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International visibility of Chinese scientific journals

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We discuss the internationalisation and the visibility of Chinese journals covered by the Institute for Scientific Information (ISI). Attention is focused on physics and chemistry journals. For these journals the country of origin of published papers and their citation patterns are analysed. As an indicator of internationality we further consider the composition of their editorial boards. It is concluded that even those Chinese journals that are covered by ISI are still rather 'local' and suffer from a low visibility in the world. Yet we are optimistic about the future of Chinese science and its scientific journals.

Introduction: increasing numbers of Chinese scientific journals are indexed by ISI's databases

In this article we study the international visibility and the importance, both international and local, of Chinese journals covered by ISI. Particular attention goes to chemistry and physics journals. As visibility indicators we consider: citation patterns, including author and journal self-citations, and the composition of the editorial board. Related to this we discuss the role of Chinese scientific journals in research performance assessment exercises.

Evolution of Chinese scientific journals and papers indexed by the SCI and the SCI-E

Between 1996 and 1999, the number of Chinese scientific journals indexed by SCI and SCI Expanded (in short: SCI-E) has increased from 4 to 14 and from 28 to 55, respectively (see Table 1).

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Table 1 Number of Chinese scientific journals indexed by SCI and SCI-E from 1996 to 1999

Year	1996	1997	1998	1999
SCI	4	9	11	14
SCI Expanded	28	35	47	55

Moreover, the number of Chinese SCI papers, by which we mean (here) articles with a Chinese first author, has also greatly increased in the 1990s (Table 2). Defining the increase ratio between year Y_1 and year Y_2 as

$$\frac{N(Y_2)-N(Y_1)}{N(Y_1)}\times 100\% \qquad (1)$$

where $N(Y_j)$ denotes the number of journals, or articles covered in the year Y_j, we see that the increase ratios for journals are 250% (SCI) and 96.4% (SCI-E).The increase ratio for Chinese articles covered by ISI is 115%. As to those published in Chinese scientific journals (covered by ISI), an even larger increase of 172% is observed. This difference indicates that Chinese scientific journals are playing an increasingly important role in the country's scientific production (at least as viewed through ISI's databases).

Table 2. Number of Chinese SCI papers published from 1992 to 1999

Year	1992	1993	1994	1995	1996	1997	1998	1999	Increase
A	6224	6645	6721	7980	8200	10033	11456	13357	115 %
B	1003	1007	838	1087	734	1708	2119	2733	172 %
B/A (%)	16	15	12	14	9	17	19	20	
C	5221	5638	5883	6893	7466	8325	9337	10624	103 %
C/A (%)	84	85	88	86	91	83	81	80	

A – Number of Chinese SCI papers; B – Number of Chinese SCI papers published in Chinese journals; C – Number of Chinese SCI papers published in non-Chinese journals.

Chinese research emphasizes physics and chemistry

The distribution per discipline of Chinese scientific journals in the SCI-E for the year 1998 is listed in Table 3. This table shows that there are relatively more chemistry and physics journals covered by SCI-E than journals from other disciplines.

Table 3. Distribution of Chinese scientific journals covered by SCI-E in 1998 according to scientific discipline

Discipline	Number of journals	Percentage (%)
Chemistry	10	21.3
Physics	8	17.0
Technology	7	15.0
Biology	4	8.5
Mathematics	4	8.5
Medicine	4	8.5
Material Sciences	3	6.4
Multidisciplinary	3	6.4
Mechanics	2	4.2
Geology	2	4.2
Total	47	100.0

Chemistry and physics are also the fields in which China has the higher number of publications and citations (in the SCI). This is shown in Table 4.

Table 4. Article production and citations in different disciplines

Discipline	A	A%	B	B%	C	C%
Chemistry	3040	26.5	3419	29.6	6628	30.8
Physics	2885	25.2	3626	31.4	7077	32.9
Biology	936	8.2	885	7.7	1693	7.9
Material Science	711	6.2	602	5.2	991	4.6
Mathematics	630	5.5	456	3.9	689	3.2
Basic Medicine	561	4.9	317	2.7	657	3.1
Earth Science	367	3.2	257	2.2	485	2.3
Medicine	242	2.1	192	1.7	318	1.5
Elec. Comm.	216	1.9	218	1.9	418	1.9
Clinical Medicine	204	1.8	195	1.7	331	1.5
Other	1664	14.5	1382	12.0	2224	10.3
Total	11456	100.0	11549	100.0	21511	100.0

A – number of SCI papers in 1998 (first author Chinese); B – number of cited SCI papers (at least once) published in 1993-1997 (citations in 1998); C – number of citations in 1998 for papers published in 1993-1997.

