

Unit V

Research Ethics and Misconduct

Overview

- Many engineers are involved in research and development works
- Many activities of postgraduate students in universities are also research-oriented
- Having the right conduct in research has a direct consequence on the credibility of the research results, and thus the prospects of the engineer and students, as well as the research institutions involved
- **Research ethics** – the study of the ethics for planning, conduct, and reporting of research

Trust-based research world

- Most research activities are conducted based on “trust”
- If we don’t have “trust” in other people’s research work ...
 - A project supervisor needs to read every program codes developed by his 10 research students, each of them may write 500 lines of codes per day
 - A research group leader needs to read every publication of his group members since all of them bear the name of the group (can be a hundred per year)
 - The University President needs to go into the details of every research work of all professors since all of them bear the name of the University (can be thousands of research papers and other research outputs)
- If we don’t have trust, the advancement of knowledge and technology will be much slower

Trust-based research world

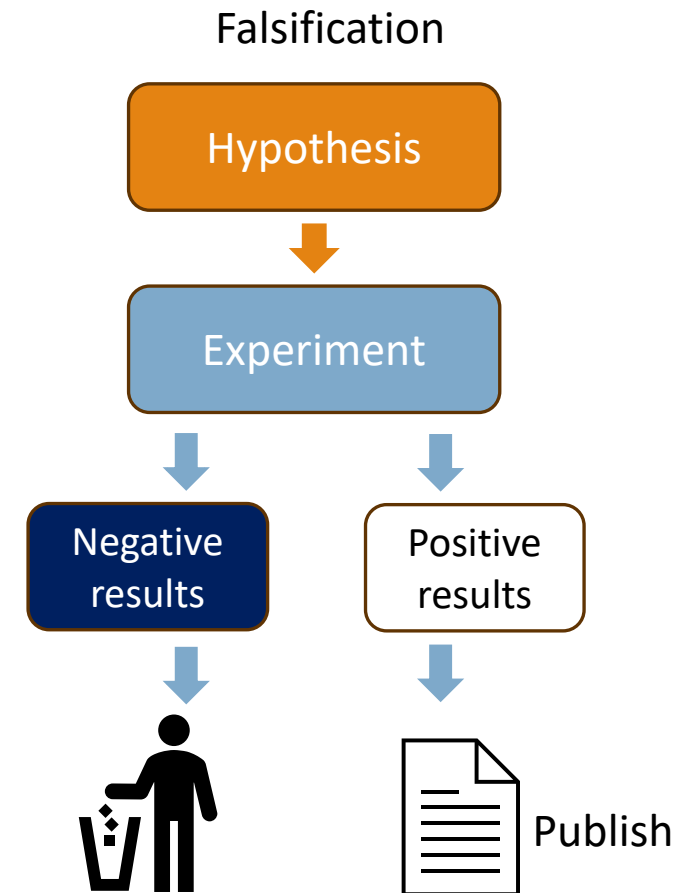
- Why can we trust other people's research results?
 - Because we know those researchers follow a set of research ethics that most researchers also follow in the world
 - It is also the reason why sometimes we can't trust the research in some parts of the world since we know the researchers there may not follow such a set of research ethic
- For this reason, **anybody who is found to have breached the trust, in particular due to research misconduct, will usually have very serious penalty**
 - For students – deregistration
 - For employees – dismissal
 - For professionals – life disqualified

Research misconduct

- **Research misconduct** covers wrongdoing (usually intentional) related to scientific research
- Need to be strictly prohibited since science is predicated on trust
 - Without confidence in the integrity of their peers, scientists would be unable to trust one another's work
- What actually counts as research misconduct? Three main acts:
 - **Fabrication** – making up of data or information without going through a scientific experimentation process
 - **Falsification** – misrepresenting of data or experiments, i.e., ‘cooking the data’
 - **Plagiarism** – presenting the work or ideas of another person as one’s own

Falsification

- Falsification is the alternation of the observed result of a scientific experiment
- Practice of manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record
- More commonly with the intention of improving the results or removing results that do not fit the hypothesis



Falsification

- Common practices of falsification
 - Remove the bad results in the experiment and report only the good results
 - Build an experiment environment that favors the proposed idea
 - Adjust the working condition of the testing equipment to let them give positive testing results
 - Tailor the survey group to ensure the survey results favor the hypothesis
- The above are all considered research misconduct **if the details of the falsification practice are not reported**

Plagiarism

- Plagiarism is defined as using other people's work and/or other sources without giving proper acknowledgment of the sources
- Plagiarism also occurs when Generative AI output is used when it is explicitly disallowed
- Sometimes it is not only an ethical issue but also a violation of law (such as copyright law)
- Plagiarism is not only limited to using other people's work. Self-plagiarism (plagiarizing oneself) sometimes is also not allowed
- For some professional bodies (such as some IEEE societies), a paper that has been published at a conference cannot be published again in a journal if it describes the same piece of work

Plagiarism

- Citation is the key to avoid plagiarism
- When to cite?
 - For any idea not originated by you
- How to cite?

