NIST'S FY 2009 BUDGET REQUEST: WHAT ARE THE RIGHT TECHNOLOGY INVESTMENTS TO PROMOTE U.S. INNOVATION AND COMPETITIVENESS?

HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

MARCH 11, 2008

Serial No. 110–83

Printed for the use of the Committee on Science and Technology

Available via the World Wide Web: http://www.house.gov/science

U.S. GOVERNMENT PRINTING OFFICE

41–065PS WASHINGTON : 2008

For sale by the Superintendent of Documents, U.S. Government Printing Office
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NIST'S FY 2009 BUDGET REQUEST: WHAT ARE THE RIGHT TECHNOLOGY INVESTMENTS TO PROMOTE U.S. INNOVATION AND COMPETITIVENESS?

TUESDAY, MARCH 11, 2008

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 2:08 p.m., in Room 2318, Rayburn House Office Building, Hon. David Wu [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

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SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION
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National Institute of Standards and Technology

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Dr. Peter Fiske
Vice President for Research and Development
PAX Scientific, Inc.

Dr. Mary Good
Founding Dean
George W. Donaghey College of Engineering and Information Technology
University of Arkansas at Little Rock

Mr. Michael Coast
President, Michigan Manufacturing Technology Center;
Chairman of the Board, American Small Manufacturers Coalition

HEARING CHARTER

SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

NIST's FY 2009 Budget Request: What Are the Right Technology Investments to Promote U.S. Innovation and Competitiveness?

TUESDAY, MARCH 11, 2008
2:00 P.M.—4:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Tuesday, March 11, 2008, the Technology and Innovation Subcommittee of the House Committee on Science and Technology will hold a hearing to consider the President's fiscal year 2009 (FY09) budget request for the National Institute of Standards and Technology (NIST). An Administration witness will review the proposed budget in the context of the President's overall priorities for NIST. In addition, there will be four witnesses who will comment on the budget request, NIST's strategic plans, and the future direction of the agency.

2. Witnesses

Dr. James Turner, Acting Director, National Institute of Standards and Technology

Dr. James Serum, Chairman, NIST Visiting Committee on Advanced Technology

Dr. Mary Good, Founding Dean, George W. Donaghey College of Engineering and Information Technology, University of Arkansas at Little Rock, Little Rock, AR

Dr. Peter Fiske, Vice President for Research and Development, PAX Scientific, Inc.

Mr. Michael Coast, President, Michigan Manufacturing Technology Center; Chairman of the Board, American Small Manufacturers Coalition

3. NIST Overview

The National Institute of Standards and Technology (NIST) is a non-regulatory agency of the Department of Commerce. Founded in 1901, NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. NIST helps U.S. industry, workers, and consumers by ensuring that technical standards are used in a way that creates a level playing field for global trade, rather than a barrier to commerce.

NIST operates research facilities at Gaithersburg, MD, and Boulder, CO, and radio stations located at Kauai, HI, and Fort Collins, CO. NIST has partnerships with and personnel located at the Hollings Marine Labs in Charleston, SC, the JILA joint institute in Boulder, CO (operated jointly with the University of Colorado), and the Center for Advanced Research in Biotechnology (CARB) in Rockville, MD (operated jointly with the University of Maryland).

NIST employs approximately 2,800 scientists, engineers, technicians, and support personnel. NIST also hosts approximately 2,600 research associates and facility users from academia, industry, and other government laboratories. NIST partners with about 1,600 manufacturing specialists and staff at affiliated centers around the country. In recent years, NIST staff members have earned three Nobel Prizes, the National Medal of Science, a MacArthur Fellowship, the L'Oréal-UNESCO Women in Science Award, and numerous other honors.

NIST operates four major cooperative programs to carry out its mission:

- **NIST laboratories and user facilities.** NIST's internal laboratories conduct basic and applied research in a wide array of fields to support the U.S. technology infrastructure. This research focuses on developing tools to measure, evaluate and standardize, which enable U.S. companies to innovate and remain competitive. NIST's user facilities provide industry, academic and government researchers with access to advanced technical equipment for research and development.
- **Baldrige National Quality Program.** The Baldrige program promotes excellence among U.S. manufacturers, service companies, educational institutions, health care providers, and non-profit organizations by conducting outreach programs and managing the annual Malcolm Baldrige National Quality Award recognizing performance excellence and quality.
- **Manufacturing Extension Partnership.** The MEP program offers services in business and process improvements to modernize the operations of small- and medium-sized manufacturers and enhance their competitiveness. MEP distributes its services through a nationwide network of local centers in all 50 states and Puerto Rico, which receive equal funding from federal sources, State and local sources, and fees charged for services.
- **Technology Innovation Program.** The TIP (formerly the Advanced Technology Program) supports and accelerates the development of high-risk, innovative technologies that promise broad benefits for the Nation by awarding cost-shared grants to small- and medium-sized companies, and to joint ventures between industry, academia, non-profit research institutes and national laboratories.

NIST Legislative Background

On April 17, 2007, Reps. David Wu and Phil Gingrey introduced H.R. 1868, the *Technology Innovation and Manufacturing Stimulation Act of 2007,* with bipartisan co-sponsorship. H.R. 1868 authorized appropriations for NIST's programs in fiscal years 2008 through 2010 (see Table 1). The authorization levels placed the overall NIST budget on a ten-year path to doubling. Within this envelope, the bill doubled NIST's laboratories over ten years, doubled the Manufacturing Extension Partnership (MEP) over ten years, replaced the Advanced Technology Program (ATP) with the Technology Innovation Program (TIP) and provided funding for $40 million in new TIP awards per year, and funded the completion of existing laboratory construction projects.

H.R. 1868 also required NIST to deliver a three-year programmatic planning document to Congress with the annual budget request. This document must address all of NIST's programs. NIST's external industrial advisory committee, the Visiting Committee on Advanced Technology (VCAT), is directed to comment on the document in its annual report.

H.R. 1868 was reported unanimously by the Committee on Science and Technology on April 30 and passed the House on May 3 by a vote of 385–23. It was subsequently incorporated into H.R. 2272, the *America COMPETES Act* (P.L. 110–69), which became law on August 9, 2007.

NIST Program Details

The **NIST laboratories** are comprised of seven labs and a technical program, and are funded under the Scientific and Technical Research and Services (STRS) account.

- **Building and Fire Research Laboratory** (BFRL) works to improve quality and productivity in the U.S. construction industry and reduce loss of life and property damage from fires, earthquakes, wind, and other hazards, by studying building materials and fire safety engineering.
- **Chemical Science and Technology Laboratory** (CSTL) conducts research in measurement science and develops the chemical, biochemical, and chemical engineering measurements, data, models, and reference standards necessary for enhancing the competitiveness of the U.S. chemical industry, and improving public health, safety and environmental quality.
- **Electronics and Electrical Engineering Laboratory** (EEEL) provides the technical basis for all electrical measurements in the U.S.
- **Information Technology Laboratory** (ITL) conducts research and develops test methods and standards for emerging and rapidly changing information technologies, focusing on technologies that will improve the usability, reli-

ability and security of computers and computer networks for work and home use.

- **Manufacturing Engineering Laboratory** (MEL) develops measurement methods, standards and technologies to enhance U.S. manufacturing capabilities and to improve manufacturing efficiency and productivity.
- **Materials Science and Engineering Laboratory** (MSEL) researches materials that are needed by industry sectors including microelectronics, automobiles, and health care.
- **Physics Laboratory** (PL) provides measurement services and research for electronic, optical, atomic and radiation technology. PL also maintains the NIST F–1 atomic clock, the primary frequency standard in the United States.
- **Technology Services** (TS) provides support for NIST programs to calibrate industry equipment, to sell standard reference materials, to train foreign technical standards officials, to accredit private testing laboratories, and other technical standards services.

In addition, the STRS account funds the Baldrige National Quality Program (described above) and NIST's two national research facilities.

- **NIST Center for Neutron Research** (NCNR) provides facilities for outside researchers to study the structure and dynamics of a wide range of materials. This facility is used heavily by industry. In fiscal year 2007, researchers from 59 U.S. companies, 40 national labs, and 137 U.S. universities conducted research at the facility in collaboration with NIST staff.
- **Center for Nanoscale Science and Technology** (CNST) leverages the unique capabilities of the NIST Advanced Measurement Laboratory complex, providing state-of-the-art facilities for nanomanufacturing and nanometrology where industry, universities, and other federal laboratories can collaborate in solving critical measurement and fabrication issues that are necessary to convert nanoscale science and technology research into usable commercial products.

NIST also manages two programs that support small businesses, which are funded under the Industrial Technology Services (ITS) account.

- **The Manufacturing Extension Partnership** (MEP) is the only federal program that specifically targets small- and medium-sized manufacturers to help them modernize their operations, improve their competitiveness, and reduce or reverse job losses. A proven public/private partnership, MEP operates a network of 59 centers in all 50 states and Puerto Rico, whose mission is to improve the competitiveness of small- and medium-sized manufacturers. The centers are funded through equal contributions from federal sources, State and local sources, and fees for service. Clients who used MEP services in fiscal year 2006 reported that they created or retained over 52,000 jobs, increased or retained sales of $6.8 billion, leveraged $1.7 billion in new private-sector investment, and generated cost savings of $1.1 billion.
- **The Technology Innovation Program** (TIP) was created by the *America COMPETES Act* (P.L. 110–69) to replace the Advanced Technology Program (ATP). TIP's purpose is to support, promote, and accelerate innovation in the United States through high-risk, high-reward research in areas of critical national need. Through private/public partnerships, TIP's early-stage investments will accelerate the development of high-risk, broadly enabling technologies and help bridge the gap between the laboratory and the market place. Through September 2007, TIP's predecessor, ATP, co-funded 824 projects with 1,581 participants. Eighty percent of single-applicant ATP awards were made to small businesses (fewer than 500 employees) while more than 170 different colleges and universities have participated in ATP projects. Benefit-cost studies from approximately 40 projects indicate an eight to one return on investment. The 56 ATP grants awarded in the final round of the program's existence (September 2007) will be continued to completion under TIP.

NIST Strategic Planning Documents

The *America COMPETES Act* created a requirement for NIST to deliver a three-year programmatic planning document to the Congress at the time of the submission of the President's budget. This document is to address NIST's programs under the Scientific and Technical Research and Services, Construction of Research Facili-

ties, and Industrial Technology Services accounts. The Act also requires the NIST Visiting Committee on Advanced Technology (VCAT, a FACA advisory committee) to comment on the document. NIST delivered the first iteration of this document in February 2008.

NIST previously developed the *NIST 2010 Strategic Plan,* released in its final form in June 2004, which outlined strategic drivers, NIST responses to these drivers, and potential impacts on the economy. The plan included technical areas of importance for NIST investments, and strategies that would be pursued by all of NIST's programs to achieve its overall mission.

In August 2006, NIST released *An Assessment of the United States Measurement System: Addressing Measurement Barriers to Accelerate Innovation,* which identified gaps in measurement technology and standards through a process of stakeholder discussions and workshops. This document included high-level judgments on where measurement technology gaps are impeding innovation in specific technology areas, and included a discussion of possible NIST responses to these gaps.

NIST Budget Summary

The enacted, COMPETES-authorized, and requested levels for FY07 to FY09 are summarized in the table below.

Table 1. NIST FY07 - FY09 Budget.

$ millions Budget line	FY07 Enacted	FY08 Request	FY08 Auth.	FY08 Enacted	FY09 Auth.	FY09 Request	FY09 Request v. Auth.	FY09 Request v. Auth. %
STRS	434.3	500.5	502.1	440.5	541.9	535.0	-6.9	-1.3%
Construction	48.3	93.9	150.9	160.5	86.4	99.0	+12.6	+14.6%
ATP/TIP	79.0	0.0	100.0	65.2	131.5	0.0	-131.5	-100%
MEP	104.6	46.3	110.0	89.6	122.0	4.0	-118.0	-96.7%
Total	666.2	640.7	863.0	755.8	881.8	638.0	-243.8	-27.6%

Figures may not add due to rounding.
Figures do not include funds transferred from other agencies or fees for calibration and other services.
Authorization figures are from the America COMPETES Act (P.L. 110-69).

STRS: Scientific and Technical Research and Services (includes NIST laboratories, Technical Services, National Research Facilities, and the Baldrige National Quality Program).
ITS: Industrial Technology Services
TIP/ATP: Technology Innovation Program/Advanced Technology Program
MEP: Manufacturing Extension Partnership

4. NIST Budget Highlights

NIST's Laboratory Programs

The FY09 budget requests $638 million for NIST, $243.8 million (27.6 percent) lower than the amount authorized in COMPETES and $117.8 million (15.6 percent) lower than the FY08 enacted amount. The request comes close to the authorized level for NIST's laboratories and user facilities, proposing a number of new research initiatives in cyber security, biotechnology, nanotechnology, and other areas. However, it eliminates all funding for the Technology Innovation Program (TIP), and provides only nominal funds for the Manufacturing Extension Partnership (MEP) program to cover the costs of eliminating federal support. The request includes construction funds for several laboratory facility upgrades that total $12.6 million (14.6 percent) above the authorized level.

The increase in laboratory programs and user facilities account (STRS) for FY09 includes 14 new research initiatives, ten of which are carried over from the FY08 request.

- **Environment, Health and Safety Measurements and Standards for Nanotechnology** (requested increase of $12 million, new in FY09) will provide standards and characterization methods to enable the assessment of the potential environmental, health and safety impacts of nanotechnology.

- **Measurement and Standards to Accelerate Innovation in the Biosciences** (requested increase of $10 million, new in FY09) will expand NIST's work in the biosciences, with a focus on developing measurement technologies, standards, and data to enable faster and more efficient research and development by the biotechnology and pharmaceutical industry.
- **Cyber Security: Leap-Ahead Security Technologies for Interconnected Systems** (requested increase of $5 million, new in FY09) will expand NIST's work in computer security. This initiative is part of the multi-agency Comprehensive National Cybersecurity Initiative.
- **Going at Light Speed: Optical Communications and Computing** (requested increase of $5.84 million, new in FY09) will accelerate the adoption of high-speed networks by developing methods for diagnosing faults in optical networks.
- **NIST Center for Neutron Research Expansion and Reliability Improvements** (requested increase of $2 million, continued from FY08) will enable the installation of instruments at the upgraded NCNR neutron source.
- **Enabling Nanotechnology from Discovery to Manufacture** (requested increase of $7 million, continued from FY08) aims to advance scientific understanding of engineered nanotechnology materials and help U.S. industry develop manufacturing technologies for these materials. This initiative is a component of the National Nanotechnology Initiative (NNI).
- **Quantum Information Science** (requested increase of $7 million, continued from FY08) will increase NIST's research in high-risk quantum technologies, including nanoscale electronics and new kinds of computer memory devices.
- **Measurements and Standards for the Climate Change Science Program** (requested increase of $5 million, continued from FY08) will enhance the NIST component of the multi-agency U.S. Climate Change Science Program (CCSP) to study the climate-relevant properties of aerosols and develop methods for improving satellite measurements of the sun.
- **Innovations in Measurement Science** (requested increase of $3 million, continued from FY08) allows NIST to pursue the development high-risk, high-reward technology to improve the precision of a variety of measurement tools.
- **National Earthquake Hazards Reduction Program Initiative** (requested increase of $3.25 million, continued from FY08) will fund research into technologies for retrofitting or otherwise protecting buildings against earthquake damage. NIST is the lead agency of the multi-agency NEHRP program.
- **Disaster Resilient Structures and Communities** (requested increase of $4 million, continued from FY08) will develop technologies for improving the resilience of structures and communities to natural disasters such as fires, wind storms and tsunamis. NIST will conduct this work in partnership with NOAA, FEMA, and insurance industry organizations.
- **Enabling the Hydrogen Economy** (requested increase of $4 million, continued from FY08) will fund research into fuel-cell design and high-volume manufacturing by developing technologies for measuring hydrogen fuel cell performance and hydrogen transportation.
- **Biometrics: Identifying Friend or Foe** (requested increase of $2 million, continued from FY08) will develop technologies and standards for testing and evaluating biometric identification systems, in partnership with DHS, the FBI, and the State Department.
- **Manufacturing Innovation through Supply Chain Integration** (requested increase of $1 million, continued from FY08) will expand NIST's efforts to move industry towards seamless global supply chains by developing open manufacturing standards, measurements, and testing tools.

The FY09 request for the construction and maintenance account (CRF) includes funds for two major construction projects and an increase to the maintenance funds for NIST facilities.

- **Boulder Building 1 Extension** (requesting $43.5 million) is the final year of requested funding for the construction of a new laboratory building on the Boulder campus with high-performance facilities.

- **JILA Expansion: Preparing the Next Generation of Physicists** (requesting $13 million) is the first year of funding requested to expand laboratories at the JILA joint institute operated by NIST and the University of Colorado. The expansion will allow JILA to expand its research capabilities in atomic, molecular and optical physics and train 30 percent more students in these fields.
- **Safety, Capacity, Maintenance, and Major Repairs (SCMMR) Increase** (requesting increase of $5.15 million) will permanently increase the NIST budget for maintenance and repair of laboratory facilities. NIST uses the SCMMR account to modernize aging infrastructure and repair damage to its buildings.

The FY09 request for the industrial technology services account (ITS) proposes elimination of both programs in the account.

- **The Technology Innovation Program (TIP)** (formerly the Advanced Technology Program, ATP): The FY09 budget request eliminates TIP, which was funded at $65.2 million in FY08. Under the provisions of the COMPETES Act, TIP will continue to support the final round of ATP grants, awarded in 2007.
- **The Manufacturing Extension Partnership (MEP):** The FY09 request for MEP is $4 million to cover close-out costs. The budget proposes that MEP Centers become self-sustaining, as was intended in the original legislation that created the program. However, the *Technology Administration Act of 1998* (P.L. 105–309) amended this original sunset provision, extending federal support for MEP Centers indefinitely so long as they receive a positive evaluation through an independent review.

5. Issues

- Does the three-year programmatic planning document establish a good strategic plan for NIST?
- Does the FY09 budget request set the appropriate priorities to achieve NIST's mission of improving U.S. competitiveness?
- What stakeholder outreach did NIST conduct to develop its budget initiatives?
- What would be the impact on small manufacturers if federal support for MEP is eliminated?
- Is eliminating TIP a good idea in today's global innovative environment? Does a competitiveness initiative in the beginning of the 21st century make sense without programs like TIP?

Chairman WU. The hearing will now come to order. Good afternoon, ladies and gentlemen. I would like to welcome everybody to this hearing of the Technology and Innovation Subcommittee.

Today, we will be discussing the National Institute of Standards and Technology, or NIST, and its fiscal year 2009 budget request. The Science and Technology Committee has always been one of NIST's strongest supporters. It is one of my favorite agencies. NIST's work on standards and technology has enabled many of the products and services in our modern economy, from semiconductors to ATMs to hearing aids.

Today, NIST is in a position to play a vital role in keeping our nation innovative and economically competitive. Last year, Congress passed the *America COMPETES Act,* which put NIST on a 10 year path to doubling as an investment in our innovation future. COMPETES included the first comprehensive authorization of NIST in 15 years.

This subcommittee developed that authorization bill, which was incorporated in the COMPETES Act, and we believe it made NIST an important component of a balanced innovation agenda. At that time, I, and other Members of the Committee, were concerned that NIST did not have a good, comprehensive plan for what its research activities would be with a doubled budget. It was not clear how NIST set its funding priorities, and how it allocated resources among different technical areas. Indeed, witnesses at last year's hearing expressed similar concerns.

That is why the *America COMPETES Act* included a requirement that NIST deliver a three-year strategic plan to Congress with the budget request. This plan was to include all of NIST's programs, including the NIST Labs and lab construction, the Industrial Technology Services Programs, and the Baldrige Award.

The document that NIST delivered falls far short of this requirement. It leaves out several of NIST's most important programs, and it does not lay out a strategic plan to ensure that NIST's investments are suitable for the competitive challenges of the 21st Century. I am deeply concerned that NIST has still not developed a comprehensive, programmatic planning document. The COMPETES Act clearly established Congressional priorities for NIST. However, the budget request this year largely ignores Congress' input.

