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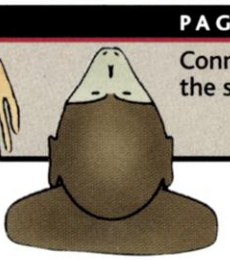
Connecting the senses



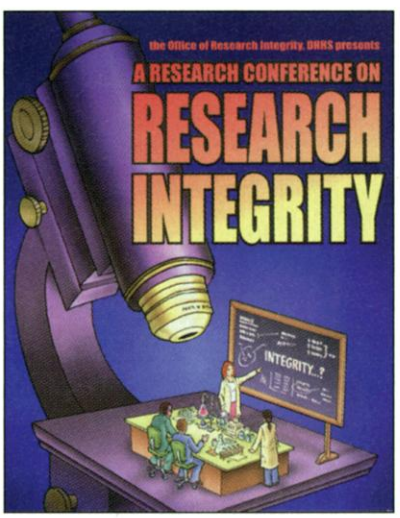
1669
Better view for U.K. science

SCIENTIFIC MISCONDUCT

How Prevalent Is Fraud? That's a Million-Dollar Question

Charles Turner still doesn't know whether his experience was like finding a rare bad apple in the barrel. But he is sure that there was something rotten in the survey data going into his federally funded study of sexual behavior. And he knows that it has taken him 2 years to pluck out the spoiled fruit and piece together a clean report for publication.

Turner, a social scientist at City University of New York/Queens College, offered his cautionary story last month at a conference* called by a key federal watchdog agency to announce a $1 million grants program to investigate the prevalence of fraud, data fabrication, plagiarism, and other questionable practices in science. The 8-year-old Office of Research Integrity (ORI), a small unit within the Department of Health and Human Services, hopes to support studies aimed at gauging the frequency of misconduct and how to raise ethical standards.



Under scrutiny. The U.S. Office of Research Integrity brought together 200 scientists to discuss research ethics, including data from two recent studies (below).

Turner's story was the most dramatic of a series of case studies presented at the ORI conference. In 1997, he explained, the National Institutes of Health funded his proposal to ask 1800 Baltimore residents about their sexual behavior. The project, an epidemiological look at AIDS and other sexually transmitted diseases such as gonorrhea and chlamydia, was managed by the Research Triangle Institute (RTI) of Research Triangle Park, North Carolina. Eleven months into the study, Turner, who has an appointment at RTI, got a call from a data-collection manager who was troubled by the apparent overproductivity of one interviewer. A closer look revealed that the worker was faking results; the address of one interview site, for example, turned out to be an abandoned house. The worker was dismissed, and others came under suspicion.

After "a horrible 6 months" pulling apart the entire study, Turner and his colleagues discovered an "epidemic of falsification" that they linked to a cessation of random quality checks. As the schedule slipped, says Turner, some staffers may have felt pressure to hurry up. Despite a "significant" loss of money and time, the investigators painstakingly plucked out data from tainted sources, sorted the remains, and pieced together a final report that has been submitted for publication.

Turner says the exercise taught him several hard lessons, the most important being to "validate the work yourself." Scientists should start analyzing survey data as soon as it is submitted, he says, with a sharp eye for anomalies. Turner says he doesn't know if other projects have faced similar problems, because most journal articles don't discuss the issue. And the incident never became public, he says, because no one was ever publicly accused of wrongdoing and the institute chose to avoid the risk of litigation.

How often does misconduct like this occur? There appears to be no consensus on the answer, although science historian Nicholas Steneck of the University of Michigan, Ann Arbor, co-chair of the conference, has drawn up a range of estimates. At the low end is an estimate of 1 fraud per 100,000 scientists per year. That's based on 200 official federal cases that fit a narrow definition that counts only fraud, data fabrication, and plagiarism, out of a community of 2 million active researchers over 20 years.

At the same time, Steneck notes that 1 in 100 researchers "consistently report" in surveys that they know about an instance of misconduct. A broader definition yields even more hands. There is a "troubling discrepancy," Steneck observed, "between public statements about how 'rare' misconduct in research supposedly is and the more private belief on the part of many researchers that it is fairly common."

A study of students at one campus suggests that the practice of massaging data is common, but the behavior decreases as students advance toward a career in science. Biologist Elizabeth Davidson and colleagues at Arizona State University in Tempe asked students in seven introductory biology and zoology courses whether they manipulated lab data to obtain desired results. A huge majority—84% to 91%—admitted to manipulating lab data "almost always" or "often." Most said they did this to get a better grade. Other studies, however, show that the willingness to fake data declines sharply as students move on to graduate and professional-level work, leading Davidson to speculate that their behavior improves as the "research becomes important to them personally."

