

Reflections on the international impact of Chinese STM journals

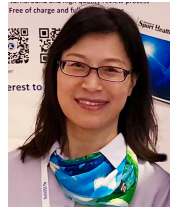
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Abstract

There are 5,020 scientific, technical and medical (STM) periodicals, including 548 English-language (E-L) journals, in China. To quickly increase the international influence of Chinese journals, government management launched significant initiatives for publishers, such as the 'Project for Enhancing International Impact of China STM Journals (PIIJ, 2013–2018)'. This paper investigates the underlying objectives and assumptions made about the value and impact of Chinese E-L journals and the effect of PIIJ support and international publisher collaboration. The authors conclude that, while the E-L journals are demonstrating some quantifiable improvements in internationalization, there are no equal pressures or recognition for qualitative quality measures, and this may undermine the ability of Chinese E-L journals to build sustainable strategic plans.

INTRODUCTION

Since the first Chinese English-language (E-L) academic journal, *China Medical Journal*, was born in 1887, there have been 548 English periodicals to date; these have been responsible for the internationalization of Chinese academic journals for more than 130 years, especially in the last decade (Bao, Zhang, & Wu, 2018). Previous researchers have studied Chinese E-L academic journals from the perspective of the trends and developments (Zhang, Wang, & Jiang, 2002), financial support (Xian, 2006), internationalization (Wang, Wang, & Weldon, 2007), and development programmes (Association of Learned and Professional Society Publishers [ALPSP], 2013). This article mainly focuses on the current status of Chinese E-L journals based on historical and

current publishing market data. Here, we examine the following datasets:

- 2018 scientific publication output by country.
- 5,020 scientific, technical and medical (STM) journals in China, 10.9% in English.
- Publishing choices of Chinese E-L journals.
- Project for Enhancing International Impact of China STM Journals (PIIJ): China's journal development programme, which covers the PIIJ Plan, its categories with expenditure, and its effectiveness.

These data allow the authors to reflect on how the impact of the Chinese E-L journals and other international journals is measured.

Key points

- There are 5,020 scientific, technical and medical (STM) journals in China, including 548 English-language (E-L) journals, with 431 from Mainland China.
- In 2013, the Project for Enhancing International Impact of China STM Journal was launched to raise the internationality of Chinese STM journals and create more E-L journals.
- The number of E-L Chinese journals indexed in the first quartile of their Web of Science category rose from 10 in 2013 to 40 by 2017.
- There remains scope for Chinese E-L journals to improve their global inclusion and adherence to international standards.
- The focus on quantitative measurements of Chinese E-L journals may undermine their desire to improve academic integrity and usefulness.

The last section mainly focuses on some questions of interest to participants or international peers in the field; for example: What is a standard international journal? What factors do we consider in addition to the impact factor (IF) for an influential journal? What publishing mode should Chinese periodicals choose in the long run? What are the best practices in China or elsewhere for evaluating journals? These questions revolve around a core issue: What is the value of operating Chinese academic journals?

DATA AND METHOD

Figure 1 shows the detailed process of data generation. We spent about 3 years compiling a list of 585 journals from 2015 to 2018 using the databases of the Society of China University Journals; the Institute of Scientific and Technical Information of China; the State Administration of Press, Publication, Radio, Film and Television of China; the China Association for Science and Technology (CAST); Journal Citation Reports (JCR); the 2017 Blue Book on the Development of Chinese Sci-Tech (STM) Journals (*Blue Book*); Airiti Library (Taiwan); and CUHK Library (Hong Kong). To present the journal information as accurately as possible, we checked all the 585 periodicals one by one using the Web of Science, Scopus, Baidu, Google, the China National Knowledge Infrastructure, and the Directory of Open Access Journals. From this, 37 journals were removed from the list, including 11 Chinese-language journals, 11 oversea published journals, 6 not-yet-published journals, and 9 incapable journals. Finally, on 26 March, 2018, we completed the data collation and retained 548 E-L journals with information on journal title, ISSN, publisher, location, founding year, subject category, IF, and JCR quartile.

