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CHINA CONDUCTS FIRST NATIONWIDE REVIEW OF RETRACTIONS

Universities must declare all their retractions and launch investigations into misconduct cases.

By Smriti Mallapaty

Chinese universities have been told to complete a nationwide audit of retracted research papers and a probe of research misconduct. By 15 February, universities had to submit to the government a comprehensive list of all academic articles retracted from English- and Chinese-language journals in the past three years. They had to clarify why the papers were retracted and investigate cases involving misconduct, according to a 20 November notice from the Ministry of Education's Department of Science, Technology and Informatization.

The government launched the review in response to Hindawi, a London-based subsidiary of the publisher Wiley, retracting a large number of papers by Chinese authors. These retractions, along with those from other publishers, "have adversely affected our country's academic reputation and academic environment", the notice states.

A *Nature* analysis shows that last year, Hindawi issued more than 9,600 retractions, of which about 8,200 had a co-author in China. Nearly 14,000 retraction notices, of which some three-quarters involved a Chinese co-author, were issued by all publishers in 2023.

This is "the first time we've seen such a national operation on retraction investigations", says Xiaotian Chen, a library and information scientist at Bradley University in Peoria, Illinois, who has studied retractions and research misconduct in China. Previous investigations have largely been carried out on a case-by-case basis – but this time, all institutions have to conduct their investigations simultaneously, says Chen.

Tight deadline

The ministry's notice set off a chain of alerts, cascading to individual university departments. Bulletins posted on university websites required researchers to submit their retractions by a range of dates, mostly in January – leaving time for universities to collate and present the data.

Although the alerts included lists of retractions that the ministry or the universities were aware of, they also called for unlisted retractions to be added.

According to *Nature*'s analysis, which includes only English-language journals, more than 17,000 retraction notices for papers published by Chinese co-authors have been issued since 1 January 2021, which is the start of the period of review specified in the notice. The analysis, an update of one conducted in December, used the Retraction Watch database, augmented with retraction notices collated from the Dimensions research database, and involved assistance from Guillaume Cabanac, a computer scientist at the University of Toulouse in France.

The ministry gave universities less than three months to complete their self-review – and this was cut shorter by the academic winter break, which typically starts in mid-January and concludes after the Chinese New Year, which fell this year on 10 February.

"The timing is not good," says Shu Fei, a bibliometrics scientist at Hangzhou Dianzi University in China. Shu expects that many universities have submitted only a preliminary report of their researchers' retracted papers.

Researchers with retracted papers will have to explain whether the retraction was owing to misconduct, such as image manipulation, or an honest mistake, such as authors identifying errors in their own work, says Chen. "In other words, they may have to defend themselves." Universities then must investigate and penalize misconduct. If a researcher fails to declare their retracted paper and it is later uncovered, they will be punished, according to the ministry's notice. The cost of not reporting is high, says Chen. "This is a very serious measure."

It is not known what form punishment might take, but in 2021, China's National Health Commission posted the results of its investigations into a batch of retracted papers. Punishments included salary cuts, withdrawal of bonuses, demotions and timed suspensions from applying for research grants and rewards.

The notice states explicitly that the first corresponding author of a paper is responsible for submitting the response. This requirement will largely address the problem of researchers shirking responsibility for collaborative work, says Li Tang, a science- and innovation-policy researcher at Fudan University in Shanghai, China. The notice also emphasizes due process, says Tang. Researchers alleged to have committed misconduct have a right to appeal during the investigation.

What next

The notice is a good approach for addressing misconduct, says Wang Fei, who studies research-integrity policy at Dalian University of Technology in China. Previous efforts by the Chinese government have stopped at issuing new research-integrity guidelines, she says, but these were poorly implemented. And when government bodies have launched self-investigations of published literature, they were narrower in scope and lacked clear objectives. This time, the target is clear – retractions – and the scope is broad, involving the entire university research community, she says.

QILAI SHEN/BLOOMBERG/GETTY

Chinese science has been "adversely affected" by retractions, a government notice says.

"Cultivating research integrity takes time, but China is on the right track," says Tang.

It is not clear what the ministry will do with the flurry of submissions. Wang says that, because the retraction notices are freely available, publicizing the collated lists and underlying reasons for retraction could be useful. She hopes that a similar review will be conducted every year "to put more pressure" on authors and universities to monitor research integrity.

What happens next will reveal how seriously the ministry regards research misconduct, says Shu. He suggests that, if the ministry does not take further action, the notice could be seen as just an attempt to respond to the reputational damage caused by the mass retractions.

The ministry did not respond to *Nature*'s questions about the investigation.

Chen says that, regardless of what the ministry does with the information, the reporting process itself will help to curb misconduct.

But it might mainly affect researchers publishing in English-language journals. Retraction notices are rare in Chinese-language journals.