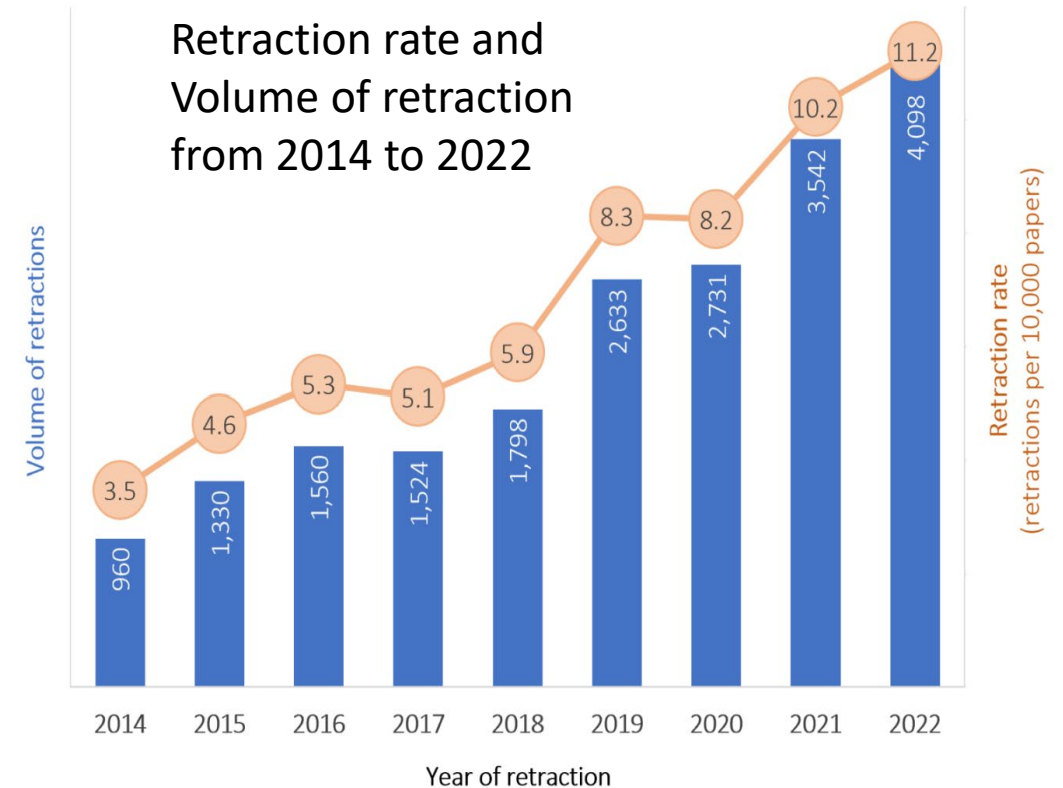
<https://libguides.lb.polyu.edu.hk/academic-integrity/citation>
- When no need to cite?
 - You are discussing your own ideas, findings, or experimental results
 - Well-known facts or common knowledge – Mothers are women (if you are not sure whether it is a well-known fact, just cite it!)

Trend of research misconduct

- How frequently does research misconduct occur?
 - There are many barriers to accurately quantifying the extent of research misconduct
 - Cases may go unreported and institutions may be biased against finding misconduct
 - It is particularly the case in some countries where research achievement can significantly affect the income of the researchers
- **Paper retraction rate** is often used as an indirect indicator of the magnitude of research misconduct
 - Refer to the ratio of the number of papers required to be retracted after publication and the total number of published papers
 - Retraction may be initiated by the journal owing to misconduct found in the paper, or just an honest mistake, such as authors identifying errors in their own work
 - Besides, there are undiscovered misconduct cases that do not result in paper retraction
 - That is why the number can only give a rough idea of the actual misconduct situation

Trend of research misconduct

- Statistics show that there was a **tremendous growth in the paper retraction rate since 2019**
- According to a report from Nature in 2021^[1], thousands of retracted papers can be traced to paper mills from several countries, including China
- In research, a **paper mill** is a business that publishes poor or fake journal papers that seem to resemble genuine research, as well as sells authorship
- Paper mill companies are not difficult to find
 - E.g., in 2022, Science covered a report exposing a Russian paper mill company^[2]
 - The report identified hundreds of published academic papers where positions for authorship had been sold through a Russian website