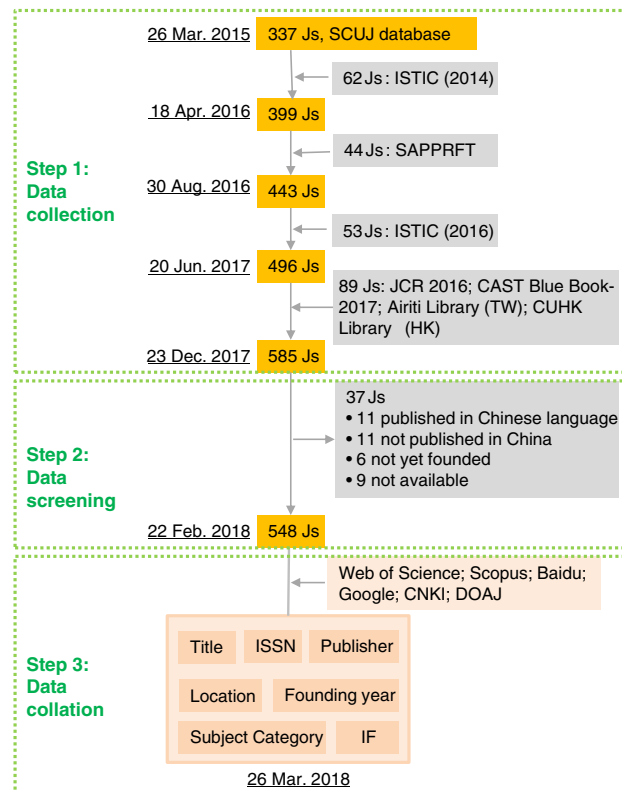


FIGURE 1 Data collection and collation process. Note: CAST, China Association for Science and Technology; CNKI, China National Knowledge Infrastructure; DOAJ, Directory of Open Access Journals; GAPP (now 'SAPPRT'), State Administration of Press, Publication, Radio, Film and Television of China; IF, impact factor; ISTIC, Institute of Scientific and Technical Information of China; JCR, Journal Citation Reports; Js, Journals; SCUJ, Society of China University Journals.

FINDINGS

The *Blue Book* on the development of Chinese Sci-Tech (STM) journals, launched by the China Association of Science and Technology (CAST, 2018), states that 'China should aim at the world's leading STM journals and focus on the forefront of global science and technology'. Considering this objective, we evaluate the various data sources for STM journals in China to determine the strength and recognition of China's science and technology journals.

2018 Scientific publication output by country

Based on the '2018 Science & Engineering Indicators' report by the National Science Foundation, researchers in the USA and China were the world's largest producers of science and engineering publications. The number of science and engineering articles in all fields from China increased nearly fivefold from 2003 ($N = 87,000$) to 2016 ($N = 426,000$). As a result, China's output exceeded that of the USA ($N = 409,000$) and became the largest in the world (National Science Board, 2018).

How do we evaluate these metrics? What are the deep-seated issues behind determining 'the largest article-publishing country' that deserve further discussion? The fact is that Chinese scientific research capabilities still lag behind those of the premier countries. For example, this is evident from the percentage of journals covered in authoritative databases such as Emerging Sources Citation Index (ESCI), Social Science Citation Index (SSCI), Arts and Humanities Citation Index (AHCI), and Science Citation Index Expanded (SCIE) (Table 1; Somoza-Fernández *et al.*, 2018). China's figures are lower than those of Japan or South Korea in Asia; only in Scopus is the number higher than those of the other two countries. Wang, Chen, Liu, and Hu (2018) studied the overall growth and quality of Chinese journals from 1949 to 2013 and found that Chinese academic journals are of low quality, although this has improved over time. However, the overall number of STM journals ($N = 5,020$; CAST, 2018) in China is much higher than that in Japan ($N = \sim 1,700$) and South Korea ($N = \sim 600$; Liu *et al.*, 2012).

STM journals in China

On 28 January 2018, the *Blue Book* was issued by CAST (CAST, 2018), which reported that there is a total of 5,020 domestic STM periodicals (including the 548 E-L journals identified in our

research, see Fig. 2) The *Blue Book* emphasized 'the construction of world-class periodicals is an important part of pushing China forward from a big country in science and technology to a powerful country in science and technology'. Actually, in order to achieve this goal, English academic journals have undertaken this task.

Figure 2 shows that, since the first E-L periodical, the *Chinese Medical Journal*, was founded in 1887 in China, there have been a further 548 (E-L journals), including about 117 E-L journals from Hong Kong (80), Macao (1), and Taiwan (36), which we further classify by STM subject category into blue (scientific journals, 28%), orange (technical journals, 34%), green (medical journals, 28%), and grey (other or social scientific journals, 10%). It shows that there are few social scientific periodicals in China. Here, dark green represents the new journals founded in that period. Since the 1980s, growth has been at an average rate of 100 new journals per decade: in the past 5 years, in Mainland China, since the PIJ Plan, 100 new journals have been published (Fig. 2). In another article, we are going to analyse these 100 newly founded journals.

Publishing choices and impact

Based on our survey and statistic, of the 431 E-L journals in Mainland China, about 72% (312 journals) choose to cooperate with

TABLE 1 Distribution of journals indexed by ESCI, Web of Science classical index, and Scopus databases by country (from Somoza-Fernández, Rodríguez-Gairín, & Urbano, 2018).

	ESCI (%)	SCIE (%)	SSCI (%)	AHCI (%)	SCOPUS (%)
England	21.32	22.24	33.61	24.33	23.12
USA	13.44	29.38	39.20	31.11	26.07
Spain	7.97	0.87	1.69	3.31	2.10
Netherlands	5.48	11.69	6.66	6.22	9.16
Italy	4.29	1.18	0.37	3.53	1.83
Germany	3.68	8.26	4.51	7.57	7.15
Brazil	3.41	1.19	0.55	0.78	1.49
Canada	2.89	1.25	1.20	2.69	1.07
India	2.70	1.08	0.21	0.22	1.65
Switzerland	2.64	2.23	0.80	0.84	1.90
Poland	2.56	1.24	0.18	0.39	1.27
Colombia	2.33	0.12	0.12	0.17	0.36
Australia	2.16	1.09	2.39	1.35	0.85
Turkey	1.76	0.55	0.31	0.34	0.73
France	1.62	1.56	0.74	3.76	2.26
Korea	1.46	0.97	0.37	0.34	0.90
Japan	0.71	1.77	0.18	0.34	1.84
China	0.52	1.33	0.12	0.06	2.56
Rest	19.05	12.00	6.79	12.65	13.69
Total	100.00	100.00	100.00	100.00	100.00

AHCI, Arts and Humanities Citation Index; ESCI, Emerging Sources Citation Index; SCIE, Science Citation Index Expanded; SSCI, Social Science Citation Index.

