

The (Scientific) Wealth of Nations

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A recent feature article in *Nature* examined the scientific impact of nations using the metrics of total publications and citations.<sup>1</sup>

For decision-making purposes, the article appears to be misleading, because critical and noncritical technologies, with high-tech and low-tech components, are country-aggregated in these numbers.

Most important for potential users are critical technologies that impact strongly defense and civilian commerce.

For example, in the 1997-2001 time frame, China is listed as ninth in numbers of total publications<sup>1</sup> and does not even show up on the footprint charts in the article.

Yet a search of the Science Citation Index for the first eight months of 2004, using a comprehensive and precise 92-term query for the ***highly critical field of nanotechnology***, retrieved the following results for the 20 countries reporting the most research papers:

**Country -- No. of Records**

China -- 3,621  
United States -- 3,182  
Japan -- 3,010  
Germany -- 2,075  
France -- 1,330  
South Korea -- 1,263  
England -- 941  
Russia -- 856  
Italy -- 758  
India -- 647  
Taiwan -- 587  
Spain -- 557  
Canada -- 518  
Switzerland -- 391  
Netherlands -- 378  
Poland -- 358  
Singapore -- 308  
Sweden -- 302  
Australia -- 298  
Brazil -- 284

China ranks first, 14% higher than the United States in this crucial technology.

In the top six countries, the Asian countries of China, Japan, and South Korea (7,894 publications) outproduce the Western nations of United States, Germany, and France (6,587 publications) by 20%.

A decade ago, the United States (1,034 publications) outproduced China (271 publications) by 380%, and these same Western nations (2,481 publications) outproduced these same Asian nations (1,694 publications) by 46%.

While country bibliometric studies may be easier and faster to do at the country-aggregated technology level, the useful information for most decision-makers requires analysis of critical technologies at very detailed levels for countries of interest. Aggregation at the country level does become useful after the detailed technology analyses have been performed, and the relationships among these technologies as expressions of national policy can be assessed (i.e., connecting the dots, in the present vernacular).

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1. D.A. King, "The scientific impact of nations." *Nature*, 430:311-6, July 15, 2004.