



## **Initiative for Nanotechnology in Virginia**

Testimony before Senate Subcommittee for Space, Science and Technology  
Tuesday, September 17, 2002

Good afternoon. My name is Nathan Swami, and I am Executive Director of the Initiative for Nanotechnology in Virginia, or INanoVA for short. We are a coalition of state government, leading research universities, and a growing family of nanobusinesses that are emerging throughout the Commonwealth of VA. A list of our members and stakeholders is appended to the written version of my testimony. INanoVA's overall goal is to position Virginia among the national leaders in nanotechnology research and business development, as we are keenly aware that leadership in this exciting field is the key to Virginia's economic future. In our short history, we have found a rising tide of interest in nanotechnology, and it is with great enthusiasm that we urge passage of the "21<sup>st</sup> Century Nanotechnology Research and Development Act."

In my remarks this morning (afternoon), I wish to sketch out some general arguments in favor of this bill, touch briefly on Virginia's perspective, and conclude with two recommendations that we believe will strengthen the impact of this important legislation.

First, we must recognize that our entire economy has become heavily dependent on technological innovation. Some economists estimate that nearly half of the American economy is now driven by new discoveries in technology-heavy sectors ranging from agriculture and medicine to man-made materials, electronics, information technology, and telecommunications. We now know that further developments in these and other industries will be driven in large part by the broad general movement known as nanotechnology. So it is inevitable that we view nanotechnology, which in its simplest definition is the natural outgrowth of our ability to work with greater and greater precision in ever smaller dimensions, as the foundation upon which we will enter a new age of innovation. This new age, the Age of Nanotechnology, is one where we will imitate nature itself, thus endowing us with the capability to make materials, devices, machines and medicines with an efficiency and effectiveness that is undreamt of today. We are on the cusp of that new age now, and government support can assure that we will get there first.

Some may ask, "But why do we need this bill? If nanotechnology is so promising, why can't private enterprise foot the bill?" The answer quite simply is this: We owe our world leadership in high technology to the government's timely investments at critical early stages, time and again, when emerging technologies were most in need of a boost in order to move toward eventual commercial success. From the dawn of modern agriculture to aerospace to the launching of the Information Age, government support has been a powerful catalyst to drive basic research and accelerate technology transfer from the laboratory to the marketplace. In industry after industry, one sees the same pattern: federal dollars encourage early discoveries in a new technology, which then attracts private investment, which then grows into a successful industry, with large employers and many jobs for working Americans. Trace the history of agribusiness and the green revolution and you find federal dollars funneled through Agricultural Extension services in our land grant universities, an ongoing investment that has revolutionized American farming. Silicon Valley and Boston's Route 128 high tech corridor would not exist if the federal government had not invested in early stage research in computer science. The



Internet itself is an outgrowth of federally supported research. We are now at another critical juncture in our technological evolution, and timely passage of this bill will go far to assure continuing American leadership in the global economy.

To those who ask, “Why pass this bill?,” we can respond with another question: “What will happen if we don’t?” The answer is discomfoting, as we see other governments of the European Union and East Asian nations investing heavily in major nanotechnology research and development centers. The hard reality is that the worldwide race for preeminence in nanotechnology is on, and America must push to stay in the lead.

From Virginia’s perspective, we see great promise for nanotechnology to boost business development in industries that are crucial to our overall economy: information technology, biotechnology, advanced materials, health-care, aerospace, shipbuilding, and telecommunications, to name just a few. We have an impressive infrastructure in this state, with leading research universities, a lively venture capital community, and a business-friendly state government. Indeed, INANOVA owes its very existence to timely funding from Virginia’s Center for Innovative Technology, an economic development agency focused on innovative technologies with an impressive track record in facilitating the start up and growth of leading edge businesses. For all our strengths, however, we are not yet at the point of critical mass, and we have not created the synergies necessary to form leading nanotechnology R&D centers, such as those currently under development in several other states. This bill, we believe, will be a catalyzing force to encourage nanotechnology research and education in Virginia, to foster the development of major public/private partnerships, and to actively engage larger segments of our academic and business communities in the nanotechnology movement.