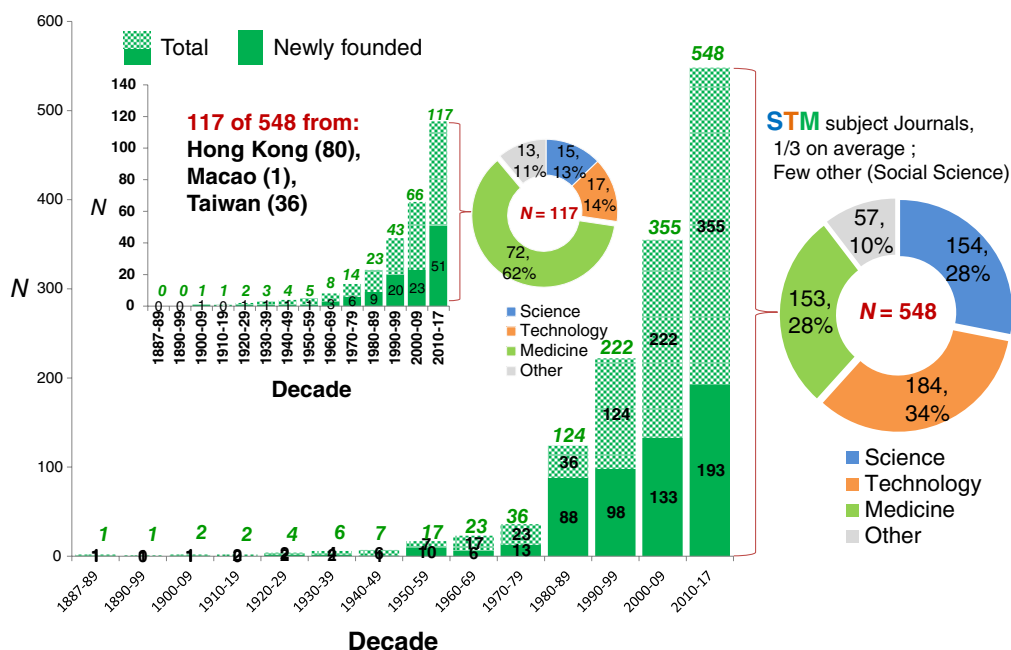


FIGURE 2 The 548 English language journals published in China (including Hong Kong, Macao, Taiwan) in 1887–2017 by STM subject category and decade (extracted 26 March, 2018). *Note.* All statistics and data from Society of China University Journals (SCUJ); Institute of Scientific and Technical Information of China (ISTIC); State Administration of Press, Publication, Radio, Film and Television of China (GAPP, now ‘SAPPRFT’); China Association for Science and Technology (CAST); Journal Citation Reports (JCR); 2017 Blue Book on the Development of Chinese Sci-Tech (STM) Journals; Airiti Library (Taiwan); CUHK Library (Hong Kong); Web of Science; Scopus; Baidu; Google; China National Knowledge Infrastructure (CNKI); and Directory of Open Access Journals (DOAJ).

overseas publishers for their internationalization in different modes, such as Open Access etc. For example, in the 2016 JCR, of the 177 E-L journals covered there, 93% (164 journals) are internationally cooperatively published. By 2017, there were 188 journals (44%), including 177 in English and 11 in Chinese published in Mainland China, with an IF in the 2016 JCR [SCIE (174 in English + 11 in Chinese) + SSCI (3 in English) = 188] (Fig. 3).

PIIJ Plan: China’s journal development programme

In September 2013, a group of Chinese governmental organizations announced the launch of the ‘PIIJ’ (see <http://www.gapp.gov.cn/news/1663/156405.shtml>). The news reported that ‘the China Association for Science and Technology, the Ministry of Finance, the Ministry of Education, and the State Administration of Press, Publication, Radio, Film and Television (past ‘GAPP’), the Chinese Academy of Sciences, the Chinese Academy of Engineering, and other departments have been organized to implement the International Impact Enhancement Program for Chinese Sci-tech Journals (hereinafter referred to as the ‘Journal Impact Plan’ (www.gapp.gov.cn/news/1663/156405.shtml)).

PIIJ Plan’s expenditure and category

The PIIJ Plan started in 2013, and the first stage (PIIJ-1: 2013–2015) funded 135 journals, including 15 Category-A,

40 Category-B, 50 Category-C, and 30 Category-D (State Administration of Press, Publication, Radio, Film and Television of China [SAPPRFT], 2013; CAST-Blue Book, 2018). The second stage (PIIJ-2: 2016–2018) planned to fund 173 journals, including 23 Category-A, 40 Category-B, 50 Category-C, and 60 Category-D (CAST, 2016; CAST-Blue Book, 2018). According to the fund categories from the CAST official report, funding for the four types is as follows:

- Category-A: RMB 2 million/year (ca. US\$300,000).
- Category-B: RMB 1 million/year (ca. US\$150,000).
- Category-C: RMB 0.5 million/year (ca. US\$75,000).
- Category-D: one-time funding of RMB 0.5 million only for new journal (ca. US\$75,000).

