

ZERO TOLERANCE

BY DAVID CYRANOSKI

Yang Wei has an easy smile and a care-free, even distracted, air — but he takes such a solemn approach to life that his wife sometimes tells him to relax. “I take everything seriously,” he says.

The former materials scientist certainly took it seriously when, two years after he became president of Zhejiang University (ZJU) in Hangzhou, China, he faced a case of scientific misconduct that became a turning point for his presidency. In early October 2008, the editor of the *International Journal of Cardiology* discovered that figures in a manuscript by He Haibo, a scientist researching traditional Chinese medicine who had been hired by the ZJU only months before, were suspiciously similar to those in an article that He had published elsewhere. Confronted, He quickly owned up, submitting a 12-page confession to Yang on 26 October.

But the case, which eventually led to the retraction of eight papers, spiralled into an international media catastrophe for the ZJU, one of China's oldest and largest universities, as well as one of the most successful in publishing science. Articles attacked the laxity of a system that gave leadership roles to the likes of Li Lianda, dean of the department of pharmaceutical sciences and He's supervisor, who was largely absent from the lab and unfamiliar with the work, but was last author on some of He's papers. “There was plagiarism, fabrication and falsification. It was a showcase of every kind of problem,” says Yang.

Facing one of the best-publicized misconduct



A UNIVERSITY CRACKS DOWN ON MISCONDUCT IN CHINA.

cases in China's recent history, Yang knew he had to act quickly. He personally wrote to all the editors of the journals involved. They supplied copies of copyright-transfer forms with all the co-authors' signatures, and Yang sent

them to the national calligraphy centre. “Most signatures were identical to He's own,” says Yang. “Even I could tell that.”

In March 2009, the ZJU fired He, terminated the contract of Wu Limao, a co-author on several of He's papers and the laboratory head in Li's absence, and took away Li's dean-ship and graduate students.

Yang didn't stop there: he launched a campaign to make the ZJU more responsive to misconduct. With an energetic companion named Yuehong (Helen) Zhang cracking down on the university's journals (see ‘Policing the plagiarists’), and assistance from a group of university administrators who share his determination and commitment to a zero-tolerance policy for misconduct, Yang hopes to make the ZJU into a role model that can help to clean up China's reputation for rife scientific misconduct. That reputation, exacerbated in the past five years by a string of high-profile cases (see *Nature* 441, 392–393; 2006), has made observers and journal editors increasingly sceptical of the ability of Chinese research institutions to ensure trustworthy science.

Yang, who now tours the country giving lectures on scientific integrity, has established a reputation as the most evangelical of the reformers. His collaborators are impressed. “He is committed to cleaning things up at Zhejiang,” says Mark Frankel, director of the Scientific Freedom, Responsibility and Law Program at the American Association for the Advancement of Science (AAAS) in Washington DC, who is working with Yang to improve

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research ethics. Frankel says that efforts such as Yang's are driving change. "What is most impressive is how open and willing the people with whom I work in China are to admit that a serious problem exists, and that they are committed to turning things around for the younger generation of scientists," he says.

THE SCALE OF THE PROBLEM

There are no comprehensive statistics on the extent of research misconduct in China — and few ministries, agencies or universities make cases public. Surveys and anecdotal evidence, however, reveal a deep-rooted problem, and suggest that students are learning unethical behaviour alongside their science. In an unpublished 2008 survey of 1,641 students at 10 universities, Cao Nanyan, a research-integrity specialist at Tsinghua University in Beijing, found that more than 20% of students admitted to changing data that didn't match their expectations. Some 60% of PhD students said that they sometimes witnessed misconduct, yet only 5% would report it — and Cao found evidence that the students' tolerance of misconduct increased the longer they stayed in education.

"It suggests that the more entangled you are in the system, the less able or motivated you are to pursue good practices," says Daniele Fanelli, a social scientist at the University of Edinburgh, UK, who has studied the frequency of scientific misconduct. Fanelli says that Cao's figures are "clearly worrying, because they would suggest much higher rates of misconduct, and lower rates of reporting, compared to what is usually reported in surveys in Western countries".

Cao and other experts on misconduct point to specific contributing factors. China's research system has developed very rapidly, and universities are scrambling to train the influx of students, scientists and administrators. "As a large, newly developed system of research, China does not have the control of its research programmes that is found in the West," says Nicholas Steneck, who studies research integrity at the University of Michigan in Ann Arbor. Some researchers are simply oblivious to the rules, says Zhong Haining, a neuroscientist who trained at Tsinghua University and is now starting a lab at Oregon Health and Science University in Portland. "The official guideline for scientific misconduct may (or may not) exist, but it's not very well publicized, at least not emphasized so much in training," he says.

