Evaluating quality of research papers of U.S. and China via Nature Index journals

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Abstract

A Japanese research institution reported that the quality of scientific research papers published by China has surpassed that of the U.S., ranking first in the world. However, the conclusion is questionable. Currently, there is no standard way to compare the quality of published research papers. In general, most high-quality papers are consistently published in Nature Index journals. Therefore, the quality of research papers can be assessed by comparing the number of papers published in Nature Index journals, which is a reliable method. Here, I first analyze the number of research papers published in all Nature Index journals in the last 3 years of U.S. and China. Further, I assess the quality of research papers published in China and the U.S. We can find that in the four fields of natural science research including chemistry, earth and environmental science, life science and physical science, the number of publications in the United States is higher than that in China. Among them, the gap is the largest in the field of life science research, the United States is 4.2 times that of China, the gap is the smallest in the field of chemical research, the United States is only 1.4 times that of China. When comparing the number of articles published in all Nature Index journals, the U.S. is 1.8 times that of China, still in the leading position. Therefore, in terms of the number of articles published in the internationally recognized Nature Index journals, the quality of the papers published in the U.S. still surpasses that of China.

Recently, a Japanese research institution reported that the number and quality of scientific research papers published by China has surpassed that of the U.S., ranking first in the world [1]. The study found that in the top 1% of the world's most cited papers in 2018-2020, there were 4,330 studies in the U.S., accounting for 24.9%, but in comparison, there were 4,744 studies in China, accounting for 27.2%. Therefore, they concluded that the quality of research papers published by China also surpasses that of the U.S. and ranks first in the world. In terms of the number of research papers, it is well-documented that the total number of research papers published by China currently exceeds that of the U.S. However, the conclusion that the quality of research papers published by China also surpasses that of the U.S. is questionable.

Currently, there is no standard way to compare the quality of published research papers. However, in general, most high-quality papers are consistently published and indexed in Nature Index journals. Therefore, the quality of research papers can be assessed by comparing the number of papers published in Nature Index

journals, which is a reliable method. Here, I first analyze the number of research papers published in all Nature Index journals in the last 3 years (2019, 2020, 2021) of U.S. and China. Further, I assess the quality of research papers published in China and the U.S.

At present, there are 82 journals included in the Nature Index journals, which are distributed in the four fields of natural science research including chemistry, earth and environmental science, life science and physical science. These four fields include 20, 16, 43 and 24 journals respectively. Among them, the Nature Index journals in these four research fields repeatedly include 5 large-scale comprehensive journals, such as *Nature*, *Science*, *The Proceedings of the National Academy of Sciences*, *Nature communications*, and *Science Advances*.

1. The number of papers published in nature Index journals in chemistry in the U.S. and China

The U.S. published 47,990 articles in 20 Nature Index journals in chemistry, compared with 35,349 in China. The U.S. is 1.4 times that of China (Figure 1 and Table 1). However, there are 7 journals in which China published more articles than the US. They are *Advanced Materials*, *Analytical Chemistry*, *Angewandte Chemie International Edition*, *Chemical Communications*, *Chemical Science*, *Inorganic Chemistry*, and *The Journal of Physical Chemistry Letters*. Among them, the journal with the largest surpassing range is *Chemical Communications*, and the number of articles published in this journal in the United States is only 20% of that in China.

2. The number of papers published in Nature Index journals in earth and environmental science in U.S. and China

In the 16 kinds of natural index journals in earth and environmental science, the total number of articles published in the U.S. is 38,645, and that in China is 16,923. The U.S. is 2.3 times that of China. Among them, China surpassed the US in the number of publications in only one journal - *Water Research* (Figure 1 and Table 2).

3. The number of papers published in Nature Index journals in life science in the U.S. and China

The U.S. published a total of 67,529 articles in 43 journals in life science, compared with 16,087 in China, and the U.S. is 4.2 times that in China (Figure 1 and Table 3). It should be pointed out that among these journals, none of the articles published in China exceeded that of the U.S.

4. The number of papers published in Nature Index journals in physical science in the U.S. and China

The U.S. published a total of 62,459 articles in 24 journals in physical science, compared with 35,291 in China. The U.S. is 1.8 times that of China (Figure 1 and Table 4). There are 6 journals in which China published more articles than the US. They are *ACS Nano*, *Advanced Functional Materials*, *Advanced Materials*, *Applied Physics Letters*, *European Physical Journal C*, and *Physical Review A*. Among them, the journal with the largest surpassing range is *Advanced Functional Materials*. The number of articles published in the journal in the United States is only 40% of that in China (Table 4).

5. The number of papers published in all Nature Index in the U.S. and China

The U.S. published a total of 130,323 articles in all 82 Nature Index journals, compared with 70,906 in China. The U.S. is 1.8 times that of China (Figure 1 and Table 5).