The total amount of funding is about 669 million RMB (~100 million US\$) from 2013 to 2018 (Table 2).

PIIJ Plan’s effectiveness and impact

As mentioned, since 2013, the PIIJ Plan aimed to enhance the international impact of Chinese STM journals. The PIIJ Plan’s evaluation indicator is mainly focused on the JCR’s quartile category ranking (Q1–Q4; Xu, Ma, & Gu, 2017). This can also be found from the PIIJ plans on the project websites (CAST PIIJ Office, 2013; SAPPRFT, 2013): ‘The candidates of Category-A should have already been in Q1 or Q2 of JCR’s IF, or have been

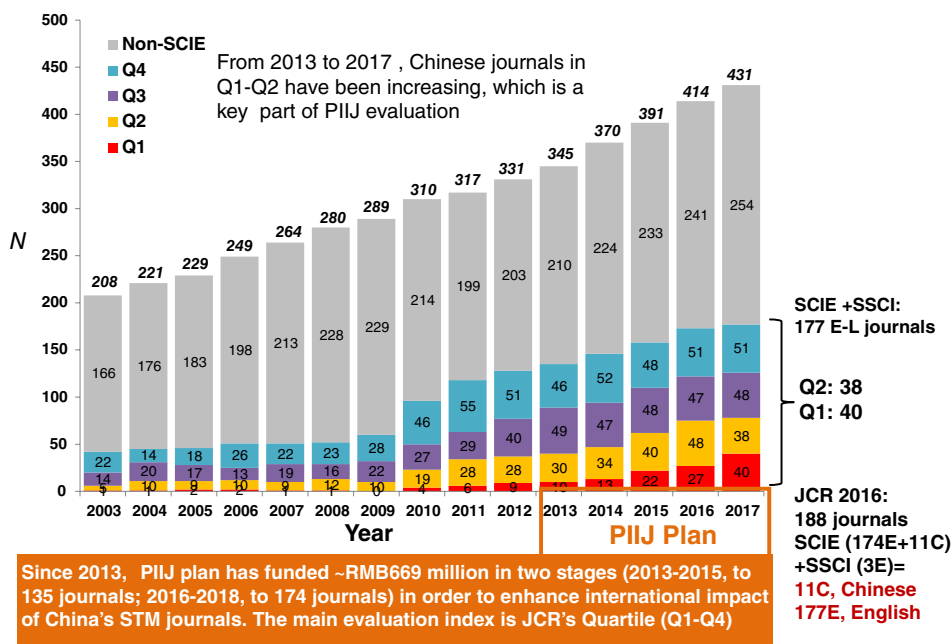


FIGURE 3 The 431 of 548 English-language (E-L) journals published in Mainland China from 2003 to 2017 (15 years). Note: All statistics and data from Journal Citation Reports (JCR 2002–2016). PIIJ, Project for Enhancing International Impact of China STM Journals; SCIE, Science Citation Index Expanded; SSCI, Social Science Citation Index.

covered by Engineering Index (EI) or MEDLINE (PubMed). The main target set for these journals is that they should try their best to become the internationally top STM journals. The candidates of Category-B are those that have already been covered by JCR or EI or MEDLINE, or the journals in Chinese key or advanced disciplines. The fund helps these journals to increase their ranking in relevant disciplines. The candidates of Category-C are those that have already been covered by JCR or EI or MEDLINE, or the journals which has not yet been covered by JCR/EI/MEDLINE but with developmental potential and discipline characteristics. The target is to rapidly increase their international influence. The target of Category-D is to establish high-level English STM

journals annually which can either represent Chinese leading and preponderant disciplines or fill the blank of domestic English STM journals.

Figure 3 shows that Chinese E-L journal numbers in Q1 (that means the journal is in the top 25% in their subject, like *Nature*, *Science*, and *Cell*) rose from 10 journals in 2013 to 40 journals in 2017, a fourfold increase in 5 years. This contrasts with 2003–2013, which went from 0 to only 10 journals in 10 years. In truth, 'PIIJ demonstrates that China can successfully contribute more high IF journals to the global research eco-system' (Garlinghouse, personal communication, April 20, 2018). However, when Clarivate issued its 2018 JCR on

TABLE 2 Funded category, journal number, and financial funds of PIIJ Plan.

PIIJ category	Funded journal number						Fund (RMB, million/year)	Total fund (RMB, million)
	PIIJ-1			PIIJ-2				
	2013	2014	2015	2016	2017	2018 ^a		
A	15	15	15	15 + 9 ^b	15 + 9 ^b	15 + 9 ^b	2	234
B	40	40	40	40	40	40	1	240
C	50	50	50	50	50	50	0.5	150
A + B + C	105	105	105	105 + 9 ^b	105 + 9 ^b	105 + 9 ^b	—	—
D	10	10	10	20	20	20	0.5 ^c	45 ^c
Total	135			165 + 9 ^b			—	~669

Source: SAPPRFT (2013), CAST (2016), and CAST-Blue Book (2018).

^a Financial funds in 2018 are estimated.

^b At the end of 2016, according to the Peak plan, nine additional funded journals were added to PIIJ-2.

