

International Collaboration, Scientific Ethics and Science Writing: Focus on China

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ABSTRACT

China is, without a doubt, the world's current focus of attention in terms of economic and scientific advances. Center to this advance lies the need to define and understand, with some profound depth of knowledge and practical expertise, the frame-work that is currently in place to provide a support structure for scientists to advance while meeting the challenges of an ever-changing international publishing landscape. It is undeniably becoming increasingly competitive for Chinese scientists to publish in high level international journals, facing serious language- and writing skill-based difficulties when writing scientific manuscripts for submission to international (mostly English) peer-reviewed journals. Thus, without a doubt, English and writing skills are, after the scientific base of an experiment, the most essential skills for success in science publishing for Chinese scientists. This paper explores how international writing collaboration can serve as one simple but effective solution and tool to fortify scientific publishing without ethical hurdles provided that strict rules and values are adhered to. By adhering to a strict set of rules and by understanding the limitations that currently exist in China at the level of scientist, laboratory and institute or Ministry of Education, it will be possible to ensure the competitive advantage that Chinese scientists will require to publish on the global stage, advance their careers and move the advancement of science – specifically that performed in China – forward. To overcome the serious difficulties and problems in publishing their articles in international peer-reviewed journals in English, Chinese scientists often collaborate with other non-Chinese scientists that help to design or conduct experiments, analyze data or improve English expression of their manuscripts. These international writing collaborators are considered, in China, to be valid authors of an article without any ethical hindrances.

Keywords: collaboration, partnerships in science writing, English and science writing skills

WHAT DEFINES COLLABORATION IN SCIENCE AND WHAT ARE THE IMPLICATIONS FOR RESEARCH AND PUBLISHING?

As outlined in a series of recently published papers, science collaboration was broadly defined as a process in which two or more parties (individuals or institutions) work together towards a common goal (Teixeira da Silva 2011a, 2011b, 2011c, 2012). In science in China, collaboration, a partnership or co-operation (CPC) are meant to move forward a proposal and to reach a common goal, usually taking the form of a research project or a scientific publication. CPC in science covers a wide spectrum of aspects within society and can ensure a power balance that is closely associated with science (Teixeira da Silva 2011d).

Basic CPC begins in the laboratory in which students or researchers assume several tasks associated with different aspects related to the research project while the supervisor(s) leads the group to achieve the desired goals, including the final publication of a research paper. CPC is increasingly involving research teams made up of national and international CPCs (in private or government institutes). Such CPCs allow researchers to fill gaps within their research plan that result from a lack of suitable equipment, technical expertise or limitations in time or funding. These CPCs allow the research to be completed within a shorter period of time by optimizing human resources while

achieving a higher level of results, usually within the framework of a nationally or internationally funded project. Economically developed countries are stimulating more and more CPC with developing countries (The Royal Society 2011), and in all cases the ultimate goal is to publish the data set in an internationally peer-reviewed journal and such CPC may also involve international writing collaboration to achieve this goal. Since not all scientists are endowed with the same research and writing skills, they also lack strong manuscript writing skills, which are usually developed over years of writing and research experience, even for native English speakers. The international writing CPC aims to form a partnership with a scientist who would provide a strong form of support at the level of linguistics and scientific rigor would increase the likelihood of acceptance of a manuscript, thus exposing that valuable data-set to a wider global scientific audience (Teixeira da Silva 2011a, 2011c).

In China, the development of science and technology has progressed rapidly in the last 30 years owing to reform and a more open policy, which have, since 1983, provided a spring-board for Chinese science research and CPC to flourish in the international arena. The trend is advancing so rapidly that China – currently No. 2 in terms of number of science publications (see SCI rankings below) – is set to overtake the USA in terms of number of papers published, investment in science and level of science in the next 3-5 years (The Royal Society 2011). In the same report, the rise

Table 1 Differences between what constitutes co-authorship in China and as established by ICMJE.

Code of function/activity	ICMJE		Chinese Institutes		Chinese Ministry of Education	
	Eligible author*	Ethical**	Eligible author	Ethical	Eligible author	Ethical
1	Yes	✓	Yes	✓	Yes	✓
2	Yes	✓	Yes	✓	Yes	✓
3	Yes	✓	Yes	✓	Yes	✓
4	Yes	✓	Yes	✓	Yes	✓
5	Yes	✓	Yes	✓	Yes	✓
6	No	✗	No	✗	No	✗
7	Yes	✓	Yes	✓	Yes	✓
8	Yes	✓	Yes	✓	Yes	✓
9	Yes	✓	Yes	✓	Yes	✓
10	No	✓	Yes or No	✓	Yes or No	✓
11	Yes	✓	Yes	✓	Yes	✓
12	-	-	-	-	-	-

* Yes = Eligible to be author; No = Not Eligible to be author.
 ** ✓ = is ethical according to ICMJE; ✗ = is unethical according to ICMJE.