The request is 28 percent lower than NIST's financial year 2009 authorization. In fact, NIST is the only science agency included in COMPETES whose budget request is actually lower this year than last year. COMPETES put the Manufacturing Extension Program, or MEP, on a 10-year path to doubling, to enhance its ability to help small manufacturers modernize their operation and remain globally competitive. I am disappointed to see that once again, the Administration proposes to eliminate this program.

In addition, COMPETES created the Technology Innovation Program, or TIP, to provide cost-shared grants to small, high-tech companies that are working to bring new technologies from concept to reality. TIP updated and replaced the highly successful Advanced Technology Program, and it will help reap the benefits of the federal investment in research. I am disappointed that the Adminis-

tration wants to eliminate this key component of a comprehensive innovation agenda.

And now, I would like to recognize the Ranking Member of the Subcommittee, the gentleman from Georgia, Dr. Gingrey, for his opening remarks.

[The prepared statement of Chairman Wu follows:]

PREPARED STATEMENT OF CHAIRMAN DAVID WU

I would like to call the Subcommittee to order.

I want to welcome everyone to this hearing of the Technology & Innovation Subcommittee. Today we will be discussing the National Institute of Standards and Technology, or NIST, and its fiscal year 2009 budget request.

The Science and Technology Committee has always been one of NIST's strongest supporters. NIST's work on standards and technology has enabled many of the products and services in our modern economy, from semiconductors to ATMs to hearing aids. Today, NIST is in a position to play a vital role in keeping our nation innovative and economically competitive.

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The COMPETES Act clearly established Congressional priorities for NIST. However, the budget request this year largely ignores any of Congress' input. The request is 28 percent lower than NIST's FY09 authorization. In fact, NIST is the only science agency included in COMPETES whose budget request is actually lower this year than last year.

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Mr. GINGREY. Good afternoon, and thank you, Chairman Wu. Thank you for convening the hearing today on the Fiscal Year 2009 budget request for the National Institute of Standards and Technology, better known as NIST.

Unfortunately, my duties with the House Armed Services Committee will pull me away from this important hearing on the most important federal agency under the jurisdiction of our Subcommittee, Technology and Innovation, and therefore, I am eager to begin testimony from our esteemed panel, and will keep my remarks brief.

NIST is simply exceptional in the quality and impact of its scientific research, services, and partnerships. Almost every federal agency in the United States industry sector uses the standards, the measurements, and certification services that NIST labs provide. In 2007 alone, NIST provided over 42,000 calibration tests and reference materials across the country. And furthermore, 78 scientists and engineers from my home State of Georgia, along with approximately 8,000 scientists and engineers nationwide, collaborated with NIST throughout the year.

NIST's work helps small and large manufacturers in our country compete in the emerging global marketplace, and the assistance NIST provides is critical to our 21st Century innovative economy.

Mr. Chairman, I am pleased with the President's request of $535 million for NIST Labs, which does put NIST back on the path to doubling its budget laid out in the American Competitiveness Initiative, as you pointed out. However, it is unfortunate that the Administration has sought to end federal contributions to the Manufacturing Extension Partnership program, or MEP.

Last year, at this subcommittee's very first hearing, I said that I was disappointed with the President's request of only $46 million for MEP. Unfortunately, I am even more disappointed with the current request to actually end federal participation in this very important program.

Mr. Chairman, MEP helps small and medium-sized United States manufacturers optimize their operations and remain competitive in a global economy. In Georgia, our MEP program served 834 manufacturing clients in Fiscal Year 2007. It helped create 761 jobs across my state. In my district alone, MEP has completed 20 unique projects for companies in northwest Georgia that will help them stay on the cutting edge of manufacture and innovation.

Because of the positive impact that the MEP program has for our economy, it deserves at least the approximate $100 million Congress has provided in recent years. So, I intend to work with my colleagues to see that it does receive an adequate appropriation for this fiscal year.

Mr. Chairman, NIST is largely an agency that does not receive its due credit for its yeomen's work across all federal agencies, and I want to thank Dr. Turner and his team for the job that they do on a daily basis. I look forward to hearing from you on the panel. I am, again, apologetic that I am going to have to run out, and may hopefully get back in time to hear the rest of your testimony.

And at this point, Mr. Chairman, I will yield back my time.

[The prepared statement of Mr. Gingrey follows:]

PREPARED STATEMENT OF REPRESENTATIVE PHIL GINGREY

Good afternoon Chairman Wu. Thank you for convening this hearing today on the Fiscal Year 2009 budget request for the National Institute of Standards and Technology. Unfortunately, my duties with the House Armed Services Committee will pull me away from this important hearing on the most important federal agency under the jurisdiction of the Technology and Innovation Subcommittee. Therefore I'm eager to begin testimony from our esteemed panel and will keep my remarks brief.

NIST is simply exceptional in the quality and impact of its scientific research, services, and partnerships. Almost every federal agency and U.S. industry sector uses the standards, measurements, and certification services that NIST labs provide.

In 2007 alone, NIST provided over 42,000 calibration tests and reference materials across the country. Furthermore, 78 scientists and engineers from my home State of Georgia—along with approximately 8,000 scientists and engineers nationwide—collaborated with NIST throughout the year. NIST's work helps small and large manufacturers in our country compete in the emerging global marketplace, and the assistance NIST provides is critical to our 21st Century innovation economy.

Mr. Chairman, I am pleased with the President's request of $535 million for the NIST labs, which puts NIST back on the path to doubling its budget laid out in the American Competitiveness Initiative. However, it is unfortunate that the Administration has sought to end federal contributions to the Manufacturing Extension Partnership program or M–E–P. Last year at this subcommittee's very first hearing, I said that I was disappointed with the President's request of only $46 million for MEP. Unfortunately, I am even more disappointed with the current request to end federal participation in this important program.

Mr. Chairman, MEP helps small- and medium-sized U.S. manufacturers optimize their operations and remain competitive in the global economy. In Georgia, the MEP program served 834 manufacturing clients in Fiscal Year 2007 and helped create 761 jobs across the state. In my district alone, MEP has completed 20 unique projects for companies in Northwest Georgia that will help them stay on the cutting edge of manufacturing innovation.

Because of the positive impact that the MEP program has for our economy, it deserves at least the approximate $100 million Congress has provided in recent years, and I intend to work with my colleagues to see it receives an adequate appropriation for FY 2009.

Mr. Chairman, NIST is largely an agency that does not receive its due credit for its yeoman's work across all federal agencies. I would like to thank Dr. Turner and his team for the job they do on a daily basis. I look forward to hearing from our panel, and I yield back the balance of my time.

Chairman WU. Thank you, Dr. Gingrey. If there are other Members who wish to submit additional opening statements, your statements will be added to the record at this point.

And at this point, I will briefly introduce three of our witnesses, to allow Dr. Ehlers to introduce two of the wonderful witnesses who come from the great State of Michigan.

First, Dr. James Turner, who has been the Acting Director of NIST since September of 2007. Dr. Mary Good, who is the Founding Dean of the College of Engineering and Information Technology at the University of Arkansas at Little Rock, and served as the Under Secretary of Technology during the first Clinton Administration. And Dr. Peter Fiske is Vice President of Research and Development at PAX Scientific, an engineering, research, and product design firm.

And I would like to yield to the gentleman from Michigan, Dr. Ehlers, to introduce the final two witnesses.

Mr. EHLERS. Thank you very much, Mr. Chairman. I appreciate you yielding.

First of all, let me just say that I have a very soft spot in my heart for NIST. Years ago, when it was still NBS, and which I think it should still be, I served as a Fellow at the Joint Institute for Laboratory Astrophysics in Boulder, and they then elected me a Nonresident Fellow, and I went back for three summers. At a great institution, I learned a great deal. I hope I contributed something, as well. But I have also served on the visiting panel for NBS for several years, and it was a good experience.

In terms of introducing the two individuals from Michigan. First of all, Dr. James Serum who, with a name like that, obviously was destined to become a scientist. He comes from Hudsonville, Michigan, which, its most important product, in addition to Dr. Serum,

is Hudsonville Ice Cream, and had I known you were here, I would have brought you a gallon of that. At one time, I got on a plane in Michigan to fly to California, and the person next to me was holding a steaming box on his lap. Today, they would have assumed he was a terrorist. It turned out he couldn't leave, couldn't go back home without taking a gallon of Hudsonville Ice Cream back home, so he had it in dry ice just to please his wife.

Next, we have Mr. Michael Coast, who is the President and CEO of the Michigan Manufacturing and Technology Center. Also, I believe, President of the National Association of the individuals who direct that, and that is why he is representing all of them here. But also, the Grand Rapids, Michigan MEP program is partially under his jurisdiction. He has done a fantastic job in Michigan. I totally agree with the comments of Mr. Gingrey that the importance of that program, I also don't understand why the Administration keeps zeroing it out. I finally decided that there is a little man buried in the bowels of the White House who thinks it is a bad program, and zeros it out every year, and then, the Congress proceeds to fund it appropriately.

I am pleased with the MEP program. I am pleased with the TIP program, and I thank you, Mr. Chairman, for giving me the liberty to expound my views on this. I think they are both excellent programs, and I assume that we will, once again, reinstate them and fund them appropriately.

Thank you for giving me the extra time.

Chairman WU. Thank you very much, Dr. Ehlers, and I not only appreciate your comments about MEP and TIP, but I will keep my eyes open for that wonderful ice cream, smoking or not, on airplanes.

As our witnesses know, your written statements will be taken into the record. Spoken testimony should be limited to five minutes, after which, Members of the Subcommittee will have five minutes each to ask questions.

And Dr. Turner, we will start with you.

STATEMENT OF DR. JAMES M. TURNER, ACTING DIRECTOR, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. U.S. DEPARTMENT OF COMMERCE

Dr. TURNER. Thank you very much, sir. Chairman Wu, Ranking Member Gingrey, Dr. Ehlers, we thank you for the opportunity to present the President's Fiscal Year 2009 budget request for NIST.

This budget puts us back on the doubling path, as envisioned in the President's American Competitiveness Initiative, and as reflected in the *America COMPETES Act* that Congress enacted last year. I want to thank the Chairman and the Ranking Member, and the other Members of the Committee, for their leadership in the *America COMPETES Act.*

For FY09, our request is $638 million, which includes $634 million for NIST's core programs, encompassing NIST's research and facilities, and $4 million for the Hollings Manufacturing Extension Partnership. The funding level decisions for MEP, as well as the TIP program, were difficult choices that had to be made in tight budget times. The budget for NIST's core represents a 22 percent increase over the FY08 appropriations for these programs.

You will hear today from our VCAT, our Visiting Committee on Advanced Technology. I want to thank them for the time and effort that they offer and provide in advising NIST. Most recently, they recommended an internal Nanotechnology Council to coordinate our nanotechnology work. We welcome their recommendation, and as of Friday, that Council now exists.

The President's request focuses on high impact research that will spur economic growth, and improve our quality of life, and thereby accomplish NIST's mission to advance innovation and industrial competitiveness. The ACI and COMPETES Act enable NIST to continue to aggressively lay the science and technology foundation recommended by so many reports and proclamations on U.S. innovation and competitiveness. It is paramount that NIST move rapidly and wisely toward realizing the vision of being the world's leader in creating critical measurement solutions and promoting equitable standards.

Well-targeted measurements and standards investments are a proven path to stimulate innovation, foster industrial competitiveness, increase economic security, and improve the quality of life of all Americans. The FY 2009 budget proposal contains a total of 17 initiatives. These initiatives were developed using a rigorous process that includes talking with industry, stakeholders, and our Visiting Committee.

Five of the initiatives are new for FY09. The rest were previously proposed in the FY08 budget, but to all our collective disappointment, the FY 2008 budget took us off the doubling track. At NIST, this has real consequences. Three hundred new employees and guest researchers were not hired. A number of important research projects were stopped or delayed, and maintenance of our facilities will slow down while increasing the risk of equipment and facility failures.

Our experience last year makes this year's budget request much more important. We must not lose this historic moment to make the significant, necessary investment in the physical sciences.

Let me briefly describe our initiatives. We have grouped them into three areas. First, addressing urgent environmental safety and security needs, which include initiatives in nanotechnology, climate change, biometrics, earthquake hazards, and disaster-resilient structures. Secondly, investment in strategic and rapidly advancing technologies, which includes initiatives in bioscience measurements, quantum computing, cyber security, optical light communications, hydrogen fuel, and manufacturing supply chain integration. And finally, building our science and engineering capacity and capability, which includes a proposed expansion of the JILA facility that Dr. Ehlers referred to, in Boulder, and a new Boulder lab facility, an expansion of the NIST Center for Neutron Research in Gaithersburg, and an increase in our major repairs and maintenance.

For 107 years, NIST research has been critical to the Nation's innovation and competitiveness. The increased funding in the President's FY09 budget for NIST's core will directly support technological advances in broad sectors of the economy that will, quite literally, define the 21st Century, as well as to improve the safety and quality of life for all our citizens.

Again, this is a historic moment. The ACI is truly a once in a generation opportunity to enable cutting edge advances in measurement science that will ensure the U.S. drives technological change.

We look forward to working with you, Mr. Chairman, and Members of the Subcommittee throughout this process. Thank you very much.

[The prepared statement of Dr. Turner follows:]

PREPARED STATEMENT OF JAMES M. TURNER

Chairman Gordon, Ranking Member Hall and Members of the Committee, thank you for the opportunity to appear before you today to present the President's Fiscal Year 2009 budget request for the National Institute of Standards and Technology (NIST). This budget reflects NIST's growth path under the President's American Competitiveness Initiative (ACI) and under the *America COMPETES Act* (P.L. 110–69) that this committee passed last year. The levels reflected in this budget will further enhance NIST's ability to provide the Nation's critical measurement and standards needs.

NIST will meet this challenge by relying on partnerships with industry and academia to plan and carry out research and provide services. These partnerships also allow NIST to stay abreast of current high priority needs and to anticipate emerging needs. More than 1,800 guest researchers work with nearly 3,000 NIST staff members in NIST laboratories and facilities on several campuses to provide the Nation with the most advanced measurement and standards research and services.

The FY 2009 request of $638M includes $634M for NIST's core programs (encompassing NIST's research and facilities) and $4M for the Hollings Manufacturing Extension Partnership. The budget for the NIST core represents a 22 percent increase (excluding congressionally directed grants) over the FY 2008 appropriations for these programs. The President's request focuses on high-impact research that will address critical national needs, spur economic growth and accomplish NIST's mission to advance innovation and industrial competitiveness.

Supporting Innovation and the Economy

The well-being of U.S. citizens is affected every day by NIST's measurement and standards work. Virtually every segment of the economy—transportation, computers, banking, food processing, health care and communication—depends on NIST research, products and services. More broadly, the quality of the water we drink, the air we breathe, and the food we eat depends in part on that work. NIST standards-which are not regulatory-ensure that consumers are confident of the quantity and quality of the product purchased whether it is a gallon of gasoline or the amount of electricity used and stated in the monthly bill. They protect our banking at ATMs and our online purchases. Soon, these standards will help to protect the privacy of our health records.

They improve the accuracy of our medical tests and treatments and help to make sure that we know the nutritional content of what we are eating. They help to convict criminals and free the innocent through more accurate and faster DNA tests. They provide crucial timekeeping that we depend upon for navigation, telecommunications, financial transactions, and basic research. And they improve the readiness of our first responders and our homeland security. The measurement and standards infrastructure provided NIST paves the way for U.S. innovation and economic competitiveness. In many instances, NIST work in measurement science is the critical path to discovery and innovations.

While companies strive to make their latest products and services as easy to use and as simple for consumers as possible, the underlying knowledge and technology base that makes this possible is certainly not simple. Consider the web of fiber optic networks that makes broadband communication—from long distance telephone, to cable television, to high-speed Internet—possible. The system includes dozens of independent networks, tens of thousands of connections and millions of miles of optical fibers, each fiber capable of carrying hundreds of separate signals simultaneously. Yet, despite its already mind boggling complexity, this fiber optic system that our economy depends on may soon suffer with the same kind of traffic congestion currently clogging highways around many major metropolitan areas.

To prevent this, communications manufacturers and service companies need faster, more accurate ways to measure the quality of optical signals, data analysis tools to diagnose transmission problems, and nanoscale monitoring systems for ultra fast

microchips that use light instead of electrons to store and process information. NIST is uniquely positioned to help meet these challenges. NIST has the right combination of world class scientists and engineers, outstanding scientific facilities, and strong ties with both the industrial and service sectors to provide the tools needed to realize next-generation optical technologies. As a result, the consumer will receive information faster, with fewer disruptions, and be able to interconnect between networks to get work done that suits their needs.

Medicine is facing a similar complexity explosion. As the project to decode the three billion "letters" of the human genome has demonstrated, the frontiers of medicine have moved in the last few decades from often qualitative assessments to increasingly quantitative measures down to the level of individual biological molecules. As a result, medical researchers skilled in the biological sciences are increasingly finding that they need to integrate physical scientists, and their quantitative measurement skills into their research teams.

Just as a systems engineer might study an entire fiber optic network from its individual components to its overall efficiency, life science researchers are beginning to treat medical and biological research problems with a "systems approach" long used in engineering and the physical sciences. Life sciences researchers are attempting to fully integrate what they know at the nano and microscale of molecules, DNA, and proteins with the macroscale problems of disease and other medical problems experienced by patients. Again, NIST, with its interdisciplinary research staff and expertise in creating ground-breaking new measurement methods and standards, can provide the tools needed to advance the field. The payoff will be faster development of new drugs, more personalized medicine, and better prediction, diagnosis, and understanding of disease. This approach leverages NIST's core competencies.

Similar opportunities exist for NIST to undertake the equally complex measurement challenges involved in safely exploiting the promise of nanotechnologies or transforming the field of computer modeling and visualization to a truly quantitative, predictive science.

To accomplish all of these goals and to meet the challenges of the ACI, NIST must continue to update and expand its own laboratory facilities. Consequently, this budget also includes a request for the final year of funding for the continued construction of an extension to NIST facilities at its laboratory in Boulder, CO (Building 1) to provide new high performance space; a new request for an expansion of facilities and capacity to train future U.S. scientists in cutting edge atomic, molecular, and optical physics at JILA—NIST's world renowned joint institute with the University of Colorado at Boulder; as well as funding for the third year of a program to expand and upgrade NIST's Center for Neutron Research—the Nation's leading facility of its kind and a critical research tool for more than 2,200 researchers annually who work in nanotechnology, advanced materials, biotechnology, and other fields.

FY 2008 Impacts

The ACI and the passage of the *America COMPETES Act* provide an unprecedented opportunity to further enhance and accelerate NIST's contributions to innovation and competitiveness.

Unfortunately, FY 2008 appropriations were well below the requested level. Those appropriations do not provide funding for NIST's laboratory research and facilities efforts at the President's request level for the ACI. We are pleased that the President's FY 2009 Request would restore NIST to the path to double over a ten-year period its core research activities. NIST will make every effort to optimize the funds provided, but the lower 2008 funding provided compared to the President's budget request will have negative impacts on NIST and its customers and partners in industry, academia, and other agencies. Those impacts include a real loss in timely research that yields positive benefits for the Nation. The FY 2008 omnibus appropriation included $83M in earmarks and unrequested grants for NIST, the impact of which is to slow down or limit the core research and facilities proposed at NIST. This means that research areas critical to U.S. innovation will not be advanced as aggressively as originally proposed in critical areas such as nanotechnology, quantum computing, climate change and earthquake and other disaster resistant structures.

It also means that NIST falls $13.5M short of the amount needed to cover salary increases and other anticipated costs, requiring several actions. Consequently, NIST will slow down new hires with specialized skills and will not be able to bring on board the estimated 300 additional staff and guest researchers anticipated with the budget initiatives requested by the President. NIST managers are reviewing laboratory and administrative activities to ensure that ongoing high priority projects re-

ceive the funding that they need and that all funds are used as efficiently as possible.