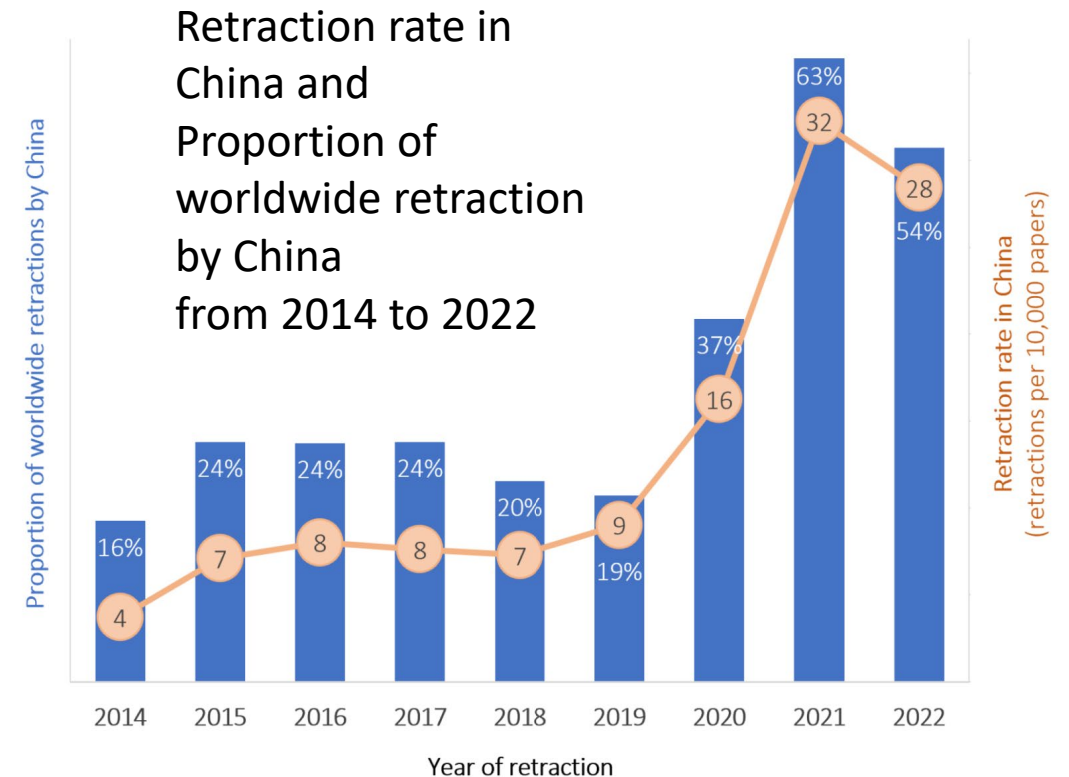
<https://scholarlykitchen.sspnet.org/2024/04/18/guest-post-making-sense-of-retractions-and-tackling-research-misconduct/>

[1] Else, Holly; Van Noorden, Richard (2021-03-23). "The fight against fake-paper factories that churn out sham science". *Nature*. 591 (7851): 516–519

[2] Chawla, Dalmeet (2022-04-06). "Russian site peddles paper authorship in reputable journals for up to \$5000 a pop". *www.science.org*

Research misconduct in China

- In the period from 2020 to 2022, China's paper retraction rate is dramatic, reaching 26.1 retractions per 10,000 papers, compared to 5.9 for the rest of the world
- Nature revealed that there were almost 17,000 retraction notices on papers with China-affiliated authors since January 2021^[1]
- Report reveals that Chinese researchers are prevalent customers of paper mill services, particularly in the biomedicine and life science areas^[1]
- Hindawi, a subsidiary of Wiley, retracted over 8000 articles involving Chinese co-authors in 2023, a record-breaking year for retractions that resulted in Wiley announcing that it would stop using the Hindawi brand



<https://scholarlykitchen.sspnet.org/2024/04/18/guest-post-making-sense-of-retractions-and-tackling-research-misconduct/>

Avoiding research misconduct

- Measures have been put forward by different stakeholders in recent years to avoid research misconduct
- A growing number of service providers, publishers, and startups have come up with **technological solutions to combat misconduct at the point of journal submission**. E.g.,
 - Wiley is developing an AI-powered papermill detection service
 - The STM Research Integrity Hub has brought together dozens of publishers and offers a holistic approach to detect offending manuscripts