Steneck adds that these issues may be rooted in a broader lack of honesty in governance, and that this makes it tough to build a culture of honest research. "It is difficult to have integrity in research if integrity in other aspects of life is questionable," he says.

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The government, universities and research institutions have introduced a cornucopia of integrity policies over the past decade. But



Yang Wei wants to reform attitudes towards research ethics at Zhejiang University and across the country.

enforcement is problematic, says Mu-ming Poo, director of the Institute of Neuroscience in Shanghai. Most Chinese funding organizations do not, for example, have permanent offices to deal with misconduct in a systematic and transparent fashion, as the Office of Research Integrity at the US Department of Health and Human Services attempts to do. "Very few people in the funding agency or in the scientific community

do this. I have to do this," he says.

In January 2009, on the basis of lessons learned in the He case, Yang created a research-integrity committee and an investigation task force at the ZJU. That March, at a conference to discuss the He situation, the Chinese minister of education called for a zero-tolerance policy towards misconduct — and Yang signed up. He issued a series of codes to guide behaviour

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are willing to be the 'bad guy' and enforce the regulations," says Poo. He points to an investigation into what he considered a clear-cut case of misconduct. A researcher was dismissed, but soon found a job elsewhere and continued to get large grants. "There's essentially no punishment for scientific misconduct," says Poo. "The tolerance and appeasement within the community — that really worries me."

TAKING ACTION

Yang had encountered misconduct before he became president of the ZJU — as a reviewer of manuscripts in fracture mechanics, and in roles such as director-general of the academic degrees committee of the State Council of China, a post that he held from 2004 to 2006. But when the He case came to light, Yang says he felt the weight of responsibility for the ZJU and its students, and this compelled him to act. "It's not that I want to

on authorship, citations and submission procedures, including one that forbids electronic submissions of papers by a non-corresponding author. This addressed one of the key problems in the He case, in which He and some graduate students had submitted papers from an account under the name of the corresponding author, Wu. Yang replaced most of the ZJU's adjunct deans with full-time executive deans in an attempt to avoid the problems created by Li's absentee leadership. And he introduced new investigative procedures and spelled out disciplinary actions.

All this helped Yang to prepare for a second big case, in mid-2010. The editor-in-chief of a journal published by Springer contacted Yang to say that plagiarism and fabrication in an article from a ZJU researcher were so egregious that Springer was considering blocking all submissions from the university to its 2,000 science,

technology and medicine journals. (Yang declines to name the researcher or editor.) “It put pressure on. We had to convince them that we could handle the case,” says Yang.

This time, Yang was ready. He dismissed the main scientist involved, and cut the salary and PhD-student allocation of the corresponding author. “Springer was satisfied,” says Yang.

Over the past two years, Yang says, he has dealt just as briskly with another 40 or so misconduct cases at the ZJU. More than 20 researchers have been found guilty of wrongdoing after discussion by the university administration. For the ten cases involving recent graduates, more than half lost their degrees. One sued the ZJU to overturn the ruling of plagiarism. She lost. If work done during your training is fraudulent, “your degree should be taken away,” says Yang firmly.

In cases involving faculty members, three had their employment terminated, four faced disciplinary action including a pay cut, and the rest were issued with public or internal warnings. Some have been temporarily forbidden from taking on PhD students.

But laws and punishment go only halfway towards tackling the problem — prevention is also essential. At the ZJU, Yang has established a system for mentoring young faculty members on research ethics, and since 2009 the university has held more than ten seminars and lectures on research integrity, with attendance at some surpassing 1,000. Yang also continues his talks at universities around the country. “We have to train them to be honest. It’s not enough to be aware of the ethics code. You need to really understand it,” says Gong Ke, president of Nankai University in Tianjin, who, with Yang and the AAAS, is preparing a book of scientific-misconduct cases that can be used to teach research integrity in China and the United States.

SLOW PROGRESS

Yang says it is too early to tell whether his efforts are really paying off. Most misconduct cases are several years old by the time they come to light, so the researchers involved haven’t been exposed to the education and enforcement efforts. And there is always the fear that teaching people about misconduct might simply make some determined individuals craftier — as in the case of those who try to outwit plagiarism-detection software with software of their own. “But at least they are more aware that they are doing something wrong,” says Yang.

