

CHINA

CORRECTED COUNT: 110.03

ARTICLES: 225

China has continued its rapid growth in high-quality basic scientific research to consolidate second spot in the Nature Publishing Index Asia-Pacific in 2011. In comparison with 2010, China has drawn closer to Japan at the top and distanced itself from third-placed Australia. China is still the fastest growing of the top five Asia-Pacific countries — and the only one of the top five nations that increased its share of the total number of articles published in Nature-branded primary research journals in 2011.

The huge expansion of research in China is the result of significant increases in funding over the past 15 years, and the Chinese government intends to sustain the growth. The Ministry of Science and Technology released its 12th Five-Year Plan for Science and Technology Development in July 2011, committing to boosting China's innovation capacity and competitiveness in high-tech sectors. China now has the world's second largest economy and the second highest investment in research and development in absolute terms, behind the US. China is also second behind the US in the total number of articles it publishes in international journals, although it ranks only sixth in Nature group publications globally, behind the US, UK, Germany, Japan and France.

China's research and development expenditure as a proportion of GDP in 2011 was 1.54% — lower than that of the US and the other top five countries in the Asia-Pacific — but the Five-Year Plan sets a target of 2.2% by 2015. Over the past few years, China's economy has continued to grow at 9–10% per annum, and its R&D spending is growing even faster at an average of 12% each year. This is significantly higher than the growth experienced in the US, Europe or the other top five Asia-Pacific countries. Yet, China's GDP per capita, at \$8,304, is much lower than its regional rivals, all above \$31,000.

PRIME MOVER

China overtook Australia to claim second place in the Nature Publishing Index Asia-Pacific on corrected count in 2008, and in terms of the raw number of articles published in 2010. China's continuing rise in the research rankings is reflected in the increasing number of Chinese research institutions placed near the top of the Asia-Pacific rankings — from seven in the top 50 in 2009

(with one in the top ten) to 14 in the top 50 in 2011. Over 2009–2011, China produced just over one-fifth of the articles published in Nature group publications by Asia-Pacific countries.

Almost 100 institutions from China that did not make the 2010 ranking were included in the 2011 rankings (nine had previously appeared in 2009). A total of 158 Chinese institutions published in Nature-

branded primary research journals, showing an increasing breadth of high quality research across the country. Even when the Chinese Academy of Sciences (CAS) — a conglomerate of 117 institutes of which 97 are research institutes — is counted as a single institute, Chinese institutions comprise more than a quarter of those contributing to the Asia-Pacific region. This compares with Japan's 33%, Australia's 13%, Korea's 9% and India's 6% (Singapore, the fifth highest ranked country, provides only 2% of the research institutes).

The CAS is the premier research institute in China. With 62 articles published in 2011 compared to 40 in 2010, the CAS has continued its steady rise in the Asia-Pacific rankings, from fifth in 2009 to fourth in 2010 and now third. This consistency has placed it fifth in the Asia-Pacific in the three-year average (2009–2011) and 23rd in the Nature Publishing Index Global Top 100 listing for 2011. The University of Science and Technology of China (in 76th place) and Peking University (94th) are the only other Chinese institutions in the index's Global Top 100 listing.

In another notable development, due to its steady ascent, the CAS looks likely to overtake Japan's Kyoto University for second place on corrected count in 2012. In 2010 and 2011, CAS researchers contributed to more articles than did Kyoto University researchers, although the latter ranked ahead of their Chinese counterparts on corrected count.



COUNTRY PROFILE			
POPULATION	1,334.7 million		
RESEARCHERS	1,592,420		
GDP (PPP)	\$11,195,000 million		
GDP PER CAPITA	\$8,304		
R&D EXPENDITURE (%GDP)	1.54%		
HONG KONG SAR			
POPULATION	7.0 million	GDP PER CAPITA	\$45,277
RESEARCHERS	24,100	R&D EXPENDITURE (%GDP)	0.76%
GDP (PPP)	\$322,000 million		

SOURCE: MEXT, IMF, UN, CENSUS AND STATISTICS DEPARTMENT

NATURE PUBLISHING INDEX CHINA

2011				2010			2009			Total 2009-2011			
RANK	INSTITUTION	CORRECTED COUNT	ARTICLES	ASIA-PACIFIC RANK	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
1	Chinese Academy of Sciences (CAS)	22.43	62	3	1	13.17	40	1	12.01	31	1	47.61	133
2	University of Science and Technology of China (USTC)	8.58	17	11	3	3.83	8	4	2.67	8	3	15.08	33
3	Peking University	7.24	21	13	5	3.46	17	3	2.82	9	4	13.51	47
4	Tsinghua University	6.36	16	15	2	6.15	16	2	3.32	9	2	15.83	41
5	Hong Kong University of Science and Technology (HKUST)	3.86	5	23	9	1.86	3	–	–	–	10	5.72	8
6	Xiamen University	3.77	6	25	10	1.83	3	11	1.00	1	8	6.59	10
7	Shanghai Jiao Tong University (SJTU)	3.73	21	28	20	0.99	4	5	1.76	10	9	6.48	35
8	The University of Hong Kong	3.58	12	29	7	2.17	8	8	1.36	5	6	7.10	25
9	Nanjing University	3.01	11	35	6	3.16	8	7	1.41	5	5	7.58	24
10	Beijing Genomics Institute (BGI), Shenzhen	2.97	11	36	4	3.59	9	19	0.52	1	7	7.08	21