As part of the ACI, NIST received $79.1M of its requested $93.9M for two new facilities initiatives and for operational maintenance, major repairs and safety of the NIST campuses. To compensate for the shortfall, NIST has adjusted its overall facilities plans in order to proceed with the two major projects. NIST will slow down its plans to reduce the backlog of deferred maintenance projects on existing facilities. This increases the chances of unanticipated major equipment outages and temporary loss of facilities use, resulting in higher repair costs and loss of researchers' productivity.

The President's FY 2009 request for NIST would get the Institute back on a doubling track—enabling NIST to continue to aggressively lay the science and technology foundation recommended by so many reports and proclamations on U.S. innovation and competitiveness. It is paramount that NIST move rapidly and wisely toward realizing the vision of being the world's leader in creating critical measurement solutions and promoting equitable standards. Well-targeted measurement and standards investments is a proven path to stimulate innovation, foster industrial competitiveness, increase economic security, and improve the quality of life of all Americans.

FY 2009 President's Budget

NIST's FY 2009 budget request totals $638M, which includes $634M for core research and facilities programs, a 22 percent increase (excluding congressionally directed grants) over the FY08 appropriations for these same core programs. The increased funding for NIST's core programs provided through the FY 2009 request will directly support innovative advances in broad sectors of the economy as well as improve the safety and quality of life for our citizens. The FY 2009 budget contains a total of 17 initiatives. Five of the initiatives have not been requested before. The balance of the initiatives was proposed in the FY08 budget. After being updated, all went through a rigorous internal process to assess their value and connection to NIST's mission. Their relevance, technical merit, and priority were reaffirmed.

The following table summarizes the proposed FY 2009 budget. In this table, we show both the FY 2007 and FY 2008 enacted levels without congressionally directed projects for comparison.

National Institute of Standards and Technology (NIST)
FY 2007 - FY 2009 Budget
Excluding Congressionally Directed Projects
(Dollars in Thousands)

	FY 2007 Enacted	FY 2008 Enacted*	FY 2009 President's Budget
National Institute of Standards and Technology (NIST)			
Scientific and Technical Research and Services (STRS)	434,371	439,624	535,000
Construction of Research Facilities (CRF)	58,686	79,148	99,000
NIST Core Subtotal (STRS + CRF)	493,057	518,772	634,000
Percentage increase from preceding fiscal year	14%	5%	22%
Industrial Technology Services (ITS)			
Advanced Technology Program (ATP)	79,078	N/A	0
Technology Innovation Program (TIP)	N/A	65,200	0
Hollings Manufacturing Extension Partnership (MEP)	104,741	89,640	4,000
Subtotal, ITS	183,819	154,840	4,000
NIST Total	**676,876**	**673,612**	**638,000**

*The FY 2008 amount for Scientific and Technical Research and Services appropriation does not include $893,000 for a congressionally directed project. The FY 2008 amount for Construction of Research Facilities appropriation does not include $51.3M in congressionally directed projects and $30M for a new competitive construction grant program that was not requested by the President.

The total request of $638M for NIST is divided into three appropriations accounts:

I. SCIENTIFIC AND TECHNICAL RESEARCH AND SERVICES (STRS) $535M. This category includes $526.5M for NIST laboratory research and $8.5M for the Baldrige National Quality Program. Major components of the FY 2009 request include four new STRS initiatives (in *italics*) and nine initiatives requested—but not funded—in FY 2008.

Addressing Urgent Environment, Safety and Security Needs (+$26.2M)

- *Nanotechnology: Environment, Health and Safety*
- Climate Change Science: Measurements and Standards
- National Earthquake Hazards Reduction Program
- Disaster Resilient Structures and Communities
- Biometrics: Identifying Friend or Foe

Investing in Strategic and Rapidly Advancing Technologies (+$42.8M)

- *Innovation in the Biosciences Measurements and Standards*
- *Comprehensive National Cyber Security Initiative: Leap-Ahead Technologies*
- *Optical Communications and Computing*
- Quantum Information Science
- Nanotechnology: Discovery to Manufacture
- Innovations in Measurement Science
- Enabling the Use of Hydrogen as a Fuel
- Manufacturing Innovation through Supply Chain Integration

II. CONSTRUCTION OF RESEARCH FACILITIES (CRF) $99M. This category includes $37.3M in base funding for operational maintenance, major repairs and safety of the NIST sites; and $63.7M for three initiatives outlined below.

Boosting U.S. Science/Engineering Capacity and Capability ($63.7M)

- *JILA Building Expansion: Pushing the Scientific Frontiers*
- Boulder Building 1 Extension: 21st Century Tools
- Safety, Capacity, Maintenance and Major Repairs
- NIST Center for Neutron Research (NCNR) Capacity and Capability

III. INDUSTRIAL TECHNOLOGY SERVICES (ITS) $4M. The Hollings Manufacturing Extension Partnership (MEP) program and the Technology Innovation Program (TIP) compose NIST's Industrial Technology Services account.

The budget also reflects the Administration's focus on its highest priorities—including basic research, consistent with the American Competitiveness Initiative—and the need to restrain spending. The request for the Hollings Manufacturing Extension Partnership is $4 million, enough for an orderly end to federal funding for the program, while no funds are requested for the Technology Innovation Program.

FY 2009 Initiatives in Detail.

The initiatives are described in more detail below. They are organized within appropriations accounts and by FY 2009 initiative categories.

I. SCIENTIFIC AND TECHNICAL RESEARCH SERVICES (STRS)

Addressing Urgent Environment, Safety and Security Needs (+$26.2M)

Nanotechnology: Environment, Health and Safety Measurements & Standards (+$12M)

Products made with nanometer-scale components and materials—a thousand times thinner than a human hair and smaller—are already dramatically improving the performance of current products from stain-resistant pants to fuel-efficient aircraft. Many more applications beckon such as targeted cancer drugs, ultra-fast electronics, and improved diagnostic tools for medicine.

The small size of these components produces new properties not seen in larger-scale "bulk" materials. While nanomaterials promise many useful applications, very little is known about the environmental, health, and safety (EHS) risks associated with them. The safety or toxicity of nanomaterials can be determined only with well-understood materials and well-defined testing methods.

The interagency National Nanotechnology Initiative (NNI) has designated NIST as the lead federal agency to develop metrology tools and methods for measuring

and characterizing nanomaterials. NIST has the interdisciplinary physical-science expertise and the facilities needed to develop accurate, validated methods for understanding the EHS properties of nanoscale materials.

The proposed initiative funding will allow NIST to launch a three-pronged approach to the problem:

- create a classification scheme for determining the characteristics of nanoparticles necessary for assessing toxicity, including size, shape, and chemical composition;
- develop detection and measurement methods for quantifying the number and nature of nanoparticles with EHS impact in biological and environmental samples; and
- predict how modifications to nanoparticles will affect their impact on the environment, health, and safety.

Measurements and Standards for the Climate Change Science Program (+$5M)

The climate is changing. Determining how fast it is changing and understanding the complex relationship between all the environmental variables to allow accurate predictions is part of the objective of the U.S. Climate Change Science Program. Some of the drivers of climate, such as the sun's output, may vary slowly over decades. As a result, climate predictions depend critically on developing absolute measurements of the sun's energy that can be compared accurately over decades from different sensors. Other important variables include the sizes, shapes, and chemical composition of particles or droplets (aerosols) in the atmosphere. Whether aerosols contribute to the warming or the cooling of the Earth depends upon their composition.

With the funding provided through this initiative and in coordination with other agencies, NIST will develop:

- an international irradiance measurement scale to be used in rigorously calibrating satellite light intensity instruments prior to launch to ensure sufficient accuracy to allow valid comparisons among results from different instruments or from data sets taken over different periods of time;
- new instrument design strategies and quality assurance programs to optimize accuracy and stability of satellite and ground-based solar measurement systems;
- techniques for generating specific types of aerosols in the laboratory, measuring aerosol optical and physical properties, and simulating aerosol properties that cannot yet be measured in the laboratory; and
- a database of critically evaluated data on aerosol properties collected at NIST and elsewhere.

National Earthquake Hazards Reduction Program (+$3.3M)

Within the United States, more than 75 million people are located in urban areas considered to be at moderate to high risk for earthquakes. Just the economic value of the physical structures within these regions—not including the potential loss of life and economic disruption—is valued at close to $8.6 trillion. A single large earthquake in the United States, like the one that struck Kobe, Japan, in 1995, can easily cause damage of $100 billion to $200 billion.

A critical gap exists between the results produced by basic research and the implementation of that knowledge in the field. New construction materials, techniques, building codes, and standards do not reflect the current state of knowledge. Through the National Earthquake Hazards Reduction Program (NEHRP), NIST is tasked with conducting problem-focused research to bridge this gap and to promote its application by the private sector.

At the proposed funding level, NIST will:

- identify implementation gaps between basic research results and design guidance and national model building code provisions;
- develop rational cost-effective, consensus-based seismic design and analysis procedures for use in national model building codes;
- design guidelines for the testing and design of major structural systems;
- characterize fully the seismic capacities of typical older building structural components and systems as they are built; and
- develop structural performance criteria, analytical models, and cost-effective rehabilitation techniques for existing buildings.

Disaster Resilient Structures and Communities (+$4M)

For the past few years, natural hazards, including hurricanes, extreme winds, storm surge, wildland fires, earthquakes, and tsunamis, as well as terrorist actions, have been a continuing and significant threat to U.S. communities.

The disaster resilience of our physical infrastructure and communities today is determined in large measure by the building standards, codes, and practices used when they were built. With few exceptions, these are oversimplified and inconsistent with current risk assessments. As construction and rebuilding costs continue to rise, there is increasing recognition of the need to move from response and recovery to proactively identifying and mitigating hazards that pose the greatest threats.

NIST and the National Oceanic and Atmospheric Administration (NOAA) have coordinated their programs in this area. Initiative funding in FY 2009 will allow NIST to develop:

- standard methods to predict losses, evaluate disaster resilience, and estimate cost-to-benefit of risk management strategies at the community and regional scales as opposed to the individual building scale;
- decision support tools to modernize standards, codes, and practices consistent with the risk;
- a validated "computational wind tunnel" for predicting extreme wind effects on structures; and
- risk-based storm surge maps to be used in designing structures in coastal regions and an improved hurricane intensity classification scale.

In addition, the funding will expand and accelerate research results for projects begun with funding in FY 2007 on prediction of fire hazards at the wildland/urban interface; and improved tools for designing and constructing earthquake-resistant structures.

Biometrics: Identifying Friend or Foe (+$2M)

NIST has decades of experience improving human identification systems and currently is working with other federal agencies, including the Department of Homeland Security, the Federal Bureau of Investigation, and the U.S. Department of State, to evaluate and improve the ability of biometrics to enhance border security. The *USA Patriot Act* and the *Enhanced Border Security and Visa Entry Reform Act* call for NIST to develop and certify a technology standard for verifying the identity of individuals and to determine the accuracy of biometric technologies, including fingerprint, facial, and iris recognition.

Biometrics technologies, primarily fingerprints, are being used broadly in the United States for border security. New technologies under development, in particular, "multi-modal" systems that combine two or more biometric technologies, such as fingerprint, facial, and iris, promise to bring significant improvements. But NIST studies have shown that the accuracy of today's facial recognition systems is relatively poor compared to fingerprints, and iris recognition needs more study and testing to determine its accuracy in operational environments.

In conjunction with several other federal agencies, including the FBI and Department of Homeland Security, private industry and universities, NIST is managing the Multiple Biometric Grand Challenge, which aims to reduce errors in both face and iris recognition systems. Also, NIST is performing large-scale evaluations of iris recognition to promote its standardization.

NIST is also supporting the development of standards for inter-operability between different fingerprint systems through large-scale testing.

With additional funding, NIST will:

- enable facial recognition technologies to be used for border security;
- build on its testing program to determine the accuracy of multi-modal systems;
- develop tests and guidelines to assure that future biometric systems are interoperable, and work efficiently in real-time applications by:
  - improving the use of fingerprints with real-time fingerprint readers;
  - improve the inter-operability, robustness, and usability of fingerprint systems and facial recognition systems;
- improve biometric systems by enabling simultaneous use of facial recognition, fingerprint, and iris-scan technologies

NIST will coordinate this work with other government agencies and the private sector while taking international standards developments into account.

II. Investing in Strategic and Rapidly Advancing Technologies (+$42.8M)

Measurements and Standards to Accelerate Innovation in the Biosciences (+$10M)

Inaccurate bioscience measurements sometimes make it hard to tell when treatments are healing or causing harm. They often increase costs and lower the quality of health care. The lack of reliable, quantitative measurements in the biosciences is also impeding progress in a number of promising life-science research areas. Compared to the measurements made in the physical sciences, medical tests and bioscience-based measurements need to be repeated and rechecked far too frequently. Today, even standard measurements on a limited number of blood proteins often yield variable results among expert laboratories.

The research initiatives newly proposed in FY 2009 will focus on three intersecting areas of research:

- make biological data more quantitative and reliable by establishing methods, standards, and benchmark data for the fundamental measurements that underpin the life sciences in techniques such as mass spectrometry and molecular imaging;
- devise new methods for simultaneously measuring hundreds to thousands of molecules at a time by developing and validating new technologies in areas such as microfluidics and live cell imaging; and
- help laboratories more easily compare and combine their measurements and computer models with one another by developing standards for the exchange of biological data and information.

Comprehensive National Cyber Security Initiative: Leap-Ahead Security Technologies (+$5M)

Many of today's tools and mechanisms for protecting against cyber attacks were designed with yesterday's technology in mind. Information systems have evolved from room-size computer workstations shut off from the rest of the world to ubiquitous mobile devices interconnected by a global Internet. In this diverse ecology of communication devices, no cyber security solution works on all operating systems and can protect every type of computer and network component. Operating systems are now composed of millions of lines of code, rather than thousands, and have many more potential holes.

The NIST request is part of the Administration's Comprehensive Cyber Security Initiative. NIST is a recognized world leader in the field of cyber security. Working with other federal agencies, NIST proposes an initiative in three essential elements of cyber security infrastructure:

- create technical standards for generating, distributing, using, storing and destroying secret numbers known as cryptographic keys, commonly used to grant access to authorized individuals on encrypted computer networks and systems. This effort will be conducted in technical consultation with the National Security Agency (NSA) and the Department of Defense (DOD), as well as other government agencies and non-government organizations;
- nurture the development of "multi-factor authentication" methods. Such methods require users to verify their identities through multiple methods, such as passwords and iris scans, rather than just one. NIST will develop a standardized framework that ensures these methods work across different computer platforms and operating systems. The effort will be coordinated with vendors and federal departments, including the Department of Homeland Security; and
- extend the Federal Desktop Core Configuration, a set of standard security settings that optimize security, to other operating systems, applications, and network devices beyond the existing support for Windows XP and Vista.

Going at Light Speed: Optical Communications and Computing (+$5.8M)

As demand on the U.S. communications network continues to grow, a new generation of transmission and networking technologies is required to keep pace. Keeping pace is critical because communications fundamentally drives productivity gains and economic growth; it cradles innovation in many current and future industries, including telemedicine, entertainment, and security.

This initiative will promote advances in light-scale communications ranging from the nanoscopic innards of an individual computer to the continent-spanning scale of the Nation's optical communications network. Already the world leader in measurements of high-speed devices and of hybrid optical and electronic devices, NIST

will work closely with industry and expand its work to include research and development of:

- new measurement capabilities to accommodate higher-speed, next-generation communications networks;
- measurements that diagnose and locate transmission problems on data networks, and provide the information needed to reconfigure and redirect traffic to match demand; and
- new measurement techniques for analyzing computer circuits that transmit light instead of electricity, enabling the manipulation of light within computer chips, and interconnecting very small electronic and optical devices.

Quantum Information Science (+$7M)

NIST scientists are world leaders in the emerging field of quantum science. Three NIST scientists have won separate Nobel Prizes in the last 10 years based on their work in the field. Many of the best minds in physics today believe that applications of quantum science will transform the 21st century just as integrated circuits and classical electronics transformed the 20th century.

Having developed potential components for quantum computers and demonstrated other advances, NIST is proposing to expand further its quantum science program in FY 2009. Several of the projects proposed under this initiative will be in collaboration with the Joint Quantum Institute established by NIST, the University of Maryland, and the National Security Agency. NIST will:

- begin development of quantum "wires" that use "teleportation" techniques to reliably transport information between the components of a simple quantum computer based on manipulation of atoms, other elementary particles, or solid-state quantum devices;
- begin development of quantum memory analogous to the random access memory of today's computers to allow more complex logic operations;
- begin development of methods for transferring quantum-based information from one form (such as atoms) to another form (such as photons);
- develop an all-optical clock for more precise time and frequency measurement; and
- exploit the unusual quantum properties of "coherence" and entanglement to provide exquisite physical science measurement capabilities with improved sensitivity, accuracy, and speed.

Enabling Nanotechnology from Discovery to Manufacture (+$7M)

In FY 2007, NIST began a major initiative to address the measurement barriers hindering rapid development of nanotechnologies. A new NIST Center for Nanoscale Science and Technology (CNST) has been established that combines both research and a state-of-the-art nanofabrication and nanometrology user facility.

While a complementary NIST initiative will provide important groundwork in measuring environmental, health, and safety (EHS) risks of nanotechnology, this research initiative will build on recent NIST advances in developing nanoscale science and technology by:

- devising ways to measure strength, stress, strain, optical, and electronic properties of nanostructures to improve processes and understanding of failure mechanisms;
- creating three-dimensional, high-resolution imaging methods that reveal details of structure, chemical composition, and manufacturing defects and allow researchers to view nanostructures as they interact with their environment;
- simulating nanoscale phenomena with computer models to allow economical development of production methods for complex nanodevices; and
- pushing existing computer technology to its ultimate limit by developing measurements and standards that support "ultimate CMOS," or the development of current transistor technology to its technological limit.

Innovations in Measurement Science (+$3M)

As new science and technology areas emerge, NIST must quickly develop the measurement methods needed to support them. The Innovations in Measurement Science Program is one of NIST's primary mechanisms for keeping pace with the measurement requirements needed for innovation in U.S. industry.

Established in 1979, the program supports high-risk, leading-edge research projects that anticipate industry needs and develop measurement science for the

next generation of technology. At some point in their careers, all three of NIST's Nobel laureates have had their research funded by this program. Current NIST expertise in quantum information science, fuel cell science, three dimensional chemical imaging, and many other areas important to national priorities were launched with "measurement innovations" funding.

This initiative will expand the scope and nature of projects selected for the Innovations in Measurement Science Program to allow this program to keep better pace with the evolving needs of industry and science. Emphasis will be placed on the development of multi-disciplinary research areas with the greatest potential for fostering innovation.

The NIST Laboratories carefully evaluate the technical merit, potential impact, and staff qualifications for detailed research proposals submitted by the NIST technical staff. Successful proposals are funded for five years-ensuring enough time for the innovative measurement science approach to be developed-and are reviewed throughout the program to ensure satisfactory progress.

Enabling the Use of Hydrogen as a Fuel (+$4M)

Hydrogen offers the possibility of lowering the impact of motor vehicles on the environment, and reducing our nation's dependence on foreign oil. While the burning of fossil fuels produces carbon dioxide and other emissions harmful to the environment, hydrogen fuel can be made from many energy sources, including renewables.

Technical challenges need to be overcome to make hydrogen-powered vehicles more practical and economical. Hydrogen can embrittle metals and other container materials, is highly combustible, and requires storage containers larger than those for other fuels with equivalent energy. Moreover, the technical infrastructure must be developed to ensure safe production, storage, distribution, delivery, and equitable sale of hydrogen in the marketplace.

Expansion of research efforts at NIST is essential to achieving widespread use of hydrogen as a fuel. NIST has been a leading provider of data on the chemical and physical properties of hydrogen for more than 50 years. It has statutory responsibility under the *Pipeline Safety Act of 2002* to develop research and standards for gas pipeline integrity, safety, and reliability. It is the lead U.S. agency for weights and measures of vehicle fuels, and the distribution and sale of hydrogen will require entirely new systems for ensuring equity in the marketplace.

