

壹：閱讀測驗

請同學根據檢附的論文內容回答下列問題，每題計分列於題後。

論文標題：

“SCIENTIFIC INTEGRITY: A Dark Tale Behind Two Retractions”.

- 1) 請問本文作者是誰？(2%)
(a) Peter Schultz, (b) Robert Service, (c) Monica Bradford, (d) Zhiwen Zhang
- 2) 本文章刊登於哪個雜誌？(2%)
(a) Nature, (b) Marine Chemistry, (c) Journal of Oceanography, (d) Science
- 3) 根據本文作者所述，引起爭議之文章是從事哪一方面之研究？(3%)
(a) 氨基酸, (b) 脂肪酸, (c) 腐植酸, (d) 檸檬酸
- 4) 根據本文所述，蛋白質主要是由多少種『氨基酸』組成？(2%)
(a) 80, (b) 50, (c) 20, (d) 10
- 5) 根據本文作者所述，引起爭議之兩篇文章是在哪一年分別登載發表？(2%)
(a) 2002, (b) 2005, (c) 2004, (d) 2001
- 6) 根據本文所述，引起爭議之文章的第一作者現在在那一個單位服務？(2%)
(a) Princeton University, (b) University of Texas, (c) The Scripps Research Institute, (d) University of California at San Diego
- 7) 根據本文所述，第一位對於引起爭議之研究提出疑問之研究人員現在在那一個單位服務？(2%)
(a) Princeton University, (b) University of Cardiff, (c) The Scripps Research Institute, (d) University of California at San Diego
- 8) 根據本文所述，誰是“Science”雜誌的總編？(2%)
(a) Bruce Alberts, (b) Monica Bradford, (c) Eric Tippmann, (d) Richard Lerner
- 9) 根據本文作者所述，張教授 (Zhiwen Zhang) 因爭議研究而被假名歹徒 (Michael Pemulis) 意圖勒索多少金額之美金？(2%)
(a) one millionth, (b) fourteen thousands, (c) four thousands, (d) fourty thousand
- 10) 根據本文作者所述，後來初步發現引起爭議之研究是因何特殊物質引起『假反應』？(3%)
(a) Enzyme, (b) DNA, (c) Sugars, (d) Glycoproteins

見背面

貳：翻譯測驗

請同學閱讀以下英文文句，將之翻譯成適當中文，每題計分列於題後。

1. Air pollution has arisen from both natural (meteoric, terrestrial, marine, volcanic, erosion and surface winds, forest fires, biogenic) and anthropogenic (coal and fuel combustion, industry, automobile, agriculture) sources. (8%)
2. It has been demonstrated that the skeleton of corals can be used as a historical recorder of trace metal pollution and climatic variations in marine environments because elements and contaminants to which the corals are exposed are trapped within their skeleton during calcification. (10%)
3. The Kuroshio is a strong western boundary current in the western north Pacific Ocean. It begins off the east coast of Taiwan and flows northeastward past Japan, where it merges with the easterly drift of the North Pacific Current. It is analogous to the Gulf Stream in the Atlantic Ocean, transporting warm, tropical water northward towards the polar region. (10%)
4. Whenever we see or hear anything, we do so because of the existence of waves. Electromagnetic waves cover a spectrum from low frequency radio waves, through visible light to X- and gamma rays. Sound propagate as a wave through the air. When someone sings or plays a musical instrument, the standing waves in their vocal chords, guitar strings or drum skins produce a pressure change, or sound wave, which is audible. (10%)
5. A tropical cyclone is a storm system characterized by a large low-pressure center and numerous thunderstorms that produce strong winds and heavy rain. Tropical cyclones feed on heat released when moist air rises, resulting in condensation of water vapor contained in the moist air. (10%)
6. Humanity's existence depends on the bounties of the Earth, oceans, and atmosphere, yet often these elements turn against citizens of this planet. Each year earthquakes, droughts, storms, volcanoes, disturbances in the Earth's magnetic field, and other natural hazards affect communities in ways that range from inconvenient to massively destructive. (10%)
7. By the third century A.D., Chinese scientists had learned how to magnetize pieces of iron by heating them to red and then cooling them in a north-south alignment. Such magnets were widely used as navigational compasses on Chinese ships by the eleventh century A.D. (10%)

