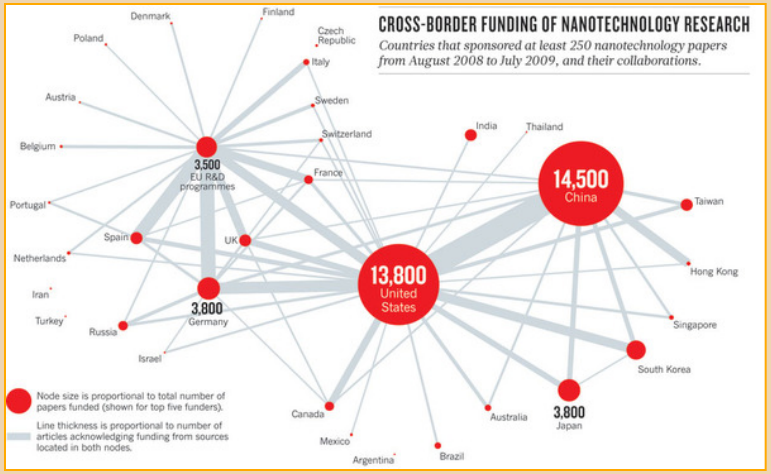
The Center for Nanotechnology in Society
ARIZONA STATE UNIVERSITY

Researchers Follow Money, Discover Nanotech Research Transcends Country Borders

Despite their focus on national economic competitiveness, the nanotechnology research initiatives now funded by more than 60 countries have become increasingly collaborative, with nearly a quarter of all papers being co-authored by researchers across borders. Researchers from the two leading producers of nanotechnology papers – China and the United States – have become each nation's most frequent international co-authors. These findings are reported in a CNS-ASU Comment piece in *Nature*, Volume 468.

Data-mining techniques were used to assemble a database of nanotechnology publications that allowed the CNS-ASU researchers to make comparisons across countries. More than 91,000 papers published worldwide between August 2008 and July 2009 were analyzed.



Although nanotech research from 152 nations were represented in the survey, just 15 countries produced 90 percent of the papers. The top four countries by author affiliation were the United States, China, Germany and Japan.

A subset of 61,300 papers were identified that were supported by grants. Of these, the National Natural Science Foundation of China was the top funder. Second was the U.S. National Science Foundation, followed by the Ministry of Science and Technology of China, the European Union's R&D programs, and the U.S. Department of Health and Human Services.

In 2008 alone, leading industrial nations invested over $8 billion in public funds in nanotechnology research initiatives. Countries that have launched major governmental programs to develop their national nanotechnologies as part of efforts to boost future economic growth include the United States, China, Germany, Japan and Korea.

Organization	Sponsored papers (and % of total)	Early-impact papers (% of sponsor's papers)
National Natural Science Foundation of China	10,200 (16.7)	4.7
US National Science Foundation	6,700 (10.8)	11.4
Ministry of Science and Technology of China	4,700 (7.7)	5.2
European Union (R&D programmes)	3,500 (5.8)	10.4
US Department of Health & Human Services (including National Institutes of Health)	3,100 (5.1)	15.0
Ministry of Education of China	3,100 (5.1)	4.6
US Department of Energy	3,000 (4.9)	12.5
US Department of Defense	2,600 (4.2)	12.3
German Research Foundation	2,600 (4.2)	10.2
Ministry of Education, Culture, Sports,Science and Technology of Japan	2,400 (3.9)	6.2

Nanotech's Top 10 Funders

But despite years of emphasis by governments on national nanotechnology initiatives, the researchers found that patterns of nanotechnology research collaboration and funding transcend country boundaries. For example, researchers in the U.S. and China have developed a relatively high level of collaboration and now publish roughly the same number of nanotechnology papers, although the U.S. retains the lead in quality of publications, as measured by the number of early citations. The numbers signal a significant trend, as China has taken over from European countries as America's leading international collaborator by volume in nanotechnology research.

Given the constraints of today's economic climate, growth in nanotechnology funding appears unlikely. CNS-ASU researchers suggest that countries foster more high-quality international collaborations, perhaps by opening funding competitions to international researchers and by offering travel and mobility awards for domestic researchers to increase alliances with colleagues in other countries.

Dr. Jue Wang
Assistant Professor, Department of Public Administration
Florida International University

Dr. Philip Shapira,
Professor of Public Policy, Georgia Institute of Technology
Professor, Manchester Institute of Innovation Research,
Manchester Business School, University of Manchester

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