Yang is not cleaning up Chinese science on his own. Other universities have established ethics courses and strengthened their investigation procedures. And China’s aggressive ‘online police’ have been rooting out frauds — the XYS blog run by Fang Shimin has become famous for its tenacity. Posts on the website discuss problems with data, as well as discrepancies between researchers’

POLICING THE PLAGIARISTS

A software arms race

In October 2008, Yuehong (Helen) Zhang became the first journal editor in China to introduce CrossCheck, a tool that compares text against published articles to flag up plagiarism. Two years later, she had found that 31% of the 2,233 submissions over that time to her publication, the *Journal of Zhejiang University* — *Science*, contained unoriginal material. After reporting the number in *Nature* (Y. Zhang *Nature* **467**, 153; 2010), Zhang was harassed on blogs. “Many people criticized me. They say I am unpatriotic. I don’t care. I think I’m doing the right thing. I think it could make science stronger in China.”

Zhang, who is also vice-president of the Society of China University Journals in Beijing, has been working to build a journal that is run to international standards. Unlike many Chinese journals, hers insists on peer review. In December 2010, she became the first Chinese person to win a grant from the International Committee on Publication Ethics, for a project to analyse types of plagiarism. But the biggest reward, she says, has been the improvement: only 15% of submissions in the first half of 2011 contained unoriginal content.

There are 5,000 science and technology journals in China, but only 200 are in English and can use CrossCheck. Zhang says that some 20 do so. A separate effort is under way

to police Chinese-language journals. In 2009, the China National Knowledge Infrastructure (CNKI) in Beijing, which shares information about research from the country, launched a system called the Academic Misconduct Literature Check (AMLC). Sun Xiongyong, director of the CNKI Academic Integrity Research Center, says that the organization was pushed by publishers and universities to develop the AMLC, which now includes about 80 million Chinese articles, conference proceedings and doctoral theses. Its subscribers include some 4,500 publishers and 600 universities.

Sun says that a crucial component of the system is the ability to check Chinese articles against the 30 million or so English articles in the database, and vice versa. “It’s the only multi-language check system,” notes Sun.

The systems can be cheated. For example, students who are given access to the AMLC to check their theses before submission might find passages that trigger the plagiarism warning and then tweak them until the text scrapes through. “AMLC is abused,” says Sun. In response, the CNKI has established a monitoring system that can check, for example, whether the AMLC was being used before submission. But the arms race continues: Sun’s latest headache is the use of software available outside China — such as Turnitin — to defeat the check system. **D.C.**

CVs and their actual achievements. Fang is not yet convinced that the ZJU is rigorously investigating all the misconduct cases that it should. “I don’t think he takes his own words seriously,” he says of Yang. But Fang notes that he has seen improvements in the 11 years since he started his own “fight” against misconduct. The media are more willing to report misconduct and appeal for reform, he says, “and the government at least admits there are problems”.

Real change will take more time and effort. At a 2007 meeting on research integrity with the China Association for Science and Technology, Frankel recalls, one Chinese speaker after another presented data on how bad the situation was and “openly worried about its effects on how science coming out of China would be perceived”. The professional guidelines that are surfacing now, he says, are “merely a first step. They have adopted investigative practices and procedures similar to the United States but lack experience and manpower needed to be truly effective. This will take time.”

Even the best efforts of administrators such as Yang might not be enough to change deep-rooted behaviours, says Sheila Bonde, an

archaeologist and historian at Brown University in Providence, Rhode Island, who is collaborating with the ZJU to create a course in ethics. “Training graduate students about ethics as they enter research laboratories is too little, too late and too specific,” she says. “There is a critical need for broader discussion of ethical choices across the spectrum of Chinese academic, political and economic issues, and this has to begin much earlier in students’ lives.”

Still, the passion for cleaning up China’s science is tangible. Frankel says that reformers such as Yang have a different kind of drive from those in the United States, where “the emphasis is on accountability for spending the public’s money, its impact on research progress, and public trust. My Chinese colleagues view research misconduct as a stain on their country,” says Frankel. “It’s almost personal there.”

The reason, suggests Steneck, is that the stakes for China are so high. “If other countries lose confidence in the integrity of Chinese science, it is the Chinese who will suffer the most,” he says. ■

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