參：英文寫作

請同學用英文簡述未來有興趣研究的海洋科學議題。(10%)

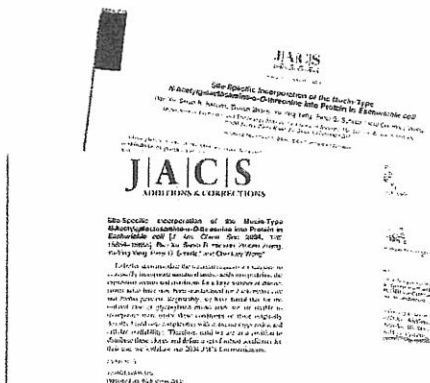
NEWS OF THE WEEK

SCIENTIFIC INTEGRITY

A Dark Tale Behind Two Retractions

The notices published in Science last month and online in the Journal of the American Chemical Society (JACS) in September were brief: Two papers from a prominent chemistry lab were being retracted because the results couldn't be replicated. Part of the story behind the retractions is anything but straightforward, however. It involves an extortion attempt and a threat of suicide.

The papers were published in 2004 from the laboratory of Peter Schultz, a chemist at The Scripps Research Institute in San Diego, California. They extended pioneering work in Schultz's lab on a method for incorporating non-native amino acids into proteins (Science, 20 April 2001, p. 498). Conventional proteins are made up almost exclusively of 20 amino acids that are coded for by DNA, though hundreds of other amino acids occur naturally. Schultz and his colleagues offered biologists a way to incorporate some of these nonstandard amino acids, which could then serve as novel chemical handles to manipulate proteins of interest. Today, dozens of these chemical handles are used by everyone from drug-makers to cell biologists looking for new ways to understand how proteins function.



In 2004, Zhiwen Zhang, then a postdoc in Schultz's lab, and several other co-authors reported in Science that they had extended the technique to introduce an unnatural amino acid that came preloaded with a specific sugar group (Science, 16 January 2004, p. 371). Such sugar groups are common appendages on glycoproteins. But because the sugars are difficult to express uniformly and to purify, understanding their role has long been viewed as a major challenge. The Science paper offered researchers the possibility of systematically

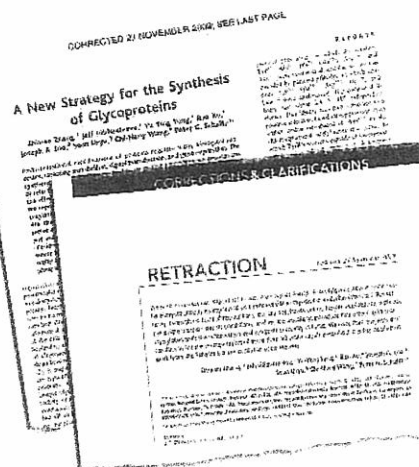
studying the effect of different ways proteins are modified. On 11 November 2004, Zhang, Schultz, and their colleagues published a second paper in JACS reporting the incorporation into a protein of a sugar-loaded amino acid that's a core unit in glycoproteins central to inflammation and cellular recognition.

At about the time of the Science paper, Eric Tippmann joined the Schultz lab as a postdoctoral assistant. Like Zhang, Tippmann worked on efforts to extend the technique of incorporating unnatural amino acids into proteins. A few months after Tippmann's arrival, Zhang left the Schultz lab to take a tenure-track position as an assistant professor of pharmacology at the University of Texas (UT), Austin. Tippmann says he became interested in Zhang's work because fellow students and postdocs told him they were having trouble replicating it. Tippmann says he reviewed Zhang's work closely in the fall of 2006. In September 2006, Tippmann spoke at a Schultz group meeting outlining reasons why he thought Zhang's work was likely incorrect.