Code of functions/activities:

1. The person who designs the experiment
2. The person who does >50% of the research
3. The person who does >25% of the research
4. The person who does a small part (<5%) of the research
5. All people who do ANY part of the research
6. The supervisor (junior or senior professor) who does nothing
7. The supervisor (junior or senior professor) who performs at least one function
8. The person who writes the paper
9. The person who makes significant improvements to language AND scientific content
10. An English teacher who revises the manuscript's English only
11. A statistician who conducts stats analyses and analyses the data
12. Others: please explain

is exponential for China, linear for the USA and negative for Japan. In 2011, in first place lies the USA while third, fourth and fifth are the United Kingdom, Germany and Japan.

In China (Web-site 1), the number of SCI papers based on international CPC (research or writing) totaled 28,474, accounting for a massive 22.3% of all SCI papers in 2009. Among these, 98 CPC countries or regions were listed when the first author came from China, and this number was 126 when the first author came from another country, but involved Chinese scientists. Nowhere in these analyses does any explanation exist regarding the form of scientific collaboration or its ethical nature.

This manuscript seeks to close that gap in our knowledge between how research is conducted, how scientific publishing is interpreted and achieved and an understanding of the decisions required to establish research and publishing ethical guidelines within China. For the purpose of this manuscript, we have adopted the definition of a writing CPC as a scientist – a non-Chinese scientist – who has not actually conducted the research or been involved in the initial experimental design but who has contributed significantly to the scientific and/or linguistic content of the paper to increase chances of acceptance in higher level journals. Provided that this collaboration is conducted under strict ethical guidelines established between both parties, a writing CPC is considered to be an ethical approach to scientific CPC (Teixeira da Silva 2011b, 2011c, 2011d, 2012).

SCIENCE PUBLISHING ETHICS IN A NUT-SHELL. WHAT IS IT AND HOW DOES IT RELATE TO AND GOVERN CO-AUTHORSHIP IN CHINA AND ABROAD?

Despite its central importance in science publishing, nearly all aspects related to authorship and publication ethics are covered only by guidelines and unspoken custom, exposure conflicting truths and difficult to resolve issues due to the lack of a single international publishing ethics body. Consequently, authorship practices and decisions can vary dramatically among disciplines and institutions, and often between labs and departments in the same institution, and even between members within one lab, giving rise to true conflicts of interest. Resources for Research Ethics Educa-

tion or RREE (2012) comments on CPC as follows: “The nature of collaborations is variable, but responsible collaborations are always defined by openness and early, ongoing communication. Science is a communal enterprise; both science and society are best served by collegiality and open collaboration. There should be a mutual understanding of what is to be exchanged through the collaboration, how the research will be undertaken, and how the products of the collaboration will be shared. Collaboration is most likely to succeed if expectations are clearly communicated (and perhaps documented) before commitments are made.” These are issues that are strongly rooted in cultural differences, and since “ethics, and the goals of science communication, also vary depending on country, cultural and political background, and circumstances” (Suhr 2009), the focus of this paper is to highlight, understand and reach some agreement of what constitutes authorship and publishing ethics in China.

Several definitions of authorship are covered by Teixeira da Silva (2011a). Moreover, ethical guidelines as defined by main-stream bodies around the world, mainly in the USA, UK and EU, tend to have a skeleton that is identical, but fleshing out the details can reveal drastic differences indicated often by extremely subtle undertones and wording, as exemplified next.

The most commonly adopted definition of authorship and ethics by many bio-medical journals is that given by the International Committee of Medical Journal Editors (ICMJE 2006), and, to some extent, aligned with that of COPE (<http://publicationethics.org/>), WAME (<http://wame.org/>), CONSORT (<http://www.consort-statement.org/home/>), CSE (<http://www.councilscienceeditors.org/>), and Elsevier's PERK (<http://www.elsevier.com/wps/find/authorhome.editors/Introduction>). Under the ICMJE definition, someone is an author if and only if they have done **all** of the following (**Table 1**): “1) made substantial contributions to conception and design, or acquisition of data, or analysis **and** interpretation of data; 2) drafted the article or revised it critically for important intellectual content; 3) approved of the final version to be published.” ... “Acquisition of funding, collection of data, or general supervision of the research group alone does not constitute authorship.” ... “The group should jointly make decisions about contributors/authors before submitting the manuscript for publication. The corresponding author/guarantor should be

prepared to explain the presence and order of these individuals. It is not the role of editors to make authorship/contributorship decisions or to arbitrate conflicts related to authorship.” ... “...Because readers may infer their endorsement of the data and conclusions, these persons must give written permission to be acknowledged.” In the ICMJE definition, authorship is specifically excluded for anyone whose contributions consist solely of arranging funding, collecting data, or supervising the research group and that each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. This definition is a valuable guideline because of its specificity; however, it is at odds both with common practice and with other views of authorship (Yank and Rennie 1999).