NIST's Center for Neutron Research is a premier facility for real-time, three-dimensional imaging of hydrogen in operating fuel cells. Using the unique resources developed at this NIST facility will help reduce technical barriers for efficient hydrogen production, storage, and use. NIST expertise will be essential for making fuel cells less costly and more reliable.

Manufacturing Innovation through Supply Chain Integration (+$1M)

America's large manufacturers are globally distributed enterprises that rely on a system of small manufacturers, parts suppliers, shippers, and raw materials producers organized in extended "supply chains." Using the auto industry as an example, the average car has more than 15,000 parts coming from 5,000 manufacturers that are made to the precise specifications of the auto company and must arrive on time.

Production costs are no longer the major cost component in these global supply chains-the dominant cost is in the engineering and business activities, which depend critically upon clear and error-free exchange of information among partners.

Inefficiencies and needless roadblocks in the exchange of product design and business data in manufacturing and construction are estimated to cost the U.S. economy more than $25 billion per year. Small manufacturers are particularly hurt by these problems, but they affect the competitiveness of entire industries.

In the 1980s NIST pioneered work in developing early open standards for data exchange. Under this initiative, NIST will conduct a much more extensive, wide-ranging, and technologically advanced program. Working closely with U.S. manufacturers to develop seamless data transactions throughout global supply chains, NIST will work to shorten the design-to-manufacturing cycle, improve quality, and lower costs for large and small U.S. firms.

Major goals will include:

- creating "roadmaps" for the development of open standards for enterprise integration in target industry sectors;
- developing validation and conformance tests to help ensure the performance of these standards as well as their proper use; and

- ensuring the standards are integrated and consistent with developing international standards and easily available to small- and medium-sized U.S. manufacturers.

II. CONSTRUCTION OF RESEARCH FACILITIES (CRF)

Boosting U.S. Science and Engineering Capacity and Capability (+$63.7M)

JILA Expansion: Preparing the Next Generation of Physicists (+$13M)

Space has run out at one of the Nation's most valuable training grounds of top scientific talent. JILA, a joint institute of NIST and the University of Colorado at Boulder, has produced three Nobel Laureates and two MacArthur Fellows, all named in this decade alone. JILA researchers are leaders in atomic, molecular, and optical (AMO) science, a field that the National Academies says is "key to training our best scientists, engineers, and technical professionals."

JILA is already over capacity, and the situation is getting worse. The existing group of 28 JILA research scientists could train approximately one-third more postdocs and student researchers, but there is literally no place for them to work. An expert external assessment of the JILA laboratories warned that this shortage of space threatened JILA's ability to retain and recruit world-class scientists.

NIST proposes a limited expansion of the laboratory and office space at JILA. With the expansion costing an estimated $27.5M, NIST would contribute $13M in FY 2009 and an additional $9.5M in FY 2010. The University of Colorado will contribute $5M in funding, as well as land and infrastructure services such as electricity, chilled water, and steam.

The funding would add approximately 4,610 square meters (49,600 square feet) of new space. Improving the laboratory facilities at JILA will ensure that the current world-class research staff maximizes its potential for both training a new generation of scientists and producing the nanoscale manipulation tools needed to keep U.S. industry at the forefront of science. The expansion is expected to increase the number of AMO grad students at JILA by approximately 50 percent. Because JILA produces five to 10 percent of all AMO science Ph.D.s in the United States per year, this will step up significantly the Nation's production of scientists in this important field.

NIST Center for Neutron Research Expansion (NCNR) and Reliability Improvements (+$2M, added to a previously funded initiative)

Serving more scientists and engineers (over 2,100 annually) than all other U.S. neutron research facilities combined, the NIST Center for Neutron Research (NCNR) is the Nation's leading neutron facility. The NCNR is especially valued for its "cold" (low-energy) neutron source, which greatly increases the utility of the neutron beam, particularly in biotech and materials research.

Although the NCNR is widely regarded as the most cost-effective and efficiently managed neutron facility in the United States, presently this critical research tool cannot possibly meet the demands placed on it.

This is a planned increase in funding for the NCNR Expansion Initiative, begun in 2007. When completed, this five-year project will provide:

- a new generation of world-class cold neutron instruments directly supporting the needs of science and industry;
- more than a 30 percent increase in the overall measurement capacity;
- the ability to serve at least 500 additional researchers each year; and
- increased operational efficiency.

The FY 2009 funding request supports the next phase of the NCNR expansion to initiate installation, testing, and commissioning of the new neutron instruments (such as spectrometers). These instruments will bring new neutron measurement capability to U.S. researchers by either exceeding the capabilities of current instruments by more than a factor of a hundred, or by providing capabilities that are not currently available in the United States.

In FY 2009, the project will focus on:

- installation of new neutron spectrometers and neutron beamlines;
- modification of beamlines and beamline shielding;
- modification of some existing instruments affected by new beamlines; and
- testing of new beamlines and instruments.

Complete State-of-the-Art Laboratory Space at NIST's Boulder, Colorado Campus Building 1 Extension (+$43.5M)

The Building 1 Extension (B1E) will provide the environmental control needed to reliably measure and manipulate atomic-scale phenomena in order to further enable 21st century technologies. Improvement in environmental conditions within NIST's Boulder, Colorado research laboratories is required to make further progress in measurements related to high-frequency electronics, advanced materials characterized at the atomic level, sub-cellular forces, timing accuracy, and other areas.

As the final funding request for a three-year program, the $43.5M proposed in the FY 2009 budget will complete state-of-the-art laboratory space that will meet the stringent environmental conditions required for 21st century scientific advances. With a total cost of $77.2M, the Building 1 Extension is the most cost-effective approach to enabling world-class measurement science in support of some of the country's most important economic sectors.

Construction of the B1E will dramatically enhance NIST's measurement capability and will directly support the needs of industry and academia. Some of the anticipated impacts include the ability to:

- make precision frequency measurements above 100 GHz (100 billion cycles per second), which are required for advanced commercial electronics, military systems, and homeland security;
- measure and perform research on the properties of materials at the single-atom level needed for the development of quantum and nanotechnologies;
- measure forces below 10–12 newtons (one billionth the weight of a feather) to understand the inner workings of cells and to apply this measurement capability to other physical systems; and
- make timing measurements with uncertainties reduced to one part in 10–18 (the equivalent of one second in 30 billion years), enabling whole new generations of position, navigation, and guidance systems.

Safety, Capacity, Maintenance and Major Repairs (SCMMR) (+$5.2M)

Aging and deteriorating buildings and infrastructure threaten NIST's ability to meet the needs of the Nation's scientific and industrial enterprise. NIST maintains about 50 specialized laboratories, offices, and support buildings at its two major sites in Gaithersburg, Maryland, and Boulder, Colorado, as well as critical infrastructure in Fort Collins, Colorado, and Kauai, Hawaii. Most of the Gaithersburg structures were built in the 1960s, and the Boulder facilities are a decade older.

Since 1995, the Construction of Research Facilities (CRF) appropriation has funded building construction and the safety, capacity, maintenance, and major repairs (SCMMR) of NIST's physical plant. Although recent increases to SCMMR have led to improvements in these facilities and infrastructure, the current state of NIST facilities—whether measured in terms of safety, capacity, or state of repair—remains a serious impediment to NIST's mission. Funding for renovations has not kept pace with NIST needs. The failure rate of major building systems such as air-handling systems and piping systems has increased dramatically in the last five years. NIST's aging facilities and their extensive backlog of deferred maintenance and repairs have resulted in lost productivity and increased costs.

These problems are not confined to the most advanced research and development projects. For example, the relatively straightforward NIST task of calibrating precision pressure gauges is the critical first step in a national measurement chain that ensures the accuracy of airplane altimeters and supports a wide variety of manufacturing sectors, including semiconductors and pharmaceuticals. However, carrying out this process has been limited by vibration problems, poor temperature control, and a pervasive black grit distributed by a 40-year-old air-conditioning, ventilation, and heating system.

Based on independent architectural and engineering reviews and in conjunction with the need to maintain world-class research facilities, NIST proposes to target the most critical SCMMR projects. These areas include repair and replacement of aging mechanical and electrical systems removal of hazardous material, including remediation of asbestos; structural repairs and replacements; and efforts to ensure accessibility in all NIST facilities.

III. Industrial Technology Services.

Hollings Manufacturing Extension Partnership (MEP) ($4.0M)

The requested $4M provides the orderly end to federal funding for the Hollings Manufacturing Extension Partnership (MEP) program. The elimination of federal funds to the local centers may have to be compensated through a combination of increased fees derived from the benefits accrued by individual companies and cost-savings in the operations of the centers.

Technology Innovation Program (TIP) ($0)

No funds for TIP are requested in the President's FY 2009 budget. Anticipated prior year recoveries will be sufficient to phase out the program.

Summary

For 107 years, NIST research has been critical to our nation's innovation and competitiveness. The increased funding in the President's FY 2009 budget for the NIST core will directly support technological advances in broad sectors of the economy that will quite literally define the 21st century—as well as improve the safety and quality of life for all our citizens.

Today, more than at any other time in history, technological innovation and progress depend on NIST's unique skills and capabilities. Helping the U.S. to drive and take advantage of the increased pace of technological change is a top priority for NIST.

The new technologies that are determining the global winners in the early 21st century—including nanotechnology, information technology, and advanced manufacturing—rely on NIST-developed tools to measure, evaluate, and standardize. The technologies that emerge as a result of NIST's development of these tools are enabling U.S. companies to innovate and remain competitive.

Technology-based innovation remains one of the Nation's most important competitive advantages, but that advantage is in danger of being lost. The American Competitiveness Initiative (ACI) and the enactment of the *America COMPETES Act* are bold initiatives to maintain this advantage. They have cast a spotlight on NIST's critical importance to U.S. economic competitiveness and innovation. To ensure that NIST programs deliver the highest impact, the Institute, working with our stakeholders in Congress, industry, academia, and other government agencies, will continue to identify the most critical measurement, standards, and technological challenges. We look forward to working with you, Mr. Chairman, and Members of the Committee, throughout this process.

BIOGRAPHY FOR JAMES M. TURNER

Dr. James M. Turner is the Acting Director and Deputy Director of the U.S. Department of Commerce's National Institute of Standards and Technology (NIST). Turner became NIST Acting Director on September 3, 2007. As Acting Director, Turner provides high-level oversight and direction for NIST.

Prior to joining NIST on April 16, 2007, Turner served as the Assistant Deputy Administrator for Nuclear Risk Reduction in the Department of Energy's National Nuclear Security Administration. In that position, he was responsible for major projects in Russia to permanently shutdown their last three weapons-grade plutonium-production reactors. He also worked with foreign governments and international agencies to reduce the consequences of nuclear accidents by strengthening their capability to respond to nuclear emergencies.

Prior to that assignment, Turner held several senior management posts at DOE concerned with laboratory oversight and with nuclear safety and the safeguarding of nuclear weapons both here and abroad.

He holds degrees in Physics from the Massachusetts Institute of Technology (Ph.D.) and Johns Hopkins University (B.A.), and taught for five years as an Associate Professor of Physics and Engineering at Morehouse College.

Among other honors, he has received the U.S. Government Presidential Rank Award for Meritorious Service, three times received the U.S. Department of Energy Exceptional Service Award, and earned the Secretary of Energy Gold Award and the National Nuclear Security Administration's Gold Medal. Dr. Turner is an active member of the American Physical Society, the American Chemical Society, the American Nuclear Society, and the American Association for the Advancement of Science, ASTM, and the Council on Foreign Relations, IEEE, Phi Beta Kappa, Sigma Xi, and the World Affairs Council.

Dr. Turner is a native of Washington, DC, is married, and has five children and one grandchild. He and his wife, Paulette, reside in Olney, Maryland.

Chairman WU. Thank you very much, Dr. Turner. Dr. Serum, please proceed.

STATEMENT OF DR. JAMES W. SERUM, CHAIRMAN, NIST VISITING COMMITTEE ON ADVANCED TECHNOLOGY; PRESIDENT, SCITEK VENTURES LLC

Dr. SERUM. Thank you, Chairman Wu, and Members of the House Subcommittee, for the opportunity to testify before you today on the 2009 budget proposal for NIST. My name is James Serum, and I am testifying on behalf of VCAT, the Visiting Committee on Advanced Technology. I am President of SciTek Ventures, and was recently elected as Chairperson for the VCAT.

I have been asked to provide feedback on the VCAT's perspective for NIST's current and future strategic investments, the 3 year programmatic plan, and the effectiveness of cross-laboratory program coordination within NIST.

We believe that NIST is performing high quality, state of the art measurement and technology research. Their equipment and facilities provide capability for world-class measurements of chemical, biological, and physical parameters, and their technical staff is highly competent.

VCAT has long believed that NIST is dramatically underfunded to effectively accomplish its designated mission. We strongly support the proposed 22 percent increase in NIST's 2009 core budget, and we support the proposed new initiatives for nanotechnology, innovations in bioscience, cyber security, and optical communication and computing. We support the established priorities for information technology and the research programs in quantum computing. The U.S. is lagging in broadband capacity, and better data is needed for access to and use of high capacity data communication capabilities. NIST can make a significant contribution in developing metrics that measure these parameters.

We support the proposed additional funding for bioscience. However, the amount of NIST research dollars currently dedicated to bioscience and healthcare is minute relative to the greater than $2 trillion annual expenditure for this industrial sector. The subcommittee considers the current projects well managed, but in general, we do not see an overall strategic plan to provide direction and prioritization. We encourage them to develop a comprehensive strategic plan for bioscience and healthcare in 2008.

A new Center for Nanoscience and Technology, CNST, was launched at NIST during 2007, to conduct nanoscale research, and to provide nanofabrication capabilities for both internal and external customers. The environmental health and safety of nanomaterials represents a major issue to this industry. CNST has established this as a priority, and they have launched a cross-laboratory program to investigate and develop measurement tools to address this issue. We caution NIST to partner appropriately with toxicology experts and organizations, rather than trying to develop this application knowledge base in-house.

As the facility gears up, it is necessary for CNST to develop new external industrial partnerships. We have reviewed the current CNST industrial interactions, and believe that they recognize the importance of developing these external partnerships.

Overall, the three-year programmatic plan represents a comprehensive strategic plan that reflects clearly the goals of the organization, its core competencies, current research priorities, as well

as an identification of future measurement needs, and a discussion about how technology priorities will be established in the future.

During recent years, VCAT has consistently recommended an improvement in strategic planning, particularly a strong, demonstrated link between strategic plans, priority setting, and selecting and staffing projects. The three-year plan demonstrates that their strategic planning process has significantly improved, and appears to be a good foundation for better strategic dialogue between NIST staff and the VCAT. We encourage them to continue their efforts to implement effective strategic planning throughout all of their departments and laboratories.

We are pleased with their proactive behavior on getting their stakeholders and the voice of the customer into their planning and prioritization process. Projects such as the U.S. Measurement System have identified more than 700 measurement needs across 11 industries. We encourage NIST management to continue to evaluate and integrate these diverse lists of measurement needs into more focused programs, and a visible process for establishing priorities.

It is evident that NIST has become much more proactive in reaching across organizational boundaries for access to innovative ideas, technology, and application expertise. We applaud this effort, and observe that it is becoming an integral part of the NIST culture. The development of new kind of partnerships is necessary for the success in addressing new technologies. Applications expertise that does not exist within NIST should often be accessed through partnerships in the future.

The Hollings Marine Laboratory in South Carolina represents an outstanding partnership with NOAA to gain applications expertise in marine biology. We believe that this type of relationship can serve as a model for future partnerships, where applications expertise in a particular field is needed.

The VCAT 2007 Annual Report provides much more detail regarding our findings and recommendations. Thank you.

[The prepared statement of Dr. Serum follows:]

PREPARED STATEMENT OF JAMES W. SERUM

Thank you Chairman Wu and Members of the House Subcommittee on Technology and Innovation for the opportunity to testify before you today on matters related to the President's Fiscal Year 2009 budget proposal for the National Institute of Standards and Technology and NIST's recently submitted Three-year Programmatic Plan.

My name is James W. Serum and I am testifying on behalf of VCAT, The Visiting Committee on Advanced Technology, an advisory committee to the Director of NIST. 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 the past 10 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 was recently elected to chair that organization for the next two years.

About VCAT: The NIST Visiting Committee on Advanced Technology (VCAT) was established in its present form by the *Omnibus Trade and Competitiveness Act of*

1988 and was updated by the *America COMPETES Act.* The VCAT charter includes reviewing and making recommendations regarding general policy for NIST, its organization, its budget and its programs within the framework of applicable national policies as set forth by the President and the Congress. The 2007 annual report covers the topics reviewed and discussed from the March 2007 meeting through the February 2008 meeting.

The Committee reviews the Institute's strategic direction, performance and policies, and provides the Secretary of Commerce, Congress, and other stakeholders with information on the value and relevance of NIST to the U.S. science and technology base and to the economy. Over the past year, the Committee has been active in assessing NIST's progress in the following:

- Strategic direction and performance
- Infrastructure and process in support of strategic needs
- Outreach—Assessing and responding to external drivers
- Organizing and executing with excellence

Throughout the year, the Committee seeks to cover a significant portion of NIST programs through direct discussion with NIST leaders, scientists and engineers. Reactions and observations are discussed candidly with the NIST representatives and other guests at each meeting. This feedback is used to seed continuous improvement in key areas in the overall operation. At most meetings, the Committee also visits various NIST laboratories and discusses the research projects directly with the technical staff. These laboratory tours help the Committee assess the relevancy of measurement technology research and NIST's progress against the strategic plan and the development of the NIST infrastructure.

Members of the Committee have careers in industry and in academia, and are selected solely on the basis of established records of distinguished service and eminence in their fields: research, engineering, business and other fields relevant to the NIST mission. Appointed by the NIST Director for staggered three-year terms, the members have diverse backgrounds and provide a representative cross-section of traditional and emerging U.S. industries.

In 2007, the VCAT created three subcommittees for Bioscience/Healthcare, Information Technology, and Nanotechnology as allowed by its charter, in order to more thoroughly explore and understand NIST's programs, competencies, organizational effectiveness and alignment with the industrial segment "customer" need. These subcommittees were chosen not only because of the size of the industry and impact on the U.S. Economy but also, because each one cuts across a wide segment of the broad spectrum of U.S. industry. The VCAT 2007 annual report provides the foundation for my testimony in this hearing.

I have been asked today to provide testimony on the VCAT's perspective related to NIST's current and future strategic investments. This includes our assessment of the proposed budget for 2009, alignment of the budget priorities with key technology investment areas, the NIST strategic planning process and the effectiveness of cross-laboratory coordination within NIST.

Importance of Measurements to U.S. Industrial Competitiveness:

We believe that accurate and precise measurements and measurement technology provide the underpinning for economic success and competitiveness in almost all U.S. industries—whether it is for the Healthcare Sector, Information Technology, Homeland Security or traditional manufacturing. For example, the future economics and effectiveness of our health care industry depends on developing a thorough understanding of the cause of diseases and the development of specific therapeutics to treat those diseases. Only a few short years ago we hailed the announcement of the identification of the human genome. Yet today, inaccurate DNA measurements lead to incorrect and confusing conclusions about genetic causes of disease. Dramatic improvements need to be achieved relative to manufacture of DNA chips and application processes for interpreting the results from DNA chips. NIST can play a key role in developing standards and technologies for both DNA and protein measurements to enable and accelerate this critical industrial segment. A NIST report (*The Economic Roles and Impacts of Technology Infrastructure,* Gregory Tassey, 2008) describes many examples of the value of measurement technology in many industrial sectors.

VCAT General Observations about NIST:

We believe that NIST is performing high quality, state-of-the-art measurement and technology research. Their equipment in general is current and provides for world class measurement of chemical, biological and physical parameters. Their staff is highly competent, and is validated through many peer awards including

three Nobel Prizes since 1997. NIST is recognized world wide for its leadership in helping to develop industry standards and they are sought after to provide global leadership for international standards organizations. NIST has put a much-needed emphasis on its strategic planning in recent years, and it is the Committee's view that they have shown considerable improvement. We observe that the quality of strategic planning continues to vary by organizational unit and program within NIST. We also observe that NIST has strong proactive programs to gain customer input from various industry sectors in which it is involved.

