

NEWS

Publish or perish in China

The pressure to rack up publications in high-impact journals could encourage misconduct, some say.

The latest in a string of high-profile academic fraud cases in China underscores the problems of an academic-evaluation system that places disproportionate emphasis on publications, critics say. Editors at the UK-based journal *Acta Crystallographica Section E* last month retracted 70 published crystal structures that they allege are fabrications by researchers at Jिंगgangshan University in Jiangxi province. Further retractions, the editors say, are likely.

Chinese universities often award cash prizes, housing benefits or other perks on the basis of high-profile publications, and the pressure to publish

seems to be growing. A new study from Wuhan University, for instance, estimates that the market for dubious science-publishing activities, such as ghostwriting papers on nonexistent research, was of the order of 1 billion renminbi (US\$150 million) in 2009 — five times the amount in 2007. In other studies, one in three researchers surveyed at major universities and research institutions admitted to committing plagiarism, falsification or fabrication of data.

“The extent of the misconduct is disturbing,” says Nicholas Steneck, director of the Research Ethics and Integrity Program at the University of Michigan in Ann Arbor. “It highlights the challenges China faces as it struggles to rapidly

improve the research capacity of a very large system — with significant variations in quality — to be a world-class player in science.”

Two weeks ago, reacting to the retractions of the crystallography papers, Jिंगgangshang University fired the correspondent authors, Zhong Hua and Liu Tao. It is unclear whether their co-authors, who include researchers from other institutions in China, will also be investigated.

The journal's editors say that the discrepancies came to light during tests of software designed to flag possible errors and unusual chemical features, such as abnormal distances between atoms. The

software identified a large number of crystal structures that didn't make sense chemically; further checking, the editors say, suggests that the authors simply changed one or more atoms of an existing compound of known structure, then presented that structure as new. Zhong and Liu could not be reached for comment.

Editors at the journal are now checking the authenticity of other published crystal structures, including all submissions from Jिंगgangshan University.

Half of the 200,000-odd crystal structures published by the journal during the past five years have come from China. William Harrison, a chemist at the University of Aberdeen,

UK, who is one of three section editors for the journal, would not discuss the ongoing investigation but says that the generation of large numbers of structures by one group would not necessarily raise questions, because diffractometers can easily collect a couple of data sets a day. “In terms of papers submitted to *Acta E*, the vast majority coming from China are correctly determined structures, and they make a valuable contribution to science,” he says.

Nevertheless, the Wuhan University study suggests that misconduct could be widespread in many fields. The team, led by computer scientist Shen Yang, used website analyses and onsite investigations to identify a wide range of dubious publishing activities. These include ghostwriting theses and academic papers on fictional research, bypassing peer-review for payment, and forging copies of legitimate Chinese or international journals.

The researchers analysed the most popular 800 websites involved in such activities — which together rack up 210,000 hits a day — and found that the cost of each transaction is typically 600–12,000 renminbi. Three-quarters of the demand comes from universities and institutions, says Shen. “There is a massive production chain for the entire publishing process,” he says.

Concerned by such trends, China's science ministry commissioned a survey of researchers,

“Counting the number of publications becomes the norm.”

Streamlined chemical tests rebuffed

Europe's chemical regulator is threatening to stall safety studies that toxicologists say could prevent millions of animals being used in tests over the next eight years.

European Union (EU) legislation requires that chemicals be tested in two generations of animals to assess the effects on their reproductive systems. But proposed new tests would allow just one generation of animals to be used, with additional tests on a second generation required only if the first round raised concerns.

But the European Chemicals Agency (ECHA) in Helsinki, which implements the EU's REACH (Registration, Evaluation,

Authorisation and Restriction of Chemicals) legislation and is responsible for issuing guidance on tests, says that there is not yet enough evidence to rely on one-generation testing.

Toxicologists who advocate the switch, however, say that their scientific case is “overwhelming”. They argue that REACH will fail unless the new test is adopted, because the two-generation tests are too expensive, demand too many animals, and require laboratory space and manpower that the EU simply doesn't have.

“Everyone is longing for this change to happen. It's the only way to make the legislation feasible,”

says toxicologist Thomas Hartung, former head of the European Centre for the Validation of Alternative Methods in Ispra, Italy, and now at Johns Hopkins Bloomberg School

of Public Health in Baltimore, Maryland. He estimates that using the extended one-generation study would reduce animal use in REACH by 40–60%. “Costs would be

reduced in a similar range,” he says.