Elsevier claims to follow the rules as defined by ICMJE, but states in its own Ethical Guidelines for Journal Publication top page (http://www.elsevier.com/wps/find/intro.cws_home/ethical_guidelines), under the section (Authorship of the Paper): “Authorship should be limited to those who have made a significant contribution to the conception, design, execution, or interpretation of the reported study. All those who have made significant contributions should be listed as co-authors. Where there are others who have participated in certain substantive aspects of the research project, they should be acknowledged or listed as contributors. The corresponding author should ensure that all appropriate co-authors and no inappropriate co-authors are included on the paper, and that all co-authors have seen and approved the final version of the paper and have agreed to its submission for publication.” (see **Table 1**). Ironically, the Elsevier ethical guideline contrasts starkly with that of ICMJE, and does not, in fact, agree with it, despite what Elsevier claims. The extremely fundamental difference is that while ICMJE demands that all three conditions be met, Elsevier’s PERK only requires that one be met (the difference indicated by a difference in a single word, and vs or). The ethical guidelines governing co-authorship as established by other publishers will be discussed in detail elsewhere. Elsevier – who owns at least 25% of the world’s science – and its ethical guidelines, and those of ICMJE, which are largely followed by most biomedical journals around the world, will definitely impact and influence how publishing, publishing ethics and authorship are perceived by Chinese scientists. If, *a priori*, there exist conflicting definitions regarding authorship and publishing ethics, then this too, will send mixed signals to Chinese scientists, who will either assume that the rule is not fixed, or who will establish their own form of ethical guidelines to suit their cultural environment and to also somehow try and meet the requirements as set about by the so-called international community. This paper explores these conflicts and how, in fact, the frame-work defining authorship and publishing ethics is in fact extremely weak and ill-defined in several key factors, explored next.

CHINA: THE FOCUS OF THE WORLD’S SCIENTIFIC COMMUNITY

What difficulties are experienced by scientists in China?

In China, the development of science and technology has increased rapidly in the last 30 years. In 2009, 521,300

papers were included in the Chinese Science and Technology Paper Citation Database or CSPTCD (<http://www.wanfangdata.com.cn>), in contrast to the 127,500 papers included in the Science Citation Index® (SCI®) (<http://apps.isiknowledge.com>). In 2010, 644713 papers were included in the CSPTCD (a massive 24% increase over one year), and 130,000 papers in SCI® (a modest 2% increase over one year). In SCI®, the number of Chinese SCI® papers ranked second in the world after the USA. However, in research and in science publishing, many Chinese scientists experience numerous serious difficulties, including those based on language and writing skills. In China, only those papers published in SCI® journals, and not those published in journals included in CSPTCD can be used to assess the achievement of a scientist or researcher in many famous universities or institutes, including South China Botanical Garden, The Chinese Academy of Sciences (SCBG-CAS), and DNU. The papers published in SCI® journals are usually assessed or evaluated according to the IF of the journal or whether it appears in a list of the top 10 or 30 in that field of study. Non-SCI® English-based journals carry the same weighting as non-SCI® Chinese-based journals. For non-SCI® journals in China, some have self-assessed their potential IF by CSPTCD. Some other non-SCI® journals in China are considered to be “central” journals (1324 journals among 6170 journal of China are considered to be central). Although there is no formula to describe the relationship between an SCI® journal and non-SCI® journal in China, in general, if a central journal of a non-SCI® journal has a score of 10 points, then SCI® journals will score 100-150 points while but non-central journals in China count for only 5 points. Even though many papers have the potential of being published in SCI®-listed journals, they are not, and they finally land up being included in CSPTCD-listed journals, simply because of language-based deficiencies. In 2009, In China, 82.44% of papers published by Chinese scientists were in CSPTCD journals while only 17.56% papers were published in SCI® journals. In other words, the lion’s share were almost all CSPTCD papers published in Chinese, most of which required a submission fee to publish in peer-reviewed journals, and several of which do not have an English abstract. Consequently, their effect and global reach is severely reduced due to the language limit as these papers can not be accessed by non-Chinese speaking scientists.

Many scientists spend much time and energy writing or revising scientists manuscripts for submission to English peer-reviewed journals which could be used more efficiently to conduct more experiments for scientific research if they were able to write the papers with more skillful English, but this is unpractical and impossible for the majority of Chinese scientists. One of the authors (S-JZ) usually spends about one month to write a paper (1-3 for C-JR) after having completed the experiment and obtained the data. If the experiment was performed by his students, they would usually spend more time (2-3 times longer) to finish the first draft of the manuscript. English revision services and text-editing services are costly, and lie often beyond the average research budget (**Table 2**; also see further quantification in Zeng *et al.* 2011). Moreover, English revision services usually do not provide advice regarding format or scientific rigor because their primary responsibility is only language. Therefore Chinese scientists are usually left with no option but to try and fill the gaps between good English

Table 2 Average costs (in Chinese Yuan* or Euro**) for scientific editing services (regular speed).