We recognize that NIST faces an immense challenge to balance its spending, resource allocation and research prioritization while serving such a broad group of industrial sectors from cement manufacturing to newer industry segments such as biotechnology, information technology and nanotechnology.

NIST FY 2009 Budget Proposal:

The VCAT has long believed that NIST is dramatically under funded to effectively accomplish its designated mission. The final 2008 budget—which was well below the levels requested by the President for the NIST laboratories—has led to setbacks in initiating important new programs in bioscience and other areas. We are pleased that the 2009 proposed budget increases—if funded by Congress—will allow these programs to get funded and launched. The development and maintenance of NIST standards have proven critical to the ongoing success of a very broad group of industrial sectors. Existing standards and reference materials need to be maintained at significant expense while simultaneously developing new measurement technologies and standards for industrial segments vital to our nation's competitiveness such as IT, Nanotechnology and Bioscience/Healthcare. NIST needs to be aggressive in finding new ways to maintain the credibility and integrity of existing standards and materials. Their NIST Traceable Reference Materials (or NTRM) program is an excellent example of possible approaches.

The VCAT is pleased with the proposed 22 percent increase in NIST's 2009 core budget. We support the proposed new initiatives for Nanotechnology EH&S ($12M), Measurement Innovations in Bioscience ($10M), National Cybersecurity Initiative ($5M) and Optical Communication and Computing ($5.8M), along with the other initiatives that were pending in FY 2008 and did not get funded—yet still are critical.

The ability to perform state-of-the-art measurement research depends on state-of-the-art facilities. Building environments related to vibration, temperature, humidity and environmental pollutants can prevent necessary measurements to be developed or standards enacted. VCAT applauds the investment in new and renovated facilities during the past several years and we support the continued facilities investment at Boulder, JILA and the Neutron Research Center (NCNR) in the 2009 proposed budget.

In summary, the VCAT strongly supports the proposed budget increase for NIST as part of the American Competitiveness Initiative and the *America COMPETES Act*.

VCAT Focus on Information Technology, Bioscience/Healthcare and Nanotechnology:

As stated earlier, in 2007 VCAT established three subcommittees on Bioscience/Healthcare, Nanotechnology, and Information Technology in order to more thoroughly explore NIST's programs and research in these very important technology and industry sectors. The following comments reflect a summary of our findings.

Information Technology—Key priorities include cyber security (a five-fold increase in malicious software was detected in 2007 compared to 2006), technology for sustainable "green" data centers for lower power consumption and less water cooling, standards for data archiving that enable representation of complex information in easily accessible, low capacity formats. We emphasize the importance of information technology to a wide number of industrial sectors including health care (electronic medical records, etc.), nanotechnology and biotechnology.

VCAT strongly endorses NIST's research program in quantum computing and communication. NIST can make a significant contribution in developing metrics that reveal computing and communications capacity, security, compliance and reliability. The U.S. is lagging in broadband capacity and better data is needed on national access to and use of high capacity data communication capabilities. The IT subcommittee recommends that NIST consider possible measurements and metrics to assist in the assessment of broadband access to Internet and related services in the United States.

The subcommittee recommends that NIST consider investigating computing requirements and algorithms used for climate and natural disaster modeling with the objective of validating them.

Bioscience/Healthcare—NIST has a long history of developing measurements and standards for the health care industry when in 1918 NBS launched a dental materials group and in the 1920s, established X-ray radiation standards for imaging technicians. Some of the current research in bioimaging has been a result of the sustained effort in this research area. However, the amount of NIST research dollars dedicated to Bioscience/Healthcare is minute relative to the greater than $2 Trillion dollar annual expenditure for this industrial sector. The need for development of advanced measurement technology to support the U.S. Bioscience/Healthcare industries is vital. Despite the need and the enormous size of the industrial sector, there is no laboratory specifically devoted to supporting the bioscience/health care industry. Research projects are limited in scope and scale and are individually located in laboratories across many different sites. We believe that the current projects are well managed but in general we do not see an overall strategic plan to provide direction and prioritization. We believe that the staff has recognized these challenges and is making considerable effort to coordinate and cross fertilize their bioscience research projects. The bioscience/health care subcommittee is concerned about continuing under funding of this sector in the Three-year Programmatic Plan. The NIST management team has identified five areas of focus in 2007: Biospectroscopy, Cell and Tissue Measurement, DNA Technology, Structural Biology and Quantitative Imaging. While we support these program areas, most lack sufficient funding resources and applications expertise to be successful or to have a major impact. NIST has identified Bioimaging as one of its key opportunities. This is appropriate and has the potential to have a major impact on disease understanding and development of effective therapeutics in the future.

We applaud the *America COMPETES Act* for doubling the NIST budget in the future. NIST staff is becoming quite proactive in gaining the "voice of the customer" related to prioritization of research programs for this industry segment. A NIST conference is scheduled in October with the specific purpose of gaining expert feedback on measurement priorities for innovation in bioscience. The NIST staff and Bioscience/Healthcare subcommittee worked in excellent harmony during 2007 to focus on priorities and future measurement needs. We would like to see a comprehensive strategic plan developed for Bioscience/Healthcare in 2008.

Nanotechnology—The National Nanotechnology Initiative (NNI) provides the foundation for NIST's work in this area. The U.S. Government spends over $1 billion dollars annually in these efforts. Within NIST, a new Center for Nano Science and Technology (CNST) has been established and the VCAT subcommittee has reviewed NIST's efforts as part of the overall NNI activity. The component areas in this initiative include; nanoscale phenomena and processes, nanoscale devices, instrumentation research and metrology and standards for nanotechnology. A major U.S. issue relates to the environmental health and safety of nanomaterials. In response to widespread concerns about the responsible development of nanotechnology as well as a recommendation by VCAT, NIST initiated in 2007 a program to develop standards and metrics associated with the responsible development of nanotechnology. We support this program and caution them to develop appropriate toxicology applications partnerships rather than bringing this expertise inside. Although the Nanotechnology programs are highly distributed, it is VCAT's assessment that they are well run and well coordinated.

Concerning CNST, we find that with respect to the Nanofabrication facility as well as the research programs residing in CNST, there has been significant progress in planning and execution of both elements. The acquisition, installation and commissioning of the major equipment for CNST is essentially complete. Approximately 85 percent of the planned technical personnel have been hired or authorized under existing funding. Completion of the personnel and equipment ramp-ups will require restoration of the funds deleted from the FY 2008 budget to at least the level in the President's proposed 2009 budget. The Nanofab facility is intended to serve both internal and external users. As the facility is gearing up, its primary users remain internal and academic. A person has been recently hired to run the new facility with one of his specific responsibilities to grow industry representation among its users. We have reviewed the industrial interactions to date and the goals for establishing external part-

nerships. We believe that CNST management recognizes the importance and priority of developing these external partnerships. Still developing are NIST internal partnerships, which involve the following OU's: MSEL (Nanomagnetics; thin film nanostructure, bi-stable switch; probe beams); EEEL (Nanomagnetics; low noise sensors; theory; magnetization dynamics) ITL (Nanomagnetics; domain properties); CSTL (Atomic Scale Measurement; atom switching dynamics); PL, (Nanofabrication; edge roughness). Other connections and projects are under consideration. A Nanotechnology Coordinating Council is being established within NIST and we recommend that this council work to enhance collaborations through all relevant OU's involved with nanotechnology.

VCAT assessment of the Three-year Programmatic Plan:

The foundation of an effective strategic plan is a clear mission and an accurate identification of the Core Competencies of the organization. NIST has a concise mission statement focused on innovation and industrial competitiveness through measurement science, technology and standards. The organization has appropriately articulated its competencies as measurement science, rigorous traceability, and development and use of standards.

The VCAT committee did not have access to the Three-year Programmatic Plan with sufficient time to thoroughly evaluate and critique its content this year. However, the following comments reflect the consensus feedback of VCAT members at its last meeting plus my personal feedback as the VCAT chairperson having reviewed the document more completely following the last VCAT meeting.

Overall, the Three-year Programmatic Plan represents a comprehensive strategic document that reflects clearly the goals of the organization, its core competencies, current research priorities as well as identification of future measurement needs and a discussion about how technology priorities will be established in the future. NIST has improved significantly in its overall strategic planning process as evidenced by this document. However, the process is not yet implemented consistently throughout the organization.

The Committee endorses the four pillars of strategic planning found in the three-year strategic plan:

- Enhanced Stakeholder outreach and identification of critical measurement and technology challenges;
- Strategic, multi-year investment framework;
- Development of infrastructure to optimize and support the Nation's technological and organizational innovation—and staff/equipment to succeed;
- Rigorous evaluation of all NIST investments.

As stated previously, The NIST organization is constantly faced with the formidable challenge of establishing appropriate program and technology priorities across an extremely broad area of industries and technologies. They have identified stakeholders both within the government (OMB, OSTP, PCAST, NSTC and DOC) and across industries that have or can help establish those priorities related to U.S. innovation and industrial competitiveness. In addition, NIST has proactively conducted workshops and programs such as USMS (United States Measurement System) to gain feedback on the critical needs for measurement in U.S. Industry. Those have led to more than 700 measurement needs being identified. We encourage NIST management to continue to evaluate and integrate these diverse lists of measurement needs into more focused programs with adequate goals and deliverables and a visible process for establishing priorities.

The Committee agrees with the Core Competencies identified in the three-year plan:

- Measurement science
- Rigorous measurement traceability
- Development and use of standards

We agree with NIST that biotechnology, advanced nano materials and IT infrastructure and communications are areas in which strategic investments are needed. We also endorse the report's detailing of the construction and renovation needs described in the appendix.

We strongly endorse NIST's proposed project evaluation strategy, in particular the seven Heilmeier questions listed below from the Defense Advanced Research Projects Agency (DARPA) adapted to NIST's work. We do not currently see these strategic questions being effectively implemented throughout the organization:

- What is the problem and why is it hard?

- How is it solved today and by whom?
- What is the new technical idea and why can we succeed now?
- Why should NIST do this?
- What is the impact if successful and who would care?
- How will you measure progress?
- How much and how long?

We believe that the current and pending budget initiatives to: Strengthen Core Competencies, Address Rapidly Developing Technology, Expand the Frontier of Measurement Science and Meeting Critical National Needs, are appropriate. We support technology measurement advancements in optical computing and communication, nanotechnology, and alternative energy research. NIST has identified quantum information science, nanotechnology and Bioscience as High Risk, High Reward areas of focus. Members of the Bioscience Subcommittee consider Bioscience/Healthcare research as a critical priority and would encourage a significantly higher investment in the short-term than is currently proposed.

The Committee is satisfied that NIST has a vigorous process for consulting with customers, industry and academia for purposes of formulating its strategic and tactical plans.

VCAT supports NIST's commitment to phasing in and phasing out of programs and agrees with NIST's investment posture in quantum science, atomic, molecular and optical physics.

Finally, we concur with NIST that it must be responsive to mandates (e.g., *Help America Vote Act*) and to other national needs in manufacturing, energy demand and supply, climate change measurement, modeling and analysis and safety in commerce. The Committee notes the extensive collaboration undertaken by NIST and recommends continued support for these wide-ranging activities.

The VCAT endorses the articulation of the issues surrounding Nanotechnology Measurement Science and the movement of Nanotechnology from discovery to manufacture. The importance of this field to both U.S. technological leadership and industrial competitiveness is clearly described. The negative impact of the 2008 budget on the important role NIST must play in the responsible development of nanotechnology cannot be overemphasized. We agree with the assessment of the importance of enhancing the NIST Center for Neutron Research but suggest that the case could be even stronger by enhancing the important symbiosis between NCNR and CNST.

NIST Strategic Planning, Technology Prioritization Processes and Organizational Effectiveness:

NIST has a clear mission and understands its core competencies. They recognize the importance of getting stakeholder and customer feedback into their processes for establishing priorities for technology and research programs and we believe that they have incorporated effective methods to gain the "voice of the customer." We commend them for working to make this a part of the NIST culture but observe that these practices are not yet uniform throughout the organization.

During recent years, VCAT has recommended an improvement in strategic planning, particularly a strong demonstrated link between strategic plans, priority setting and selecting and staffing projects. Although NIST has developed strategic plans such as the NIST 2010 document and the USMS document, the Committee has not been able to fully embrace and evaluate the programs and priorities within an overall strategic framework. We would attribute this at least in part to the lack of sufficiently clear links between strategy, programs and the prioritization processes. The current Three-year Programmatic Plan appears to be a good foundation for better strategic dialogue between NIST staff and VCAT.

Due to NIST's expertise in measurement systems and standards, they are often called upon to initiate "ad hoc" studies for the benefit of the Nation, such as the study of the World Trade Center disaster and the *Help America Vote Act.* We support these efforts and recognize their importance but they have the capability of distracting from the strategic mission and vision of the organization. Care must be taken to effectively manage external influences and requests.

It is a always difficult for any organization to stop projects that are no longer of critical priority or that are not producing expected results in order to dedicate those resources and funds to more important projects and priorities. NIST has been proactive in this area and VCAT applauds these efforts. However, it is our belief that NIST still has too many programs that are not sufficiently coordinated and appropriately funded and staffed to achieve the desired projects and program goals. We also recognize the need for independent pioneering research of the type that pro-

vides the foundation for "innovation in U.S. industry" and we do not propose that every project be managed and coordinated within defined strategic programs. A balance is entirely appropriate.

A "metrology" organization such as NIST should be able to evaluate its own effectiveness in serving their customers. In recent years, NIST has authorized independent outside evaluation studies to determine the leverage of dollars invested in NIST compared to its "value" to a particular industrial segment. An average return on investment (ROI) is reported to be 44:1, a very impressive number and a number which we consider to be a conservative calculation. One may conclude that at least those programs chosen for evaluation were highly effective and chosen properly to effectively and efficiently benefit U.S. industry.

Organizationally, NIST laboratories are primarily structured by disciplines and technology including Information Technology, Chemical Science and Technology, Physics, Electronics and Electrical Engineering, Manufacturing Engineering, Materials Science and Engineering, Neutron Research, and Building and Fire Research. No structure can effectively reflect the rapidly changing needs in the industries that NIST serves and the technologies and applications that it needs to develop and standardize. It is our impression that historically research projects were chosen within these "silos" according to perceived industry need and capability within the laboratory. It is evident that NIST has now become proactive in establishing NIST wide programs that require coordination across organizational boundaries for access to innovative ideas, technology and applications expertise. We also observe that cross fertilization of ideas and expertise is becoming an integral part of the NIST culture. We observe a new vigor for cross laboratory coordination for key technology areas such as information technology, nanotechnology and bioscience and we encourage it to become a pervasive behavior throughout the organization. We urge caution, that as new initiatives are launched, an appropriate assessment is made of necessary resources and expertise and plans are developed to acquire that expertise or partner within the organization or externally. There are numerous examples of cross department coordination and the creation of external partnerships to gain access to new technology and expertise needed to accomplish their goals. An internal example is the new Nanotechnology program to explore environmental, health and safety issues utilizing resources from the Chemical Science and Technology Laboratory but also many of the other NIST labs. The Hollings Marine Laboratory in South Carolina represents an outstanding partnership with NOAA to gain applications expertise in marine biology. We believe that this type of relationship can serve as a model for future partnerships where applications expertise in a particular field is necessary, for example in pursuing measurement solutions for the field of Diagnostics in Health Care.

Research in Information Technology including optical computing and communication, cyber security, and data structures permeate most industrial sectors—so it is not surprising that each of the NIST laboratories relies heavily on IT-related research in order to perform their missions. The IT lab, with a strict focus on IT, has been proactively coordinating its efforts across all relevant parts of the NIST organization to assure efficiency and effectiveness of its programs. (See IT subcommittee summary for more detail).

The VCAT 2007 Annual Report provides much more detail regarding our findings and recommendations.

BIOGRAPHY OF JAMES W. SERUM

Dr. Serum received a B.A. in Chemistry from Hope College and was awarded a Ph.D. degree in Organic Chemistry in 1969 from the University of Colorado. His doctorate research was directed toward studies in Mass Spectrometry. Following his graduate studies, he taught and did research at the University of Ghent, Belgium. He spent a year at Rice University as a Welch Fellow, and then joined the staff at Cornell University as Director of the National Institutes of Health High Resolution Mass Spectrometry Facility.

Dr. Serum joined the Hewlett-Packard Company in 1973 as Applications Chemist for Mass Spectrometry. Since then he has held a number of management positions, including Technical Support Manager for Mass Spectrometry in Europe (Paris, France); Marketing Manager for Mass Spectrometry and Spectroscopy at the Scientific Instruments Division; R&D Manager at the same division; and R&D Manager for the Avondale Division (Laboratory Automation and Chromatography Instrumentation). Since 1984 he has held business unit level positions as Operations Manager for Laboratory Automation Systems, Automated Chemical Systems Operation and Analytical Group Research & Development Manager. In 1992 Dr. Serum was named General Manager for Mass Spectrometry, Infrared, and Protein Chem-

ical Systems. He was the founder of HP's Bioscience Products business. He has served as chairman of HP's Bioscience Council, co-chairman of the Hewlett-Packard R&D Council and the Pharmaceutical Business Council. He retired from Hewlett Packard in August 1999 to co-found Viaken Systems Inc, where he was a Director and served as Executive Vice President and Chief Operating Officer. Dr. Serum has been a Venture Partner with Flagship Ventures and currently serves as President of SciTek Ventures, a science and technology consulting firm that he founded in 2002. In 2002 he was elected as a lifetime National Associate of the National Academy of Sciences and in 2004 he was elected to serve on the Visiting Committee for Advanced Technology of NIST. In 2005, Dr. Serum was named to the President's Advisory Board for Advanced Technology at the Research Corporation. In 2008 he was elected Chairman of NIST's Visiting Committee on Advanced Technology. Dr. Serum has served or currently serves as a member of the Board of Directors for a number of emerging technology based companies.

OTHER PROFESSIONAL ACTIVITIES

- Member of National Academy of Sciences task force on the Future of Analytical Chemistry in the U.S. (1986)
- Member of National Science Foundation task force to Review Policy for Science Education in the U.S. (1987)
- Invited speaker at numerous educational meetings and conferences on Science Education
- Past member of Hewlett-Packard Education Relations Board
- Review Panel for Hewlett-Packard Grants Program for Analytical Chemistry (1989–1992)
- Member of Science & Technology Board, College of Letters and Science, James Madison University (1988–1993)
- Member of Board of Directors, Biotechnology Research and Development Corporation (1988–1994)
- Member of the National Institute of Standards and Technology (NIST) technology assessment panel (1990–1992)
- Counselor (alt), Analytical Chemistry Division, American Chemical Society (1992–1995)
- Member of the Board, Center for Photochemical Sciences, Bowling Green State University (1994–Present)
- Member of ACS subcommittee for improvement of chemistry curriculum (1994–1995)
- Member of National Research Council, Committee on Undergraduate Science Education (1996–2001)
- Member of National Research Council, Committee on A National Digital Library (1997)
- Chairperson, NRC Review committee on National Math Standards (1999)
- Member & Vice Chairman of Board of Assessment for Chemical Science & Technology Laboratory, NIST (1997–2001)
- Chairman of Board of Assessment for CSTL, National Institute of Standards and Technology (2001–2003)
- Member National Research Council Committee on Undergraduate Science Education (2002–2003)
- National Associate (life), National Academy of Sciences (2002)
- Member of Visiting Committee for Advanced Technology, NIST (2004–2009, Vice Chair 2007–2008, Chair 2008–2010)
- President's Advisory Board for Advanced Technology, Research Corporation (2005–present)

Chairman WU. Thank you very much, Dr. Serum. Dr. Good, please proceed.

STATEMENT OF DR. MARY L. GOOD, GEORGE W. DONAGHEY PROFESSOR AND DEAN, DONAGHEY COLLEGE OF ENGINEERING AND INFORMATION TECHNOLOGY, UNIVERSITY OF ARKANSAS, LITTLE ROCK

Dr. GOOD. Thank you, Mr. Chairman. And Chairman Wu and Congressman Ehlers, it is always nice to see friends that you know from a long time ago. Really, it is a great opportunity to be here today, and to say a few words about NIST.