Tables 3 and 4 indicate that chemistry and physics play a leading role in Chinese basic research. Indeed these are the fields in which China is the strongest, and this already for quite some time.[1-3]

We have calculated the concentration of publications and citations (based on Table 4) using the Gini index and the coefficient of variation.[4,5] Results are given in Table 5. These results indicate a high degree of concentration (in the fields of physics and chemistry). They, moreover, confirm the general tendency that the more difficult it becomes to obtain 'credits' the higher the concentration (showing the presence of elitism). Indeed, the concentration values for publications are the lowest, followed by those for cited articles (at least once), while taking all citations into account leads to the highest degree of concentration.[6]

Table 5. Gini indices and coefficients of variations for columns A, B and C of Table 4

Concentration measure	column A (Table 4)	column B (Table 4)	column C (Table 4)
Gini index	0.4826	0.5526	0.5676
Coefficient of variation	0.9504	1.1582	1.2167

Table 6. Chinese physics and chemistry journals covered by the SCI and the SCI-E (1998), ranked by impact factor

Journal name	IF	L.	JCR Category	Rank
HIGH ENERG PHYS NUCL	0.818	C	Phys, Nuclear	15
	0.818		Phys, Particles & Fields	12
ACTA MECH SINICA	0.506	E	Mechanics	40
	0.506		Engineering, Mech	23
SCI CHINA SER B	0.479	E	Chemistry	74
CHEM J CHINESE U	0.331	C	Chemistry	88
SCI CHINA SER A	0.273	E	Multidisciplinary Sci	34
CHINESE PHYS LETT	0.254	E	Physics	56
CHIN J CHEM	0.229	E	Chemistry	97
CHEM RES CHINESE U	0.208	E	Chemistry	100
CHINESE J CHEM ENG	0.202	E	Engineering, Chem	84
CHIN CHEM LETT	0.195	E	Chemistry	103
ACTA CHIM SINICA	0.178	C	Chemistry	108
COMMUN THEOR PHYS	0.150	E	Physics	61
CHINESE J POLYM SCI	0.088	E	Polym Sci	63
ACTA PHYS SIN-OV ED	0.065	E	Physics	65
ACTA MECH SOLIDA SIN	0.041	E	Mechanics	80
	0.041		Materials Sci	136
ACTA PHYS-CHIM SIN		C	NO DATA	
ACTA POLYM SIN		C	NO DATA	
APPL MATH MECH		E	NO DATA	

Table 6 gives the Chinese physics and chemistry journals covered by ISI (1998), their impact factor, the language of the published articles (E: English; C: Chinese with English titles, abstracts and keywords), JCR (Journal Citation Reports) category to which they belong and the rank the journal occupies in this category. Some journals are classified in two categories: accordingly, data for both categories are presented. Three journals are covered by SCI-E but not by the JCR. Appendix A gives full titles of all journals. Appendix B gives more information about the relative stature of these journals within their journal category.

Internationalisation: analysis of Chinese chemistry and physics journals

What do we mean by an 'international' journal? There are many aspects that make a journal an international one. In our opinion, and following *Wormell*,[7] *Zitt* and *Bassecoulard*,[8] *Gutiérrez* and *López-Nieva*,[9] the most important ones are: attracting authors from all over the globe, having an international readership, an international editorial board and attracting citations from scientists from all nationalities.

Analysing the internationalisation of Chinese scientific journals, we consider the article source (Chinese or overseas), the citation pattern of Chinese chemistry and physics journals covered by SCI-E and their editorial boards.

Citation analysis of SCI-E covered chemistry and physics journals

According to *Moed*,[10] Chinese articles in the field of chemistry are published for 89% in Chinese journals (and only 11% in journals not published in China).

An analysis of the citations (in 1998) of 18 Chinese chemistry and physics journals indicates that citations to these journals come mainly from other Chinese authors (Table 7). Indeed, Table 7 shows that 24% of all citations received by a Chinese physics or chemistry journal are actually first author self-citations; counting all national self-citations (Chinese first authors citing Chinese first authors) amounts to 81% of all citations.

A linear regression of column D (number of first author self-citations) over column C (total number of citations) gives the following best-fitting line: $D = 0.2005\ C + 8.657$ (correlation coefficient $R = 0.92$); similarly, a regression of column F (Chinese citations) over column C gives: $F = 0.8393\ C - 6.3644$ (correlation coefficient $R = 0.98$). These two regression lines are shown in Figures 1 and 2. For calculations of the linear regression lines and the meaning of the correlation coefficient we refer to *Egghe* and *Rousseau*.[5]

Table 7. Citations of Chinese physics and chemistry journals covered by ISI (1998)

