The Atomic Shopping Cart

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The mission of *Nano Nano*, which appears on *ePrairie* every Monday, is to keeps tabs on the exponential growth of nanotechnology using the i[3] principle of exposition: information, investment advice and infuriation.

"Children need money. As they grow older, they need more money. They need money for essentially the same reasons that adults need money. They need to buy stuff."
~ Donald C. Medeiros

CHICAGO – In a time of global terrorism, conflicts in the Middle East and a growing budget shortfall, what kind of insanity would compel someone to spend $700 million on the National Nanotechnology Initiative (NNI)?

You'd either have to be nuts or a Republican (or, like a child, you have bad dreams and only a $700 million lollipop will let you sleep soundly at night).

It was a dark and stormy night in the summer of 1999. Some 23 years before, the U.S. Congress in 1976 had established the Office of Science and Technology Policy (OSTP) with a broad mandate to advise the president and others within the executive office on the impacts of science and technology on domestic and international affairs.

In the summer of 1999, the OSTP had presented a report to Congress that said: "The rest of the world is spending more on nanotechnology than we are" and "we will lose the technical high ground – again – just like we did with televisions, automobiles and memory chips."

It's not that any of the members of Congress had a clue as to just *what* nanotechnology was, but they all knew the Japanese were spending $400 million per year on nanotechnology and if the U.S. didn't start then, the future of the world's economy would be in the hands of people who have yet to immigrate to this country.

We discover in retrospect that the Japanese were lumping nanotechnology and biotechnology into the same pot, so in actual fact, they were spending one-tenth of what was claimed on nanotechnology. The global economic meltdown was just beginning, which made the rest of the world rethink its technology investment. That's just history at this point. Congress spoke and the NNI was born.

Once a Federal feeding frenzy starts, all kinds of things can happen. The least likely is that spending will decline. After all, a Federal bureaucracy has a life of its own that by default is subject to cost overruns, increases in infrastructure costs and at some level the actual execution of whatever goals and objectives are promoted from the highest levels.

So what programs is the government buying with our nanotechnology dollars through the NNI? According to NNI reports, there are five program areas where activity is warranted:

1. Fundamental research, which provides sustained support to individual investigators and small groups doing fundamental and innovative research.
2. Grand challenges for research on major, long-term objectives.
3. Centers and networks of excellence for interdisciplinary research, networking and industry partnerships.
4. Research infrastructure metrology, instrumentation, modeling/simulation and user facilities.
5. Societal implications, workforce education and training for a new generation of skilled workers.

In what proportions is the NNI spending this money? The NNI breaks it down by seven rather indistinct spending areas:

NNI Spending Areas

Spending Area	Percent
Nanostructure by design (novel phenomena)	45 percent
Device and system architecture	20 percent
Biosystems at the nanoscale	14 percent
Multiscale and multiphenomena modeling	9 percent
Environmental processes	6 percent
Manufacturing at the nanoscale	6 percent
Education and social implications	0 percent

It's funny how the five programs don't match the seven spending categories. I'm also amused by the actual NNI definition for investment in the "education and social implications" item (the one that really counts).

The NNI suggests that it's not "0 percent" as I report but rather it's "distributed," which is government speak for "we don't spend money here but definitely attend conferences and would appreciate if you'd talk to your local congressman or senator."

When you dig through the budgets in some detail, what you discover is that a third of the money goes to the national laboratory system and two-thirds of the money goes to universities. A lot of the money (I mean a *lot* of the money) goes into building infrastructure, which means buildings. Of course, history proves that it is impossible to perform novel and breakthrough research without a new building from which to perform

novel and breakthrough research.

One of the nice things about the NNI is that it isn't large enough yet to have the infrastructure necessary to actually disburse very much of its own money. Thus, it relies heavily on other government agencies to do its spending. In fact, it spreads the wealth through:

1. Department of Agriculture (USDA)
2. Department of Commerce (DOC)
3. Department of Defense (DOD)
4. Department of Energy (DOE)
5. Department of Justice (DOJ)
6. Department of State (DOS)
7. Department of Transportation (DOT)
8. Department of Treasury (DOTreas)
9. Environmental Protection Agency (EPA)
10. Food and Drug Administration (FDA)
11. Intelligence Community (IC)
12. National Aeronautics and Space Administration (NASA)
13. National Institute of Standards and Technology (NIST)
14. National Institutes of Health (NIH)
15. National Science Foundation (NSF)
16. Nuclear Regulatory Commission (NRC)

Most of these agencies distribute the money through research grants called SBIR or STTR programs, which are small amounts of money granted in $50,000 to $600,000 increments to small companies that perform research specified by the funding agencies.

Thus, while the NNI represents a single pot of money, the distribution of the money is handled under the policies and practices of 16 different federal agencies. Needless to say, when one asks each of these agencies what nanotechnology is, you get a slightly different answer. We'll come back to *that* topic in four weeks.

Next Monday, we're going to take a look at a small company that routinely uses nanotechnology as part of its business model – a small and obscure company that goes by the name Intel.

Glenn Fishbine has 30 years of business and technology experience. He has more than a dozen U.S. patents and recently published "The Investor's Guide to Nanotechnology and Micromachines" with John Wiley & Sons.

He is also the director of information systems at a biomedical device company, the chairman of the board of a biometrics company and the managing director of Venture Technologies, an investment sourcing company. He can be e-mailed at glenn@venture-technologies-llc.com.

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