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Commentaries

Keeping a clean research environment: Addressing research misconduct and improving scientific integrity in China

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Honesty and integrity are the backbone of scientific research; they ensure objectivity and reproducibility in academic practice [1]. Furthermore, they can also protect science from bias, plagiarism, falsification, and fabrication. Unfortunately, there has always been scientific misconduct that inevitably harms the reputation of the academic community. In the past few years, we have noticed an increasing trend in scientific misconduct and astonishing academic scandals both in China and in other countries.

The investigation of scientific misconduct is costly in terms of both human and financial resources. In some countries, the cost for an investigation into a single case of scientific misconduct is staggering [2]. Irreproducible scientific results also waste hundreds of thousands of dollars [2]. Governments and academic communities worldwide have made enormous efforts to clamp down on scientific misconduct and improve research environments and scientific integrity.

1. Scientific integrity

While ranking as the largest producer of publications in 2018 [3], China has been facing serious challenges on scientific integrity in the meantime. This misconduct includes problems with publications, grant applications, and other ethical issues.

1. Misconduct in publications
   - Data manipulation: Authors have used image processing software to manipulate the data or results of their studies.
   - Inappropriate authorship: Academically renowned scientists have been listed as co-authors, despite contributing little to the manuscript or being unaware of their alleged authorship [4].
   - Purchased articles: Scholars have purchased articles from third parties including individuals or groups for commercial purposes, without knowing the sources of the data, let alone the objectivity or reproducibility.
   - Disingenuous reviewer suggestion: During manuscript submission, the authors themselves or their friends, etc. have been suggested as reviewers.
   - Duplicate submissions: Manuscripts have been submitted to more than one journal for consideration or under redundant simultaneous peer review.

Chinese researchers have examined reasons for article retractions [5] and found that the increasing number of retractions was mainly due to misconduct such as plagiarism, fraud, and faked peer review.

2. Misconduct during grant application procedures
   - Plagiarism: Applicants have copied the results and preliminary data from others without proper citation or acknowledgment.
   - Duplicated application: Applicants have submitted duplicated proposals even though the proposal was already funded.
   - Grant proposals purchase: As more and more people apply for Natural Science Foundation of China (NSFC) funding, the funding rate has been dropping. In order to have a competitive grant

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proposal, some people have chosen to purchase grant proposals from third parties (referred to individuals or groups that sell manuscripts or grants for commercial purpose).
- Personal profile manipulation: In order to meet the application requirements of the NSFC, or even to create a more appealing professional background, some applicants have manipulated their ages, titles, and CVs to make their proposals look better.

3. Other ethical issues

Some clinical studies have not been conducted in accordance with ethical principles [6]. Clinical trials have been started without the approval of the Ethics Committee, while some animal experiments have not been approved by the Institutional Animal Care and Use Committee.

4. Root cause of scientific misconduct in China

Determining the causes of scientific misconduct in China is complicated. First, high publication pressure combined with limited time and resources is one reason for data fabrication, especially for young people who just graduated and need to get promoted [7]. Second, the initial and primary purpose of rational and modest research rewards, including financial or reputational rewards for publications and grant applications in some academic institutions, encourages researchers to improve their academic level and accelerate the transformation of research results under the premise of scientific integrity. However, excessive research rewards sometimes prompt researchers to pursue material and reputation blindly for increasing their professional status and gaining high titles in a short period, while ignoring the basic principles of scientific integrity and academic ethics. At present, this unhealthy phenomenon has seriously affected the academic ecology of China and its positive development. Research rewards for papers and grants should not be encouraged. Once a researcher is found to be guilty of research misconduct, rewards should be returned and the accused author should be limited in access to academic resources or even be demoted or fired from their institution. The NSFC determinedly insists that scientific papers and grants should not be involved in any form of commercial benefit, including monetary rewards. Third popularity and efficiency of scientific research integrity education is limited. The weak role of integrity in the education of researchers has directly led them to have insufficient understanding of scientific research integrity. In addition, the development of scientific research ethics education is late in China, and the function of the Ethics Committee has not been fully clarified in certain areas of China. Accordingly, some researchers do not clearly understand the importance of obtaining ethical approval before starting a study, leading to the occurrence of ethical issues.

2. What has the Chinese government done to improve scientific integrity?

China is currently facing serious challenges in scientific integrity. Apparently, the current regulations cannot effectively clamp down on academic fraud. In response to this situation, official Chinese institutions are making joint efforts to improve the integrity of research and reduce scientific misconduct and fraud.