A	B	C	D	E	F	G
HIGH ENERG PHYS NUCL	0.818	147	46	31.3	140	95.2
ACTA MECH SINICA	0.506	167	47	28.1	147	88.0
SCI CHINA SER B	0.479	488	88	18.0	391	80.1
CHEM J CHINESE U	0.331	772	174	22.5	695	90.0
SCI CHINA SER A	0.273	425	114	26.8	363	85.4
CHINESE PHYS LETT	0.254	329	119	36.2	274	83.3
CHIN J CHEM	0.229	145	32	22.1	94	64.8
CHEM RES CHINESE U	0.208	77	24	31.2	57	74.0
CHINESE J CHEM ENG	0.202	30	9	30.0	18	60.0
CHIN CHEM LETT	0.195	354	81	22.9	213	60.2
ACTA CHIM SINICA	0.178	549	71	12.9	419	76.3
COMMUN THEOR PHYS	0.150	233	72	30.9	194	83.3
CHIN J POLYM SCI	0.088	74	12	16.2	58	78.4
ACTA PHYS SIN-OV ED	0.065	38	11	28.9	30	78.9
ACTA MECH SOLIDA SIN	0.041	37	9	24.3	29	78.4
ACTA PHYS-CHIM SIN	–	38	11	28.9	34	89.5
ACTA POLYM SIN	–	45	21	46.7	44	97.8
APPL MATH MECH	–	13	9	69.2	10	76.9
TOTAL		3961	950	24.0	3210	81.0

A – Journal name; B – 1998 Impact Factor (if given in the Journal Citation Reports); C – Total number of citations received in 1998; D – Number of first author self-citations in 1998; E – D/C (%); F – Number of citations originating from articles with a Chinese first author, including self-citations; G – F/C%.

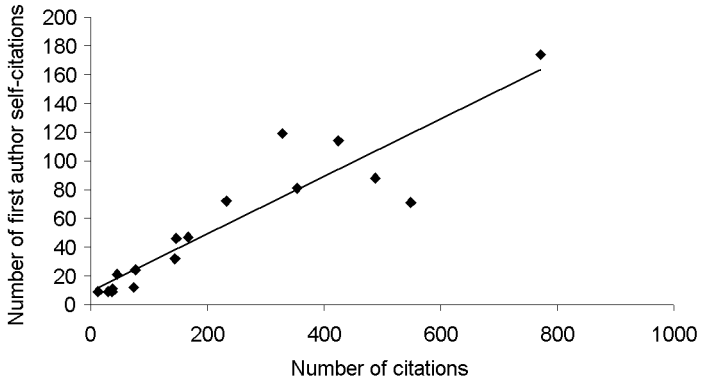

Figure 1. First-author self-citations as a function of all (journal) citations

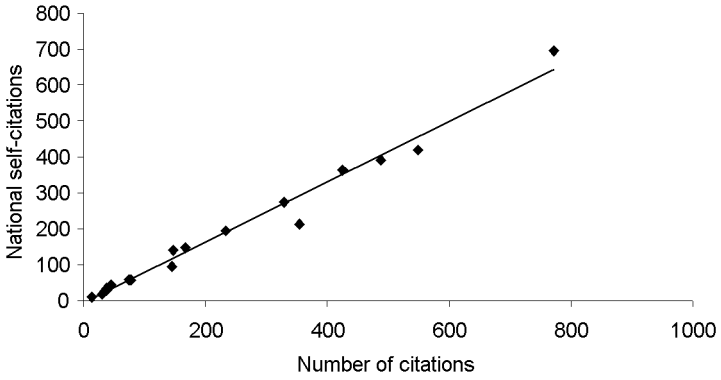

Figure 2. National self-citations as a function of all (journal) citations

These figures show that first-author self-citations and national self-citations are highly correlated with the total number of citations to these journals. In particular, a journal's total number of citations is an excellent predictor for the number of national self-citations (Figure 2). Moreover, data presented in Appendix C (Table 12) show that about 40% of ISI's 1998 impact factor of these journals originates from first author self-citations.

Table 8. Journal self-citations (in 1998) of Chinese physics and chemistry journals covered by ISI

A	B	C	D	E	F
HIGH ENERG PHYS NUCL	147	26	17.7	98	66.7
ACTA MECH SINICA	167	11	6.6	48	28.7
SCI CHINA SER B	488	24	4.9	207	42.4
CHEM J CHINESE U	772	327	42.4	453	58.7
SCI CHINA SER A	425	54	12.7	183	43.1
CHINESE PHYS LETT	329	60	18.2	93	28.3
CHIN J CHEM	145	16	11.0	37	25.5
CHEM RES CHINESE U	77	6	7.8	29	37.7
CHINESE J CHEM ENG	30	3	10.0	4	13.3
CHIN CHEM LETT	354	7	2.0	62	17.5
ACTA CHIM SINICA	549	83	15.1	175	31.9
COMMUN THEOR PHYS	233	66	28.3	104	44.6
CHIN J POLYM SCI	74	4	5.4	12	16.2
ACTA PHYS SIN-OV ED	38	4	10.5	9	23.7
ACTA MECH SOLIDA SIN	37	3	8.1	12	32.4
ACTA PHYS-CHIM SIN	38	0	0.0	5	13.2
ACTA POLYM SIN	45	13	28.9	14	31.1
APPL MATH MECH	13	12	92.3	13	100.0
TOTAL	3961	719	18.2	1558	39.3

A – Journal name; B – Total number of citations; C – Number of journal self-citations; D – self-cited rate = C/B (%); E – Chinese journal self-citations; F – country self-cited rate = E/B (%)

In Table 8 we analyse the internationality of the citations received by Chinese physics and chemistry journals. Although, generally, the journal self-cited rates are not excessively high (column D), column F shows that many citations originate from other Chinese journals. In view of the previous table we may safely assume that many of these are author self-citations.