^c One-time funding for a new journal.

TABLE 3 Distribution and number of 105 + 9^a PIJ [Categories A (24) + B (40) + C (50)]-funded English language journals co-publishing with overseas publishers in 2016 (PIJ-2).

Overseas publishers	Co-publishing journal number
Springer Nature ^b	56
Elsevier	30
Wiley-Blackwell	7
IOP Publishing	5
Oxford University Press	5
Cambridge University Press	2
Wolters Kluwer	1
IEEE Xplore Digital Library	1
Global Science Press (HK)	1
OSA Publishing	1
BioMed Central	1
Without cooperation	4
Total funded (A + B + C) journals in 2016	114 (co-pub 96%, no-co 4%)

Source: Data from Journal Citation Reports (JCR); Scopus; Baidu; Google; journal homepage; CAST-Blue Book, 2018; and refer to Zhao and Li (2017).

^a At the end of 2016, according to the Peak plan, nine additional funded journals were added to Category-A of PIJ-2.

^b Before the merger of Springer Science + Business Media and the majority of Macmillan Science and Education in May, 2015, Nature Publishing Group owned 17 journals.

26 June, its 'Title Suppression' exposed bad practice used by some journals to quickly increase their IF, and unfortunately, it includes two Chinese journals (Clarivate Analytics, 2018a), which should make us think about whether the pursuit of high impact pressurizes journals to deviate from quality values?

As mentioned above, 72% of the 431 E-L journals in Mainland China chose to cooperate with overseas publishers. In Table 3, we report on the journals funded by PIJ-2 in Categories A, B, and C to see how they are published. For these journals, the cooperation rate is 96% (110 journals), that is, only 4% (4 journals) are not cooperating with overseas publishers, and 75% (86 journals) chose Springer Nature and Elsevier as international partners.

Two PIJ funded journals

For further analysis, we consider two journals with the two highest IFs in China examples, *Cell Research* (IF = 15.606, No. 1) and *Light-Science & Applications* (IF = 14.098, No. 2; Fig. 4). *Cell Research* started co-publishing with Nature Publishing Group (NPG) in 2006 when its IF was only 2.161. In 2017, its IF was 15.606, which is the highest IF (No. 1) among Chinese journals in the JCR (2005–2016). *Light-Science & Applications* was founded in 2012, co-publishing with NPG. In 2014, its first IF was 8.476, and it was in Q1. Its 2016 IF is 14.098, which has been No.2 in

China. They are very famous in China's STM areas as are *Nature* and *Science* throughout the world. Even though they are different subject journals, their citation geographic distribution, total cites, and publications have comparability. In order to see the 'citation geographic distribution', which is an international indicator for our reference, here, we take that of *Science* and *Nature* as a comparison with *Cell Research* and *Light-Science & Applications*, which will demonstrate the strong international impact in STM (Table 4). For example, around half of the citations for *Nature* came from US researchers although it is actually published in the UK, and most of the citations for *Cell Research* come from the USA and those for *Light-Science & Applications* come from China. Table 4 also shows the obvious gap in the annual amount of publications, which are around 120 for *Cell Research* and *Light-Science & Applications* and 2,600 for *Nature* and *Science*, respectively.

Both journals chose to work with NPG. Table 5 indicates that since NPG came into China in 2006, there have been a total of 17 Chinese E-L journals opting for the NPG co-publishing model, and 8 of these participating journals' first IFs when cooperating with NPG are in Q1 or Q2.

DISCUSSION

What is the value of operating academic journals?

We currently live in a time when data are king because we like to think of quantitative measures, and it looks as if we have a simple one for journals, the IF. Perhaps sadly for us, we seem to live in an age where we cannot think or measure gains and losses without numbers. So, the IF is still with us. Perhaps Eugene Garfield, who invented it, had it right when he concluded that, despite its flaws, there is no other better metric to accomplish this task. However, the values that we use to evaluate academic journals

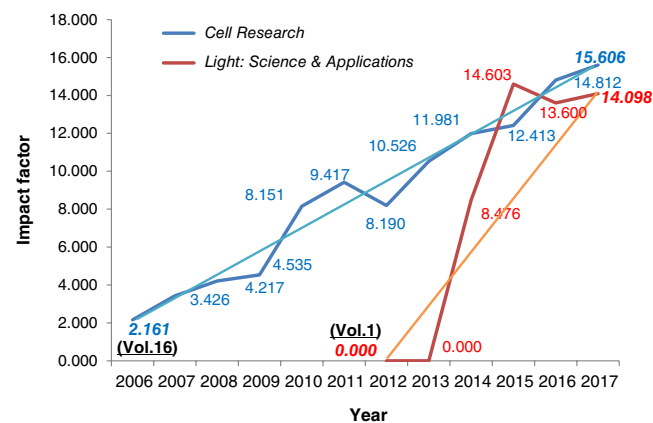


FIGURE 4 Growth of impact factor of *Cell Research* (CR) and *Light-Science & Applications* (Light S&A) following cooperation with NPG (2006 for CR and 2012 for Light S&A to 2017) based on Journal Citation Reports.

TABLE 4 Comparison of the number of publications, citations, and citation geographic distribution between *Cell research (CR)*, *Light-Science & Applications (Light S&A)*, and *Science*, and *Nature* based on Web of Science.