Cost type	Short communication (<3000 words)		Original research paper (3000-6000 words)		Review (> 6000 words)	
	Service in China	Service abroad	Service in China	Service abroad	Service in China	Service abroad
Used by Chinese researchers*						
Per word	0.22	0.33	0.22	0.33	0.22	0.33
Used by foreign researchers**†						
Per word	0.05-0.1					

In July, 2012, 1 Euro = 9.2 Yuan

† range based on an average of three commercial services in the USA, UK and Japan

Table 3 Factors which Chinese scientists (average of three Chinese co-authors) consider to be important when selecting a journal of choice.

Factor	Rank*	Importance**
Does the journal have an IF?	1	5
Is the journal listed on Thomson Reuter's ISI/SCI?	2	5
Is the journal listed on Elsevier's Scopus?	4	4
Is the journal listed on other data-bases?	7	3
Is the journal Open Access?	6	3
Does the journal have an international editorial board?	8	3
Are there publication or submission fees?	5	3
Is colour printing free?	10	3
If the journal is not Open Access, is there a paid free-view option?	12	1
Is copyright retained by the authors or transferred to the publisher?	11	2
What is the speed of acceptance?	3	4
Is the review process (i.e. acceptance) easy?	9	3
Others (please specify)		

* Factors ranked as: 1 = most important, 2 = second most important, 3 = third most important, etc.

** Importance scale: 1 = not important (not necessary); 2 = slightly important; 3 = important; 4 = very important; 5 = extremely important (i.e., absolutely necessary)

IF = Impact Factor®

and good science rigor to meet demands for publication in an SCI® journal. International writing collaboration can serve as one simple but effective solution at no cost. Other difficulties that Chinese scientists in some universities and institutes have include (all within the context of international, primarily English-based, publishing): a lack of understanding of organization of a scientific paper; little research or publishing experience; difficulty with online submission systems; poor access to literature; access to literature is expensive; no support from supervisors; among others.

In China, scientists have several obvious problems related to their scientific research and publication of their results in international peer-reviewed journals in English. At first, when they design their experiments and create an experimental outline, it is necessary and important to cooperate with international colleagues, since this will allow them to discuss and exchange transnational ideas and information, i.e. creating research CPC. This is helpful for improving and effectively achieving the desired experimental objective. Despite the fact that many scientists in China have learnt English over many years, English expression and writing capacity remain difficult for Chinese scientists; thus, putting English into practice remains a hurdle as large as or even larger than the scientific hurdles, making it a consistently great challenge for Chinese scientists to publish their results in international peer-reviewed journals in English. Many young scientists in China often receive letters from peer-reviewed journals stating "your manuscript is rejected because of poor English expression"; in those cases, the editorial advice is consistently the same: a need to improve the manuscript by a native English speaker or by a person with good or excellent English writing skills. Due to the different culture and language system in China, there is a deficiency in organizing articles in English, including English expressions and grammar, especially when dealing with treatments, methods and data analysis. Thus, it is extremely important for scientists in China to cooperate with scientists whose mother tongue is English or with scientists with excellent English skills, in other words, creating scientific writing CPC. For example, one author (C-JR) published 52 articles from 1999 to 2004, only three of which were published by internationally peer-reviewed journals; after this, he published 27 articles from 2005-2010 by cooperating with leading scientists from the USA, Japan and Belgium. Another author (S-JZ) published 62 articles from 2000 to 2006, only one of which was published in an SCI® journals; after this, he published 12 articles in SCI® journals from 2007-2010 by cooperating with foreign leading scientists, including some international writing collaborators. This pressure is further confounded by the fact that Chinese research institutes require more and more from their researchers to achieve international results. For example, one of the authors (XNY) is required to publish at least 6 papers in SCI-listed journals with an IF of ≥ 0.5 over a 4-year period to maintain a contract and position (2012 regulation). For

another author (SJZ), only the corresponding author or corresponding author can use a publication for career advancement, although other criteria such as rewards, patents, new varieties, etc. are also important; due to increased competition and limited staff positions, at least two SCI-listed journals with an IF > 4 must be published within a 3-year period; even so, even associate professors who might have published over 10 SCI papers are not necessarily promoted to the position of full professor, which depends on several other factors determined by the university's academic board. At DNU (CJR's research institute), to be promoted from associate professor to professor, at least 5 papers must have been published in SCI journals or in a top Chinese journals, although promotion usually depends on the candidate being a principal investigator more than the publications record.

How do Chinese scientists select an appropriate target journal?