Composition of editorial boards

The composition of the editorial board of a scientific journal is another indicator for its international visibility. Table 9 shows that only one Chinese journal has more than 50% overseas members in the board. It is, however, well known that in many journals (not only Chinese ones) it is actually the office of the main editor that runs the journal, and many members are only honorary members that do not take part in the main editorial decisions.

Table 9. Overseas and Chinese members of editorial boards of Chinese ISI-covered physics and chemistry journals

A	B	C	D
HIGH ENERG PHYS NUCL	12	45	21%
ACTA MECH SINICA	26	29	47%
SCI CHINA SER B	0	31	0%
CHEM J CHINESE U	2	68	3%
SCI CHINA SER A	0	38	0%
CHINESE PHYS LETT	3	41	7%
CHIN J CHEM	0	59	0%
CHEM RES CHINESE U	2	68	3%
CHINESE J CHEM ENG	9	33	21%
CHIN CHEM LETT	3	23	12%
ACTA CHIM SINICA	5	58	8%
COMMUN THEOR PHYS	0	38	0%
CHIN J POLYM SCI	18	17	52%
ACTA PHYS SIN-OV ED	9	44	17%
ACTA MECH SOLIDA SIN	44	67	40%
ACTA PHYS-CHIM SIN	0	61	0%
ACTA POLYM SIN	3	48	6%
APPL MATH MECH	2	93	2%
TOTAL	138	861	14%

A – Journal name; B – number of overseas members; C – number of Chinese board members; D = B/(B+C) percentage of overseas members (%) [Note that CHEM J CHINESE U and CHEM RES CHINESE U have the same editorial board.]

Country of origin of articles published in SCI-E covered chemistry and physics journals

Considering the first authors of papers from the analysed 18 journals (Table 10), we see that two journals' papers are all from Mainland China, ten journals have only one or two papers from abroad, and only one journal has more than ten papers from abroad.

Table 10 Number of authors of some Chinese SCI covered journals in 1998

A	B	C	D	E	F	G	H	I
HIGH ENERG PHYS NUCL	165	1076	164	99.4	1048	97.4	159	96.4
ACTA MECH SINICA	40	93	36	90.0	80	86.0	28	70.0
SCI CHINA SER B	90	411	90	100.0	402	97.8	83	92.2
CHEM J CHINESE U	340	1841	319	93.8	1819	98.8	325	95.6
SCI CHINA SER A	163	427	159	97.5	412	96.5	150	92.0
CHINESE PHYS LETT	272	1408	264	97.1	1328	94.3	232	85.3
CHIN J CHEM	76	284	74	97.4	272	95.8	70	92.1
CHEM RES CHINESE U	58	411	57	98.3	394	95.9	46	79.3
CHINESE J CHEM ENG	48	153	44	91.7	123	80.4	35	72.9
CHIN CHEM LETT	55	216	55	100.0	211	97.7	52	94.5
ACTA CHIM SINICA	190	847	189	99.5	837	98.8	182	95.8
COMMUN THEOR PHYS	218	549	210	96.3	525	95.6	200	91.7
CHIN J POLYM SCI	52	213	45	86.5	193	90.6	42	80.8
ACTA PHYS SIN-OV ED	87	335	84	96.6	320	95.5	81	93.1
ACTA MECH SOLIDA SIN	37	113	36	97.3	109	96.5	36	97.3
ACTA PHYS-CHIM SIN	215	846	214	99.5	838	99.1	210	97.7
ACTA POLYM SIN	116	438	115	99.1	431	98.4	109	94.0
APPL MATH MECH	125	281	123	98.4	277	98.6	122	97.6
TOTAL	2347	9942	2278	97.1	9619	96.8	2162	92.1

A – Journal name; B – Number of articles; C – Total number of authors of all papers; D – Number of Chinese first authors; E – Percentage of Chinese first authors: D/B (%); F – Total number of Chinese authors; G – Percentage of Chinese authors: F/C (%); H – Number of articles written completely by Chinese authors; I – Percentage of articles written completely by Chinese authors: H/B (%)

Discussion of the role of Chinese scientific journals in assessing the international research performance of Chinese scientists

The development of Chinese scientific papers, as measured by ISI, is startling compared with the world scientific production. China, which was 15th among about 50 producers of science in 1995, ascended to the 10th place in 1999.[2,11,12] On the other hand, with more and more Chinese journals indexed by SCI and SCI-E, the ratio of Chinese SCI papers published in Chinese journals increased firmly, i.e., from 14% in

1995 to 20% in 1999. As to the Chinese SCI-E papers, this ratio is even larger, i.e., among the 19936 Chinese SCI-E papers (based on a first author count), there are 7674 published in Chinese journals. The ratio is about 38%. Strictly speaking, those papers published in Chinese scientific journals should not be classified as international production.[13] Indeed, *Moed*[10] suggests excluding the national Chinese journals from an analysis of the position of Chinese research from an international perspective.

