

Testimony

of

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House of Representatives
Committee on Appropriations
Subcommittee on Commerce, Justice, and
Science

*“The Role of the National Institute of
Standards and Technology in the Overall
Science Enterprise”*

Thank you Chairman Mollohan, Ranking Member Wolf, and members of the House Subcommittee on Commerce, Justice, and Science for the opportunity to testify before you today on the role of NIST in the overall science enterprise.

My name is James W. Serum. I am the President of Scitek Ventures, a science and technology consulting firm focused on helping young companies commercialize innovative ideas and early stage technology. I have been deeply engaged in developing and commercializing measurement technologies and applications for over 40 years, having spent most of my career with Hewlett Packard Company. Upon retirement in 1999, I founded an information technology business, Viaken Systems Inc. and a technology consulting firm, Scitek Ventures LLC, both focused on measurement systems. I have been associated with NIST for almost 11 years, having served first as a member of the National Research Council Assessment Panel for the Chemical Science and Technology Laboratory (CSTL), and, since 2004, as an elected member of NIST's Visiting Committee on Advanced Technology (VCAT). I am currently the chair of that organization.

From my long association with NIST I can tell you that NIST is a unique research agency that is a critical element of this Nation's scientific enterprise especially as it provides the tools necessary to accelerate technological innovation and competitiveness. In fact NIST is the only Federal Research agency I can think of that is specifically focused on promoting U.S. economic competitiveness, and unlike other government research agencies the primary stakeholder of all NIST programs is industry. Today I hope to show you that whether it is through technology research, the development of advanced precision measurements, or the creation of standards that promote quality and enhance efficiency, NIST provides the tools essential to increase the productivity and efficiency of industry, accelerate the adoption of new technology, and to enable fair trade.

Measurement science and standards, the foundation of technological innovation

The core of NIST's scientific impact flows from the NIST laboratories, and their continued focus on measurement science and standards. The NIST Laboratories continue to be the premier measurement and standards laboratory in the world with the highest level of expertise. The measurement science performed at NIST is often at the cutting edge of science providing the foundation to enable many new technical innovations. Like an extreme athlete - competing at the edge of human endurance, NIST's measurement science is focused at the extremes - measuring smaller objects or phenomena faster or more accurately than anyone else. This is important because if you can't measure something -- you can't control it. And if you can't control it - you can't *reliably* manufacture it. NIST's unique role is to advance measurements and standards so that the next innovation can be realized and commercialized.

The impacts of NIST measurement science research are numerous. Take for example the work of one of NIST's Nobel Laureates, Dr. Jan Hall who won the Nobel Prize in Physics in 2005. Dr. Hall's work was focused on the precise measurement of the wavelength (color) of light. The unprecedented accuracy and precision of the technology pioneered by Dr. Hall has been the foundation upon which numerous technological advancements have been built including the development of exquisitely accurate atomic clocks that have resulted in unprecedented improvements in navigation and positioning (GPS), increased

capacity of fiber optic communications, new methods to rapidly diagnose disease, and ways to identify trace chemical species in the environment and complex industrial products.

The measurement science research at NIST also provides industry with the critical tools that will help the US overcome some of our most daunting challenges. For example in our Nation's effort to develop cleaner and renewable sources of Energy, measurement science at NIST is enabling new technological opportunities in everything from Green buildings to photovoltaics. In the area of fuel cells scientists at NIST's Center for Neutron Research recently have developed ways to use neutrons to make key observations of the interior of operating fuel cells. These measurements have led to improvements in fuel cell design and are being used by large and small companies such as General Motors, Chrysler, Dupont, and PlugPower to improve the efficiency and durability of fuel cells for zero carbon emission vehicles. A National Academy of Sciences report describes this NIST work as "*...a considerable achievement and one of the most significant analytical advances in the membrane fuel cell field realized in decades.*"

In addition to performing research in measurement science, another critical element to NIST's role in innovation is its role in standards. Standards come in many forms. There are the SI units - for example the meter, kilogram, and second. There are also documentary standards like the formats that describe ways to store digital data for movies or music. In addition, there are standard reference data and materials. Standards provide technical definitions and guidelines for design and manufacturing. They serve as a common language, define quality and establish safety criteria. In the United States, standards are developed by private-sector organizations such as American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME) and many, many, more. These standards are used by industry and are frequently adopted by government agencies as a means of establishing regulatory requirements. They are vital to the economic health of many industries, and – more important – they help to ensure the health and safety of the American people and of citizens in countless nations around the world. One of the biggest impacts of NIST's role in standards comes in facilitating global trade. The Department of Commerce and NIST have a vital role in ensuring acceptance by other nations of U.S.-developed standards that incorporate technological advances and that meet changing industry, regulatory, and public safety needs. Enabling U.S. manufacturers to design and build to one standard or set of standards increases their competitiveness in the world market, which makes NIST efforts to assist U.S. standards developers in their negotiations with international and national standards organizations critical to the U.S. business community.

