

December 20, 2005

## Global Trend: More Science, More Fraud

By Lawrence K. Altman and William J. Broad

The South Korean scandal that shook the world of science last week is just one sign of a global explosion in research that is outstripping the mechanisms meant to guard against error and fraud.

Experts say the problem is only getting worse, as research projects, and the journals that publish the findings, soar.

Science is often said to bar dishonesty and bad research with a triple safety net. The first is peer review, in which experts advise governments about what research to finance. The second is the referee system, which has journals ask reviewers to judge if manuscripts merit publication. The last is replication, whereby independent scientists see if the work holds up.

But a series of scientific scandals in the 1970's and 1980's challenged the scientific community's faith in these mechanisms to root out malfeasance. In response the United States has over the last two decades added extra protections, including new laws and government investigative bodies.

And as research around the globe has increased, most without the benefit of such safeguards, so have the cases of scientific misconduct. Most recently, suspicions have swirled around a dazzling series of cloning advances by a South Korean scientist, Dr. Hwang Woo Suk.

Dr. Hwang's research made him a national hero. His team outdid rivals by claiming to have extracted stem cells from cloned human embryos and to have cloned a dog, an extraordinary feat. Some observers hailed the breakthroughs as worthy of a Nobel Prize.

Last month, critics charged that Dr. Hwang's published findings hid ethical lapses. And last week, collaborators accused the researcher of fabricating results in one of his landmark human cloning studies, published in *Science* last spring.

Dr. Hwang has insisted on his innocence but said he would retract the *Science* paper. Now questions are growing about his earlier work, including Snuppy, the dog he claims to have cloned. Yesterday, news agencies reported that Seoul National University officials investigating Dr. Hwang's claims locked down his laboratory, impounded his computer and interviewed his colleagues, among other actions.

"The Korean case shows us that we should be a lot more cautious," Marcel C. LaFollette, the author of "Stealing Into Print: Fraud, Plagiarism, and Misconduct in Scientific Publishing," said in an interview. "We have been unwilling to ask tough questions of people who are from other countries and whose systems are different because we were attempting to be polite."

To be sure, most scientists resist pressures to cut corners and adhere to the canons of science, honoring the truth above all else. But surveys suggest that there are powerful undercurrents of misbehavior and, in some cases, outright fakery.

In June, a survey of 3,427 scientists by the University of Minnesota and the HealthPartners Research Foundation reported that up to a third of the respondents had engaged in ethically questionable practices, from ignoring contradictory facts to falsifying data.

Scientific fraud as a public danger burst into public view in the 1970's and 1980's, when major cases of misconduct shook a number of elite publications and institutions, including Yale, Harvard and Columbia.

In 1981, Dr. Donald Fredrickson, then the director of the National Institutes of Health, defended the standard view of science as a self-correcting enterprise. "We deliberately have a very small police force because we know that poor currency will automatically be discovered and cast out," he said.

But fraud after fraud made the weaknesses of that system impossible to ignore. In the early 1980's, a young cardiology researcher, Dr. John R. Darsee, was found to have fabricated much data for more than 100 papers he wrote while working at Harvard and Emory Universities. His work appeared in *The New England Journal of Medicine*, *The Proceedings of the National Academy of Sciences* and *The American Journal of Cardiology*, among other top publications.

Startled, the federal government, beginning in 1985, took steps to augment the existing safeguards. For instance, Congress passed a law requiring public and private institutions to establish formal ways to investigate charges of fraud, in theory helping to assess damage, clear the air and protect the innocent. Eventually, the federal government established its own investigative body, now known by the Orwellian title of the Office of Research Integrity.

Journal editors, at the center of the storm, also took collective action to enhance their credibility. In 1997, they founded the Committee on Publication Ethics, or COPE, "to provide a sounding board for editors who are struggling with how to best deal with possible breaches in research and publication ethics," according to the group's Web site.

Consisting mostly of editors of medical journals, the committee now has more than 300 members in Europe, Asia and the United States.

Still, the frauds kept coming. In 1999, federal investigators found that a scientist at the Lawrence Berkeley Laboratory in Berkeley, Calif., faked what had been hailed as crucial evidence linking power lines to cancer. He published his research in *The Annals of the New York Academy of Sciences* and *F.E.B.S. Letters*, a journal of the Federation of European Biochemical Societies.

