

Testimony of  
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**U.S. Senate Committee on Commerce, Science and Transportation**  
**Subcommittee on Trade, Tourism and Economic Development**  
Hearing on  
**Promoting Economic Development Opportunities**  
**Through Nano Commercialization**  
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I would like to thank you, Chairman Smith, Ranking Member Dorgan, and Members of the Senate Subcommittee on Trade, Tourism and Economic Development for the opportunity to testify on a topic of importance to the American economy - nanotechnology and its role in increasing our GDP, creating jobs and providing America with high-value goods to power our exports in the increasingly global economy. I also want to thank you for introducing the Nanoscience to Commercialization Institutes Act of 2005, which will help expand our nation's nanotechnology commercialization capabilities.

My name is Sean Murdock, and I am the Executive Director of the NanoBusiness Alliance. The NanoBusiness Alliance is the nanotechnology industry association and the premier nanotechnology policy and commercialization advocacy group in the United States. NanoBusiness Alliance members span multiple stakeholder groups and traditional industrial sectors, including newly formed start-ups surviving on angel funding or government grants, Fortune 500 companies with multimillion dollar commitments to nanotechnology R&D, academic research institutions, and public-private partnerships working to derive economic development and growth through nanotechnology. This wide group of stakeholders has come together because we believe that nanotechnology will be one of the key drivers of quality-of-life improvements, economic growth and business success in the 21st century. The Alliance provides a collective voice and a vehicle for efforts to advance the benefits of nanotechnology across our economy and society.

With that perspective in mind, I would like to share with you my thoughts on the impact of nanotechnology on economic development in America.

### **Nanotechnology's Potential for Economic Development**

Developments in nanotechnology boost a broad range of industries. Today nanotechnology is found in approximately 80 consumer products, and over 600 raw

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materials, intermediate components and industrial equipment items that are used by manufacturers. While the number is small at this juncture, the diversity of the products and applications – stain resistant clothing, tennis racquets, cosmetics, catalytic converters, fuel cells, solar cells, flat screen displays, molecular diagnostics and cancer therapies – provide testament to its broad impact which will deepen in the coming decade as more products come to market. Lux Research has predicted that nanotech will account for 15% of our global manufacturing output totaling \$2.6 trillion by 2014.

The potential for economic development that nanotech represents is profound. Nanotechnology will create more jobs and better jobs over the next decade. According to Lux estimates, the number of jobs in making nano-enabled products is set to balloon from 47,000 globally today to more than 10 million in 2014 – 11% of total manufacturing jobs in that year. Of these, the U.S. should capture at least 37% or 3.7 million. And, studies show that on a national level, nanotechnology employees today have higher than average salaries and are highly educated. In the United States, the average annual salary for an employee in the nanotechnology sector is \$97,978.

#### **The State of Nanotechnology Commercialization in the U.S.**

According to the NanoBusiness Alliance's proprietary database on all companies involved with nanotechnology worldwide, a little over 50% of the companies are in the United States. However, if one is to believe the announcements made at the ChinaNano2005 trade expo that China has almost 800 companies involved with nanotechnology and a recent EU report claiming that Europe has 500, the share would appear to be significantly lower. Unfortunately, it is notoriously difficult to track commercial developments in nanotechnology, so we cannot be precisely sure.

Regardless of the international situation, the growth of new, venture backed nanotech start-ups has been relatively stagnant over the past few years. This is, perhaps, one of the most disconcerting indicators for nanotechnology in the U.S. The entrepreneurial culture and deployment of risk capital, especially venture capital, toward early stage technology companies has been a key source of competitive advantage for the United States.

States are making investments with the hope and expectation of attracting nanotechnology companies and capturing these new nanotech jobs. According to Lux Research, state and local governments poured more than \$400 million last year into nanotechnology research, facilities, and business incubation programs, aiming to attract further funds from the nearly \$1 billion being disbursed at the federal level.

Most of the \$400 million was invested in a very few, large projects to build new research facilities and buildings to house those facilities. Albany Nanotech in NY, The International Institute for Nanotechnology in Illinois, and The California Nanosystems

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Institute are good examples.

Little money is actually going to public-private partnerships that focus on connecting those performing our Federally funded research to the existing businesses that may be able to use that technology and make use of the new facilities and infrastructure that have been created.

#### **Barriers to Nanotech Commercialization in America**

The following outlines some of the most prominent barriers to commercialization.

- **The Valley of Death**

The trying period between a company's formation and its achieving significant cashflow, referred to as the "valley of death," is particularly acute for nanotechnology. Lab research holds the potential to develop game-changing products but requires a significant investment in process knowledge and internal capabilities before any revenues can be generated. This investment is required to identify a particular product need, integrate the lab process with current manufacturing techniques, develop the lab process so that efficient large-scale production is possible, handle compliance with any regulatory statutes, and also fund the operational infrastructure of the company.

Burned by the dot com bubble and needing to raise IRR's in order to raise the next fund, VC's have been shying away from early stage technologies without near term commercialization processes and end market economics. According to statistics from Small Times, investment in startup and seed-stage companies has dropped as a percentage of total investment, by 50% (with startups receiving only 3% in 2005).