Note that usually assessment of science puts extra weight on international visibility.[14] Yet it is debatable if publishing only mainstream research in international journals is the best for every country. Often countries situated in tropical regions have a typical vegetation, fauna and climate. Also diseases may be indigenous. Under those circumstances it is in the best interest of the country that research is performed on these typical points of interest, and published in the local language (in local journals). This point was also made by *Torricella-Morales*, *Van Hooydonk* and *Araujo-Ruiz*[15] in an analysis of Cuban research. Comparing local data with ISI's data and the indicators derived from it gives an 'outsider's' view on research being done in a scientific institute or, even, a country. Such an outsider's view does not imply any commitment to coherently developing the scientific activities of the institute (or country).[16] This should be taken into account in any evaluation exercise. Following *Lane*[17] we could say about this subject that science should erase borders, but that still each community should retain its identity.

It must be observed that for a complete assessment of Chinese science also local journals must be taken into account. For this reason China has developed its own citation indexes: the *Chinese Science Citation Database* (CSCD)[18,19] and the *Chinese Science and Technology Publications and Citations* (CSTPC).[20,21] These two databases cover at the moment more than 1000 journals each (but with a considerable overlap).

Impact factors of Chinese scientific journals are indicators of a low international visibility: some possible explanations

What are the reasons that Chinese journals, even those indexed by ISI, have such a low total number of citations? (A question also raised by *Moed*.[10]) There are many possible reasons. We just mention them, without implying though what are the most important ones.

1) The influence of scientific evaluation procedures. Under the pressure of scientific evaluation procedures Chinese scientists tend to publish their more important work in international journals.[22] Indeed, about 80% of all Chinese articles in the SCI are published in journals published outside China. This enhances the international visibility

of Chinese scientists, leading to a bigger chance to be cited by colleagues from around the globe. A similar effect has been observed for Japanese publications.[23]

2) Local versus international science, language problems. A consequence of the preceding argument is that many articles published in Chinese journals are either only of local importance (but may be of a very high scientific level) or are those that were rejected by international journals. Note, though, that this rejection may be an indication of low qualify (at least as perceived by the journal's referees), but may also be an indication of the poor style and use of the language in which the article was written.

3) Low international subscription rates of Chinese journals. There is clearly only a small market outside China for Chinese language scientific journals. Yet, also the English language Chinese scientific journals have very low subscription rates. There are many English language Chinese journals having no more than 100 foreign subscriptions.[24] As scientists may shy away from reading articles that their own libraries do not subscribe to, these low subscription numbers have a detrimental effect on the visibility and use of Chinese journals.

4) Chinese researchers do not cite their own journals at the expected level. Considering the local Chinese database CSTPC (made available by ISTIC), we found that the average number of references is 6.58. For the other local Chinese database, the CSCD, the average (for the years 1998 and 1999) is 8.1.[25] Recall though that, according to *Abt*,[26] in the physical sciences the average number of references is a linear function of the paper length (in the West), while *Hargens*[27] notes that in a number of fields (astronomy, chemistry, theoretical nuclear physics) the median number of references per paper is between 15.5 and 18. In organizational population ecology it is even 46.5. The lowest median number (in his study) is found for literary criticism (9), still higher than the (average) number of references in Chinese journals. We checked these assertions for a number of articles published in Chinese chemical and physical journals covered by ISI[28] and found the following values. The articles in chemical journals had an average of 4.7 pages (median value: 4) and an average number of references equal to 11.4 (median value: 10). The articles in physical journals had an average number of 5.1 pages (median value: 5) and an average number of 13.5 references (median value: 12). All these values are higher than those for a general Chinese article published in a local journal, but are still low compared with an international standard. Best linear fits between number of references and number of pages (checking *Abt*'s claim) are as follows:

We investigated 7 issues of Chinese chemistry journals (SCI CHINA SER B, ACTA CHIM SINICA, CHINESE J ANAL CHEM (in Chinese), ACTA PHYS-CHIM SIN (2 issues), CHEM J CHINESE U (2 issues)) and 10 issues of physics journals

(SCI CHINA SER A, J. INFRARED MILLIMETER WAVES (in Chinese), CHINESE PHYS LETT (2 issues), CHINESE PHYSICS (changed from ACTA PHYS SIN-OV ED), ACTA PHYS SIN (in Chinese; 5 issues)), all published in 2000. Best linear fits are: for chemical journals: $y = 1.12 x + 6.15$, with correlation coefficient 0.33 and for physical journals: $y = 0.85 x + 9.1$, with correlation coefficient 0.25. In both equations the variable y denotes the number of references, and the variable x denotes the number of pages. A standard t-test rejects the null hypothesis of no correlation (in both cases, on any reasonable significance level), see *Egghe* and *Rousseau*.[5]

It even happens that Chinese researchers, publishing about China in international journals, do not cite a single Chinese journal.* In this context it should be mentioned that more studies such as *Liu*'s[28] on the citing motivation of Chinese scientists would be very welcome. She found, for a group of Chinese physicists, that the quantity of references depended heavily on how heavily the institutional library was used. Most uses of library materials were concentrated on prestigious English language journals. These physicists gave the least attention to publications in Chinese. *Liu* concluded that these scientists most carefully selected references which they considered essential to their work (the knowledge claim).