Schultz says the concerns raised were serious enough that he asked a group of lab members to try to replicate the work in Zhang's Science paper in addition to several other important discoveries Zhang had made. That task, however, was complicated by the fact that Zhang's lab notebooks, describing his experiments in detail, were missing. Schultz says that in the early fall of 2006, the notebooks were in Schultz's office. But at some point after that they were taken without his knowledge and have never resurfaced.

After considerable effort, Schultz says his students were able to replicate most of the work. The biggest exception was the work that served as the basis for the 2004 Science and JACS papers. "It was clear the glycosylated amino acid work could not be reproduced as reported. So we tried to figure out what was going on," Schultz says.

In the midst of this process, events took an ominous turn. On 1 March 2007, Zhang received an e-mail that listed the author as "michael pemulis," who claimed to have discovered "fraud" in multiple papers. If Zhang did not send \$4000 via overnight mail to a post office box in San Diego, the e-mail sender said he or she would reveal this "fraud" to faculty at Scripps and UT Austin. "They will investigate you. ... pete will retract all your post-doctoral work. you lose job. ... Texas will fire you before you tenure," the e-mail states.



No longer valid. Papers in Science (above) and JACS (left) were retracted when the work could not be replicated. It now appears that the problem may be with an enzyme that resulted in false positives.

"I was scared to death," Zhang recalls. He immediately contacted Schultz, who in turn contacted Richard Lerner, president of Scripps. At Lerner's urging, Schultz and Zhang then contacted the San Diego Police Department, which forwarded their case to its electronic crimes unit. About a month later, in April 2007, Zhang says the officer in charge of the case told him that they had a suspect and asked whether he wanted to press charges. Zhang says he decided not to do so in hopes the situation would blow over.

It didn't blow over. In November 2007, an anonymous letter was sent to officials at several institutions, including Scripps; UT Austin; the University of California, Berkeley; and Science's editorial department. The letter stated that it was from "a member of PGS [Peter G. Schultz] lab" and called the 2004 Science paper a "fake." "I feel like leaving science or committing suicide," the letter stated. Zhang says that when he saw the letter, "my jaw dropped again."

The disturbing events haven't stopped. Zhang says over the past 2 years, he has received several anonymous phone calls at his UT Austin office phone number in which the caller hasn't said anything and then hangs up. Zhang says he's tried calling the number that pops up on his caller ID, but a recording on the other end says it is a long distance calling card center in Mississippi. Zhang says he and his family have become unnerved. "We don't feel safe anymore." The stress has gotten so high, that his wife and children moved away from Texas some time ago and have since been in virtual hiding. "It's horrible," Zhang says. "I'm just trying to be a good scientist. This is not science."

The events, Schultz says, affected him deeply as well. "It put me in a situation where I

NEWS OF THE WEEK

ScienceNOW.org

From Science's Online Daily News Site

HIV Outwits Yet Another Microbicide

The largest study ever conducted of a microbicide designed to prevent HIV infection has resulted in yet another case of high hopes being dashed about a promising product. Earlier in the year, a smaller study of the same vaginal gel gave a hint that it might offer modest protection, but the new results put the question to rest. <http://bit.ly/hivgel>

A Cheap Way to Chop Up Nitrogen

Nitrogen atoms are needed to make many important chemicals, from drugs to fertilizers. But getting those atoms into chemicals is challenging because nitrogen molecules are tough nuts to crack. They consist of two atoms sharing a stubborn triple bond, which chemists can break up only by scorching them with temperatures of up to 500°C. And that results in the simple chemical ammonia, which needs further processing to produce more complicated compounds. Now chemists have devised a new way to split molecular nitrogen and synthesize a common fertilizer. <http://bit.ly/nitrogen>

A Mind That Touches the Past

Imagine planning your schedule for the week and seeing the days on the calendar appear before you as a spiral staircase so real you feel like you could touch it. That's what it's like to have spatial-sequence synesthesia, a condition in which people perceive numbered sequences as visual patterns. Now researchers have shown that individuals with the condition have superior memories, recalling dates and historic events much better than the average person can. <http://bit.ly/time-space>