**Federal investment in basic research without adequate capital support for the startup companies that translate it into real world applications will not result in economic development.**

- **Lack of a Level International Playing Field for American Companies**

On a per capita basis and relative to GDP, the U.S. funding of nanotech innovation and commercialization is matched or exceeded by its Asian competitors (particularly Japan and Korea). Also, Asian investments tend to be more focused on specific applications. While these competitors are not outperforming the U.S. in knowledge development (i.e. overall patents), they are developing leadership in specific areas, particularly electronics related applications. Foreign governments (particularly in Asia) also provide direct subsidies for application development which creates an un-level playing field for American nanotech startups.

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The U.S. government must be the “gold standard” as the most hospitable climate for commercializing nanotech innovations. We must lead in the development of new nanotech knowledge and research infrastructure. **As such, our share of worldwide government investment should be at least on par with our share of global GDP.**

- **Insufficient Opportunities for Public-Private Partnerships**

Turning the ideas and innovations being funded into manufactured products is the key to the government seeing a return on its investment in research. However, to create a truly revolutionary or ground-breaking product, often several innovations have to be realized and combined. For example, developing a successful nanomaterial requires advances in measurement and metrology, materials engineering, product integration and manufacturing process. This requires an extensive research infrastructure with multiple areas of specialization. It is not feasible for a single company to shoulder the burden of infrastructure investment and development.

Public-private partnerships allow both parties to align their strategies for commercialization, leverage each others resources and help create fundamental roadmaps for economic growth and development. Currently, there are no institutions that foster or house these partnerships.

- **Lack of Support for Regional Economic Initiatives**

Startup nanotech companies are pioneers - rich in potential, courage and ambition but poor in resources. As such, their ability to have a voice in policy discussions, to travel and network and even to access and apply for federal programs and support is extremely limited. Support for organizations that work on a grassroots level and act as a means for these companies to meet, share strategies and cooperate is essential to regional successes in this industry.

### **Recommendations and Proposals**

- **Create Commercialization Centers to Promote Public-Private Partnerships**

We recommend creating centers for nanotech commercialization that allow public and private stakeholders to share the costs of developing infrastructure for conducting fundamental, application-focused nanotechnology research. We strongly support the Nanoscience to Commercialization Act of 2005 (S. 1908), sponsored by Senators Smith and Cantwell. This bill has the potential to significantly impact job growth and revenues through a modest federal investment. It achieves this by leveraging industry investments and know-how through a set of public-private partnerships.

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The proposed commercialization centers would:

- Encourage application focused research
- Developing metrics and measurements for economic growth in the industry and publishing analyses of American competitiveness in this space
- Informing policymakers with real data on the impact of federal research funding in nanotech on job growth and revenues
- Provide strategic research guidance and meaningful, achievable goals and challenges for various application areas

The centers could act as the focal point for industry to develop roadmaps for multi-component applications. This would help small businesses that have innovations for one or more components to focus their development and collaborate to create the larger application.

In addition, the data being generated at these centers can streamline federal research investments so that dollars are being spent to achieve a maximum return. It can also draw on regional initiatives to develop effective and relevant strategies for dealing with commercialization challenges. Finally, by focusing on areas that do not already have nanotechnology centers, the bill promotes an expansion of the nation's nanotechnology infrastructure.

- **Providing Funding for Regional Economic Initiatives**

Regional economic initiatives are engaged, broadly, in the following missions:

- Developing nanotech clusters to allow resource sharing
- Raising awareness of federal and state programs and infrastructure available to startups
- Convening conferences to promote cooperation across geographies
- Giving the nanotech industry a voice when discussing policy at the regional, state and national levels.

There are over 40 nanotech initiatives throughout the U.S. dedicated to developing tactical plans to realize the strategy above. To date, two workshops have been held by the NNCO to facilitation coordination across these initiatives. The main focus of these workshops has been to compare strategies for acquiring funding and models for building working nanotech clusters in the various regions. The product has been the development of some "best practices" and a series of recommendations on how to structure an initiative and best utilize the scarce resources.

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The regional economic initiatives are the grassroots industry organizations through which small businesses can have a voice and be heard. Given the importance of small business to innovation, providing these regional initiatives with sufficient support must be an important part of any nanotech economic development strategy.

- **Provide a Tax Incentive for Investment in Small Business**

A recommendation for addressing the “valley of death” and the un-level playing field is to develop tax incentives for investors in small businesses engaged in translating research from labs into applications and products.

The R&D Tax Credit in section 41 of the Tax Code is, of course, an important incentive. However, it does not benefit many small nanotechnology companies, because they do not have profits and thus do not have taxes against which the credit can apply. Furthermore, our experience is that investors do not factor the future availability of credit “carry-forwards” into account, especially for small companies. Thus, many small nanotechnology companies will fail from a lack of capital before the credits are available.

States have successfully used tax credits to dissuade nanotech companies from migrating to other states (e.g. in Wisconsin). The same can be accomplished on a national level, thereby preventing off-shoring of nanotech development. In addition, this approach would rely on market forces to decide which small businesses get the benefit; in other words, investors still will invest based on which nanotech companies have the highest potential for commercialization (and other business-driven factors). As a result, tax incentives for seed-stage investments will, through market means, encourage funding for companies most likely to produce jobs and revenues.

Thank you Mr. Chairman. I would be happy to answer any questions.