Avoiding research misconduct

- New policies were put out in some countries to discourage research misconduct
- E.g., in 2024, China Ministry of Education issues a notice indicating that:
 - Universities must declare all their retractions and launch investigations into misconduct cases
 - Researchers with retracted papers will have to explain whether the retraction was owing to misconduct, or just an honest mistake
 - The notice states explicitly that the first corresponding author of a paper is responsible for submitting the response. This requirement largely addresses the problem of researchers shirking responsibility for collaborative work
 - If a researcher fails to declare their retracted paper and it is later uncovered, they will be punished
 - Possible punishments may include salary cuts, withdrawal of bonuses, demotions, and timed suspensions from applying for research grants and rewards, as what China's National Health Commission did in 2021

Avoiding research misconduct

- Universities also provide education programs for research personnel to understand the importance of research ethics
- For example, PolyU has subscribed to the **Collaborative Institutional Training Initiative (CITI) Program** since 2023 December
 - The **CITI Program is an online platform offering comprehensive training in research ethics and compliance**, which can enhance students' professional profile and demonstrate their dedication to the highest standards in research and compliance
- With this subscription, all PolyU students and staff can access the following courses:

Animal Care and Use	Good Clinical Practice
Compensation Reporting (Effort Reporting)	Human Subjects Research: Biomedical and
Conflicts of Interest	Social/Behavioral (plus Revised Common Rule)
Export Compliance	Information Privacy and Security
False Claims Act: A Primer and Guide for	Responsible Conduct of Research
Research Organizations	Technology Transfer
GDPR for Research and Higher Ed	Undue Foreign Influence: Risks and Mitigations

Research misconduct – Lifelong black mark

- All research misconduct behaviors are due to dishonesty
- Similar to many dishonest cases, the research personnel involved usually just wants to tell a small lie at the beginning, making benefit of the trusting nature of the research world
- If it goes unnoticed, the research personnel often needs to tell a bigger lie to cover up the first lie in order to sustain his/her career, leading to bigger and bigger lies and pressure on the research personnel
- Most research misconduct behaviors will lead to black-and-white records
 - Plagiarized theses, falsified papers, fake designs, etc.
- They become **lifelong black marks** that can be easily utilized by the enemies to attack the research personnel at the time he/she becomes important

Case study: Hanxin-I

- Hanxin has ever been considered the biggest technological breakthrough in the microchip industry in China
- Claimed as the first China-designed and made digital signal processing computer chip
- However, it was all a fraud confirmed by the Chinese government after a detailed investigation^[1]



Hanxin-I



The announcement of Hanxin-I at a news conference

Case study: Background

- In the early 2000s, there was enormous pressure in China to design and produce its own integrated circuit chips
- China was spending billions of dollars buying foreign-made chips to put in electronics equipment. So the government has made it a major priority
- **Chen Jin**, a top computer scientist, was involved in the scandal
- Chen earned a bachelor's degree at Shanghai Tongji University in 1991. Then, he moved to the United states to study computer engineering at the University of Texas at Austin
- In 1998, he got a Ph.D. there and worked at Motorola Research Center as an engineer responsible for chip testing (however, he claimed himself a senior design manager in that company)



Chen Jin announcing Hanxin-I
<http://www.china.org.cn/english/scitech/168482.htm>

Case study: The beginning ...

- After getting back to China, Chen formed his team at Shanghai Jiaotong University in 2001
- Within two years, Chen announced that he created a digital signal processor with the capability of processing 200 million instructions per second
 - It astonished the whole chip manufacturing industry. For a newly formed team, developing a chip from design to manufacturing in two years was just too fast
- The DSP can process the digitized data for mobile phones, cameras, and other electronic devices
- In the announcement news conference, Chen Jin demonstrated the capability of the chip to play MP3 and perform fingerprint recognition
- Hanxin chips were officially recognized as reaching the international high-end microprocessor chip standard

Case study: The beginning ...

- Chen was named as the Dean of the microelectronics school of Shanghai Jiaotong University.
- He headed his own university research institute and a few companies, all of them were heavily financed by the government
- He was named a Chang Jiang Scholar, a title with privileges given to a select group of China's best young scholars, by Beijing. At that time, he was only 35
- With the financial support of the government, Chen announced in 2004 the creation of the even faster Hanxin-II and-III
- The **total research funding obtained from the government was up to a Billion RMB**

Case study: The downfall ...

- In December 2005, a whistleblower posted a message on an Internet bulletin board of the Tsinghua University
- The message, and letters to the government and the university, led to an avalanche of scrutiny and bad publicity
- The whistleblowers also gave details of an array of companies that Chen operated to profit from the big government contracts
- They triggered the government to form an investigation panel to understand if the allegation was true
- After about 3 months of investigation, **the panel concluded that there existed serious forgery and dishonest behavior** in the case for obtaining huge financial support from the government

Case study: The fact ...