The year 2002 proved especially bleak. At Bell Labs, a series of extraordinary claims that seemed destined to win a Nobel Prize, including the creation of molecular-scale transistors, suddenly collapsed. Two of the world's most prestigious journals, *Science* and *Nature*, had

published many of the fraudulent papers, underscoring the need for better safeguards despite two decades of attempted repairs.

Experts now say that the explosive growth of science around the globe has made the problem far worse, because most countries have yet to institute the extra measures that the United States has put in place. That imbalance is at least partly responsible for a rise in scientific scandals in other countries, they say.

Dr. Richard S. Smith, a former editor of *The British Medical Journal* (now *BMJ*) and the co-founder of the Committee on Publication Ethics, a group of journal editors, said in an interview that fraud was becoming increasingly difficult to root out because most countries' protective measures were either patchy or altogether absent. "It's hard enough to do something nationally, and to do it internationally is still harder," he said. "But that's what is needed."

Contributing to the problem is a drastic rise in the number of scientific journals published around the world: more than 54,000, according to Ulrich's Periodicals Directory. This glut can confuse researchers, overwhelm quality-control systems, encourage fraud and distort the public perception of findings.

"Foreign scientific journals have gone through the roof," said Shawn Chen, a senior associate editor at Ulrich's, nearly doubling to 29,098 in 2005 from 15,300 in 1980. "We're having a hard time keeping up."

While millions of articles are never read or cited - and some are written simply to pad résumés - others enter the pressure cooker of scientific and biomedical promotion, becoming lucrative elements of companies' business strategies.

Until now, cases of questionable research in other countries have gotten little attention in the United States. But international editors, shaken by scandal, are now publicizing them and expressing concern. This year, the July 30 issue of *BMJ* devoted four articles to the subject, asking on its cover: "Suspicious of fraud in medical research: Who should investigate?"

The articles discussed cases in which several publications, including *BMJ*, had stumbled in resolving serious doubts about the truthfulness of published studies done in Canada and India. The Canadian research claimed that a patented mix of multivitamins improved brain function in older people, and the Indian study said that low-fat, high-fiber diets cut by nearly half the risk of death from heart disease.

The *BMJ* said that it published its own version of the Indian research in April 1992 and that it had later investigated serious questions about the validity of the research for more than a decade before speaking out.

The difficulty, the editors said, was that journals could go only so far in fraud inquiries before needing the aid of national investigative bodies and professional associations that oversee scientific research. But in the Indian and Canadian cases, they added, such bodies either did not exist or refused to help, so "the doubts are unresolved."

The journal's editors, Dr. Fiona Godlee and Dr. Jane Smith, noted that the United States and Scandinavian countries had adopted institutional defenses and that Britain was considering such safeguards. Journals have an obligation to help the process, they concluded, by publicizing their difficulties and doubts.

Most recently, the South Korean uproar illustrates the tangle of publishing and policing issues that can arise as science becomes increasingly competitive and international.

"Now we're in a situation where we have these alliances between university researchers in countries and between institutions that really weren't working together before," said Dr. LaFollette, author of "Stealing Into Print."

The journal *Science*, owned by the American Association for the Advancement of Science, published the research of Dr. Hwang of Seoul National University and his colleagues in March 2004 and June 2005, hailing it as pathbreaking.

On Dec. 14, the magazine noted in a statement how fraud charges about the 2005 research had led to two investigations - one in South Korea and the other at the University of Pittsburgh, home to one of the article's 25 co-authors. "The journal itself is not an investigative body," Donald Kennedy, the magazine's editor, argued. "We await answers from the authors, as well as official conclusions, before we come to any ourselves."

On Friday in a news conference, Dr. Kennedy emphasized that the magazine had made no accusations of fraud against Dr. Hwang. "As of now we can't reach any conclusions with respect to misconduct issues," he said.

Independent scientists said it remained to be seen how thoroughly authorities in South Korea, where Dr. Hwang is a celebrity, would investigate the case and resolve knotty issues in what amounts to a highly public test of institutional maturity.

Seoul National University is leading the inquiry. Its committee, which apparently has the authority to examine Dr. Hwang's raw data and to question his colleagues, may have the best chance of discovering how much of his work remains valid.

But experts also cautioned that the committee's credibility requires the addition of outsiders, and perhaps scientists from other countries, who know the field and can help ensure that the investigation will retain its objectivity.

"Unfortunately, individual institutions have an enormous conflict of interest," said Dr. Smith, the former editor of *The British Medical Journal*. "It's a lot easier," he said, for such bodies when examining an allegation of fraud on their own, "to slide someone out of the organization or to suppress it altogether."