Chinese scientists tend to find several factors important when selecting a target journal of choice (Table 3). However, Chinese scientists often select international peer-reviewed journals based on the three main criteria: a) is the journal cited by Thomson Reuter's ISI/SCI®? b) what is the level of the Impact Factor® (IF®) of a journal listed on SCI®? c) is the journal listed on Elsevier's Scopus at www.sciencedirect.com? Other minor considerations include the speed of acceptance, if there are journal submission fees and if the journal is Open Access (www.doaj.org).

What constitutes authorship to a scientist in China?

According to the latest Copyright Law of the People's Republic of China (2001/10/27; http://www.ahga.gov.cn/government/fagui/mf4/low_view1.htm), the definition of an author is a citizen who produces works, including corporations, other organizations or individuals. A co-author must participate in the production of the works. However, there is no official document that formulates who can become a co-author or what the order of co-author is in China. In general, the authors in a paper include individuals as prescribed by the three guidelines defined by ICMJE (described above and in Table 1). Sometimes, co-authors can include individuals that are specifically excluded from authorship as defined by the ICMJE, whose contributions consist solely of arranging funding, collecting data, or supervising the research group. Usually, however, such individuals are included in the Acknowledgements, as ICMJE prescribes (Table 1). The co-author is usually decided by the corresponding author who is usually the supervisor of the research group and who provides research funding. However, some Chinese journals, for example *World Chinese Journal of Digestology* (<http://www.cqvip.com/>) requires that each author sign a document indicating their specific contribu-

tion and that they have been involved in either the conception of the project, or analysis or interpretation of the data or other correlative works. In other words, only one of these factors is important similar to the definition as provided by ICMJE, but not that provided by Elsevier's PERK. What is of great relevance to this discussion is that what Chinese universities and the Chinese Ministry of Education regard as ethical, the ICMJE regards as unethical (highlighted in **Table 1**). It is these differences in eligibility to become an author and the ethical basis of authorship that not only brings confusion to Chinese scientists, but also to bio-medical authors around the world who actively publish in journals that cover both ethical guidelines, at least. Another important aspect to notice is that there is consistency between Chinese universities and the Chinese Ministry of Education.

In China, including in SCBG-CAS and DNU, there are no clear ethical guidelines or rules to decide who can become an author and the order of authors. In fact the policy is held uniformly throughout all CAS institutes. In general, the order of authors is decided by the size of the contribution to the work, but the corresponding author is generally arranged in the end. For example, if a graduate or postgraduate student or researcher who holds a PhD conducts research under the guidance of a supervisor, while other individuals help to complete several aspects of the experiment and obtain data that is embodied in the manuscript, all of them can become a co-author in the manuscript, but always the supervisor, who is the corresponding author, appears last. Previously, the concept of corresponding author did not exist and some supervisors were the first author while the student appeared second in a publishing paper. A comparison between what has been established by the ICMJE and Chinese universities or the Chinese Ministry of Education is listed in **Table 1**.

At present, a lot of international research collaboration in China exists and many papers resulting thereof have been published in SCI[®] journals. In 2009, the number of SCI[®] papers involving international collaboration was 28,474 accounting for 22.3% of all SCI[®] papers. In 2009, the number of SCI[®] papers involving international collaboration was 55, accounting for 29.4% of all SCI[®] papers. In some cases, co-authors were only a writing collaborator and who would be in a position to enrich and strengthen (English and scientific content) the manuscript (**Tables 4, 5**). In 2009 in SCBG-CAS, the number of collaboration SCI[®] papers was 55, accounting for 29.4% of all SCBG-CAS SCI[®] papers; in 2010 in SCBG-CAS, the number of collaboration SCI[®] papers increased to 68, accounting for 34.7% of all SCBG-CAS SCI[®] papers but in 2011 in SCBG-CAS, the number of collaboration SCI[®] papers was 66, accounting for 39.1% of all SCBG-CAS SCI[®] papers; in 2009 and 2010 in DNU, the number of collaboration SCI[®] papers were 23 and 36, accounting for 35.4 and 40%, respectively of all DNU SCI[®] papers; in 2011, the number of non-SCI[®] decreased dramatically to 126 from 737. In SCBG-CAS and DNU, writing collaborators (i.e. CPC) are accepted as co-authors without any ethical hurdles.

Who writes a paper and how are text editing services used in China?

In China, it is usually the researcher or their supervisor who writes the original manuscript in Chinese or in English. If they face language- and writing skill-based difficulties when writing these manuscripts for submission to international, English-based peer-reviewed journals, they usually seek help from scientific editing, writing, translation, and consulting services for editing or translating the manuscript. The cost is usually 0.22 Yuan/word for local services offered in China and 0.33 Yuan/word for services conducted abroad. These prices contrast to prices for services run abroad for foreign non-English speaking scientists. It is unclear whether these services are considered by the authors or by their institutes to be ghost-writing. However, Chinese scientists do not have to acknowledge these com-

panies that provide text-editing services in the Acknowledgements section in both SCI[®] or CSPTCD journals.