I have turned in my report, and I won't read that, but I will simply summarize the three pieces of it that I wanted to make, and I will do that very quickly. First of all, all of you already have talked about the quality and the significance of NIST. I think that goes without saying. I don't think we even have to defend that any more. I think everybody essentially agrees with us on that.

And if you have to talk about the quality, we can talk about Nobel Prize winners, and some of the other things that go with NIST these days. And certainly, one point I would like to make, and that is that the facility in Colorado absolutely is long, long overdue. Congressman Ehlers knows we have been trying to get that facility, I have forgotten how long ago. Actually, very high quality work gets done there, and they really need a first class facility to do it in, so I was very pleased to see that as part of the budget.

But the only thing I would say with respect to how good NIST is—if you want to really understand that, you go into places where they don't have a NIST. I was invited down to South Africa to review their National Bureau of Standards about seven or eight years ago, and they were just then, as you know, coming out of the apartheid era, and trying to really get everything going, and they wanted people to come in, they had an international committee come to review it, and to tell them what they were doing right, and how to improve things, and it was really a very eye opening experience, because things that we in this country absolutely take for granted, and have been doing for 100 years, they were trying to get installed. So, if you really want to understand where we are, you can go someplace where they are still now trying to do what really NIST did in many ways at the turn of the century. These people were still trying to get good standards for gasoline pumps in the countryside, because people were being cheated, in terms of the standards that they were using to measure it, if you like.

So, there is just no question about the quality, and I won't spend very much more time on that. It clearly is the metrology laboratory, the best in the world, and without it, our enterprise would not work nearly as well as it does.

The second issue that I would like to speak to, I also was very disappointed with the lack of any funding for MEP, and for the Technology Initiation Program, and I would like to put a little different spin on why I think those are so very important, in addition to the ones that have already been stated. First of all, it is very true that MEP has been extraordinarily valuable to the states and to their manufacturing industries, and particularly to the medium and small manufacturers. They have been extraordinarily important in keeping those people in the forefront of being innovative.

But today, NIST is being asked to look at new technologies and nanotechnology, in the health sciences, they are looking also at areas in biotechnology. All of these cutting edge technologies that are there, they are being asked to do the standards, and they are being asked to look at the manufacturing facilities that go with those. So it is my opinion that the MEP is the vehicle for getting NIST to understand what is important in those small companies out there today, because I was on the National Review Panel for the National Initiative for Nanotechnology, and there are now thousands of small companies out there who are making nanoproducts. They have two major problems. One is, they don't understand the manufacturing technologies very well. They don't have standards in place. And secondly, they don't know very much about the health effects at all. We have not done very much about that yet, so if you could hook these state centers, and have the NIST people who are working on those new, cutting edge technologies, and have them mesh with the state centers, and have those state centers out there helping these small startup companies, everybody would win, because NIST would begin to understand exactly what those companies need, and how to use it. They could better prioritize what they are doing, and secondly, certainly, the companies would win. So, this is kind of a win-win situation that seems to me is just, it goes without saying, is really very necessary.

So, I would argue that the MEP program is as important for NIST as it is for the small manufacturers, if they are going to really be at the cutting edge in the coming years.

I can make the same argument about TIP. If you pick the right ones, and NIST has shown through the stewardship of ATP that they can run a good program. They know how to do that. They have done it quite well, so if they pick the right small businesses to partner with, this is also one of the ways to really understand what small startups and small businesses need, so you can get your hands dirty. And one of the best ways for technology transfer, as everybody knows, is to get your hands dirty and be a part of the transfer.

So, I would argue that the omission of these two programs is a real detriment to NIST, never mind to the detriment of the manufacturing sector out there, as well as these small businesses, if you like.

The second thing has to do with the strategic plan, and I do agree with the Oversight Committee with respect to the strategic plan. It is an excellent plan, in the sense that it describes what the laboratories are doing in a very good way, but it doesn't really have much to do with the strategic plan over time. I would like to see NIST actually do a strategic plan which drives what they do, rather than having just the budget numbers drive what they do. I know that is asking a lot, and I understand the—believe me, I understand the political issues very well, but if I come in here from NIST with a real strategic plan, I think you fellows in this committee and other parts of the Congress would listen to that, and would move to the direction that makes sense, so I would like to see them put together a plan over the next three or four years which will point out where they are going, and why they are going there, and

what portion of that they are going to—what is it that they provide, and what do they have to do to actually have interactions with the rest of the enterprise to make that work appropriately.

So, I agree that the plan is excellent with respect to what it says about what they are doing today, but I don't find it to be much in the way of a strategic plan looking forward, and so, I think they would have to go back and sort of redo that.

Also, I didn't see any real mention of the Baldrige, the National Quality Award either, and I think that was a big oversight. That really ought to be part of that strategic plan, it seems to me, because that is one of those places where we can really make some difference, and I think it has made a lot of difference in the past. And I haven't seen much publicity with respect to the Baldrige Award lately, and I would really like to see that take a little bit more front and center, and see that they have properly thought that one through.

And then, of course, the last thing is just to say that if you look at NIST as a whole, it really is one of those laboratories, and one of those activities in the United States, that without it, and without it functioning really at a high level, our competitive position is just not going to be possible, because it really does have a lot to do with the competitive position that we will have going forward.

So, I will be happy to answer questions, Mr. Chairman, but thank you for your time.

[The prepared statement of Dr. Good follows:]

PREPARED STATEMENT OF MARY L. GOOD

Chairman Wu and Members of the Subcommittee: It is a great pleasure for me to be able to testify on the behalf of NIST and its activities. I regard NIST, as does most of the technology community (including the technology based industry), as perhaps the most important national laboratory because of its relevance to the long-term success of American industry in the stimulation of innovation and contributions to the competitiveness of the American enterprise. NIST has a long history of providing the standards for commerce which allow for an orderly and fair process for doing business, protecting the health of the population, and promoting best practices in the complex enterprise which is today's global economy. The value of NIST and its pervasive influence was brought home to me a few years ago when I was invited to South Africa as part of an international advisory group to review the South African Bureau of Standards and to provide the government with proposals for improvement. The work there could be defined as developing, institutionalizing, and monitoring everyday weights and measures used in everything from country stores to gasoline distributors to food processors to multinational companies manufacturing everything from automobiles to everyday household goods. The quality of transactions that we in the U.S. take for granted were still being monitored and improved. Some of these activities in the rural areas of the country would have been NIST activities a hundred years ago! The U.S. public just assumes that commerce and regulatory activities will be carried out with consistency and be based on appropriate standards that can be verified if necessary. This complacency is possible because of the long history of NIST standards work including calibration and metrology science in all areas of our enterprise. The value of the government's role in these activities was first acknowledged by the Founding Fathers when they included in the Constitution the need to establish a system of weights and measures. The establishment of the National Bureau of Standards in 1901 (NBS) gave this important government function to NBS. New responsibilities for direct industry interaction were added and NBS was renamed the National Institute for Standards and Technology in the 1980's. NIST continues the production and distribution of standards for all areas of commerce and modern life but it has now gone beyond these early responsibilities. Today NIST is the premier laboratory for metrology research in the world with applications in all areas of emerging technologies like nanotechnology, biotechnology, and high performance computing. The quality of this work is epitomized by the receipt of three Nobel Prizes by NIST scientists in the

last few years. In summary, NIST is an American jewel that provides one of our advantages in a competitive global environment. Long-term support for its programs should be an investment at a very high priority in our federal budget. However, NIST should be held to very high standards and should be expected to justify its activities and prioritize its opportunities to play a significant role in the competitiveness initiatives in the Competes Act of 2007.

I have reviewed the President's proposed budget for NIST for 2009 and the planning document NIST provided to the Congress. The requested additional support for the NIST laboratories is certainly justified by the proposed new research activities outlined in their planning document. The facilities funding, particularly for the expansion and up-grade of the Colorado facilities, is long overdue. The world class research that takes place there deserves a world class facility.

However, the President's budget proposal to phase out funding for the Manufacturing Extension Program (MEP) and the new Technology Initiation Program (TIP) is both short-sighted and represents a misunderstanding of the value of these programs. It is my assessment that this oversight is disastrous for the incentivization of innovation in small and medium sized enterprises and for NIST as it carries out its mandates for the support of cutting edge manufacturing technologies and the incentivization of new American companies utilizing emerging technologies. Two examples will be illustrative of these values. The National Academies convened a panel (I was a member of the panel) to review the National Nanotechnology Initiative funded through several government bureaus. Two of the findings were: (1) there are many (in the thousands) start-ups and early stage companies with potential products and processes utilizing nanoparticles and nanotechnology, and (2) the health and environmental effects of nanomaterials in the work place and in consumer products are not well understood. These findings certainly justify the proposed NIST work on nano-manufacturing processes and the development of metrology and standards for nanomaterials. The question is how to effectively couple the NIST work to these businesses in emerging technologies.

The legislation renaming NBS contained the following directives: "to. . .modernize and restructure that agency to augment its unique ability to enhance the competitiveness of American industry while maintaining its traditional function. . ."; "to assist private sector initiatives to capitalize on advanced technology"; and "to advance, though cooperative efforts among industries, universities and government laboratories, promising research and development projects, which can be optimized by the private sector for commercial and industrial applications." These directives were further endorsed by the *America COMPETES Act of 2007* where the Congress authorized MEP (with a proposed doubling of its budget over time) and TIP. How better to carry out the NIST mandate that coupling the MEP State programs with the NIST scientists who are developing these new manufacturing and metrology technologies? Many research studies have shown that technology transfer is most efficient if the technology developers have a close relationship with the users. Thus NIST could create a model of tech transfer by educating the personnel in the State MEP centers about their evolving technologies and then challenge the State centers to catalog and reach out to the start-ups and early stage technology companies in their State. The NIST scientists could both focus their efforts better and more rapidly see their efforts utilized by understanding the needs of these new companies in real time. Thus MEP represents a unique vehicle for a faster, better focused effort on NIST's part and the companies have the benefit of the early adoption of NIST standards and manufacturing technologies. This provides a win-win success for NIST, the companies, and the American competitiveness.

A similar argument can be made about TIP. TIP was authorized in the *America COMPETES Act* to "support, promote, and accelerate innovation in the United States through high-risk high-reward research in areas of critical national need." The mechanism to carry out this mandate was the establishment of a program of competitive grants for partial funding of small or medium size enterprises via contracts, collaborative efforts with universities, etc. Again, if NIST is to carry out its mandate for aiding the private sector in moving successfully to new, promising technologies, what better vehicle than interacting with real companies who are trying to turn technology into commercial projects and processes. The NIST experience with ATP clearly demonstrates their ability to propose and effectively manage a grants/contracts program as outlined in the TIP authorization legislation. Thus I see the President's budget initiative to eliminate MEP and to not establish TIP, very short sighted and an example of not understanding what NIST gains from these programs and how important they are for the U.S. to stake out leadership in the commercialization of the new and emerging technologies where we have funded much of the underlying fundamental research. These two programs can be very instrumental in the successful start-ups in nanotechnology, biotechnology, high per-

formance computing (including light-scale communications), hydrogen fuel, and quantum computing.

With respect to the NIST *Three-Year Programmatic Plan,* it describes NIST's value in the U.S. enterprise, its processes for internal quality reviews, and the programs they plan with additional funding the 2009 budget provides for the laboratories. However it is not a usual "strategic" plan. For example, they point out that the programs they plan to focus on are: "address critical national needs and measurement barriers to innovation; improve the capacity and capability of the NIST laboratories; and form new and strengthen existing partnerships with industry and academia." The plan, if you include the Appendices to the report, do a good job of the strategy pertaining to maintaining the NIST laboratories but the plan does not provide a strategy for determining national needs or how to make a significant increase in industry and academic ties. A strategic review and prioritization of the national needs results would then inform the planning for the laboratories. Recently the ASTRA (Alliance for Science and Technology Research in America) Legislative Task Force released a report entitled *"Riding the Rising Tide: ASTRA's Strategy for Enhancing U.S. Competitiveness and Prosperity."* This report, which was contributed to and vetted by several scientific and engineering societies, several industry partners and several academic institutions, proposed a 14-point Innovation Action Agenda for the U.S. The 14 points can be divided into three strategic areas: Federal Funding of R&D; workforce and STEM education; and a business climate that supports innovation. NIST clearly has a major role in the federal research efforts but it also has the opportunity to play a role in assuring an "innovation agenda" for U.S.-based industry. Thus the NIST forward plan should include insight beyond just next year's budget constraints. It would have been helpful if they could have correlated their forward plan to the overall innovation agenda so that they stake out their opportunities and responsibilities for a major impact on the rate and quality of innovation in the United States. Such a longer-term strategic view would then maximize their opportunity to guide the budget process rather than having the yearly budgets guide their activities.

I would have also liked some detailed discussion of the Baldrige National Quality Award program although it is a small portion of the budget. This program has the opportunity to disseminate best practices in businesses, health, and education. It should be integrated into the overall push for innovation in these sectors.

Clearly, in the limited scope of this hearing and the time available, it was not possible to comment on all of the facets of the NIST activities. So, in summary, let me say that the attention to, and planning for, accelerated innovation in the U.S. enterprise is the most important part of any plan to maintain U.S. competitiveness. Other factors are important, but without innovative new companies and the ability of established businesses to continue to change and innovate, the U.S. outlook for providing a high quality of life for its citizens gets much less positive. NIST is an important link in this plan for the future and a significant investment in both their internal and external activities is a must investment from the federal budget.

BIOGRAPHY FOR MARY L. GOOD

Mary L. Good is the Donaghey University Professor at the University of Arkansas at Little Rock, and serves as Dean for the College of Information Science and Systems Engineering. She is managing member for the Fund for Arkansas' Future, LLC. (an investment fund for start-up and early stage companies), past President of the AAAS, past President of the ACS, and an elected member of the National Academy of Engineering. She presently serves on the Boards of Acxiom, Inc., St. Vincent Health System, and Delta Bank and Trust.

Previously she served a four-year term as the Under Secretary for Technology for the Technology Administration in the Department of Commerce, a Presidentially appointed, Senate confirmed, position. In addition, she chaired the National Science and Technology Council's Committee on Technological Innovation (NSTC/CTI), and served on the NSTC Committee on National Security. Previously she has served as the Senior Vice President for Technology for Allied Signal and as the Boyd Professor of Chemistry and Materials Science at Louisiana State University.

She was appointed to the National Science Board by President Carter in 1980 and by President Reagan in 1986. She was the Chair of that board from 1988–91, when she received an appointment by President Bush to be a member of the President's Council of Advisors on Science and Technology.

She has received many awards, including the National Science Foundation's Distinguished Public Service Award, the American Institute of Chemists' Gold Medal, the Priestly Medal from the American Chemical Society, and the Vannevar Bush Award from the National Science Board, among others.

Good received her Bachelor's degree in Chemistry from the University of Central Arkansas and her MS and Ph.D. degrees in Inorganic Chemistry from the University of Arkansas at Fayetteville.

Chairman WU. Thank you very much, Dr. Good. Dr. Fiske, please proceed.

STATEMENT OF DR. PETER S. FISKE, VICE PRESIDENT FOR RESEARCH AND DEVELOPMENT, PAX SCIENTIFIC, INC.; CO-FOUNDER, RAPT INDUSTRIES, INC.

Dr. FISKE. Thank you very much, Chairman Wu, Committee Members, for the opportunity to speak today.

Seven years ago, I committed an unthinkable act. I left a comfortable and reasonably well paid job at Lawrence Livermore National Lab, and I set off to create a new business. It was oriented around a novel optical manufacturing technology called reactive atom plasma processing. The technology was developed at the lab, but my co-founder, Jeffrey Carr, could not find any support within the Laboratory. In fact, when I met him, the prototype was sitting under a tarp outside a loading dock in one of the buildings.

Taking the new technology from the benchtop to demonstrate its commercial viability is an enormous undertaking. It is easy to demonstrate that a new technology works at some rudimentary level in the laboratory, but it takes a tremendous amount of engineering, testing, and market analysis to make a new technology work reliably, economically, and fit within the needs of the marketplace. This journey is often referred to as crossing the Valley of Death, and it is an absolutely critical process for the U.S. economy and for economic competitiveness overall.

So, having been through the Valley of Death, I would like to share with you some observations about how this process of technology commercialization really works, and how federal policy can help, and specifically orient my comments around TIP, and its previous incarnation, ATP. I would also like to add that I have spoken with many entrepreneurs, in Silicon Valley and elsewhere, and my comments are largely echoed by all of them.

No matter what anybody's politics, nearly everybody believes that technology innovation is the key factor in U.S. economic growth. Our ability to take scientific discoveries from the laboratory, and turn them into productivity enhancing technologies that rapidly proliferate in the national and international market is a key strength of the U.S. economy. Small technology businesses play a particularly important role in this. They, and the entrepreneurs who found them, take the risks on the new technologies because it is the only way that these small companies can get traction in the marketplace.

So, while we would all like to believe that the U.S. is the best in the world at fostering this sort of entrepreneurship, I have to impress upon you how difficult the process actually is, how vital such tools as ATP and TIP are to entrepreneurs such as myself.

Contrary to popular belief in Washington, venture capital does not fund a lot of early stage technologies at the early stages of commercialization. Venture capital shies away from these sorts of investments, because of the long—the high degree of uncertainty, and the long and uncertain pathway that technology has to travel. Ven-

ture capital only focuses on funding opportunities that are less than five years away from profitability, and that have a potential for enormous equity appreciation, and that fall within a narrow range of markets.

Many new technologies do not fit this model, and most, like my company, do not receive venture funding. Technology with enormous potential to help the U.S. economy, in fields such as manufacturing and transportation, do not make attractive investments at their early stage for venture capitalists. This is not to say that venture capital is not vital or does not play a valuable role, but not at these early stages of technology development and commercialization. Any venture capitalist would tell you this.

Ironically, the most important venture capitalist in the United States is named Uncle Sam. The Federal Government supports cutting edge technology development in small business through a range of programs, such as SBIR, cooperative research and development agreements, and other contract mechanisms. In my years building RAPT Industries, my company has benefited from many of these programs, and all of them were helpful in keeping us alive as we marched through the Valley of Death. But out of all these programs, ATP stands out as particularly effective. Our company won an ATP award in 2003, and while it was far from the largest R&D contract we received, it was by far the most potent. ATP and TIP are unique in several respects. First, these programs focus on technologies with the greatest potential for the U.S. economy. In contrast, programs like SBIR focus on topics and technologies that are of interest to the agencies, and those topics tend to be very narrow, and sometimes, with limited commercial application.

Second, ATP grants support early stage technology commercialization for several years. SBIR Phase I contracts last as little as six months, and there is almost always a break in funding between Phase I and Phase II. That is not enough time really to travel the Valley of Death.

Third, ATP couples financial support with business development and advice and expertise. We were paired with an extremely helpful business analyst from NIST, who helped us identify several key potential customers and new applications.

Lastly, the ATP program is efficient and well-run. I will speak as a customer. Despite a highly competitive and rigorous review process, they take only a few months to render opinions on projects, and take even less time to get under contract. If you don't do that, if you let those processes linger, technology proceeds at a snail's pace. ATP was so valuable to my company and to many others because it was well aligned to the needs of small business. ATP encouraged and facilitated a collaboration with end customers, rather than simply tolerating it.

In a nutshell, a focus on high risk, high reward technologies, multi-year funding, business advice, and an efficient program management made ATP extremely effective for helping small technology businesses such as mine. TIP appears to carry on these principles, but without much funding, it doesn't do us entrepreneurs very much good.

I don't mean these comments to be interpreted as a criticism of SBIR and any of these other funding mechanisms, and we entre-

preneurs are grateful for all the help we can get in building our companies, but the argument that ATP or TIP is somehow redundant or unnecessary is simply incorrect. In my opinion, it is the best program the Federal Government has that supports technology commercialization.

I would not have been able to do what I did without ATP, and had there been no ATP or TIP, I would have been a lot less inclined to quit my job at Lawrence Livermore Lab and try.

