## SCIENTIFIC MISCONDUCT

## *Science* Retracts Discredited Paper; Bitter Patent Dispute Continues

In an unusual decision. Science this week retracted a 2005 report without the agreement of all the authors (see p. 463). The report, authored by a group at the Korea Advanced Institute of Science and Technology (KAIST) and at CGK Co., both in Daejeon, South Korea, describes a method, dubbed MAGIC, to identify drug targets by tracking protein movements in live cells (Science, 1 July 2005, p. 121). The retraction is based on an investigation by KAIST that concluded that although the technique might be valid, data in the paper were fabricated and "the extent of the fabrication is serious enough to damage the authenticity of the entire paper." The same group claimed in the journal Nature Chemical Biology in July 2006 that it had used MAGIC to identify an antiaging molecule; this report was retracted last July.

But in a twist, a legal battle is raging over

evidences will be provided to prove that MAGIC technology and anti-aging compounds in two papers are real," chemical geneticist Tae Kook Kim, formerly at KAIST, wrote in an e-mail to a *Science* reporter. He added that he intends to take legal action "against several parties for my defamation and libel."

The convoluted saga began in July 2004 when Kim and several partners established CGK Co. to commercialize a technique for identifying drug targets. The method, MAGnetism-based Interaction Capture, works by coating a magnetized nanoparticle with a molecule of interest. The coated nanoparticle is then introduced into a cell in which a target protein has been tagged with a fluorescent label. Applying a magnetic field forces the nanoparticle to move. If the fluorescence moves in concert, that indicates that the molecule of interest has bound



Seeing is not believing. An investigation by the Korea Advanced Institute of Science and Technology concluded that experiments to support these images were never conducted.

the intellectual property at the heart of the discredited papers. "We strongly believe that there is value in the patent rights to the MAGIC technology," KAIST's Research Integrity Committee wrote in an e-mail responding to questions from a *Science* reporter. "Even though the data and results in the paper were fabricated, the idea of the methodology is original." And the senior author of both retracted papers staunchly defends the findings. "A number of strong to the target protein. Kim and two members of his lab, Jaejoon Won and Yong-Weon Yi, are listed as inventors in a patent application, according to a translation of a Korean Intellectual Property Office document that CGK provided to a *Science* reporter.

After describing MAGIC in the *Science* paper, the group reported in *Nature Chemical Biology* how the technique had been used to identify a molecule, CGK733, that resets a cell's intrinsic aging clock by

inhibiting a certain protein. Won was first author and Kim was corresponding author on both papers. In July 2006, the same month the report appeared in *Nature Chemical Biology*, CGK completed raising more than \$2.5 million in venture capital, according to a statement CGK provided to a *Science* reporter on 10 March 2008.

But that statement also notes that CGK had trouble getting MAGIC to work. This led Yi—an author on both papers who by then had moved from KAIST to CGK to become the company's chief technology officer—to ask *Science* and *Nature Chemical Biology* to remove his name from the papers in December 2007, according to the CGK statement. On 11 February 2008, CGK informed KAIST of concerns about MAGIC. KAIST launched its own investigation on 12 February 2008.

On 28 February, the university informed both journals that although its investigation was continuing, the panel had come to a preliminary conclusion that "the two papers do not contain any scientific truth," according to an "editorial expression of concern" Science posted on its Web site on 3 March 2008 (Science, 14 March 2008, p. 1468). On 13 March, KAIST issued a press release in English summarizing the results of the preliminary investigation and alleging that Won, Yi, and Kim were involved in or aware of the misconduct. Unlike the press release, the final report later shared with Science does not assign responsibility for alleged misconduct.

In the e-mail to the *Science* reporter, Yi says he played a minor role in the project and even questioned Kim about his inclusion as an author "because I thought I hadn't contributed enough." Before the investigation, he claims, he hadn't suspected superiors would commit misconduct: "It was almost impossible for me to find out the truth" from them, he wrote.

In its July 2008 issue, Nature Chemical *Biology* published a letter signed by eight of the nine authors retracting the Won et al. paper. The letter states that the preliminary KAIST investigation "revealed several irregularities." One was that the "applicaυĽ tion of MAGIC technology for identifying ATM (a key protein) as the target of SCIENCE 305 CGK733 was fabricated." It also says "our original notebooks and data are not available to substantiate the scientific claims of the paper." Kim did not sign the letter. An editor's note reads: "T.K. Kim supports the retraction of the paper but maintains that of the paper—specifically, that the MAGIC screening was improperly performed and the chemical structure of CGK733 was misrepresented."

Retraction of the Science paper did not go as smoothly. Science requires that all authors agree to a retraction, says Monica Bradford, Science's executive editor. But the journal could not reach one co-author, Neoncheol Jung, whose affiliation was listed as CGK. The whereabouts of Jung, who was CGK's founding CEO, remain unknown. Yeon-Soo Seo, a KAIST biochemist who served on the investigating committee, says his panel received one e-mail from Jung, who wrote that he was not involved in the case, he had nothing to do with the fabrication, and his name was included in the paper against his will. Lacking Jung's agreement and without full consent of authors and their institutions, Bradford says Science waited for KAIST to

"The extent of the

fabrication is serious

enough to damage

the authenticity of

the entire paper."