How important is a statistician for Chinese scientists? Can a statistician be included as a co-author?

In China, there is no formal documentation stating whether a statistician can be included as an author, or not. In general, the researchers who conduct the experiment complete the analyses themselves. However, sometimes the collection of data takes place over a long-term, and the person who oversees data collection or analysis becomes an integral part of the research team, and is, in this case, included as a co-author. If the analysis of data is complicated, or if the experimental design is complex, then a statistician is required. In this case, too, in China, a statistician could then also be considered to be a valid co-author without any ethical hindrances (**Table 1**). Another paper recently describes the importance and weighting of a statistician in science (specifically plant science), and the weighting given to a statistician to be included as an author, assessed through a survey (Teixeira da Silva and Van 2011).

Can a person who provides ONLY English language revision services be included as a co-author?

In China, there is no formal documentation stating whether someone who only provides assistance to English or who provide substantial improvement to language and to scientific content can become a co-author. In general, someone who only provides assistance to English could be included in the acknowledgements. According to Teixeira da Silva (2011e), English language teachers, or ELTs, are not sufficiently qualified to comment on scientific English, much less on science, unless they possess a scientific background, and generally should not qualify as authors in exchange for assistance with language-related editing. However, if someone provided substantial improvement to language and to scientific content, they could be included as a co-author without any ethical barriers (**Table 1**). The corollary to this rule, however, is that such a person should not be paid a salary. In China, it is generally understood that a fee for revising a paper is usually reserved for scientific editing, writing, translation and consulting services, specifically for language revision, and not for collaborators. In other words, neither research nor writing CPCs should be paid, although they are equally valid authors, without ethical issues. This contrasts to the definition established by the ICMJE (**Table 1**).

In China, including SCBG-CAS and DNU, there are no clear ethical guidelines or rules to decide who can become an author and the order of authors. In general, the order of authors is decided by the size of the contribution to the work, but the corresponding author (usually the supervisor) is generally placed last. For example, if a graduate or postgraduate student or researcher who holds a PhD conducts research under the guidance of a supervisor, while other individuals help to complete several aspects of the experiment and obtain data that is embodied in the manuscript, all of them can become a co-author in the manuscript, but always the supervisor, who is the corresponding author, appears last. Previously, the concept of corresponding author did not exist and some supervisors were the first author while the student appeared second in a paper. The manuscript was written by the first author and the corresponding author was responsible (ethically and legally) for the manuscript. A comparison between what has been established by the ICMJE and Chinese universities or the Chinese Ministry of Education (2009) is listed in **Table 1**.

At present, much international research collaboration in China exists and many papers resulting thereof have been published in SCI[®] journals. In 2009, the number of SCI[®] papers involving international collaboration was 28474 ac-

Table 4 The latest statistics on the total number of papers published in journals of different levels.*

	SCI journals	Total non-SCI journals		Total
		Chinese	English	
China				
2009	127500	521300		648800
2010	148400	530600		679000
South China Botanical Garden - CAS				
2009	188	26	216	430
2010	196	119	12	327
2011	169	129	11	309
Dalian National University				
2009	65	598	663	1326
2010	90	647	737	1474
2011	105	729	126	960
Beijing Forestry University				
2009	191	2718	202	3111
2010	258	3064	402	3706

* Previous year's values for SCBG-CAS are only available in October-December of the following year

counting for 22.3% of all SCI[®] papers. In SCBG-CAS, in 2009, the number of SCI[®] papers involving international collaboration was 55, accounting for 29.4% of all SCI[®] papers. In some cases (unquantifiable), co-authors were only writing collaborators and who were be in a position to enrich and strengthen the English and scientific content of the manuscript. In 2010 in SCBG-CAS, the number of collaboration published SCI[®] papers was 68, accounting for 34.7% of all SCBG-CAS SCI[®] papers; in 2011 in SCBG-CAS, the number of collaboration published SCI[®] papers was 66, accounting for 39.1% of all SCBG-CAS SCI[®] papers (Tables 4, 5).

In China, if a CPC conforms to only one of the following principles, he/she could be included as an author or corresponding author: 1) a **supervisor** that provides help to MSc or PhD students to design experiments and provide funds for the experiment is usually the corresponding author; 2) a **cooperator (CPC partner)** that acts as a supervisor; 3) Scientists that exchange information on the studied topic and help to design experiments; 4) Scientists **or individuals** who help to treat data, re-write the manuscript, including structure, discussion, references and English expression.

In SCBG-CAS, writing CPCs are accepted as co-authors without any ethical hurdles. In China, the contribution of a collaborator is not usually indicated, including who is a writing collaborator. However, if the author violated internal or international publishing ethics rules, it is the responsibility of each university or institute to dealing with the issue.

How is responsibility in research and publishing determined in China?