Some problems with citations of Chinese scientific journals – the case of the Chinese Science Bulletin

Many English journals published in China have a Chinese counterpart. In general, only the English edition journals are indexed by ISI. For example, there are 47 Chinese scientific journals covered by SCI-E in 1998. Among these 47 journals, 34 journals are published in English, and 21 of the 34 journals are also published in Chinese. Although some articles appear in both editions, not all do.

Mistakes of references and different language edition of Chinese SCI-E covered journals result in many problems in cited items for Chinese scientific journals. The following examples come from the *Chinese Science Bulletin (CSB)*.

Chinese Science Bulletin is a high quality multi-disciplinary journal in China, published in an English and in a Chinese edition. In 1998, this journal was cited about

* A case in point (admitting this is just anecdotal evidence) is: Sato K (from Japan), Liu Y Y (from China), Zhu Z C, et al. Paleomagnetic study of middle Cretaceous rocks from Yunlong, western Yunnan, China: evidence of southward displacement of Indochina. *Earth and Planetary Science Letters*, 1999, 165: 1-15. This article has 51 references, of which 46 refer to journal articles. Not a single Chinese journal is cited, which seems odd, given the subject of this article.

1000 times, which is the highest number among all Chinese scientific journals covered by SCI-E. Among the 1000 cited items, 86 and 147 are citations to articles published in 1997 and 1996, respectively.

Among the 86 cited items of 1997, 17 items could not be found in the CSB, 16 items belong to CSB's Chinese edition and 2 items are duplicates. The error rate is 41%. Among the 147 cited items of 1996, 35 items could not be found in the CSB, 52 items belong to CSB's Chinese edition and 4 items are duplicates. The error rate is 62%.

We see that the problems with the *Chinese Science Bulletin* are similar to those with the journal *Angewandte Chemie.*[29]

Conclusion

Overall quality (also related to the use of the English language) and low international visibility are two key problems for Chinese scientific journals. Yet, we predict that an increase in citations (due to an increase in quality and higher conformity with international publication and research habits) will follow the observed increase in publications. This, together with increased Web visibility, will lead to higher subscription rates for Chinese journals, so that in the foreseeable future most Chinese (mainly English language) journals will join the group of international mainstream journals.

A note on style

A referee commented that the article should be organized according to a subdivision in methodology – results – discussion (with an introduction and a conclusion). We claim though that such a division, originating in the fields of biomedicine, physics and chemistry is not appropriate for this article (and many others in the fields of scientometrics, information science and even mathematics). In this article there are no formal methods used, hence also no results. Indeed, we only present a discussion, supported with data. This together with an introduction and a conclusion constitutes (we hope) an acceptable form for an article in our field. We do not claim to exhaust all possible elements related to the visibility of Chinese journals. On the contrary, we are convinced that more articles can be written on this subject, considering the issue from other points of view. We just hope that we have presented some acceptable arguments for such a discussion.