Journal	n ^a	Total cites ^b	Citation geographic distribution [country, %, (cites)] ^c				
			No. 1	No. 2	No. 3	No. 4	No. 5
CR	151	2,176	USA, 37.5% (816)	China, 31.1% (677)	Germany, 8.9% (194)	UK, 5.6% (121)	Japan, 4.8% (104)
Light S&A	85	1,417	China, 46.2% (655)	USA, 20.3% (288)	Germany, 9.9% (141)	UK, 6.0% (85)	Japan, 4.4% (63)
Science	2,560	5,903	USA, 47.4% (2800)	Germany, 14.1% (831)	China, 13.5% (794)	UK, 12.1% (713)	France, 9.1% (540)
Nature	2,746	7,475	USA, 44.7% (3343)	China, 15.1% (1131)	UK, 13.9% (1037)	Germany, 13.0% (969)	France, 8.8% (661)

^aNumber of papers published in 2016.

^bTotal cites in 2016 for the publications in 2014–2015.

^cCitation geographic distribution in 2016 for the publications in 2014–2015.

TABLE 5 Nature.com partnership journals in China from 2006 to 2016.

No.	Title	OA/Hybrid	Launch date	IF 2016 ^a	Quartile category ^a
1	<i>Cell Research</i>	Hybrid	January 2006	15.606	Q1
2	<i>Acta Pharmacologica Sinica</i>	Hybrid	January 2009	3.223	Q2
3	<i>Cellular & Molecular Immunology</i>	Hybrid	January 2010	5.897	Q1
4	<i>International Journal of Oral Science</i>	Fully OA	January 2012	3.93	Q1
5	<i>Light Science & Applications</i>	Fully OA	May 2012	14.098	Q1
6	<i>Emerging Microbes & Infections</i>	Fully OA	July 2012	5.605	Q1
7	<i>Horticulture Research</i>	Fully OA	January 2014	4.554	Q1
8	<i>Bone Research</i>	Fully OA	April 2014	9.326	Q1
9	<i>Cell Discover</i>	Fully OA	April 2015	Indexed by SCIE	
10	<i>Microsystem & Nanoengineering</i>	Fully OA	May 2015	Indexed by SCIE	
11	<i>Signal Transduction and Targeted Therapy</i>	Fully OA	January 2016	N/A	
12	<i>NPJ Computational Materials</i>	Fully OA	November 2015	Indexed by SCIE	
13	<i>NPJ Quantum Materials</i>	Fully OA	July 2017	Indexed by ESCI	
14	<i>NPJ Science of Food</i>	Fully OA	October 2017	N/A	
15	<i>NPJ Materials Degradation</i>	Fully OA	July 2017	N/A	
16	<i>NPJ Flexible Electronics</i>	Fully OA	September 2017	N/A	
17	<i>NPJ Molecular Phenomics</i>	Fully OA	TBD	N/A	

Source: Data from Nature.com. Note. ESCI, Emerging Sources Citation Index; IF, impact factor; SCIE, Science Citation Index Expanded; TBD, to be determined.

^a2016 Journal Citation Reports.

and to express the authenticity of science cannot change. We believe, on the one hand, that JCR itself is seeking changes in order to make the data more objective, transparent, and reasonable, such as the 'Percent Citable Item' in the 2017 JCR (Clarivate Analytics, 2018b; Lariviere *et al.*, 2016); on the other hand, a journal publisher should stick to the principles of publishing good-quality content without only constantly referring to their IF.

A case worth thinking about

While we do not dislike the IF, we have observed that it does make journal publishers anxious. Here, let us take the *Journal of*

Zhejiang University-Science (JZUS) as a sample to express our views on these aspects of a journal. This was a story that the first author, as the publishing manager of *JZUS*, experienced about IF or international influence of journals.

In PIJ-1 and -2, the ratio of recurrent funded journals is 66%, and this includes *Cell Research* and *Light-Science & Applications*. They are thus double-funded journals. *JZUS-A* was only funded (Category A, see Table 2) in the first stage (PIJ-1: 2013–2015), but it lost out in the PIJ-2 (2016–2018) application process. One of the reasons for failure was that its IFs in 2013–2015 were hovering in Q4–Q3, not up to Q2 (Fig. 5), even though this journal proposed an effective strategy plan focusing