In China, there is no formal documentation stating who is responsible for decision-making. In general, a laboratory supervisor is responsible for both research and publishing, and is thus the corresponding author. Thus, it is understood that decision-making lies exclusively in the hands of the

supervisor. Meetings are held, including all laboratory staff, and the distribution of work and the order of authors of manuscript are decided as a group. The laboratory supervisor usually provides the research fee.

What benefits do Chinese authors receive from active research activity and publishing?

Chinese Scientists receive real tangible benefits based on their publication success and academic activity. These benefits include increased salary, higher position, promotion, increased research funding. Salary and funding are determined according to the scale indicated in Table 6, although there is no national standard and rules and formulae are calculated by each institute, at their discretion.

What are the consequences of unethical behaviour in science in China?

Chinese scientists who are found to falsify data, submit the same data set in Chinese and in English to different journals, or not follow the ethical guidelines have the following consequences (Table 7). In China, there is no formal documentation stating who is to deal with such ethics cases. However, if these ethics cases occur within a research project supported by National Natural Science Foundation of China (NSFC) (<http://www.nsf.gov.cn/Portal0/default124.htm>), the NSFC committee would deal with these cases by canceling financial support or giving open (public) criticism or punishment. Sometimes, some scientists maybe lose their jobs or positions, although, to date, there have been no reports of scientists that have faced jail time or have had to pay a fine.

For example, in 2009, unethical behaviour was publically denounced in papers with first author Haibo Huo, whose study was funded by NSFC-No. 30500661. This brought seriously negative impacts to Chinese research. Prof. Limao Wu, who was the principal investigator of this fund and the corresponding author of the paper, was also responsible for this unethical publication. Accordingly, such unethical behaviour resulted in the withdrawal of funding by the NSFC. Moreover, Haibo Huo could not obtain any qualifications nor apply to the NSFC within seven years. In addition, Limao Wu lost his qualifications and cannot apply for NSFC project funding within five years (http://www.nsf.gov.cn/nsfc/cen/00/its/jiandu991013/20090420_01.html).

In March, 2009, China's Ministry of Education (CME 2009) issued a notice on how to deal seriously with academic misconduct, aimed at higher education, and categorizes academic misconduct as follows: (1) plagiarize or use other's academic achievements; (2) tamper with other's academic achievement; (3) fake or tamper data, literature to concoct facts; (4) fake notes; (5) use other's academic achievements without participating in the creative work; (6) the improper use of other's signature without permission; (7) other academic misconduct.

Based on the above information, we can see that, as long as the personnel that make the global and local contributions to the paper can give a different sort of signature depending on how much participation in the workload.

Table 5 Number of scientific papers in China between 2006 and 2011.*

	CSPTCD	All SCI	SCI from International collaboration	All SCI/CSPTCD (%)	SCI from international collaborations /All SCI (%)	No. of international collaborations
2006	405000	71000	19000	17.5	21.9	82
2007	463000	89100	21000	19.2	21.9	90
2008	472000	95500	23000	20.2	20.1	124
2009	521300	127500	28474	24.5	22.3	126
2010	530600	148400	32807	28.0	22.1	> 105
2011	644713	130000	NA	NA	NA	NA

* No 2012 data yet exists

NA = not available

Table 6 Formulae or relative amounts used to calculate remuneration (or reward) based on type of collaboration and publishing achievement in China*.

Categories/position	Research or writing collaboration (CPC)		SCI journals		Paid writing/editing		Others**
	China	Abroad	China	Abroad	Chinese company	Foreign company	
Full professor							
Salary	3-fold	About 5- to 8-fold	IF × 1-fold	IF × 1-fold	1-fold	1.5-fold	
Position							
Research funding							
Travel award							
Others							
Junior professor (assistant or)							
Salary	2 to 2.5-fold	About 3-5-fold	IF × 1-fold	IF × 1-fold	1-fold	1.5-fold	
Position							
Research funding							
Travel award							
Others							
Post-doc researcher or researcher/research assistant							
Salary	1.5- to 2.0-fold	2 to 3-fold	IF × 1-fold	IF × 1-fold	1-fold	1.5-fold	
Position							
Research funding							
Travel award							
Others							
Graduate student (MSc or PhD)							
Salary	1.2- to 1.5-fold	1-5 to 2-fold	IF × 1-fold	IF × 1-fold	1-fold	1.5-fold	
Position							
Research funding							
Travel award							
Others							
Undergraduate student (Bachelors or Honours)							
Salary	1-fold	1.5 to 2-fold	IF × 1-fold	IF × 1-fold	1-fold	1.5-fold	
Position							
Research funding							
Travel award							
Others							

CPC = collaboration, partnership or co-operation; IF = Impact Factor®

* There are no uniform formulae in China.