LARGE-SCALE SCIENCE

As in previous years the composition of the top four places in the Nature Publishing Index in 2011 was relatively stable with three of the featured institutions appearing in this section of the table for the third successive year.

The number one-ranked Chinese institution in the Nature Publishing Index in 2011 is again the Chinese Academy of Sciences (CAS) — a fact that is hardly surprising given its position as the largest research institution in the world. The importance of its impact as a research institution is shown by the fact that 17 of its 62 articles were published in the flagship journal *Nature*, ranking it second in the Asia-Pacific region for publications in that title. The CAS publications mostly came from the Shanghai Institutes for Biological Sciences (15 articles) and the Institute of Physics (11 articles), but 31 institutes under the CAS umbrella published in Nature-branded primary research journals in 2011. This is up from the 27 that contributed in 2010. Many of the Nature articles were on palaeontology, but other fields included astronomy, physics, earth science and stem cell research. The CAS also published five articles in *Nature Structural & Molecular Biology* and four in *Nature Immunology*, reflecting its strength in the life sciences.

China's second-ranked institute in 2011, the University of Science and Technology of China (USTC), is one of two universities affiliated with the CAS but is ranked separately. USTC is now placed 11th in the Asia-Pacific (and 76th globally), up from 16th in 2010, reflecting a doubling of the raw number of articles published from eight in 2010 to 17 in 2011. This is a relatively small number of articles for the level of its corrected count, indicating the strength within the institution. USTC ranked second in the Asia-Pacific for publications in *Nature Photonics* and fourth in *Nature Physics*.

On the three-year average, the prestigious Tsinghua University ranks second in China, and tenth in the Asia-Pacific, but in 2011, dropped to fourth place in China with 16 papers in the Nature Publishing Index, of which five were papers in *Nature*. The Beijing-based institute has strengths in life sciences, particularly structural and molecular biology, and physics. Although the number of articles published by Tsinghua University remained steady at 16, and its corrected count increased slightly from 2010, it was overtaken in 2011 by UTSC and Peking University. The latter more than doubled its corrected count from 2010 to 2011, which brought

it up from fifth to become the third-ranked Chinese institution. Peking University publications covered a range of fields, including genetics, physics, chemical biology, earth science, materials and neuroscience.

ONWARD COURSE

Two institutions rose rapidly in the rankings last year — the Hong Kong University of Science and Technology (HKUST) and Shanghai Jiao Tong University (SJTU). HKUST, which was established in 1991, has been making steady upward progress. It did not appear in the 2009 rankings,

was ranked ninth in China in 2010, and fifth in 2011, with five articles and a high corrected count of 3.86. SJTU, a large university with more than 40,000 students, has fluctuated dramatically in its publication record. In 2011, the institution published 21 papers in Nature-branded primary research journals, of which 12, including several genome-wide association studies of diseases, were in *Nature Genetics*. This contrasted with 2010, when the institution ranked 20th in China with four articles and 2009 when ten articles pushed it into fifth place in the country. In between these two, came Xiamen University which consolidated its spot in the top ten. Although its total haul of six articles in 2011 was comparatively modest compared with most of the other institution in the top echelon it was double the number produced in the previous year and a huge improvement on its single paper in the Index in 2009. Of the six articles contributed to the Index in 2011, three were published entirely by Xiamen University researchers giving a high corrected count and propelling the institution up four places on its 2010 ranking. On a smaller scale, BGI Shenzhen (formerly the Beijing Genomics Institute) dropped from fourth to tenth place, with ten articles published including the genome sequences of the potato, naked mole rat, Chinese hamster, the roundworm *Ascaris* and two species of macaque. In 2009, BGI Shenzhen published only one Nature paper and it makes it into seventh place in the three-year average rankings, largely on the basis of articles published in 2010 and 2011.

Taking a wide view, as China improves the quality of its academic teaching and the impact of its research publications, the country's continued economic and R&D growth is expected to fuel further increases in its publishing contribution. There is still a sizeable gap between China and Japan above it but, on current trends, China looks set to challenge its eastern neighbour for top spot. ■

