of 16 launches in 10 years. They even managed to save Gaia and introduce a new mission into the $3.4 billion mix. Despite the axing of one planetary mission, "the final result is the best of the possible solutions," says Bo Andersen of the Norwegian Space Centre in Oslo, chair of ESA's Science Programme Committee.

Over the next decade, Southwood's "cosmic vision" program calls for, among other goals, landing spacecraft on Mars, Mercury, Saturn's moon Titan, and a comet; observing the birth, evolution, and death of stars and galaxies at gamma ray and infrared wavelengths; studying the afterglow of the big bang; and mapping the positions and motions of nearly every star in the Milky Way. ESA will also join NASA in building Hubble's successor, the Next Generation Space Telescope, and LISA, a gravitational wave observatory in space.

The program's transformation squeezes many missions to the limit. For example, Gaia is now $140 million cheaper thanks to a less costly spacecraft that will fit on a smaller launch vehicle. For the BepiColombo mission to Mercury, ESA is hoping to cut a deal with Russia on a less expensive lander and launcher. Also to cut costs, BepiColombo will be delayed a few years and developed in tandem with the Solar Orbiter, a mission to study the sun. All this leaves little slack in the program. "You can do this only once," says Southwood. "[ESA ministers shouldn't] ask me to repeat the trick. I'm not a magician."





Double save. Europe's new plan preserves Gaia (*top*) and includes Eddington.

The savings have allowed Southwood to pull one extra mission out of the hat. Previously just a backup mission, Eddington will study the composition and structure of stars by measuring seismic vibrations at their surfaces, a technique known as asteroseismology (see p. 1595). It will also look for small extrasolar planets moving across the disks of parent stars. Eddington is a step toward a proposed mission called Darwin, pegged for 2015, that would study the atmospheres of extrasolar planets and search for life. "I can't imagine a human being not interested in this," Southwood says.

The drastic pruning of the program budget did nip one bud, however. ESA's planned mission to Venus, called Venus Express, was dropped last week because "not everybody could commit to the necessary schedule," says Southwood, who warns that future missions that don't stick to tight schedules might suffer the same fate.

Some scientists rue the loss of Venus Express. "It's tragic that we now have a scientifically very interesting mission without an option of really flying it," says Michael Grewing of the Institute for Millimeter Radio Astronomy in Grenoble, France, chair of ESA's Space Science Advisory Committee. But Southwood's sword of Damocles hanging over future missions might end up saving Venus Express in the end. Grewing says that Venus Express could get a second chance if another mission is dropped from the roster. According to Joop Hovenier of the Free University in Amsterdam, the decision to cancel Venus Express came like a bolt from the blue. "It's a pity," he says. "It was a cheap mission, because it would use the same platform as Mars Express. You would expect projects like that to be applauded." **–GOVERT SCHILLING**

Govert Schilling is an astronomy writer in Utrecht, the Netherlands.

BIOTERRORISM

Congress Adopts Tough Rules for Labs

Biomedical and agricultural researchers working with potential bioweapons face an array of new regulations under a new U.S. law aimed at combating bioterrorism. Science lobbyists say that the rules, passed overwhelmingly last week by Congress, are more reasonable than earlier drafts developed last fall immediately after a wave of anthrax-tainted letters killed five people. But they remain cautious until the Bush Administration spells out how it plans to implement the law.

The Public Health Security and Bio-

CREDITS: ESA