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With Output and Impact Rising, China's Science Surge Rolls On

by Christopher King



Accelerating a trend noted in *Science Watch*® four years ago, the People's Republic of China has in recent years dramatically increased its output of scientific papers, while also seeing the citation impact of those papers steadily rise. In all, the figures clearly signify a nation rapidly securing prominence in world science.

The graph to the right shows the number of papers indexed by Thomson Reuters between 1985 and 2007 that listed at least one author address in the People's Republic of China. (The chart also reflects comparable figures for other, selected Asian nations). From roughly 3,700 papers in 1985, China's representation in the database increased to nearly 80,000 papers in 2007—almost a doubling of the 40,000-odd papers indexed as recently as 2003.

When *Science Watch* last surveyed China research in 2004 (15[5]: 1-2, [September/October 2004](#)), the nation's annual output of Thomson Reuters-indexed papers still fell shy of Japan's 2003 total of 75,000+ papers. Subsequently, as the current graph shows, China's rising trajectory in output intersected that of Japan in 2006 and soared past in 2007. In fact, among all nations, China ranked #2 by number of papers published during 2007, second only to the United States.

Table 1 below details China's recent output, showing 20 main fields of science ranked according to the nation's percent share of Thomson Reuters-indexed papers in each field for the cumulative period 2003 to 2007. The table also shows the citation-impact figure (that is, cites per paper) for China in each field, along with the world cites-per-paper average.

As in the 2004 survey, China's greatest concentration in the

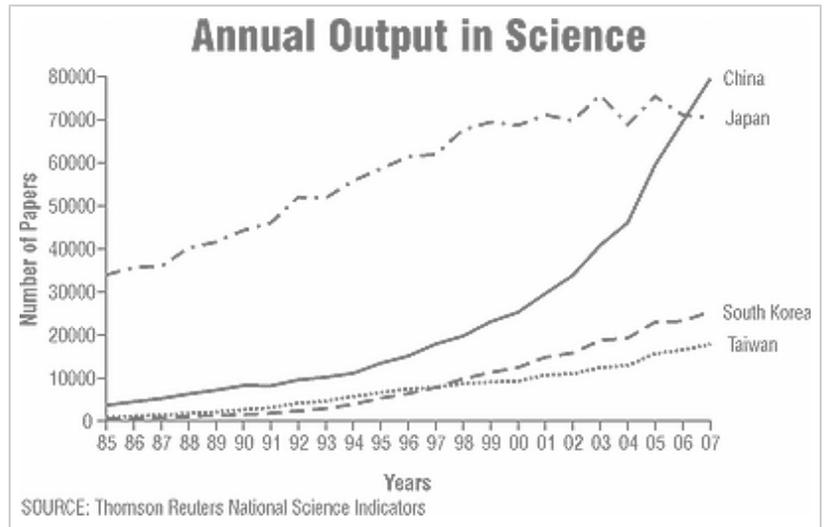


Table 2

China's number of High-Impact Papers by year, 1998-2007	
1998:	73
1999:	83
2000:	127
2001:	187
2002:	245
2003:	321
2004:	363
2005:	458
2006:	530
2007:	511
SOURCE: Thomson Reuters <i>Essential Science Indicators</i>	

Table 2 above provides another indication of China's growing influence in the literature. Based on figures from Thomson Reuters's *Essential Science Indicators*SM, the table shows China's annual numbers of "high-impact" papers—those that ranked among the top 1% most-cited reports of each year since 1998. As the table indicates, China fielded more than 500 such papers in each of the last two years, a seven-fold increase over the figure of 73 high-impact papers recorded from China in 1998.

According to *Essential Science Indicators*, the most-cited paper in the last 10 years exclusively featuring authors based in the People's Republic of China is "**Coronavirus** as a possible cause of severe acute respiratory syndrome," by **J.S.M. Peiris** and colleagues, *Lancet*, 361(9366): 1319-25, 2003; this paper has now been cited nearly 900 times. (Peiris was interviewed in these pages in the September/October issue of 2004.)