1. Declaration of “Five No's for Publication”

In November 2015, the China Association for Science and Technology, Ministry of Education, Ministry of Science and Technology, National Health Commission, Academy of Sciences, Academy of Engineering, and NSFC produced a joint declaration of “Five No's for Publication:” no purchases from a third party; no submissions by a third party; no revision of content by a third party; no fake information on recommended reviewers; and no violations of authorship regulations.

2. Declaration on “Opinions on further strengthening the construction of scientific research integrity”

Scientific integrity is the backbone of scientific research. In 2018, the Central Office of the Communist Party of China and the Office of the State Council published a declaration on “Opinions on further strengthening the construction of scientific research integrity,” which became the programmatic document for the next stage of scientific research integrity management. They introduced a series of reforms to clamp down on scientific misconduct [8]. They requested that each institute set up independent agencies to conduct investigations into academic fraud and warned the whole research community that those responsible for misconduct may be prosecuted and punished. Right before releasing the declaration, the Ministry of Science and Technology and other related government agencies responded quickly to the mass retraction event for fake peer-reviews [9], and agreed to investigate jointly [10].

3. Building an extensive honor code and punishment system

In 2018, the Chinese government, including forty-one departments, jointly launched a program to build an extensive punishment system for scientific misconduct. The system goes beyond the academic community and has been featured in the journal *Nature* [11]. The responsible subject of scientific research covers all research-related individuals and collectives, including research individuals, review experts, project undertakers, and scientific research management departments, etc. Those who commit scientific misconduct will be tagged in the national credit system, which could result in restrictions on almost all aspects of daily life, including insurance, tax credit evaluation, production licenses, credit card applications, and personal travel, etc.

Intellectual property right protection is crucial in research systems. The Chinese government, including thirty-eight departments, has also launched a program to build up an extensive punishment system, especially for serious misconduct in the field of intellectual property rights. The implementation of these initiatives will help create a cleaner scientific research environment for the academic community and bring new impetus for promoting the development of scientific research in China.

4. Declaration on “Opinions on further promoting the spirit of scientists and strengthening the style construction of work and study”

In June 2019, the two offices issued “Opinions on further promoting the spirit of scientists and strengthening the style construction of work and study,” emphasizing that scientific research integrity is part of the scientific and technological lifestyle. Within a month after the publication of papers and other scientific research achievements, the original data, such as experimental records and experimental data, should be submitted to institutions for unified management and preservation for reference.

5. Ethical prevention and education on scientific misconduct

With the development of scientific research, the Chinese government has attached great importance to standardizing ethical issues. For instance, in 2019, the Chinese National Health Commission has been working on revisions to the official regulation on the ethical review method for human biomedical research that was developed in 2016. The Chinese government has been implementing full process management: for example, obligatory biomedical ethics courses for all medical students and compulsory ethical approval for NSFC grant applications involving human research. The government and other research institutes will continue their commitment to extensive education and propagation to further ethical system construction and improvement. More emphasis should be put on scientific ethics instead of academic

reputation, which should start early during education for young students. According to this constantly evolving situation, the Chinese government is constantly developing a more complete scientific ethics management system.

3. What has the NSFC done to strengthen the scientific integrity?

Basic research is crucial to national science and technology development. NSFC, as China's largest basic research funder, always provides scientists with high-tech research support. Based on its importance and superiority, many institutions in China evaluate their faculties' academic performance by identifying their ability to get NSFC grants. Therefore, researchers in China are under tremendous pressure to obtain NSFC funding, and some of them have taken advantage of the application system to commit fraud. In response to these emerging issues regarding scientific integrity, the NSFC is developing an efficient system to improve the integrity of scientific research. Additionally, the NSFC has its own supervisory committee, which takes responsibility for handling any research-related misconduct.

1. Building a more powerful similarity screening system

In order to impede plagiarism, the NSFC is developing a system that can screen the content of grant proposals so that they can easily identify self-plagiarism/plagiarism either from the applicant's own grant proposals or from others' proposals. Meanwhile, this system also helps prevent duplicate applications.

2. Promoting the application of AI in selecting peer reviewers

In order to achieve fair and reasonable peer review, the NSFC is applying artificial intelligence (AI) technology to the grant application peer review selection system gradually [11]. The efficiency of the management department has been greatly improved by the application of AI techniques in the peer review selection system. This also can improve the confidentiality of the assigned information by avoiding interference from human factors to optimize the quality of the peer review.