**—KAIST** 

provide the investigating committee's final report, which had been completed in June 2008. But the report's release, she says, "got tied up with a legal dispute."

The legal dispute is murky as well. CGK claims it reached an agreement in August 2004 with KAIST

assigning intellectual property and commercial rights to the MAGIC technology to the company. But in March 2007, KAIST initiated legal action to reclaim those rights, according to statements from both CGK and KAIST. "KAIST hoped that through those legal proceedings they would have a chance to learn more from CGK." Bradford says she was told by a KAIST official. CGK, however, "was pushing for retraction," she says. CGK sent a copy of what it said is the KAIST investigating committee's final report, dated 22 May 2008, to Science editors, who had it translated. Science delayed taking action until it received an official version from KAIST, Bradford says.

Meantime, CGK devised an alternative to MAGIC, described by its researchers in the 10 December 2008 issue of the *Journal of the American Chemical Society*. CGK has applied for two patents, one of which has been granted, related to the technology, which, like MAGIC, relies on coated magnetic nanoparticles and fluorescent-tagged proteins. In an e-mail to a *Science* reporter, CGK charged that KAIST had delayed the retraction process to bolster its legal position; KAIST strongly denied this in an e-mail.

Although a Korean court on 9 Decem-

ber returned MAGIC patent rights to KAIST, the Korean Intellectual Property Office recommended on 19 January that the patent be rejected. The final decision is expected this summer; if it goes against KAIST, KAIST officials have said the company will appeal.

On 28 February 2009, KAIST forwarded to *Science* parts of the final report related to the *Science* paper. The authors could not provide notebooks or original data for any of the experiments described in the paper, according to a translation of the report prepared for *Science*. The KAIST report notes that Won and Tae Kook Kim admitted that experiments supporting Figure 2 in the *Science* paper, which purports to show magnetic manipulation of proteins tagged with fluorescent markers, were not carried out as reported. Based on the KAIST report, "The data, results, and con-

clusions in the Won *et al.* report are clearly not reliable," writes *Science* Editorin-Chief Bruce Alberts.

Bradford says that when she informed senior author Tae Kook Kim that the paper would be retracted, he said he would agree if the wording was changed to indicate that

only parts of the paper were not reliable. *Science* declined. "Our paper, as it stands, cannot be substantiated; it's got to go," Bradford says.

Repercussions for the Korean scientists have been severe. Last November, KAIST dismissed Tae Kook Kim; CGK is suing him for criminal fraud, says CGK's Dae-Joong Kim. Sometime after the papers were published but before problems arose, Won took an "associate specialist" position at the University of California, Los Angeles; he left that post in July 2008, according to a UCLA spokesperson who declined to describe the circumstances, citing privacy concerns. Won did not respond to an e-mail or to a voice mail message seeking comment.

Late last year, Yi sought to have criminal defamation charges brought against five members of KAIST's investigating committee, according to Yi's e-mail. Prosecutors declined to pursue criminal charges on 29 December, but Yi has appealed to a court.

The KAIST Research Integrity Committee says it "learned a lot from this incident" and is planning educational programs "to prevent research misconduct and to promote research ethics and integrity."

-DENNIS NORMILE

- Science Insider

## From the *Science* Policy Blog



An innovative approach to provide the best malaria drugs to the world's poor officially got under way last week in Oslo. Instead of providing money to governments to buy the medicines for their public health systems, the Affordable Medicines Facility for malaria (AMFm) (Science, 21 November 2008, p. 1174) will subsidize companies to sell the drugs on the private market at bargain prices. Most of the world's poorest rely on small pharmacies for their drugs, but to save money, they often pick cheap, ineffective drugs or counterfeits instead of state-of-the-art combination therapies. So far, AMFm has received \$225 million to tackle the problem.

The U.S. Environmental Protection Agency has asked scientists how to revise the Clean Water Act to protect seas against **ocean acidification** from atmospheric carbon dioxide. Under the current rules, waters are designated as impaired if their pH deviates from naturally occurring levels by 0.2 units. But biologists say that some organisms are affected by smaller changes. A more complex approach would also take into account how organisms or ecosystems are affected differently by changing pH levels.

Last week's announcement that **William Brinkman**, former head of research at Bell Labs, would be nominated to run the \$4.8 billion Office of Science at the Department of Energy suggests that Energy Secretary Steven Chu, another alum, hopes to tap the fabled lab's expertise at marrying basic and applied research.

Elsewhere ... Bush science adviser John Marburger returned to Washington, D.C., to make science policy more scientific. The Union of Concerned Scientists released a report suggesting that genetically engineered crops have not outperformed more traditional varieties. British spy service agency MI5 is looking for a scientific adviser—the equivalent of James Bond's Q. Time to spell check your résumé.

For the full postings and more, go to **blogs.sciencemag.org/scienceinsider**.

www.sciencemag.org **SCIENCE** VOL 324 24 APRIL 2009 *Published by AAAS*