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References

1. Y. SHANG, China's scientific and technical standards as analysed from document statistics, *Journal of the China Society for Scientific and Technical Information*, 7 (1988), 252-266 (in Chinese). English translation published in: G. RUI and P. DALE, (Eds) *Information Science in China*, London: ASLIB, (1991) 66–95.
2. B. MÉLY, M. ABD EL KADER, G. DUDOGNON, Y. OKUBO, Scientific publications of China in 1994: evolution or revolution? *Scientometrics*, 42 (1998) 3–16.
3. Y. OKUBO, JC. DORE, T. OJASOO, J.F MIQUEL, A multivariate analysis of publication trends in the 1980s with special reference to South-East Asia, *Scientometrics*, 41 (1998) 273–289.
4. D. NIJSSEN, R. ROUSSEAU, P. VAN HECKE, The Lorenz curve: a graphical representation of evenness, *Coenoses*, 13 (1998) 33–38.
5. L. EGGHE, R. ROUSSEAU, *Elementary statistics for effective library and information service management*. London: ASLIB-IMI, 2001.
6. R. ROUSSEAU, Concentration and diversity of availability and use in information systems: a positive reinforcement model, *Journal of The American Society for Information Science*, 43 (1992) 391–395.
7. I. WORMELL, Informetric analysis of the international impact of scientific journals: how 'international' are the international journals? *Journal of Documentation*, 54 (1998) 584–605.
8. M. ZITT, E. BASSECOULARD, Another view on internationalization of scientific communication: evolutions at the journal level. In: C. A. MACIAS-CHAPULA (Ed.) *Proceedings of the seventh conference of the International Society for Scientometrics and Informetrics*, Universidad de Colima, 1999, 558–570.
9. J. GUTIÉRREZ, P. LÓPEZ-NIEVA, Are international journals of human geography really international? *Progress in Human Geography*, 25 (2001) 53–69.
10. H. F. MOED, Bibliometric assessment of research performance based on the Science Citation Index: opportunities for China. To be published in: *Proceedings of the Second International Symposium on Quantitative Evaluation of Research Performance*, Shanghai, China, 23-25 October 2000.
11. ISTIC (Institute of Scientific and Technical Information of China), *Annual Report of Statistics and Analyses for Chinese S&T Papers (1995)*, ISTIC: Beijing, 1996 (in Chinese).
12. ISTIC (Institute of Scientific and Technical Information of China), *Annual Report of Statistics and Analyses for Chinese S&T Papers (1999)*, ISTIC: Beijing 2000 (in Chinese).
13. VAN LEEUWEN, TH. N., MOED, H. F., TIJSSEN, R. J. W., VISSER, M. S., VAN RAAN, A. F. J., First evidence of serious language-bias in the use of citation analysis for the evaluation of national science systems. *Research Evaluation*, 9 (2000) 155–156.
14. J. RUSSELL, Publication indicators in Latin America revisited. In: B. CRONIN and H. B. ATKINS (Eds), *The Web of Knowledge . A Festschrift in Honor of Eugene Garfield.* Medford (NJ): Information Today, 2000, pp. 233–250.

15. R. G. TORRICELLA-MORALES, G. VAN HOOYDONK, J.A. ARAUJO-RUIZ, Citation analysis of Cuban research. Part 1. A case study: the Cuban Journal of Agricultural Science, *Scientometrics*, 47 (2000) 413–426.
16. G. PERRY, Research evaluation, *The Scientist*, 15 (1) (2001) 6.
17. N. LANE, Erasing the boundaries and retaining the identities. Talk presented at the "Internationality of Research Symposium", 1996, http://www.nsf.gov/od/lpa/forum/lane/nl96-ger.htm
18. B. JIN, B. WANG, Chinese Science Citation Database: its construction and application. *Scientometrics*, 45 (1999) 325–332.
19. R. ROUSSEAU, B. JIN, N. YANG, X. LIU, Observations concerning the two- and three-year synchronous impact factor, based on the Chinese Science Citation Database, *Journal of Documentation*, 57 (2001) 349–357.
20. ISTIC (Institute of Scientific and Technical Information of China), *Annual Report of Statistics and Analyses for Chinese S&T Papers (1988)*, ISTIC, Beijing 1989 (in Chinese).
21. GROUP for STATISTICS and ANALYSIS of CHINESE ARTICLES, Chinese sci-tech paper and citation database selection standard and application process, *Chinese Journal of Scientific and Technical Periodicals*, 12 (2001) 177-178 (in Chinese).
22. S. REN, G. ZU, P. LIANG, Quality of Chinese scientific journals needs to be improved, *Science Foundation in China*, 7 (1) (1999) 16–17.
23. T. STANKUS, K. ROSSEEL, W.C. LITTLEFIELD, Is the best Japanese science in Western journals? *The Serials Librarian*, 14 (1988) 95–107.
24. S. REN, P. LIANG, G. ZU, The challenge for Chinese scientific journals. *Science*, 286 (1999) 1683.
25. B. JIN, E-mail communication on May 12, 2001.
26. H. A. ABT, The reference-frequency relation in the physical sciences, *Scientometrics*, 49 (2000) 443–451.
27. L. L. HARGENS, Using the literature: reference networks, reference contexts, and the social structure of scholarship, *American Sociological Review*, 65 (2000) 846–865.
28. M. LIU, A study of citing motivation of Chinese scientists, *Journal of Information Science*, 19 (1993) 13–23.
29. T. BRAUN, W. GLÄNZEL, The sweet and sour of journal citation rates, *The Chemical Intelligencer*, (January), (1995) 31–32.

Appendix A
Full titles of Chinese chemistry and physics journals studied in this article

ACTA CHIM SINICA	Acta Chimica Sinica
ACTA MECH SINICA	Acta Mechanica Sinica
ACTA MECH SOLIDA SIN	Acta Mechanica Solida Sinica
ACTA PHYS-CHIM SIN	Acta Physico-Chimica Sinica
ACTA PHYS SIN-OV ED	Acta Physica Sinica – Overseas Edition
ACTA POLYM SIN	Acta Polymerica Sinica
APPL MATH MECH	Applied Mathematics and Mechanics
CHEM J CHINESE U	Chemical Journal of Chinese Universities
CHEM RES CHINESE U	Chemical Research in Chinese Universities
CHIN CHEM LETT	Chinese Chemical Letters
CHIN J CHEM	Chinese Journal of Chemistry
CHINESE J CHEM ENG	Chinese Journal of Chemical Engineering
CHINESE J POLYM SCI	Chinese Journal of Polymer Science
CHINESE PHYS LETT	Chinese Physics Letters
COMMUN THEOR PHYS	Communications in Theoretical Physics
HIGH ENERG PHYS NUCL	High Energy Physics & Nuclear Physics English Edition
SCI CHINA SER A	Science in China Series A – Mathematics Physics Astronomy
SCI CHINA SER B	Science in China Series B – Chemistry