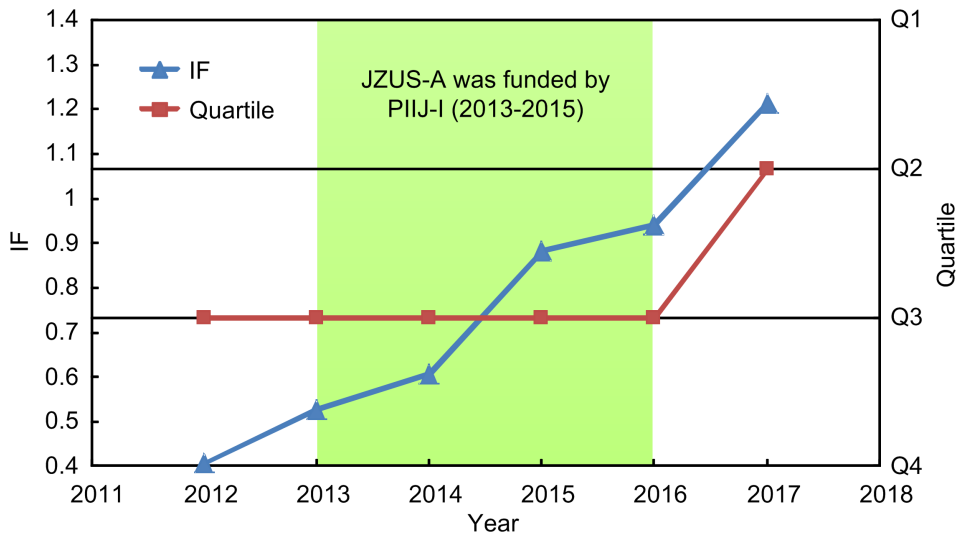
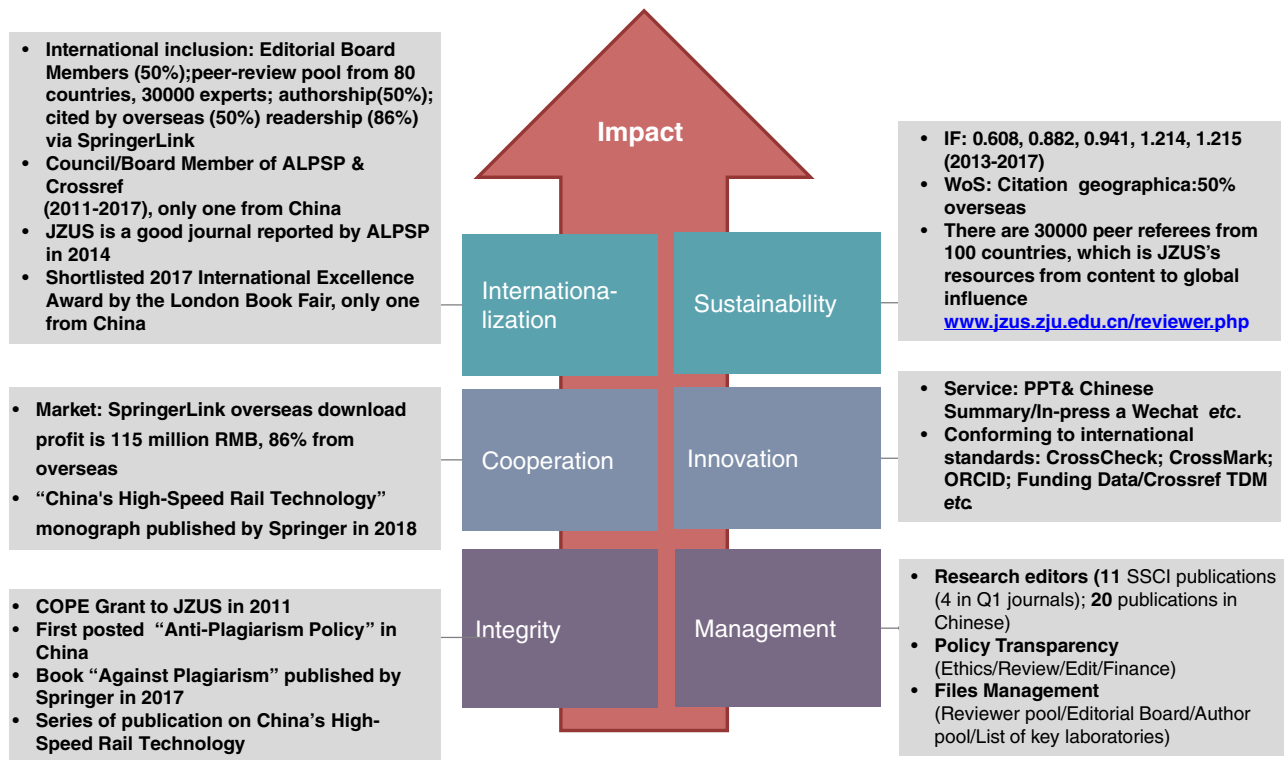


FIGURE 5 Impact factors (IFs) and quartiles of *Journal of Zhejiang University-Science A (JZUS-A)* funded (Category A) by PIJ-1 (2013–2015); 2012–2017 based on Journal Citation Reports.



they are, in addition to the recent addition of Chinese language abstracts to increase usability to the largest Chinese researchers community today, as well as adding a ppt. guide to each article to facilitate the readers' first understanding of the main point of papers'. (ALPSP, 2014; Qu, 2017) In 2017, not only was JZUS (China) shortlisted for an Academic and Professional Publisher Award alongside OECD (France) and CSIRO Publishing (Australia) by The London Book Fair International Excellence Awards Organization (The London Book Fair [LBF], 2017), but the JZUS team also did a lot of practical research and published a book, *Against Plagiarism: A Guide for Editors and Authors*, that was published by Springer and funded by COPE (COPE, 2011; Zhang, 2016), which certainly raised JZUS's profile on the international scene, but this activity does not rate a score in PIJ evaluation indicators.