Better Nanotubes May Be on the Way

In the world of nanotechnology, few things get as much billing as nanotubes. Experts say that these cylinders composed of one-molecule-thin sheets could someday be used in everything from superstrong jet engines to cancer cures. Now researchers think they've found a way to make large amounts of an elusive type of nanotube that could provide even more impressive applications. <http://bit.ly/bnnt-nanotubes>

Read the full postings, comments, and more on scienow.sciencemag.org.

felt there was an extra burden on me to find out what was going on, given the threats," he says. Today, after years of effort, Schultz says he feels he and his students are starting to understand what may have gone wrong with the original experiments. Although still preliminary, it appears that the problem might be with the enzyme that they thought was binding to the unnatural amino acid and incorporating it in the protein. A test with a different glycosylated amino acid shows that it actually binds the unnatural amino acid not in the normal "active site" but at another site. Here it then prompts a conventional natural amino acid to be incorporated in the active site, giving a false positive reading. In the end, Schultz says, Tippmann was right to have doubts. "There was something wrong with the work."

That meant the *Science* and *JACS* papers needed to be retracted. Zhang says Schultz contacted him in July and suggested that the papers be pulled. Zhang was preparing for his tenure review at UT Austin and says he was concerned that retracting the papers would prove damaging to his chances of receiving tenure. Nevertheless, after Schultz and Zhang talked it over, they agreed to retract both papers. After receiving signed agreement from each of the authors, a process that took several weeks, Schultz sent the retractions to *Science* and *JACS* on 11 August.

JACS quickly accepted the retraction. But editors at *Science* informed Schultz that the journal's editorial practice requires that they

get signatures directly from all authors wishing to retract a paper. During that process, Zhang informed *Science's* executive editor, Monica Bradford, of the extortion e-mail and the missing lab notebooks. In response, *Science's* editor-in-chief, Bruce Alberts, called Schultz to suggest that the retraction letter in *Science* should state that the lab notebooks were missing through no fault of the authors; that wording helped explain why they had trouble replicating the experiments. In the end, the retraction was published on 27 November.

The summer brought other developments. On 7 August, Tippmann, now a lecturer at the University of Cardiff in the U.K., co-authored a paper that laid out several reasons why Zhang's original glycosylated amino acid experiments could not have worked. And in October, Zhang was told he would be denied tenure by UT Austin. For his part, Tippmann says he's sorry that Zhang has had to undergo this ordeal, but that his involvement has been

entirely limited to the science, and he had nothing to do with the missing notebooks, the March 2007 e-mail sent to Zhang, or the November 2007 letter. Schultz says he and his Scripps colleagues will continue to search for answers. Lerner concludes: "There was somebody who did this, really turned lives upside down, and made doing science a lot harder than it had to be."

—RICHARD LERNER,
SCRIPPS RESEARCH INSTITUTE

—ROBERT F. SERVICE

With reporting by Michael Torrice.

"There was somebody who did this, really turned lives upside down, and made doing science a lot harder than it had to be."

U.S. SCIENCE POLICY

Chair of Science Panel to Leave Congress

Saying that "it's time to do something else," the chair of the House Science and Technology Committee announced this week that he will retire at the end of 2010. Ending a 26-year career in Congress, Representative Bart



Gordon (D-TN) leaves Democratic Party leaders scrambling to defend a seat in a Republican-leaning district and research lobbyists wondering how his successor will take to the role of spokesperson for science.

The 60-year-old Gordon, who joined the committee as a freshman in 1985 and has

been chair since 2007, helped turn a 2005 National Academies report into 2007 legislation that has provided a blueprint for research and education programs at the Department of Energy and the National Science Foundation. He says reauthorizing the America COMPETES Act next year is his highest priority.

The second-ranking Democrat, Representative Jerry Costello (D-IL), has already declared his interest in becoming chair. One of the less-visible members of the committee, Costello has been active on national transportation issues and has championed the FutureGen carbon sequestration and storage project in his southwestern Illinois district. —JEFFREY MERVIS

CREDIT: U.S. CONGRESS