3. Emphasizing the quality rather than the quantity of publications

Some applicants may include lots of publications in their grant submissions, in the hope of gaining an advantage during evaluation. NSFC is revolutionizing the submission system to rigorously restrict the number of representative publications. For instance, no more than five representative publications can be included in a grant submission. NSFC wants to convey a message to the whole academic community that applicants are evaluated by the quality rather than the quantity of their publications.

4. Strengthening the process supervision of the grant

In order to consolidate the deterrence and importance of scientific research integrity in grant application and implementation, the NSFC has set up a live supervision of the grant review process to avoid and eliminate phenomena violating scientific research integrity during the grant live review process. During the implementation of the grant, the NSFC systematically establishes the supervision of key aspects, such as grant plan, mid-term inspection of the project, and acceptance of the project.

5. Highlighting the role of the supervisory committee in the construction of scientific research integrity

As early as 1998, the NSFC established the Supervisory Committee, which is the earliest official academic supervision organization in China and consists of 19 professionals. It is mainly responsible for organizing investigations and deliberations on academic misconduct that violates scientific research integrity requirements and proposes treatment suggestions. This supervisory committee is also responsible for making recommendations for confirmed scientific research ethics case. Based on its objectivity and impartiality, this organization has made important contributions to maintaining research integrity for improving the quality of grants from the NSFC.

6. Maintaining construction of a credit system

The NSFC is working to build a scientific research credit system and case library to further ensure the effectiveness of the research integrity system in scientific research management throughout the life cycle. For a long time, some related work has been carried out and achieved certain results. For example, the NSFC has flagged the applicants, reviewers, and institutions that have been proven to have committed severe scientific misconduct, potentially leading to serious social effects during grant application, review, and implementation. Some typical scientific misconduct cases have also already been announced to the public, serving as both warning and education, intended as a long-term mechanism.

7. Strengthening the management of the grant responsibility department

In future scientific research management work, the NSFC emphasizes that the grant responsibility department should be further integrated as the first line of responsibility on the subject of scientific research integrity construction and academic misconduct investigation, which strengthens the role of the department in overall grant management.

8. Improving the publicity of scientific research integrity

In order to expand the influence of China's scientific research integrity development, the NSFC has successfully held several media briefings on “defending scientific ethics and opposing scientific research misconduct” since 2013, achieving wide-ranging effects and positive influence. More importantly, the deputy director of the NSFC, Chengwen Wang, led a delegation to participate in the 6th World Scientific Research Integrity Conference held in Hong Kong, showing determination and confidence to international colleagues.

4. Perspective

Chinese government agencies, including the NSFC, have essentially realized the upgrade of scientific research integrity management modes through great effort, specifically reflected in several changes including overall environmental planning to specific domain governance, from separation to synergy, combining social science with natural science, from high-level design to national participation, from separate punishment to joint punishment, from passively accepting cases to active investigation of the academic misconduct by the management agency, and from passive reception to active self-examination and self-correction by the grant responsibility department. Finally, we sincerely hope that researchers can join our efforts to reshape the academic landscape and pledge to improve scientific integrity to create a clean research environment, together for consolidating the foundation of research and enhancing the competitiveness of science and technology in China.

Conflicts of interest

The authors declare that there is no conflict of interest.

References

[1] C.G. Begley, J.P. Ioannidis, Reproducibility in science: improving the standard for basic and preclinical research, Circ. Res. 116 (2015) 116–126.
[2] The long road to reproducibility, Nat. Cell Biol. 17 (2015) 1513–1514.
[3] J. Tollefson, China declared world's largest producer of scientific articles, Nature 553 (2018) 390.
[4] M. Hvistendahl, Academicmisconduct. China pursues fraudsters in science publishing, Science 350 (2015) 1015.
[5] L. Lei, Y. Zhang, Lack of improvement in scientific integrity: an analysis of WoS retractions by Chinese researchers (1997-2016), Sci. Eng. Ethics 24 (5) (2018) 1409–1420.
[6] B. Zhang, Z. Chen, J. Yi, H. Tang, C. Wang, Chinese Academy of Engineering calls for actions on the birth of gene-edited infants, Lancet 393 (2019) 25.
[7] F. Huang, Quality deficit belies the hype, Nature 564 (2018) S70–S71.
[8] D. Cyranoski, China introduces sweeping reforms to crack down on academic misconduct, Nature 558 (2018) 171.
[9] D. Cyranoski, China cracks down on fake peer reviews, Nature 546 (2017) 464.
[10] D. Normile, China cracks down on fraud, Science 357 (2017) 435.
[11] D. Cyranoski, Artificial intelligence is selecting reviewers in China, Nature 569 (2019) 316.