Is this 'an interesting story, or typical question' worth thinking about by journal publishers? Is there any way to quickly increase the IF? Even if there is, like increasing the nominator or decreasing the denominator of the IF equation, favouring review articles and hot topic articles, rejecting negative and confirmatory studies (Falagas & Alexiou, 2008; Wallner, 2009), and inflating self-citation (Miyamoto, 2017; Shah, Gul, & Gaur, 2015), is there a way to be regular or honest? Is it worth learning or worthy of respect in the area? Falagas and Alexiou (2008) suggested that editors and publishers should 'strive for quality through fair and thoughtful selection of papers forwarded for peer review and editorial comments that enhance the quality and scientific accuracy of a manuscript'.

So, in short, we firmly believe that eager success, quick gain, and other shortcuts are not the values that academic journal publishers should have.

What is a standard international journal?

We think that the first step for the internationalization of the Chinese E-L journals should be becoming a standard international journal. After discussion with an international peer (personal communication, 2018), we think a standard international journal would be able to demonstrate 'international' in two ways or more:

- Conforming to international standards (such as COPE, Crossref, ORCID etc.). Fu, Zhang, and Yan (2018) compared Chinese domestic journals with foreign counterparts, finding that the foreign leading journals adopt service technologies such as JATS and BITS, ORCID, and Crossref better than Chinese journals. We suggest that Chinese E-L journals should consider following the international publishing rules and trends, especially for the journals that are not cooperating with overseas publishers.
- Global inclusion (authorship/readership/global citation; international membership of publishing organizations like STM, ALPSP, SSP etc.). The Institute of Scientific and Technical Information of China (ISTIC, 2018) reported that the average overseas publication ratio for Chinese E-L journals in 2016 is 27%, which also includes the publications by cooperation

between Chinese and foreign authors, and only 52 Chinese E-L journals reached a ratio more than 50%. Table 4 shows that the global citation for the top two highest IF journals in China *Cell Research* and *Light-Science & Applications* are 68.9 and 53.8%, respectively. To our knowledge, few of the Chinese E-L journals play active roles in the international publishing industry associations. For example, as the only publishing editor from China, the first author of this article was invited to make a keynote speech in the STM US Conference, but there were very few participants from China. Therefore, more and more Chinese E-L journal editors should be encouraged to go to the international stage and express their views of the industry.

What factors do we consider in addition to the IF?

Today's evaluation of the impact of a journal must encourage us to ask ourselves: what factors do we consider in addition to the IF? What should the focus, or key performance indicators (KPIs), of a publisher and editorial team be? Is exclusive focus on IF the optimal way to manage a journal?

In summary, we believe that high impact should be focused on three points, from quantitative to qualitative:

- Quantitatively: Substantial effect on its discipline (IF, Cite Metric, etc.).
- Qualitatively: changing practice in the areas. For example, if a journal is cited in policy documents, government reports, or international award, this would make it a high-impact journal.
- International peer recognition and awards in publishing area, such as the ALPSP Annual Innovation Award and the London Book Fair International Excellence Award.

What publishing mode should Chinese periodicals choose in the long run?

An industry consultant in the West, Garlinghouse, asked 'Is the dependence of journals in China on foreign publishers something that the funders of PIJ should care about?' (person communication, April 20, 2018). Actually, in the past 30 years, 'to borrow a boat to go sea' or 'sailing by ship', as we call it, was the only way to the international market because, up to now, China did not have its own independent international periodical group platform and global market in English such as those that publishers like Springer Nature, Elsevier, OUP, and CUP have. We should greatly appreciate the overseas publishers that help Chinese E-L journals obtain international visibility. However, many of Chinese E-L journals find limited benefits from partnership with international publishers, which may be due to unrealistic expectations, especially for the non-SCI journals (Lin & Zhan, 2016). In the long run, Chinese E-L journals should have their own independent international market and platform in the world. We need about 5–10 years to learn how to open up the international market (global readership by library, university, and institution) with high

academic market consciousness, which is not for a quick profit or instant benefits.

What are the best practices in China or the field for evaluating journals?

We think it should be important to focus on 'trusted resource and academical integrity and the technological innovation', which is now discussed and advocated by the science and technology industry. The core idea is to 'make all the scientific output valuable so it can be used'. So, our mission is to enable valuable publications to be disseminated faster and wider for more potential influence. Therefore, we should not only pay attention to the quantitative evaluation but also pay more attention to the academic integrity and usefulness of the content of our journals, which will bring real value to scientific research and human progress. This topic is worthy of common discussion between academia and the publishing industry for future consensus. We also would like to ask this question to our Chinese colleagues and international peers to discuss it in our practice.

CONCLUSION

Although the scientific publication output from China has ranked first in the world, most of the articles were not published in the 548 Chinese E-L journals due to their limited capabilities. Since 1980, an average of 10 new E-L journals has been founded in Mainland China per year. Driven by the PIJ Plan, this figure has doubled, that is, 100 new journals have been published from 2013 to 2017; meanwhile, the Q1 journals increased more than fourfold in past 5 years. Even so, the quantity, quality, and international influence of Chinese E-L journals need to be carefully promoted.

So far, we still think the IF index itself is not wrong; the wrong thing is to use it as the most important indicator of a good journal and the only thing that drives the operation. If we look at the 2021 STM Publishing technology trends and values, such as 'Trust & Integrity', it is necessary for Chinese publishers to include them in their critical thinking. Then, we should build a journal strategic plan, taking it from innovation to market according to international standards, and ensure that the product is capable of sustainable development.

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