6. Conclusion

From the above data, we can find that in the four fields of natural science research including chemistry, earth and environmental science, life science and physical science, the number of publications in the United States is higher than that in China. Among them, the gap is the largest in the field of life science research, the United States is 4.2 times that of China, the gap is the smallest in the field of chemical research, the

United States is only 1.4 times that of China. When comparing the number of articles published in all Nature Index journals, the U.S. is 1.8 times that of China, still in the leading position. Therefore, in terms of the number of articles published in the internationally recognized Nature Index journals, the quality of the papers published in the U.S. still surpasses that of China.

References

[1] Ryosuke Matsuzoe, Nikkei, China tops U.S. in quantity and quality of scientific papers. August 10, 2022

Figure Legends

Figure 1. The number of research papers in Nature Index journals in chemistry, earth and environmental sciences, life sciences, and physical sciences and all Nature Index journals in China and U.S.

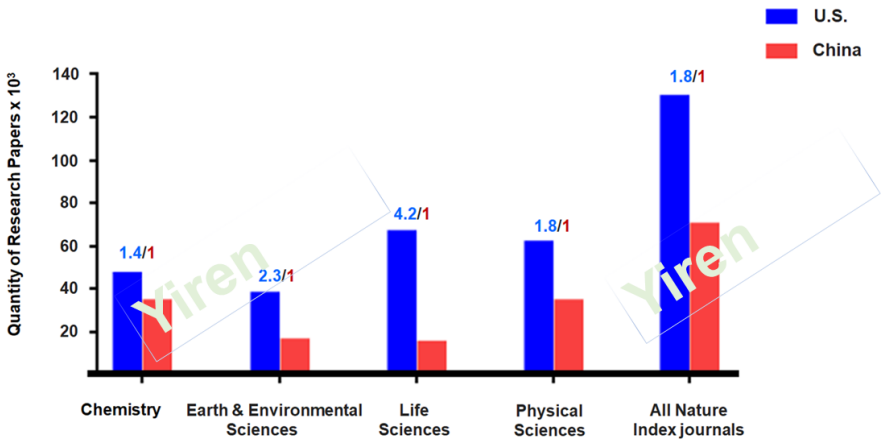

Figure 1: This is a caption

Table 1. Quality of research papers in nature index journal in chemistry between U.S. and China

	Nature index Journals in life sciences	Amount of US	Amount of C
1	Advanced Materials	1351	2690
2	Analytical Chemistry	1744	2792
3	Angewandte Chemie International Edition	2086	4474
4	Chemical Communications	1143	4766
5	Chemical Science	1191	1452
6	Inorganic Chemistry	1330	2075
7	Journal of the American Chemical Society	3583	2334
8	Macromolecules	1026	873
9	Nano Letters	1510	1454
10	Nature Chemical Biology	392	89
11	Nature Chemistry	303	105
12	Nature Materials	443	167
13	Nature Nanotechnology	305	151
14	Organic Letters	2904	856
15	The Journal of Physical Chemistry Letters	1362	1693
16	Nature	3184	665
17	Science	3223	601

18	Nature Communications	9528	5001
19	Proceedings of the National Academy of Sciences of the United States of America	8162	1679
20	Science Advances	3220	1432
Total	**47990**	**35349**	**1.4**

Table 2. Quality of research papers in nature index journal in Earth & Environmental Sciences between U.S. and China

	Nature index Journals in life sciences	Amount of US	Amount of C
1	Earth and Planetary Science Letters	789	368
2	Ecology Letters	348	59
3	Environmental Science and Technology	2269	2134
4	Geochimica et Cosmochimica Acta	778	382
5	Geology	461	161
6	Geophysical Research Letters	3025	1295
7	Journal of Geophysical Research: Atmospheres	1246	837
8	Journal of Geophysical Research: Solid Earth	982	579
9	Nature Climate Change	359	67
10	Nature Geoscience	320	72
11	Water Research	751	1591
12	Nature	3184	665
13	Science	3223	601
14	Nature Communications	9528	5001
15	Proceedings of the National Academy of Sciences of the United States of America	8162	1679
16	Science Advances	3220	1432
Total	**38645**	**16923**	**2.3**

Table 3. Quality of research papers in nature index journal in life sciences between U.S. and China

	Nature index Journals in life sciences	Amount of US	Amount of C
1	American Journal of Human Genetics	449	61
2	Cancer Cell	395	68
3	Cancer Research	13108	1695
4	Cell Host & Microbe	446	48
5	Cell Metabolism	445	111
6	Cell Stem Cell	391	72
7	Current Biology	1399	191
8	Developmental Cell	566	100
9	Ecology Letters	348	59
10	eLife	3540	427