“We can't perform all the two-generation studies that we are required to perform under REACH,” adds Susanne Böhn, a toxicologist for BASF, a chemical company headquartered in



Watership downer: testing the toxicity of chemicals over two generations rather than just one will mean the deaths of millions more animals.

K. GULDBRANDSEN/SPL



STARFISH SUCK UP CARBON

Echinoderms sequester more carbon than previously thought.

go.nature.com/psbWrW

MEDIO/IMAGES



K. BROFSKY/GETTY

Under pressure: one-third of researchers surveyed in China admit to plagiarism, falsification or fabrication of data.

the results of which remain under wraps. However, several sources revealed to *Nature* that roughly one-third of more than 6,000 surveyed across six top institutions admitted to plagiarism, falsification or fabrication. Many blamed the culture of *jigong jinli* — seeking quick success and short-term gain — as the top reason for such practices, says Zeng Guopin, director of the Institute of Science Technology and Society at Tsinghua University in Beijing who was involved in running the survey.

The second most-cited cause is bureaucratic interference in academic activities in China. Most academic evaluation — from staff employment and job promotion to funding

allocation — is carried out by bureaucrats who are not experts in the field in question, says Fang Shimin, a US-trained biochemist who runs a website called 'New Threads' that exposes research misconduct in China. "When that happens, counting the number of publications, rather than assessing the quality of research, becomes the norm of evaluation," he says.

Cao Nanyan, a colleague of Zeng's at Tsinghua, conducted a similar survey commissioned by the Beijing municipality, which surveyed 2,000 researchers from 10 universities and research institutions. It, too, found that roughly one-third of respondents admitted to illegitimate practices.

To critics such as Rao Yi, dean of the life-science school at Peking University in Beijing, the lack of severe sanctions for fraudsters, even in high-profile cases, also contributes to rampant academic fraud. Many researchers criticize the fact that Chen Jin, a former researcher at Shanghai Jiao Tong University who is accused of falsely claiming to have developed a series of digital signal-processing chips, was fired with no other repercussions. Meanwhile, others involved in the scandal have gone unpunished.

"You send out a very wrong signal when such high-profile cases are not dealt with properly," says Rao.

Jane Qiu

Ludwigshafen, Germany.

REACH came into force in 2007, and is the world's most extensive attempt at improving the safe use of chemicals. All chemicals sold in the EU in quantities of more than one tonne per year must be registered, along with toxicity data, by 2018.

The ECHA estimates that about 30,000 substances will be logged, requiring 9 million animals to be used in tests costing €1.3 billion (US\$1.9 billion). But a study by Hartung suggests that this is a gross underestimate, and that at least 68,000 chemicals will have to be registered, requiring the use of 54 million animals (T. Hartung and C. Rovida *Nature* 460, 1080-1081; 2009).

The Organisation for Economic Co-operation and Development

(OECD) is drawing up guidelines for its member states for a one-generation study. These would include a more extensive battery of tests that are not routinely performed in the existing two-generation studies, including histopathology and neurobehavioural tests. OECD member states, except for Sweden, agreed on a draft of the guidelines at a meeting on 21-23 October 2009 in Paris.

At the meeting, Elizabeth Méndez, a toxicologist at the US Environmental Protection Agency (EPA), presented an analysis of 350 substances — mostly pesticides — showing that only one would not have been picked up as dangerous had a second-generation study not been performed. "There is a great

deal of redundancy in the second-generation tests," she says. The EPA has already begun trialling the extended one-generation tests on a case-by-case basis. Another study (G. Janer *et al. Reprod. Toxicol.* 24, 97-102; 2007) found that in 176 multi-generation studies on 148 substances, there were only three instances in which reproductive toxicity was not identified until the second-generation test.

But it is up to the ECHA to recommend that the new tests be used in REACH, and the agency, which attended the October meeting, is not convinced by such studies. At the meeting, agency representatives expressed concern that some fertility effects could be missed in a one-generation study, and criticized the EPA analysis for not

considering whether reproductive effects seen in the second-generation tests were more severe than in the first. In a statement to *Nature*, the ECHA said: "The two-generation study is the only study that covers effects on reproduction after exposure during all life stages." The agency added that the scientific evaluation of the OECD's guidelines is "on-going", and that it "considers it premature to evaluate the impacts on the number of test animals and costs of the test designs under development". Hartung points out that the OECD, which is expected to approve a final version of the guidelines for one-generation tests in March, could use its political clout to lobby for European regulators to approve the tests.

Natasha Gilbert