- The Hanxin-I chip that Chen developed was simply purchased from a foreign company and with the logo sandpapered
- Its structure is rather simple and does not have the capability of playing MP3 or fingerprint recognition on its own as demonstrated in the announcement news conference
- The demo made in the announcement was done by a Motorola DSP chip purchased on the market
 - Surprisingly, the chip used in the demo has 144 pins but the one developed by Chen has 208 pins. But no one noticed that in the demo
- Hanxin-II and III were really developed by Chen's team but Chen did not have the IP of their core technology. Besides, they also could not perform complex tasks like playing MP3 or performing fingerprint recognition on their own
- Chen was not working as Senior Chip Design Manager in Motorola US. He was just a testing engineer with no experience in chip design

Case study: The consequence ...

- Chen Jin was fired from the Shanghai Jiaotong University and stripped of his state honors and privilege
- He was also banned from conducting further state-funded research
- He was also required to return all research funding obtained from the government
- However, there was no mention of any relevant responsible persons were subject to legal prosecution
- The news was soon spread out all over the world. China became a laughing stock for allowing such an event to happen
- Also seriously jeopardize the reputation of Shanghai Jiaotong University

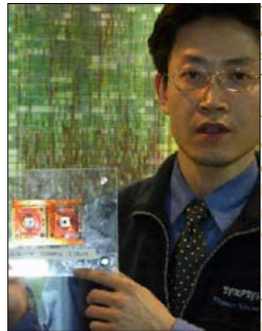
Hanxin-1 Scandal



Chip scandal hurts high-tech

(chinadaily.com.cn/NYtimes)
Updated: 2006-05-15 09:27

Chen Jin became a national high-tech hero almost as quickly as his "breakthrough invention" -- com fraud.



In 2003, just three years from the United States engineering, the then scientific breakthrough first homegrown digital

The achievement was China's rising technological of the country's brightest huge research grant research institute and China's most prestigious

But on Friday, Jiaotong team were based, and research. He was fired

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Last Updated: Monday, 15 May 2006

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Fake chip research

A top Chinese academic has been fired after it emerged he faked research into computer chips that aimed at ending the nation's reliance on foreign suppliers.

Chinese officials would not say if Chen Jin, the former head of Shanghai Jiao Tong University's Microelectronics School, will face criminal charges.

The scandal comes as China pushes its high-tech industries.

According to reports, Mr Chen's firm to fool university and government

Fixing the figures



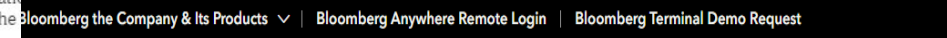
TECHNOLOGY

In a Scientist's Fall, China F

By DAVID BARBOZA MAY 15, 2006



Chen Jin, the Chinese computer scientist accused of fraud. Associated



A Chinese chip scandal?

by Bruce Einhorn

March 26, 2006, 1:00 PM GMT+8



It hasn't generated global headlines like the South Korean stem-cell controversy, but China may be in the midst of an embarrassing high-tech scandal of its own. In 2003, Chen Jin, a professor at Shanghai's Jiaotong University (alma mater of former President Jiang Zemin and one of the most prestigious schools in the country), led a team that developed China's first home-grown digital signal processor, dubbed the Hanxin 1. Since building a local semiconductor industry was (and still is) a top priority of the

Case study: Far-reaching effect

- Impacted by the scandal, the indigenous innovation in China's IC sector was questioned and many projects were suspended
- The **government's financial and policy support was severely reduced accordingly**
- The country became more reliant on the chips imported from the US, Taiwan, Japan, South Korea, etc.
- The situation continued until 2014 when the National Integrated Circuit Industry Investment Fund was established and the release of the Outline of the Program for National Integrated Circuit Industry Development by the State Council
- **Due to the scandal, the country lagged behind other competitors for nearly 10 years in IC design.** This led to great difficulty for the electronic industry particularly when President Trump forbade the US IC design technologies from importing China in 2019

Summary

- Scientific research is based on trust or the advancement of knowledge and technology will be much slower
- Anyone who is found to breach the trust particularly due to research misconduct will be seriously punished
- Three main acts of research misconduct: fabrication, falsification, and plagiarism
- Different stakeholders have put forward measures in recent years to avoid research misconduct
- Anyone who practices research misconduct will leave a lifelong black mark
- Research misconduct of individuals may not only affect oneself but can have a far-reaching effect