Some institutions have attempted to remedy the problem of scientific misconduct with special education programs. The University of Minnesota, for example, reported on an ambitious ethics training program at the medical school that in 1 year spent $500,000 on 60 workshops and signed up 2200 re-

ESTIMATING SCIENTIFIC MISCONDUCT

Documented cases	1 in 10,000
Know of an undisclosed case	1–13 in 100
Major deviation found in audit	1 in 10
Misrepresentations in fellowship applications	1 in 5
Students willing to fake data	1 in 2

CREDITS: (TOP TO BOTTOM) ORI RESEARCH; SOURCES: "ASSESSING THE RISKS OF PUBLICLY FUNDED RESEARCH," BY NICHOLAS H. STENECK; "DATA MANIPULATION IN THE UNDERGRADUATE LABORATORY," BY ELIZABETH W. DAVIDSON *ET AL.*

* ORI Research Conference on Research Integrity, 18–20 November, Bethesda, Maryland.

searchers as participants. But Steneck and others say that it's hard to measure the effectiveness of such training, and that the meager results to date are disheartening.

A study of 172 University of Texas students enrolled in a "responsible conduct of research" course, for example, found "no significant change" in attitudes after training, says Elizabeth Heitman of the University of Texas School of Public Health in Houston. The finding is consistent with what Steneck has seen, including a 1996 study that found that people who had gone through a training course were actually more willing to grant "honorary authorship" to colleagues who had not performed research than were those who had not been trained.

ORI director Chris Pascal says his office has received several favorable comments about the new grants program and that 70 scientists interested in the topic showed up last month for an ORI workshop on how to apply for biomedical research grants. The first round of winners will be announced next year. **–ELIOT MARSHALL**

CLIMATE POLICY

Too Little, Too Late, at The Climate Talks

Under pressure from too many complex issues, too many divergent views, and too little time to forge consensus, international negotiations aimed at reducing greenhouse gas emissions collapsed last week. The most obvious bone of contention was whether the United States, the world's biggest source of humanmade greenhouse gases, should be allowed to meet much of its obligation without actually cutting its own emissions. The United States softened its controversial stance in the final hours, but European negotiators found even the scaled-back U.S. position unacceptable. Although the negotiators headed for home with nothing tangible to show for their efforts, they say the rule-setting process is not over, just suspended.

Filling in the details of the Kyoto Protocol crafted by governments in 1997 was obviously going to be tough (*Science*, 3 November, p. 920). "The fundamental problem is that you have several intersecting issues and a complicated set of coalitions," says economist Henry Jacoby of the Massachusetts Institute of Technology. The mix becomes even more daunting when you add in an agreement on targets for reducing greenhouse emissions in developed countries—an average 5% reduction of emissions below their 1990 level—that was reached before anyone established how those reductions could be made. The United States found itself in a particularly tight spot, facing the need for a two-thirds majority in the U.S. Senate to ratify the treaty and a hot economy that would require a 30% reduction in emissions over the next 10 years relative to business as usual.

A valiant effort. Dutch environment minister Jan Pronk, chair of the conference negotiating the climate treaty, lent a hand to protesters building a mock dike but was unable to build a consensus among negotiators.

To lessen the economic pain, the U.S. negotiators latched onto several "flexibility" opportunities allowed by the protocol. One is to let growing forests and soils soak up carbon dioxide emitted by burning fossil fuels. Initially, U.S. negotiators proposed that almost 310 million tons of carbon—about half of the U.S. reduction target—be accounted for by its forest and soil "sinks" (*Science*, 3 November, p. 922). Not fair, countered E.U. negotiators as well as observers from some environmental groups, claiming that such generous use of sinks amounted to "rewriting the Kyoto targets." Many of those same forests and soils were soaking up carbon dioxide in 1990, they pointed out, without any effort on the part of the United States government. The Europeans insisted that the United States must actually reduce its greenhouse emissions rather than rely largely on sinks or another Kyoto option involving trading credits for emission reductions made in other countries.

By the final hours—actually, during a last-minute extension of negotiations—the U.S. team agreed to let sinks account for just 50 million tons of its mandated 620-million-ton reduction. But by then, "there was a lack of time and a lack of trust," says Jennifer Morgan of the World Wildlife Fund in Washington, D.C. A compromise on sinks carefully crafted by the U.S. team and a small group of European negotiators was rejected by the full European contingent as time ran out.

In several other problem areas, progress was made but nothing settled. Left undecided, for instance, was the extent to which a country can buy emission-reduction credits from another country—such as Russia, where a sagging economy has resulted in large emission reductions since 1990. Nor did the negotiators agree on how compliance might be enforced. And it remains unclear how much help developing countries would get to cope with climate change. The protocol mandates that developed countries transfer money and technology to help these countries make the transition to cleaner energy production. But developing countries did not even have the opportunity to weigh in before the talks ended.

They may get another chance in a few months. In an unusual move, the parties to the protocol agreed to meet again, probably in Bonn in May, to take another stab at setting rules. "The parties aren't letting the protocol fail," says economist Michael Toman of Resources for the Future in Washington, D.C. "They're still far apart, but these things don't come easily." **–RICHARD A. KERR**

CHEMICAL TESTING

Sweden to Get Tough on Lingering Compounds

STOCKHOLM—For generations the Orrefors Kosta Boda glassworks has earned international acclaim for its fine leaded crystal art glass. But its handiwork may soon go the way of gasoline: lead-free. A Swedish government panel has called for banning from commerce any substance that persists in the

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