Thank you, and I will be happy to take your questions.

[Prepared statement of Dr. Fiske follows:]

PREPARED STATEMENT OF PETER S. FISKE

A Postcard From the Valley of Death

Thank you, Chairman Wu and Committee Members, for the opportunity to speak with you today about the NIST 2009 Budget Request in particular and U.S. Innovation Policy in general.

Seven years ago I committed an unthinkable act. I left a comfortable and reasonably well-paid job as a research scientist at Lawrence Livermore National Lab and set off to create a new business oriented around a novel optical manufacturing technology called Reactive Atom Plasma processing. The technology was developed at Lawrence Livermore National Lab by my co-founder, Dr. Jeffrey Carr, but was viewed by Laboratory management as too immature. In fact, when I first learned about the technology the only prototype was sitting under a tarp on a loading dock outside one of the laboratory buildings.

Taking a new technology from the benchtop through to a demonstrated commercially viable product is an enormous undertaking. It is easy to demonstrate that a new technology works at some rudimentary level in a laboratory setting. It takes a tremendous amount of engineering, testing and market analysis to make a new technology work reliably, economically and fit within the needs of the marketplace. This journey is often referred to as crossing the "valley of death," and it is an absolutely critical process for the U.S. economy and economic competitiveness.

So, having been through the Valley of Death, I'd like to share with you some observations about how this process REALLY works, how federal policy can help, and specifically orient my comments to the TIP program and it's previous incarnation—ATP. I would also add that I have spoken to many other technology entrepreneurs and their experiences are similar to my own.

No matter what their politics, nearly everybody believes that technology innovation is a key factor in U.S. economic growth. Our ability to take scientific discoveries from the laboratory and turn them into productivity-enhancing technologies that rapidly proliferate in the national and international market is a key strength of the U.S. economy. Small technology businesses play a particularly important role—they, and the entrepreneurs who found them—take the risks on new technologies because that's the only way they have to get a foothold in the marketplace.

While we would like to all believe that the U.S. is the best in the world at fostering this sort of entrepreneurship I have to impress upon you how difficult the process of technology commercialization actually is—and how vital tools such as ATP and TIP are to entrepreneurs such as myself.

Contrary to popular belief in Washington D.C. venture capital is NOT a major funder of new technologies at the earliest stages of commercialization. Venture capital shies away from such investments because of the long and uncertain pathway that technologies must travel to demonstrate economic viability. Venture capital ONLY focuses on funding opportunities that are less than five years away from profitability, have the potential for enormous equity appreciation, and fall within a narrow range of markets. Most new technologies do NOT fit this model, and most, like my company, don't get funded. Technologies with enormous potential to help the U.S. economy, in fields such as manufacturing and transportation, do NOT make attractive investments for venture capitalists. This is not to say that venture capital is not vital—it is—but it cannot be relied upon to support early-stage, high-risk technology commercialization across the board—and any venture capitalist you spoke with would confirm this.

Ironically, the most important "venture capitalist" for early-stage technologies is Uncle Sam. The Federal Government supports cutting edge technology development in small businesses through a range of programs such as SBIR, Cooperative Re-

search and Development Agreements (CRADAs) and other contract mechanisms. My company has benefited from many of these programs, and all of them were helpful in keeping us alive as we marched through the valley of death.

But out of all these programs, the ATP stands out as particularly effective. Our company won an ATP in 2003 and, while it was far from the largest R&D contract we received, it was the most potent. ATP (and TIP) are unique in several respects. First—these programs focus on technologies with the greatest potential for the U.S. economy. In contrast, programs like SBIR, focus on topics and technologies that are of interest to the sponsoring agency—and those topics tend to be very narrow and with limited commercial application. Second, ATP grants support early-stage technology commercialization for several years—SBIR Phase I grants are as short as six months—hardly enough time to travel the valley of death. Third, ATP couples financial support with business development advice and expertise. We were paired with an extremely helpful business analyst from NIST who helped us identify several key potential customers and new applications. Lastly, the ATP program is efficient and well-run—despite a highly competitive and rigorous review process, funding decisions happen quickly. In contrast, programs such as SBIR can take many months to select projects, and several months more to get under contract—technology development proceeds at a snail's pace.

ATP was so valuable to my company, and to many others, because it was well-aligned to the needs of a small business. ATP encouraged and facilitated collaboration with end customers—rather than simply tolerating it.

In a nutshell: a focus on high-risk/high reward technologies, multi-year funding, business advice, and efficient program management made ATP extremely effective for helping small technology-based businesses such as mine. TIP appears to carry on these principles—but without much funding it doesn't help us.

I do not mean these comments to be interpreted as a criticism of SBIR and other funding mechanisms—we entrepreneurs are grateful for all the help we can get! But the argument that ATP or TIP is somehow redundant or unnecessary is simply incorrect. In my opinion it is the BEST program the Federal Government has that supports technology commercialization.

I would not have been able to do what I did without the ATP. And had there been no ATP or TIP, I would have been a lot less inclined to quit my job at Lawrence Livermore Lab and try.

Thank you. I would be happy to answer your questions.

BIOGRAPHY FOR PETER S. FISKE

MBA, UC–Berkeley, 2002; Ph.D., Stanford University, 1993

Prior to starting RAPT Industries, Inc., Dr. Fiske led a research team at Lawrence Livermore National Laboratory in condensed matter physics. His business plan for RAPT Industries won First Place at the 2001 U.C. Berkeley Business Plan Competition. He is the author of 20 technical articles in leading scientific journals including *Science* and two books. In 1996 Dr. Fiske was awarded a White House Fellowship and served in the Pentagon as Assistant to the Secretary of Defense for Special Projects. His other awards include an NSF Graduate Fellowship (1988–91), a STA Fellowship by the government of Japan (1995), the U.S. Department of Defense Outstanding Achievement Award (1997) and an Aspen Scholarship at the Aspen Institute in 2001. Dr. Fiske was CEO of RAPT Industries from May, 2001 to April, 2004.

Chairman WU. Thank you very much, Dr. Fiske. Mr. Coast.

STATEMENT OF MR. MICHAEL J. COAST, PRESIDENT AND CEO, MICHIGAN MANUFACTURING TECHNOLOGY CENTER; PRESIDENT, AMERICAN SMALL MANUFACTURERS COALITION

Mr. COAST. Chairman Wu, Members of the Subcommittee, thank you for the opportunity to appear here today. I am Mike Coast, President of the Michigan Manufacturing Technology Center, Michigan's affiliate of the National Manufacturing Extension Partnership.

I am also the current Chairman of the Board of the American Small Manufacturers Coalition, the trade association of the 59 MEP Centers. Congressman Ehlers is already well aware of our

work, as he represents the district that is home to our west Michigan office, the Right Place Program, and all the good work that they do over there with the manufacturers from the west side of the state.

I testify today about the dire situation facing small and mid-sized manufacturers, and about how the President's proposed elimination of federal funding for MEP would affect them. There are more than 30,000 fewer small and mid-sized manufacturing plants in the U.S. than there were a decade ago. In Michigan, there were 16,000 such facilities in 1998. Today, there are barely 13,000.

MEP Centers have proven over the past decade or more that they can help these smaller manufacturers succeed, despite this challenging landscape. In a typical recent year, MEP clients credit their services with: improving productivity in eight of every ten cases, with cost savings totaling more than $1.1 billion; helping companies served to add or retain nearly $6.8 billion in sales and 52,000 jobs, inducing those companies to help make more than $1.6 billion in additional investments. In Michigan, my center's clients credit it with more than $100 million in new and retained sales, 956 jobs, $18 million in cost savings, and more than $30 million in investment.

As their traditional customers globalize, small manufacturers have found that they need to do more than improve quality and reduce costs to remain competitive. The MEP network has responded by developing or partnering to require new services that help them prospect for new customers, evaluate new markets and product concepts, and improve the way they develop and launch new products. Indeed, MEP's new catchword is 20/20, expressing that many smaller manufacturers need not just 20 percent lower costs, but also, a 20 percent top line growth.

At the Michigan MEP Center, services related to new customers, new markets, and new products have grown from almost nothing to about 15 to 20 percent of our total service portfolio. Congress recognized the effectiveness of the MEP program last year when it passed the *America COMPETES Act.* The legislation foresaw the need not only to maintain, but to grow MEP. Under the ACT, MEP's federal funding would rise from its recent $104 to $106 million annual level, to $122 million for fiscal year 2009, with further increases in 2010 and 2011.

Despite MEP's track record of impact and efficiency, and ignoring the will of Congress, the President now proposes the virtual elimination of federal funding for MEP. One can debate what the precise effect of this would be, but the main outcomes are beyond dispute. Many Centers would close. Most that do not would shrink significantly, partly because many of the states that support the Centers explicitly in the form of matching funds.

Some have argued that smaller manufacturers could go out and buy the services similar to those offered by MEP Centers from the private sector consulting firms, but history shows us that without some public funding to offset the cost of outreach and sales, consultants shy away from all but the best-heeled of these small companies. And that is only logical. Without public funds, my Center and most other Centers would have no choice but to focus on larger manufacturers.

With your help, however, the Nation can avoid this sharp reduction in services to smaller manufacturers. By turning back the President's proposal, and returning it to the support levels authorized by the *America COMPETES Act,* the Congress can help save MEP and help it grow. MEP is the country's only national program created specifically to help the U.S. small manufacturing base, and preserve its nearly 10 million good jobs.

At this moment of grave risk to the manufacturers and the rest of the economy, MEP brings otherwise unavailable technical expertise to tens of thousands of struggling U.S. companies.

In closing, I urge you, on the behalf of my Center, 58 other Centers of the MEP network, and nearly 340,000 small and medium-sized manufacturers across the Nation, to act to restore full funding to MEP. For you on the Subcommittee, I have enclosed one success story for each Member of the Subcommittee from their district or state, and also, from Michigan, you will notice that there is a list of companies that are from Michigan, of the 440 companies in the last couple of years that we have worked with, from the MEP.

Thank you.

[The prepared statement of Mr. Coast follows:]

PREPARED STATEMENT OF MICHAEL J. COAST

Chairman Wu, Congressman Gingrey, Members of the Subcommittee—Thank you for this opportunity to appear today. I am Michael J. Coast, President of the Michigan Manufacturing Technology Center, Michigan's affiliate of the national Manufacturing Extension Partnership. I am also the current President of the American Small Manufacturers Coalition, the trade association of the 59 MEP centers. Congressman Ehlers is already well aware of our work, as he represents the district that is home to our West Michigan office.

I testify today about the dire situation facing small- and medium-sized U.S. manufacturers, and about how the President's proposed elimination of federal funding for MEP would affect them.

There are more than 30,000 fewer small- and medium-sized manufacturing plants in the U.S. today than there were a decade ago. In Michigan, there were 16,000 such facilities in 1998; today, there are barely 13,000. Thanks to increased imports of both manufactured products and their parts, U.S. manufacturing value-added is essentially unchanged over the past decade; in Michigan, it is quite clearly lower.

This is not some long-term, inevitable decline analogous to the job losses in agriculture during the past century. In agriculture, employment fell because of rising productivity, but real output grew, and continues to grow. No, in manufacturing, the issue is the failure of many small- and medium-sized companies to perform well enough to withstand the competitive pressures of a globalized economy in which the U.S. operations of most of their traditional customers are no longer growing. With the sharp slowdown in economic activity that began last October, the situation has become even more difficult. U.S. manufacturing employment has plunged from 17.6 million in 1998 to barely 13.6 million in January of this year. Since last August, manufacturing has been losing an average of 60,000 jobs a month, a sharp reversal after a nearly four-year period of relative stability.

MEP centers have proven over the past decade or more that they can help these smaller manufacturers succeed despite this challenging landscape. In a typical recent year, MEP centers' clients credit their services with:

- Improving productivity in eight of every ten cases, with cost savings totaling more than $1.1 billion;
- Helping the companies served to add or retain nearly $6.8 billion in sales and 52 thousand jobs; and
- Inducing those companies to make more than $1.6 billion in additional investments.

In Michigan, my center's clients credit it with more than $100 million in new and retained sales, 956 jobs, $18 million in cost savings, and more than $30 million in induced investment during the last full year for which survey data are available.

As their traditional customers globalize, smaller manufacturers have found that they need to do more than improve quality and reduce costs to remain competitive. The MEP network has responded by developing or partnering to acquire new services that help them prospect for new customers; evaluate new markets and product concepts; and improve the way they develop and launch new products. Indeed, MEP's new catchword is "20/20"—expressing that many smaller manufacturers need not just 20 percent lower costs, but also 20 percent top-line growth. At the Michigan MEP center, services related to new customers, new markets, and new products have grown from almost nothing to about 15 percent of our total service portfolio. By 2010, I expect that they will exceed 25 percent of what we do with our clients.

Congress recognized the effectiveness of the MEP program last year when it passed the *America COMPETES Act.* That legislation foresaw the need not only to maintain, but to grow, MEP. Under the Act, MEP's federal funding would rise from its recent $104–$106 million annual level to $122 million for FY 2009, with further increases in FY 2010 and FY 2011.

Despite MEP's track record of impact and efficiency, and ignoring the will of the Congress, the President now proposes the virtual elimination of federal funding for MEP. One can debate what the precise effect of this would be, but the main outcomes are beyond dispute. Many centers would close. Most that do not would shrink significantly, partly because many states' support for the centers is explicitly in the form of matching funds: that is, it could be withdrawn if federal funding were to end. Some have argued that smaller manufacturers could go out and buy services similar to those offered by the MEP centers from private sector consulting firms. But history shows that, without some public funding to offset the cost of outreach and sales, consultants shy away from all but the best-heeled small companies. And that's only logical: without public funds, my center and most others would also have no choice but to focus on larger manufacturers.

With your help, however, the Nation can avoid this sharp reduction in services to smaller manufacturers. By turning back the President's proposal and returning to the support levels authorized by the *America COMPETES Act,* the Congress can save MEP and help it grow. MEP is the country's only national program created specifically to help the U.S. small manufacturing base and preserve its nearly 10 million good jobs. At this moment of grave risk to manufacturing and the rest of the economy, MEP brings otherwise unavailable technical expertise to tens of thousands of struggling U.S. companies.

In closing, I urge you—on behalf of my center, the other 58 centers of the MEP network, and the nearly 340,000 small and medium-sized manufacturers across the Nation—to act to restore full funding to MEP.

Thank you.

BIOGRAPHY FOR MICHAEL J. COAST

Mike Coast is the President and CEO of the Michigan Manufacturing Technology Center (MMTC) and is responsible for directing the operations, programs, and working relationships with Michigan's industrial, business, and governmental stakeholders. In 2007, MMTC was awarded the Not-for-Profit of the Year award from the Automation Alley.

Additionally, he is responsible for maintaining and building on the successful partnership between the MMTC and the Michigan Economic Development Corporation (MEDC). The MMTC has been chosen to play a lead role in coordinating and streamlining technology-related services to Michigan's established industries.

Previously, Mike was Vice President and Executive Director for the MMTC's statewide program. As Executive Director, he was responsible for developing new business, working with manufacturers to implement manufacturing technologies, collaborating with service providers, and discovering potential funding sources to increase the capabilities of the MMTC.

Mike came to the MMTC with more than eight years of technology development experience and more than sixteen years of manufacturing experience. Prior to joining the MMTC, he was the Associate Director for the Youngstown State University Technology Development Corporation in Youngstown, Ohio. Also, Mike held a variety of managerial positions with engineering and technologically based organizations including Leeds & Northrup, Mayer China, Sargent Electric Company, and Airway Industries, Inc.

Mike received his Bachelor of Science degree in Engineering with a minor in Industrial Engineering at Geneva College, Beaver Falls, PA.

DISCUSSION

Chairman WU. Thank you very much, Mr. Coast, and now comes the time for questions. Members will be permitted five minutes each to ask questions, and the Chair recognizes himself first.

In the interests of saving some time, before I ask question about MEP and TIP, Dr. Turner, I just want to say very clearly that the three-year planning document which we have received is not what we had in mind when this Congress passed the requirement last year, and while the document speaks sometimes in sort of consultant's language about general values, about the need for outreach, all of which is commendable, it does not label out what research areas NIST should participate in, how those research areas make us a more competitive economy, and perhaps, most importantly, how we get from where we are to where we want to go in those identified research areas. It becomes an agreement about what those research areas are. And I hope that this Subcommittee, the Committee as a whole, at both the Member and the staff level, can work with you and your staff to come up with more focused three-year plans in the future, because I think that that is the only way that we can justify this increase in funding for NIST over the long haul. We simply have to have that statutorily required strategic planning document.

Now, on MEP and TIP, we heard from Mr. Coast, we hear eloquently from Dr. Fiske about how TIP helped march him and his company over the—through the Valley of Death, and from Dr. Good about how MEP and TIP can be good, not only for the purported beneficiary, but also for NIST as an organization, to be more attuned to what our economy needs. These programs, MEP and TIP, are supported, as you heard here today, by both Republicans and Democrats. We have sought to avoid this seesaw battle where the funding goes up and down and up and down, and things become undependable from a user perspective.

And Dr. Turner, you have only been in place since September. Let me just give you an opportunity to defend, as best you can, to lay out the rationale that NIST or the Administration may have, for zeroing out TIP, and in effect, zeroing out MEP, permitting closedown costs only.

Dr. TURNER. Yes, sir. Let me first say, with regard to the three-year plan, we welcome the opportunity to work with you and your staff to make the kind of document that you would find useful. We would like to go ahead and do that.

But now, with respect to MEP and TIP, let me just say first of all, one of the things that I did, you know, the first few months I was at NIST was to visit an MEP Center in Colorado and to meet with some clients, and I was extremely impressed. And so, again, I believe it is a good program. In conjunction with the VCAT meeting that took place this past December in South Carolina, I had, you know, insisted on setting aside some time to visit the South Carolina Center, and again, meet with the clients down there. Unfortunately, there was a medical emergency involving my son and his family that caused him to be MedEvaced out of Cairo back to the United States, that prevented me from going to that meeting. But my Deputy did follow-up, visited the South Carolina Center,

and met with some of their clients, and similar to my experience in Colorado, he came back very impressed with the work that was being done.

Chairman WU. It would be fair to say that both you and your staff, and members of the agency are supportive of MEP.

Dr. TURNER. Well, let me just say, we all agree that MEP is a good program, but for us, it came down to a matter of priorities and limited resources, and for us, our highest priority is to get our core programs back up to the doubling curve, and we tried to do that.

Chairman WU. But this Congress set priorities for you, and put those programs on a doubling curve, along with MEP and TIP.

Dr. TURNER. Well, again——

Chairman WU. With all due respect, Acting Director Turner.

Dr. TURNER. For us, it was the combination of the American Competitiveness Initiative, and the *America COMPETES Act,* and again, for us, the priority was those core programs, which affect broad industrial sectors, as well as creating new industries, and so, that was our priority, and you know, and we had to make some difficult choices. This was not an easy call to make, and so, it was a difficult choice to make.

Regarding TIP, first of all, we fully intend to run a successful TIP competition, using the '08 appropriation. The rule that will establish the governance of TIP is now out for public comment. We are prepared to move forward with it, and as you heard, you know, we intend to apply the same standard of excellence to the TIP program as we did to ATP, as far as our ability to carry those programs out. And so, we look forward to that.

Again, with TIP as well as MEP, it came down to a situation of priorities, trying to get our core programs back up to the doubling curve, and the situation where we have the resources at our disposal were limited, and so, we had to make those tough calls, and so, again, the point I want to make is, we agree that MEP is a good program, and with regard to TIP, we are going to carry out a successful '08 competition.

Chairman WU. Thank you very much. My five minutes has expired. We have a vote on, so I want to turn to Dr. Ehlers, but let me just reiterate, with all due respect, sir, those priorities were set in statute by the enabling legislation last year, and we would really like the agency to obey the law, as enacted.

Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman.

Dr. Good, do you, you were sort of, positions related to NIST, or directly in NIST for some time. You talked about, pretty strongly about the need for a good strategic planning process.