Appendix B
Category related information about Chinese Physics & Chemistry journals covered in the 1998 edition of the JCR

Journal Name	IF	Journal Category	Rank	Tot J	IF(Max) Journal	IFMax
HIGH ENERG PHYS NUCL	0.818	Phys, Nuclear	15	21	Annu Rev Nucl Part S	4.281
	0.818	Phys, Particles & Fields	12	18	Annu Rev Nucl Part S	4.281
ACTA MECH SINICA	0.506	Mechanics	40	83	Annu Rev Fluid Mech	6.214
	0.506	Engineering, Mech	23	95	Adv Appl Mech	3.778
SCI CHINA SER B	0.479	Chemistry	74	126	Chem Rev	20.228
CHEM J CHINESE U	0.331	Chemistry	88	126	Chem Rev	20.228
SCI CHINA SER A	0.273	Multidisciplinary Sci	34	62	Nature	28.833
CHINESE PHYS LETT	0.254	Physics	56	65	Rev Mod Phys	13.439
CHIN J CHEM	0.229	Chemistry	97	126	Chem Rev	20.228
CHEM RES CHINESE U	0.208	Chemistry	100	126	Chem Rev	20.228
CHINESE J CHEM ENG	0.202	Engineering, Chem	84	113	Chem Phys Carbon	8.667
CHIN CHEM LETT	0.195	Chemistry	103	126	Chem Rev	20.228
ACTA CHIM SINICA	0.178	Chemistry	108	126	Chem Rev	20.228
COMMUN THEOR PHYS	0.150	Physics	61	65	Rev Mod Phys	13.439
CHINESE J POLYM SCI	0.088	Polym Sci	63	67	Adv Polym Sci	4.486
ACTA PHYS SIN-OV ED	0.065	Physics	65	65	Rev Mod Phys	13.439
ACTA MECH SOLIDA SIN	0.041	Mechanics	80	83	Annu Rev Fluid Mech	6.214
	0.041	Materials Sci	136	143	Adv Mater	4.960

Tot J – The number of journals included in the category
IF(Max) Journal – Name of the journal with maximum IF in the corresponding category
IFMax – IF value of the journal with the highest impact factor

Appendix C
Data for calculating the percentage of Chinese journal's impact factor attributable to first-author self-citations (collected by Shengli Ren)

Journal name	TC	SC	S96	T96	S97	T97	S98	T98
HIGH ENERG PHYS NUCL	147	46	15	33	7	12	1	2
ACTA MECH SINICA	167	47	10	22	8	13	1	1
SCI CHINA SER B	488	88	17	42	9	27	3	4
CHEM J CHINESE U	772	174	38	148	53	133	16	25
SCI CHINA SER A	425	114	15	42	24	42	5	8
CHINESE PHYS LETT	329	119	24	64	42	69	11	15
CHIN J CHEM	145	32	9	29	3	12	0	0
CHEM RES CHINESE U	77	24	7	16	3	5	1	2
CHINESE J CHEM ENG	30	9	0	5	6	11	1	1
CHIN CHEM LETT	354	81	30	100	20	45	0	1
ACTA CHIM SINICA	549	71	10	43	9	20	4	5
COMMUN THEOR PHYS	233	72	10	18	21	37	6	12
CHIN J POLYM SCI	74	12	1	4	1	3	2	4
ACTA PHYS SIN-OV ED	38	11	3	14	5	9	2	2
ACTA MECH SOLIDA SIN	37	9	1	3	2	3	0	0
ACTA PHYS-CHIM SIN	38	11	0	0	8	15	0	1
ACTA POLYM SIN	45	21	4	11	3	9	2	3
APPL MATH MECH	13	9	0	0	9	10	0	1
TOTAL	3961	950	194	594	233	475	55	87

TC — Total number of citations received in 1998.
SC — Number of first author self-citations in 1998.
S96, S97, S98 — Number of first author self-citations in 1998 for papers published in 1996, 1997 and 1998, respectively.
T96, T97, T98 — Number of papers published in 1996, 1997 and 1998, respectively.

This table shows that 233 + 194 (= 427) journal citations are actually first-author self-citations. As the total number of journal citations is 475 + 594 (= 1069), we may conclude that first-author self-citations contribute for 0.3994 ≈ 40% to the total 1998 journal impact factor of Chinese Physics & Chemistry journals covered by the JCR.

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