** Other factors that are increased by publishing choice: For SCBG-CAS, research funding needs application. The position is decided by a researcher's outstanding achievements. Travel awards are decided by differences in travel and hotel costs according to the position of the awardee. Prizes are calculated by the following formula: IF X cardinal number, in which the first institution in the paper is full (i.e. X1), the second institution is 1/3, and the third institution is 1/3 × 1/3, the fourth is 1/3 × 1/3 × 1/3, etc. In this formula, the total number of authors or the total number of international collaborators do not affect the weighting of this formula in any way. The prize is based exclusively on SCI paper IF and on the rank of an institute listed in a paper.

Other note: In Henan Agricultural University, scientists are financially remunerated as follows:

a) For a paper in a Chinese journal: 1000 Yuan RMB + 5000 Yuan RMB × IF

b) For an SCI paper: 10,000 Yuan RMB + 5000 × IF

Table 7 Consequences suffered by Chinese scientists as a result of one or more of these unethical actions.

Unethical action	Consequence (provide details and indicate if I or G)
Data is stolen	Punished by I and G
Copyright is infringed	Punished by I and G
Patent is infringed	Punished by I and G
Data is falsified	Punished by I and G
Experiment is falsified	Punished by I and G
Plagiarism	Punished by I and G
Self-plagiarism	Punished by I and G
Inclusion of guest/honorary authors or omission of author*	No official rule or document
Failure to disclose/acknowledge ghost-author/writer	No official rule or document
Failure to acknowledge funding body	No official rule or document
Submission to two or more journals simultaneously	Is unethical
Publication in two or more journals of the same data set in English	Is unethical
Publication of the same data set, once in English and once in Chinese	Is unethical
Physical or psychological abuse by one lab member towards another (independent of rank)	Corrected (i.e., action to avoid re-occurrence)
Forcing someone to pay for English revision services	Few cases
Forcing someone to do any action (e.g. including choice of authors, journal)	Few cases

I = institutional; G = Government

* Guest author is defined as someone who is invited simply for convenience without satisfying any of the conditions for authorship as defined by ICMJE. The United States National Academy of Sciences, however, warns that such practices "dilute the credit due the people who actually did the work, inflate the credentials of those so 'honored,' and make the proper attribution of credit more difficult." (<http://www.nasonline.org>)

What other existing problems in research and publishing affect Chinese research and publishing policy?

In China, a low percentage of journals are SCI® journals, and most CSPTCD-indexed journals are published in Chinese. The only way – at present – that Chinese scientists can expand their international effect and research impact would

be to have more Chinese-based journals listed in SCI® and for Chinese scientists to publish more in SCI® journals. The papers published in SCI® journals are usually assessed or evaluated according to the IF of the journal or, if listed on a top 10 or 30 list of that field, and the journals do not have an IF, they are usually regarded as being of the same level. Papers published in non-SCI® English-based journals are regarded as the same level non-SCI® Chinese-based jour-

nals and are usually not assessed to attain scores in famous universities or institutes, including SCBG-CAS. However, in some other universities or institutes, papers published in non-SCI® English journals or in CSPTCD journals can be used in the evaluation of the academic level of research. These papers are usually assessed according to the grade that they belong to nation, province or city. In addition, they need to improve the level of papers and attain more citations.

Although in recent years the Chinese government has continued to strengthen IPR (Intellectual Property Rights), despite publicity and relevant policies and regulations, for various reasons, many Chinese researchers are not really aware of the importance of the meaning of the copyrighted and assigned co-authorship of scientific papers, which is related to several problems: (1) Too many and too complex signatures. For example, when introducing a small and professional article, the real author always signs some names of associated professionals or even helps people who have a fair number of papers to become co-authors. (2) The phenomenon of “human relationship signature”. Usually an acquaintance may be engaged in the same profession, but not directly involved or engaged in the paper’s research, but is assigned co-authorship. (3) The concept of an official standard. Far too many executive leaders are assigned co-authorship while those actual researchers who are the major players in the creative work are only assigned a subordinate position. There are several reasons why co-authors are falsely assigned. In China, many regard a paper published in an authoritative journal as a prerequisite for promotion. Moreover, China is very ceremonial and some authors are willing to assign co-authorship to those who have helped them in return as a form of favour.

At present, several provisions of scientific papers in China are: (1) The term “author” refers to those that are engaged in the thematic conception of the thesis, the implementation of specific research and involved in making the main contribution in writing of all or part of the research paper; they can be responsible for the content of the thesis defense and are the legal bearers and responsible parties of the paper; (2) The number of co-authors should not be too many, specifically not > 5 (although one of the co-authors (SJZ) is of the opinion that there should be no limits), those who do not help or participate in some way to the research should not be considered co-authors, unless they can specify in a concrete manner which part they have been involved in; others that have made small contributions or work can be acknowledged at the end of the paper to show the authors’ appreciation; (3) Co-authors should be sorted or ranked according to their contribution to the work; (4) Paper authorship should be practical and realistic, and should not involve individuals that do not participate in work as CPCs.

CONFLICTS OF INTEREST AND DECLARATION OF ETHICS

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