These are just a couple of examples of the impact of NIST's measurement science and standards can have. Again let me reemphasize that this work forms part of the foundation upon which innovation is built. NIST measurements and standards were integral to the successful development and adoption of virtually every one of the 20th century's greatest engineering achievements – including automobiles, aircraft, lasers, computers, and the internet. It is essential that NIST's role in innovation not be overlooked and that it receives the resources it needs to

continue their significant contribution to the advancement of technology, measurement innovation and industrial competitiveness.

Catalyzing future technical advancement and strengthening America's manufacturing base

In addition to NIST's role in measurement science and standards, its Technology Innovation Program (TIP) and Manufacturing Extension Partnership (MEP) provide critical support and services to America's competitive backbone – its small businesses. Together these programs:

- Foster collaboration across diverse technology partners and fund small businesses and universities to incentivize the development of transformational technologies that address key national needs;
- And, provide services that strengthen and enhance the productivity of U.S. small manufacturers

The creation of the TIP program by the America COMPETES act provides NIST with the capability to overcome the barriers to successful innovation and disruptive technology development faced by the private sector and government that were identified in the seminal National Academies report *Rising Above the Gathering Storm*. TIP has already made a start to address some of the Nation's key technology challenges. With its inaugural competition for funding in FY 2008, TIP addressed the nation's critical need for improvements in physical infrastructure. Specifically, TIP conducted a competition for high-risk, high-reward research addressing "Advanced Sensing Technologies for Infrastructure: Roads, Bridges, Highways and Water Systems." Outputs for the first Program year include the awarding of 9 cooperative agreements with 31 recipients, including 17 small or medium businesses, 11 universities and 3 local government laboratories in 12 states. These 9 awards have the potential to generate an additional \$46 million in industry cost-share over 3-5 years. I feel that with appropriate and stable resources the new Technology Innovation Program will be a key part of the federal portfolio to accelerate American innovation by supporting transformational research in areas addressing critical national needs.

The Manufacturing Extension Partnership is one of NIST's better known programs. It is a unique program partnering manufacturers, states, and the federal government to provide a wide range of services strengthening U.S. small manufacturers. Currently MEP runs a network of 59 centers in 443 locations across the U.S. This network enables MEP to bridge the productivity gap for small manufacturers by identifying opportunities for growth and profitability, and encouraging technology deployment. MEP assistance enables manufacturers to streamline plant operations, create or retain jobs, develop new markets and products, and successfully compete in the global marketplace.

The MEP program has a strong history of measurably improving the productivity and competitiveness of Hollings MEP clients. The most recent (FY 2007) client reported impacts include:

- new sales of \$5.60 billion,
- retained sales of \$4.88 billion,
- client cost savings of \$1.44 billion,
- new client investment in modernization of \$2.19 billion,
- creation and retention of 57, 079 jobs, and
- 28,004 clients served.

MEP successfully provides the services that reduce manufacturers' bottom-line expenses, increase efficiencies and build capacity. I am confident that MEP will continue to improve the efficiency and growth of US small manufacturers positively impacting the employment and profitability of this important part of the U.S. economy.

From my long association with NIST I have seen year after year that NIST generates a high rate of return for investment in its programs. Whether through investment in its laboratories and user facilities where nineteen retrospective studies of economic impact show that, on average, NIST labs generated a benefit-to-cost ratio of 44:1 to the U.S. economy, or through programs like MEP that leverage less than \$100 million dollars of federal investment into a nearly \$300 million dollar program by teaming with industry, state, and local organizations to increase sales, reduce costs, and generate and save jobs for our nation's small manufacturers, NIST programs have a high impact and benefit entire industries or sectors of the economy.

If NIST is fully enabled it is sure to have dramatic near and long term impact--increasing the productivity and efficiency of US industry, promoting safe and fair commerce, and helping to ensure an economically, vigorous and competitive United States as we move to the future. Unfortunately Federal support for NIST has been falling relative to U.S. GDP and industry research for many decades. This means that even though technology has become more and more important to the U.S. economy, the federal infrastructural support that NIST provides has been severely challenged due to resource constraints. I applaud NIST scientists and engineers for their "can do" attitude and doing their utmost to address a growing list of challenges and needs with limited resources. I have been encouraged that the America COMPETES Act, intended to double the NIST budget in ten years, remains a priority of the Congress and the administration. I also applaud this Subcommittee on its leadership in writing a Fiscal Year 2009 appropriations bill for NIST that provides it with the resources outlined by COMPETES. I would urge Congress to continue to show a strong commitment to NIST and not to overlook the important and essential role it plays in our Nation's scientific enterprise.

Again thank you for the opportunity to testify today. I look forward to answering any of your questions.