Research into SARS, in fact, accounts for the top three China-based blockbusters of recent years: the second-most-cited paper is "A major outbreak of severe acute respiratory syndrome in Hong Kong," by N. Lee, *et al.*, *New Engl. J. Med.*, 348(20): 1986-94, 2003, now cited more than 675 times. Peiris and colleagues also fielded the #3 paper: "Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study," *Lancet*, 361(9371): 1767-72, 2003, with upwards of 550 citations. ■

latest five-year period proved to be in materials science, but the change between then and now is striking and illustrative of China's progress. In the previous survey, the nation fielded roughly 15,000 materials papers, or nearly 10.5% of Thomson Reuters-indexed papers in the field. The current figures, by contrast, show more than 27,000 materials papers, representing upwards of 16% of the field. The numbers for physics tell a similar story: the 2004 survey noted 37,985 papers and 8.19% of the field for 1999-2003, while the current tally indicates 70,483 physics papers and 13% of the field.

Along with the surge in output, the figures demonstrate an appreciable rise in the impact of China's published papers in recent years. The second graph to the right tracks citation impact compared to the world average in four selected fields, in overlapping five-year periods from 1985 to 2007. In materials science, for example, papers from China registered at 87% of the world average in the field (or just 13% below) in the most-recent period, up from 44% of the world mark in the 1985-89 period. In mathematics, China's impact scored at 90% of the world mark, up from 42% in the mid-1980s. Although the impact of papers from China has yet to attain the world average in any of these main fields, the nation appears to be on a steady upward course in that direction.

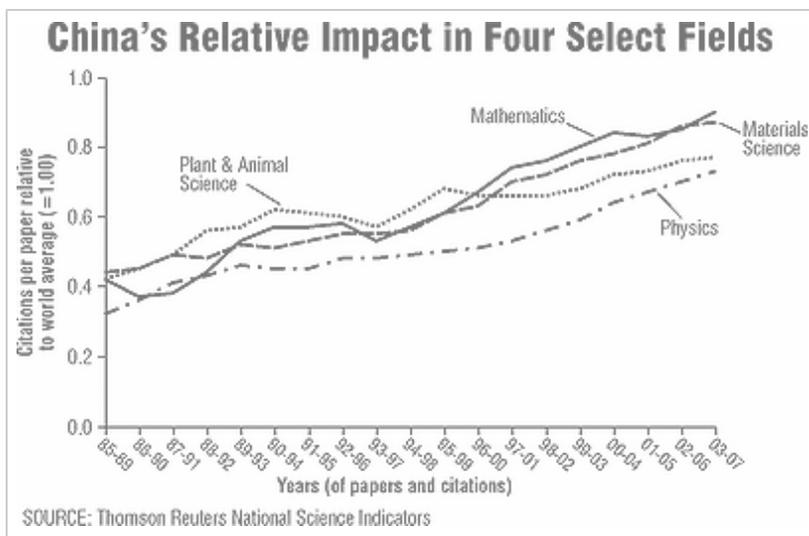


Table 1

China's Research Output by Field

(Ranked by share of world literature, 2003-07)

Rank	Field	China world share, 2003-07 (%)	China no. papers, 2003-07	China citation impact	World citation impact
1	Materials Science	16.01	27,060	2.50	2.88
2	Physics	13.07	70,483	2.91	3.96
3	Chemistry	12.65	76,886	3.52	4.81
4	Mathematics	11.40	9,997	1.30	1.44
5	Engineering	9.68	35,324	1.75	1.98
6	Geosciences	8.00	10,369	3.04	3.80
7	Computer Science	7.95	4,674	1.27	1.50
8	Pharmacology	6.20	5,528	2.99	5.40
9	Ecology/Environmental	6.06	7,423	2.69	4.06
10	Space Science	4.73	2,461	4.27	7.80
11	Plant & Animal Sciences	4.37	11,195	2.48	3.21
12	Microbiology	4.37	4,076	4.22	7.13
13	Agricultural Sciences	4.34	4,435	2.34	2.93
14	Biology & Biochemistry	4.24	12,738	4.18	7.68
15	Molecular Biology & Genetics	3.56	4,160	5.40	11.96
16	Economics & Business	3.08	2,037	1.67	2.08
17	Immunology	2.68	1,715	4.61	10.78
18	Clinical Medicine	2.47	24,577	4.56	5.78
19	Neuroscience & Behavior	2.20	3,521	4.54	8.05
20	Social Sciences	1.66	2,708	1.74	2.15

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