BIOLUMINESCENT HOUSEPLANT HITS US MARKET FOR FIRST TIME

Engineered petunia emits a continuous green glow thanks to genes from a light-up mushroom.

By Katherine Bourzac

Consumers in the United States can now pre-order a genetically engineered plant for their home or garden that glows continuously. At a base cost of US$29.00, residents of the 48 contiguous states can get a petunia (*Petunia hybrida*) with flowers that look white during the day; but, in the dark, the plant glows a faint green. Biotechnology firm Light Bio in Sun Valley, Idaho, will begin shipping a batch of 50,000 firefly petunias in April.

Researchers contacted by *Nature* seem enamoured by them. This is a "groundbreaking event" – to have made a plant that can bioluminesce brightly enough to be seen with the naked eye and can be sold to plant lovers, says Diego Orzáez, a plant biologist at the Institute of Plant Molecular and Cellular Biology in Valencia, Spain. "Being a European, I have envy that consumers in the United States can have their hands on these plants."

Growing and glowing

Keith Wood, chief executive and co-founder of Light Bio, has been working on bioluminescent plants – which emit light through chemical reactions inside their cells – since the 1980s. In 1986, he and his colleagues reported[1] making the first such plant, a type of tobacco (*Nicotiana tabacum*) into which they inserted the luciferase gene from fireflies (*Photinus pyralis*). At the time, the goal was to learn about the basics of gene expression, and the tool is still used by plant biologists. Researchers can engineer plants so that, when a particular gene of interest is activated, the luciferase gene is switched on too, and the plant will light up.

Because this was "a cool thing", Wood says, start-up companies then tried to make the plants for decorative purposes. But the plants glowed only faintly and needed special food to fuel their light-emitting chemical reaction.

The firefly petunia glows brightly and doesn't need special food thanks to a group of genes from the bioluminescent mushroom *Neonothopanus nambi*. The fungus feeds its light-emitting reaction with the molecule caffeic acid, which terrestrial plants also happen to make. By inserting the mushroom genes into the petunia, researchers made it possible for the plant to produce enzymes that can convert caffeic acid into the light-emitting molecule luciferin and then recycle it back into caffeic acid – enabling sustained bioluminescence[2]. Wood co-founded Light Bio with two of the researchers behind this work: Karen Sarkisyan, a synthetic biologist at the MRC Laboratory of Medical Sciences in London; and Ilia Yampolsky, a biomolecular chemist at the Pirogov Russian National Research Medical University in Moscow.

"If you treat the plant really well, if it gets enough sunlight and it's healthy, it will glow brighter."

Unlike fluorescence, which requires special light bulbs, the petunia's bioluminescence happens without needing any particular type of light. That sets the plant apart from other glowing organisms on the market, the GloFish. These aquarium pets, available in many species and colours – including electric green tetras – fluoresce under ultraviolet light.

"If you treat the plant really well, if it gets enough sunlight and it's healthy, it will glow brighter," Sarkisyan says. But he wants to manage people's expectations: it's not bright enough to keep you awake at night. It's a gentle green glow similar to the light of the full Moon.

Engineering in a different light

The plant was approved by the US Department of Agriculture in September. Sarkisyan says that Light Bio chose petunias because they're used widely as ornamental plants in the United States. It also chose them to minimize risk. This type of petunia is not native to North America, and is not considered an invasive species. So the chances of the modified genes spreading into native plants and disrupting ecosystems should be minimal.

Scientists contacted by *Nature* didn't see any safety risks. "I cannot imagine any reason why this should be a concern," Orzáez says.

"People's reactions to genetically modified plants are complicated," says Steven Burgess, a plant biologist at the University of Illinois Urbana–Champaign. Many concerns centre around who owns a technology and who benefits from it. A glowing houseplant is different from plants used by the agriculture industry, in which one company owns the seeds, he says.

Burgess compares the glowing petunia with another timely product. The purple tomato (*Solanum lycopersicum*), for which seeds went on sale earlier this month in the United States, is the first genetically modified food product to be marketed directly to gardeners. Researchers inserted genes from a snapdragon plant (*Antirrhinum majus*) into the tomato[3] to achieve its colour and high levels of anthocyanins, which are antioxidants.

Asked whether Light Bio is worried about plant lovers sharing cuttings of the petunia with friends, Sarkisyan says that although the firm owns patents, it doesn't plan to crack down aggressively on the behaviour. "The most positive way of dealing with it is to come up with new, better products," he says.

Orzáez is excited about the research potential of the technology behind the petunias. He is currently developing plants that use the mushroom luciferase system to communicate when they are stressed or infected by a virus. "Genetic engineering can be used for the good of humanity," Orzáez says, acknowledging that many people are scared of it. "Having positive examples of genetic engineering, something people can touch and bring home" could help people to see such modifications in a different light, he says.

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