11	Genes & Development	267	24
12	Genome Research	356	73
13	Immunity	461	86
14	Journal of Biological Chemistry	2483	630
15	Journal of Cell Biology	514	74
16	Journal of Clinical Investigation	1371	221
17	Journal of Experimental Medicine	540	102
18	Journal of Neuroscience	1394	168
19	Molecular Cell	828	167
20	Molecular Psychiatry	762	183
21	Nature Biotechnology	462	86
22	Nature Cell Biology	281	84
23	Nature Chemical Biology	392	89
24	Nature Genetics	410	108
25	Nature Immunology	400	57
26	Nature Medicine	671	72
27	Nature Methods	397	79
28	Nature Neuroscience	458	61
29	Nature Structural & Molecular Biology	278	50
30	Neuron	909	108
31	PLOS Biology	612	143
32	PLOS Genetics	954	220
33	Proceedings of the Royal Society B	826	100
34	Science Translational Medicine	728	134
35	The EMBO Journal	343	141
36	The ISME Journal: Multidisciplinary Journal of Microbial Ecology	424	163
37	The Plant Cell	393	253
38	Cell	1211	201
39	Nature	3184	665
40	Science	3223	601
41	Nature Communications	9528	5001
42	Proceedings of the National Academy of Sciences of the United States of America	8162	1679
43	Science Advances	3220	1432
Total	**67529**	**16087**	**4.2**

Table 4. Quality of research papers in nature index journal in Physical Sciences between U.S. and China

	Nature index Journals in life sciences	Amount of US	Amount of C
1	ACS Nano	1705	2065
2	Advanced Functional Materials	1412	3592
3	Advanced Materials	1351	2690
4	Applied Physics Letters	1810	2246
5	Astronomy & Astrophysics	2231	592
6	European Physical Journal C	492	855
7	Journal of High Energy Physics	2471	1054
8	Monthly Notices of the Royal Astronomical Society: Letters	5237	1454
9	Nano Letters	1510	1454
10	Nature Materials	443	167
11	Nature Nanotechnology	305	151
12	Nature Photonics	201	99
13	Nature Physics	421	117
14	Physical Review A	1665	1863
15	Physical Review B	4761	3100
16	Physical Review D	3859	2208
17	Physical Review Letters	3487	1677
18	Physical Review X	409	101
19	The Astrophysical Journal Letters	1372	428
20	Nature	3184	665
21	Science	3223	601
22	Nature Communications	9528	5001
23	Proceedings of the National Academy of Sciences of the United States of America	8162	1679
24	Science Advances	3220	1432
Total	**62459**	**35291**	**1.8**

Table 5. Quality of research papers in all nature index journals of U.S. and China

		Amount of US	Amount of C
1	Nature	3184	665
2	Science	3223	601
3	Nature Communications	9528	5001
4	Proceedings of the National Academy of Sciences of the United States of America	8162	1679
5	Science Advances	3220	1432
6	Advanced Materials	1351	2690
7	Analytical Chemistry	1744	2792
8	Angewandte Chemie International Edition	2086	4474
9	Chemical Communications	1143	4766
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25	Geology	461	161
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28	Journal of Geophysical Research: Solid Earth	982	579
29	Nature Climate Change	359	67
30	Nature Geoscience	320	72
31	Water Research	751	1591
32	American Journal of Human Genetics	449	61
33	Cancer Cell	395	68
34	Cancer Research	13108	1695
35	Cell Host & Microbe	446	48
36	Cell Metabolism	445	111
37	Cell Stem Cell	391	72
38	Current Biology	1399	191
39	Developmental Cell	566	100
40	eLife	3540	427
41	Genes & Development	267	24
42	Genome Research	356	73
43	Immunity	461	86
44	Journal of Biological Chemistry	2483	630
45	Journal of Cell Biology	514	74
46	Journal of Clinical Investigation	1371	221
47	Journal of Experimental Medicine	540	102
48	Journal of Neuroscience	1394	168
49	Molecular Cell	828	167
50	Molecular Psychiatry	762	183
51	Nature Biotechnology	462	86
52	Nature Cell Biology	281	84
53	Nature Genetics	410	108
54	Nature Immunology	400	57
55	Nature Medicine	671	72
56	Nature Methods	397	79
57	Nature Neuroscience	458	61
58	Nature Structural & Molecular Biology	278	50
59	Neuron	909	108
60	PLOS Biology	612	143
61	PLOS Genetics	954	220
62	Proceedings of the Royal Society B	826	100
63	Science Translational Medicine	728	134
64	The EMBO Journal	343	141
65	The ISME Journal: Multidisciplinary Journal of Microbial Ecology	424	163
66	The Plant Cell	393	253

67	Cell	1211	201
68	ACS Nano	1705	2065
69	Advanced Functional Materials	1412	3592
70	Applied Physics Letters	1810	2246
71	Astronomy & Astrophysics	2231	592
72	European Physical Journal C	492	855
73	Journal of High Energy Physics	2471	1054
74	Monthly Notices of the Royal Astronomical Society: Letters	5237	1454
75	Nature Photonics	201	99
76	Nature Physics	421	117
77	Physical Review A	1665	1863
78	Physical Review B	4761	3100
79	Physical Review D	3859	2208
80	Physical Review Letters	3487	1677
81	Physical Review X	409	101
82	The Astrophysical Journal Letters	1372	428
Total	**130323**	**70906**	**1.8**