

# Nano World: National ranking in nanotech

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The United States, Japan, Germany and South Korea dominate nanotechnology today, but in 2012 Taiwan should also leap into a leading role, with China making dramatic gains and France sliding into the minor leagues, experts told UPI's Nano World.

Nanotechnology analyst firm Lux Research in New York investigated 14 nations spanning four continents that play significant roles in nanotechnology. They measured each country based on its nanotechnology activity, including national funding in nanotechnology, number and quality of government and university nanotech centers, and corporate research-and-development spending. They also gauged each nation's technology development strength -- its demonstrated ability to develop its economy through science and technology in general, including metrics such as high-tech manufacturing and research and development as a percentage of gross domestic product or the size of science and technology workforces.

The United States, Japan, Germany and South Korea all rank as dominant, scoring high on both nanotechnology activity and technology development strength. The United States leads the world, but Japan is right behind, performing better when it comes to nanotech initiatives, government and corporate nanotech funding, and active companies. While the United Kingdom and France both come out as "ivory tower" nations that are high on nanotechnology activity but relatively low on technology development strength, Germany is both strong in technology development, with a large number of science and engineering doctorates and solid infrastructure and R&D spending, and nanotech activity,

having 57 nanotech centers. South Korea likewise has a good mix of high government and corporate nanotech spending levels and strong technology development, with 16 percent of GDP from high-tech manufacturing and 3 percent of GDP invested in R&D.

Taiwan, Israel and Singapore are currently niche players, having high technology development strengths to capitalize on nanotech activity levels that are relatively low due to their small populations. As a result, they tend to focus on developing centers of competence in specific domains. Taiwan concentrates on materials and electronics, while Singapore focuses on electronics and Israel on life sciences.

China, Australia, Canada, Russia and India currently fall in the minor leagues, claiming neither high levels of nanotech activity nor technology development strength. For instance, while Russia has a massive technical workforce, it remains an untapped resource. Australia has high-profile life-science nanotech successes such as Starpharma in dendrimer-based therapeutics and pSivida in drug-delivery systems, but two-thirds of the countries Lux Research measured scored better in government nanotech spending, and Australia also ranks near the bottom in nanotech publications and patents. While China scores comparatively high on government nanotech spending, number of centers and publications, it has low technology development strength and its overall nanotech spending remains weak, hampered by balkanized regional initiatives. Canada has a high number of nanotech publications but particularly weak showings in active nanotech companies, while India has relatively low government nanotech spending and an infrastructure lagging far behind the other countries studied.

Still, Lux Research predicts these positions will change rapidly. The United States should remain out front, but its lead will narrow as Japan's superior technology strength races it forward. In the next three years Taiwan should leap to a dominant position as it establishes foundry

services. "Nowadays, in Taiwan, you see things never happening in the West, such as underwriting the expenses of corporations for doing R&D and supplying subsidies to any PhD student taking a postdoc position in Taiwan doing nanotech work," said Lux Research senior analyst David Lackner.

While China's huge size and persistent rural poverty keeps it from a dominant position, its technology development strength should rise as it improves international patent activity and risk capital for nanotech and its economy focuses attention on commercialization and partnerships with major corporations. Moreover, France may actually slide into the minor league while the United Kingdom begins improving nanotech activity. "Where France really falls down is an inability to do anything to develop the good intellectual property they might be establishing," Lackner said. In comparison, the United Kingdom has programs "that do so much for companies in the U.K. that are starting up and trying to commercialize technology."

"What's interesting is how they characterized the U.K. moving from an 'ivory tower' to closer to a dominant position, and you have a couple of U.K. companies identified as leaders in their fields in nano. I think it points to an interesting movement international. A historical advantage of the United States is now being replicated in innovation, in the greater willingness and ability to absorb and manage risk, and some of the entrepreneurial ecosystem that helped make the United States so successful in commercializing advanced technology," said NanoBusiness Alliance Executive Director Sean Murdock in Chicago.

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