Regarding the bill itself, we have two recommendations that we believe will enhance its effectiveness.

First, we judge that the pace of nanotechnology research will be accelerated considerably if the bill were to encourage the development of regional centers for excellence in research instrumentation, encompassing both multi-disciplinary facilities and state-of-the-art infrastructure. All scientific disciplines are engaged in nanoscale research, and much of this work requires sophisticated and expensive equipment. If this bill were to encourage the formation of regional networks of such research equipment, then access would be enhanced. We would anticipate more efficient utilization of the equipment, a much broader participation of researchers from colleges and universities of all sizes, and a faster spread of scientific, technological, and educational benefits.

Second, we believe the bill should specifically require coordination between the National Nanotechnology Coordination Office and existing state nanotechnology initiatives, as well as university research offices. This decentralized approach is particularly necessary for nanoscale sciences where much of the fundamental innovations occur in a “bottom-up” fashion. One method to accomplish this is for the national office to directly fund state nanotechnology initiatives and charge them with identifying and encouraging specific lines of research and business development based on identified strengths in their particular regions.



In conclusion, the Initiative for Nanotechnology in Virginia strongly supports the proposed bill and envisions it as a much-needed catalyst to help the nation and regional centers realize their ultimate potential for scientific, technological, business and educational innovations, through the enabling science of nanotechnology.

Finally I would like to thank the Committee for inviting me to speak, and I gladly offer the services of our organization (INanoVA) to help in the swift passage of this bill. Thank you.



## About Nanotechnology

Nanotechnology is the enabling science for precise and controlled fabrication or assembly of atoms and molecules at nanometer ( $10^{-9}$ m) dimensions, into novel materials and devices with unique properties determined by quantum mechanics, for applications in sectors including electronics, photonics, structural materials, biomedical devices, and custom chemicals. Its promise for our society include timeless opportunities such as:

- Unfolding of novel scientific phenomena through active collaboration among numerous disciplines that will enhance the nation’s technological competitiveness.
- Steering and driving economic development, based on revolutionary applications it can bring forth to existing markets, while aiding in the creation of new ones.
- Serving as an ideal platform for education and outreach to the workforce, students, and to the public-at-large, including legislators and service organizations, based on its grand scientific and technological implications.

## The Initiative for Nanotechnology in Virginia (INanoVA)

INanoVA is a statewide consortium of Virginia’s universities, federal labs, and industrial partners dedicated to promoting collaborative nanotechnology research, education, technology transfer, and commercialization. Established through seed funding from Virginia’s Center for Innovative Technology (CIT) and matching awards from partner institutions and industrial members, INanoVA’s purpose is to build a “nanotechnology community” in Virginia and place the state in the forefront of nanotechnology research and innovation. Activities include:

- Establishing <http://www.INanoVA.org> as an information base, serving as a nanotechnology “clearinghouse” for news, funding updates, and user services.
- Coordinating and developing inter-institutional and inter-departmental nanotechnology research throughout Virginia, to establish the state as a major nanotechnology research center.
- Linking industry to nanotechnology research performed in the state, thereby accelerating technology transfer, commercialization and economic development.
- Establishing open access nanotechnology research instrumentation centers, to enable collaboration among universities, and with industries.
- Connecting the nanotechnology community by co-sponsoring scientific, educational and business meetings and conferences.
- Leveraging CIT seed funding with additional public and private investments for nanotechnology.

## INanoVA Partners

Educational Institutions	State & Other Nonprofits	National Labs	Businesses
College of William & Mary	Virginia’s Center for Innovative Technology	National Aeronautics and Space Administration, Langley Research Center	Foley & Lardner, LLP
George Mason University	Virginia Economic Development Partnership	Naval Research Laboratory, Washington, DC	Infineon Semiconductor
James Madison University	Virginia Space Grant Consortium	Thomas Jefferson National Accelerator Facility	Leica Microsystems
Old Dominion University			Luna Innovations
University of Virginia			Micron Technologies
Virginia Commonwealth University			NanoTITAN, Inc.
Virginia Polytechnic and State University			Northrop Grumman Newport News