I would be interested in a little more detail from you. What would you be looking for, how would you proceed with it? NIST is such a diverse organization that ranges from the esoteric research which, frankly, in my experience, is left best outside strategic planning, because you are always looking for that spark of genius, which doesn't fit in the strategic planning charts, but it ranges from that all the way to things like TIP and MEP and other programs.

Could you describe for me what you have in mind when you talk about strategic planning?

Dr. GOOD. I can say a few words about that. I don't disagree with you, with respect to the percentage of really, what I would call blue sky kinds of research they do. To include that, or try to include that, in a forward-looking mode, in strategic planning is very difficult to do, and if you do it too tightly, you end up not getting very much really new stuff.

Now, the industry, over time, has that out, but what I was really referring to is the fact that it seems to me that NIST does need, though, there are so many of these new, what I call emergent technologies today, where they are in the process of now beginning to set standards for those, and the Metrology Lab, particularly, the Micrometrology Lab, allows them to set standards in areas that are truly very new.

And so, the question is, which ones of those do they want to try to develop first, where is the biggest need, and how do you go about finding out, how do you try to at least prioritize where those needs are going to be? And so, I would not disagree with you with respect to the fundamental research that is done in NIST, but I would suggest that they need a strategic plan, though, in all of those activities that are what I call technology assistance programs, and MEP and TIP fit that, as does, really, the standards development in these emerging technologies. Because you cannot do all of them. You will never have enough money to do them all at the same time, so you need some prioritization of those, and you need some mechanism up front which tells you which ones are not going to, not—how do you figure out which ones don't work, and which ones, then, were really important, and how do we stay ahead of the competition. In other words, we need some view, for example, where is the metrology and nanotechnology transition in the rest of the world, and how do we compete, and how does NIST stand up against that? And I would think a strategic plan would have those sorts of issues included in it.

Mr. EHLERS. Thank you, and I want to make it clear, I wasn't questioning the need for it. I was just curious what, from your perspective, you would see.

Just on, and getting back to MEP for just a moment, before we have to go off and vote, it has always struck me, you know, this nation grew strong over the years, particularly in agriculture, which was the first industry that this nation had, and it was one of the most important, until just a few years ago, and it is still extremely important. The government, including the Congress, recognized that many years ago, we established the land grant universities, which were designed to do research in agriculture. They set up the Cooperative Extension Services, which is the combination of the federal and State, and everyone thinks it is a wonderful system, and we put about $400 million a year into the cooperation Extension Service.

Now, it has always seemed very strange to me, that since back then, agriculture was 80 percent of the employment in the country. Now, it is less than two percent because of the modernization, and we are still spending $400 million a year on the Cooperative Extension Service, whereas at the same time, manufacturing is now roughly 14 percent of the employment in the country, and we have trouble getting $100 million for an extension program. Now, there

is something wrong with this picture, isn't there? And I think we just have to recognize that.

Agriculture grew strong because of assistance from the Federal Government. Manufacturing is, has been strong without government assistance. Now, I think we are at the point where it needs some, and the MEP, I think, and TIP, are very good programs with a huge payback to the government, in terms of taxes, general economic health, and so forth.

So, I—you can tell I am the son of a preacher. I have to get that message across. I preach it all the time, but I just wanted to make my point clear on that. I think this country has made a bad mistake on those issues, and we should carry the ball forward on them.

Thank you very much.

Chairman WU. Thank you very much, Dr. Ehlers. Ms. Richardson.

And returning to other subjects under NIST, Dr. Turner, I have heard concerns both within the Federal Government and in the private sector, about the status of the cyber security initiatives at NIST, and setting standards for cyber security, and I wanted to ask you and ask other members of the panel to comment, if you would, on where we are in developing cyber security standards, and whether we are making adequate progress for where we ought to be.

Dr. TURNER. Yes, sir, one of our initiatives is a cyber security initiative, that we are working with NSA, the FBI and other groups on that. It is basically to provide defense in depth in protecting computer assets. It is looking at cyber security keys, but also, looking at other measures that can take the, you know, that can move forward, and layers of protection that we can have, and so, that is, this is something that we are very serious about.

We are also—the Quantum Computing Initiative also feeds into that, because not only will that revolutionize the way computing is done, but also, it provides a huge increase in the level of security that can be provided for computing, and making sure that your messages are easily accessible to those who have authorization to them, but extremely difficult for an adversary to tap into. So, we are moving forward on both of those areas. Cyber security, also, is an extremely important area for us, because again, the way that our nation now relies on the network and using, moving things back and forth, you know, using the electronics that we have available, you know, we need to make sure that this is being done.

Also, I would like to point out that we are, you know, doing other things to help facilitate electronic commerce, which highlights to us, even more, the need for a secure network.

Chairman WU. Well, if there are no other comments by other panelists, we are drawing down to about the last two and a half minutes before this voting clock expires on the House Floor, and let me just flag, for submission by staff and for response, concerns about two other general areas.

And one is whether there has been sufficient investment in biomaterials, because there is discussion that sufficient reference materials for biologics would be of great assistance to developing technologies and industries. And the other is whether there is sufficient

oversight over the tremendous investment that is going on in nanotechnology. Now, nanotechnology is a very appropriate thing to be investing in. However, I am told that about 20 percent of NIST's research budget is currently being invested in nanotechnology, and I want to make very sure that those investments are made with some coordination, and that it is a bottoms-up effort to support various things going on in our economy, and not a response to a top-down, things ought to fit in nanotechnology, so whatever it is you are doing, let us fit it under the nanotech rubric.

My apologies to the panel for sort of the interruptions that we have had today, but thank you all very much for appearing this afternoon. Further statements will be, can be submitted into the record for the next five days, and I thank everyone for appearing.

This hearing is adjourned. Thank you.

[Whereupon, at 3:06 p.m., the Subcommittee was adjourned.]

Appendix 1:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by James M. Turner, Acting Director, National Institute of Standards and Technology, U.S. Department of Commerce

Questions submitted by Chairman David Wu

Q1. How much of NIST's resources will be devoted to cyber security in FY08? Apart from the $5 million cyber security initiative will this year's budget, how much does NIST propose to spend in FY09 on cyber security?

A1. NIST will devote approximately $20.8 million from STRS appropriations to cyber security in FY 2008, and will increase that by $5 million if Congress funds the FY 2009 request.

Q2. How did NIST determine the size of the FY09 biotechnology initiative ($10 million)? What external strategic partners does NIST plan to work with in expanding its investments in the life sciences?

A2. As part of the American Competitiveness Initiative, the $10 million requested in the President's budget for this initiative was determined as sufficient to acquire the appropriate expertise and resources necessary in FY 2009 for building up our foundation to meet anticipated future needs in biosciences measurement. NIST's role in the biosciences is to leverage the agency's expertise in the quantitative physical and informational sciences that provide the measurement infrastructure for enabling increased innovation in this area, and to provide confidence for measurements of complex biological systems. To develop a robust measurement capability, NIST has been reaching out to stakeholders that include government, industry, and academia (examples include: FDA, NIH, Pharma, Amgen, Genetech, Merck, the Institute for Systems Biology, California Institute of Technology, the Mayo Clinic, and other organizations) to identify critical measurement needs. As a result of these efforts, the NIST FY 2009 budget initiative targets the need for quantitative, traceable measurements and standards for biomarkers, the ability to quantitatively make simultaneous multiplexed measurements of multiple biological molecules (including genes, proteins, RNA, etc.), and the informatics and computational tools and standards to manage and manipulate the tremendous amounts of data generated by biological experimentation.

As NIST expands investments in the life sciences, we are continuing to work with stakeholders to continue our efforts in identifying other critical measurements and standards needs. As part of this planning process, NIST is working with the University of Maryland Biotechnology Institute to sponsor a meeting entitled "Accelerating Innovation in 21st Century Biosciences: *Identifying the Measurement Standards and Technological Challenges.*" The meeting will be held from October 20–22, 2008, at NIST and will be open to leaders from industry, academia, and government. Details of the meeting can be found at *http://www.cstl.nist.gov/Biosciences.html.* Input from this meeting and other outreach activities will form the basis of NIST's strategic plan for future program expansion in the biosciences.

Q3. In each of the last five years, NIST has spent approximately 20 percent of its research budget on nanotechnology, the highest percentage of all the agencies in the National Nanotechnology Initiative. How did NIST decide to allocate this level of resources to this one technology area? Does NIST have a roadmap for its work in nanotechnology? If not, why not?

A3. The focus of a majority of research at NIST is the advancement and application of measurement science. This work relies increasingly upon advances at the nanoscale—one billionth of a meter—and smaller (the single atom, ion, photon, electron, etc.) It is a natural development as the capabilities and needs of science and industry have advanced, and it has been part of NIST's measurement science strategy before the term "nanotechnology" became commonly used.

The label nanotechnology is, in fact, a broad one, linked mainly to the size at which a material is being fabricated or examined. So it is relevant to multiple disciplines ranging from physics, chemistry, and materials science to electronics, building and fire research, and information technology. That also makes nanotechnology relevant to many scientific and engineering advances and industrial applications being pursued by the customers served by NIST—and makes NIST measurement-oriented contributions important to the nanotechnology revolution. This multi-disciplinary, multi-sector involvement explains the relatively high percentage of work at NIST that is classified as nanotechnology. It should be expected that a good per-

centage of NIST's work in nanotechnology also can be classified with other labels, such as "materials science" or "bioscience" or "electronics."

That is why NIST invests heavily in nanotechnology-related research. This work is always informed by current and future needs of industry, academia, and government for measurement-based advances. The National Nanotechnology Initiative is the overarching government effort to identify and address nanotechnology needs, and NIST's priorities are derived from this cooperative planning effort—and supplemented by information provided by NIST's primary customers and potential customers in industry, academia, and government.

The *Nanotechnology: Discovery to Manufacture initiative and the Nanotechnology: Environment, Health, and Safety Infrastructure* initiative are two FY 2009 budget initiatives that tackle specific challenges in the development and manufacture of nanodevices, or products incorporating nanomaterials. Both of these initiatives were mapped out and planned after significant consultation and coordination with multiple stakeholders through interagency working groups, and technical workshops. Moreover, it fits into a multi-year matrix of phased investments in nanotechnology that NIST developed with the active involve of leaders of all laboratories at NIST working on nanotechnology. The final decision about these planned, phased investments was made by the NIST Director.

NIST will continue to coordinate with the NNI and our stakeholders in industry to ensure that our research programs that are specifically targeted to nanotechnology continue to address the highest impact challenges and problems. We will update our planning accordingly.

Q4a. How will NIST ensure that the results of the new initiative in the environmental, health and safety (EHS) implications of nanotechnology will be disseminated to regulatory agencies such as EPA and FDA?

A4a. NIST will adhere to strict guidelines published within the Federal EHS research strategy to ensure results of the NIST nanoEHS initiative will be disseminated, particularly to the regulatory agencies, to coordinate existing, and foster expanded, agency efforts to address priority research needs and identified gaps. NIST will work closely with the Nanomaterials Environmental Health Implications (NEHI) Working Group (WG) to continue to facilitate coordination and increased collaboration among the NNI agencies' research programs to address priority research needs both individually and jointly, leverage investment and expertise, and avoid duplication of effort.

Additionally, NIST will work with the other agencies and convene workshops tailored to assess the state of science as this initiative moves forward. The nanoEHS initiative research will be discussed in detail and areas of weakness and gaps will be assessed during these workshops. Participants will include representatives from the NNI agencies, particularly the regulatory agencies, as well as academia, nongovernmental organizations, and industry. These workshops will:

- facilitate development of joint programs among NNI regulatory agencies to ensure research needs critical to regulatory missions are being met
- clarify priorities and areas of focus for pursuit and collaborations with the regulatory agencies
- avoid unproductive redundancy and research that is decoupled from regulatory agencies' missions and real-world application, and
- identify synergistic opportunities.

In addition, NIST will continuously evaluate its activities with the regulatory agencies via the framework outlined below.

Establishing a regular review process. NIST with work with the NNI member agencies, particularly the regulatory agencies, and the NEHI Working Group to conduct periodic progress review of this initiative, anticipated at a minimum yearly, and will update the research activities and priorities, taking into consideration advances from private sector and international entities. Formats for review may include, for example:

- a novel peer-consultation panel review by representatives from the NNI member agencies, practitioners from industry and academia, and representatives from NGOs conducted in a public venue,
- a review via the NIST National Research Council (NRC) Laboratory Assessment Program, and
- a review via the NIST Visiting Committee on Advanced Technology.

Facilitate partnerships with industry. Through its interactions with the NNI and the NEHI Working Group, NIST will explore and develop mechanisms with participating agencies for partnering with industry to support priority research that reduces risk uncertainty facing the range of businesses and industry sectors that are commercializing nanomaterials for beneficial and practical applications.

Coordinate efforts internationally. Participate actively in international efforts related to EHS research, particularly in the work of the OECD Working Party on Manufactured Nanomaterials (WPMN), e.g., WPMN efforts to develop internationally agreed EHS research priorities, testing protocols, and predictive tools.

Focus on development of consensus-based documentary standards to support oversight of nanomaterials research. Participate in and support efforts by national and international standards development organizations to develop nanotechnology-related documentary standards particularly those related to EHS research.

Facilitate wide dissemination of research results. Participate in and support activities aimed at broadly disseminating available information about EHS aspects of nanomaterials. Such activities include those already underway in the OECD WPMN, and the ISO Technical Committee on Nanotechnologies (TC 229) Working Group on Health, Safety, and Environment.

This initiative builds upon existing NIST expertise. NIST is already engaged in collaborative efforts with the FDA to address metrology needs that will enable physical and chemical characterization of nanoparticles as well as bio-compatibility studies. These interactions will continue under this initiative. Additional interactions with the National Institute for Occupational Safety and Health (NIOSH) for safety evaluations of nanomaterials are planned with laboratories on the main campus in Morgantown, WV. EPA has identified four key research themes in its recently released draft Nanotechnology Research Strategy that are designed to provide leadership for the NNI and support the science needs of the EPA. These are: (1) sources, fate, transport, and exposure; (2) human health and ecological research to inform risk assessment and test methods; (3) risk assessment methods and case studies; and (4) preventing and mitigating risks. NIST's initiative on nanoEHS will support the development of instrumentation, analytical methods, and standards that will be essential to meeting the demands to understand and manage nanoEHS research under these four themes at EPA.

Ultimately, NIST will take a leadership role in coordinating and communicating with the regulatory agencies, and will facilitate the ongoing adaptation of NNI research priorities to new discoveries and new materials through its continued interactions with the NNI member agencies via participation on the NEHI interagency working group.

Q4b. What is the process by which NIST determines the nanotechnology research needs of these regulatory agencies?

A4b. As one in 20 of the 26 NNI agencies that participate in the Nanomaterials Environmental Health Implications (NEHI) Working Group (WG), NIST contributes and serves effectively to coordinate the planning and implementation of the Federal EHS nanotechnology research and activities. Through this process, the NEHI WG creates the framework that supports a robust, proactive process for identifying, prioritizing, and addressing EHS research needs with respect to nanotechnology. Moreover, the NEHI WG operates on a consensus basis. As a result, reports and documents created by the WG, reflecting the priority research needs of the regulatory agencies, have broad approval from all member agencies. Such reports reflect the input of appropriate experts within the regulatory agencies. Research needs are presented from the perspective of mission specific activities. NIST participates in the process of building consensus, enabling NIST to fulfill its part of the research activity and through that work, address the needs of the regulatory agencies.

Q5. The 21st Century Nanotechnology Research and Development Act *(P.L. 108–153) tasks NIST with disseminating nanotechnology research results to small- and medium-sized manufacturers through the MEP program. If federal support for MEP is eliminated, how will NIST carry out this statutory requirement?*

A5. NIST will rely on its laboratories to help disseminate its nanotechnology research results to smaller manufacturers. All of the NIST laboratories, including the Center for Nanoscale Science and Technology (CNST), play an active role in transferring both knowledge and technology to industry—and this includes both large and small companies as well as the universities that are engaged in nanotechnology.

This takes place on a regular basis as the normal course of business at NIST via publications, seminars, as well as direct contact and collaborative research.

Q6. In FY08, NIST is receiving about 20 percent of its research budget from funds transferred from other agencies. How does NIST ensure that this external funding does not interfere with its core mission? How does NIST ensure that acceptance of external funding does not jeopardize its position as an independent technical authority?

A6. NIST ensures that external funding does not interfere with its core mission by having and applying clear policies and guidelines for accepting other agency funding and by being selective in its ultimate decisions.In keeping with its authorizing legislation, NIST provides unique measurement services and makes available its technical competence for the support of important missions of other Federal Government agencies, including agencies where mandatory measurement and test standards are embodied in regulations which may be essential to enforcement responsibilities, e.g., law enforcement, and fair and rational management of the Nation's technology.

The Congress recognizes this role by encouraging and directing NIST to work with other agencies on a number of issues including: the Election Assistance Commission on voting system testing and certification, and DHS on first responder communications inter-operability.

NIST ensures that acceptance of external funding does not jeopardize its position as an independent technical authority by strictly avoiding conflict of interests and maintaining high standards of scientific research and ethical conduct.

Any proposed other agency work must meet at least one of the following criteria before NIST can accept the work:

1. Acceptance by NIST establishes traceability of measurements to national standards.
2. Private sector cannot or will not develop test methods for materials, mechanisms, and structures related to items purchased by the government or important to the public interest.
3. Support services to other agencies authorized or mandated by specific legislation.
4. A contract placed outside the Federal Government would result in an unavoidable conflict of interest.
5. Requirements for accuracy of physical constants and properties of materials cannot be met by other sources.
6. Unique capability of NIST required for support services to other agency.
7. Use of a private sector source by the other agency would cause significant and intolerable delays in providing services and results.
8. Use of a private sector source by the other agency would result in a higher cost to the government.

Q7. The Committee noted that this year's Budget Requests for FEMA, NSF, and USGS did not specifically request FY 2009 funding for the National Earthquake Hazard Reduction Program (NEHRP). As the agency chairing the interagency working group on this program, what measures did NIST take to ensure a coordinated budget process? Are the NEHRP related activities of these agencies coordinated with NIST's? Please describe what the FY 2009 will entail at each agency.

A7. NEHRP leadership is provided by the Interagency Coordinating Committee (ICC), which includes the directors of the NEHRP agencies, as well as the directors of OMB and OSTP. The ICC submitted the Annual Report of the National Earthquake Hazards Reduction Program to the House of Representatives' Science and Technology Committee staff in March 2008, which contains much valuable information. This report is also available on the web at *http://www.nehrp.gov/pdf/2008NEHRPAnnualReport.pdf.* Table 2.2 (page 8) of the report lists the agencies' FY 2008 enacted budgets, while Table 2.3 of the annual report lists their FY 2009 requested budgets (page 9).

As reported on page 3 of the Annual Report, the ICC members agreed in mid-2007 to a formal process of unified interagency program planning with coordinated budget requests, commencing with the FY 2010 budget request. While this formal agreement was not in place for the FY 2009 budget, the agencies nevertheless worked closely together as they prepared their respective budgets. Table B.1 (page 66) of the Annual Report lists the various formal NEHRP meetings that occurred in FY 2007. The ICC met three times. The Program Coordination Working Group (PCWG), which is composed of working-level representatives of the four agencies

and chaired by NIST, met 10 times during FY 2007. Similarly, the ICC and PCWG have continued to meet in FY 2008. Budget and interagency coordination discussions occur at almost all of the ICC and PCWG meetings. In addition, the NEHRP Director (a NIST research engineer) is in constant communication with the other agencies' representatives to coordinate their activities.

As the agencies prepared their FY 2009 NEHRP budget requests, they worked toward maintaining their already ongoing activities that contribute to the Nation's earthquake preparedness, and also began addressing the nine Strategic Priorities that the agencies have identified in the new draft NEHRP Strategic Plan that is now undergoing public review prior to its formal adoption. This draft plan may be found on the web at: *http://www.nehrp.gov/pdf/NEHRP_StrategicPlan_Draft.pdf*

The ICC has agreed on future directions for the program through the Strategic Priorities. The NEHRP Advisory Committee on Earthquake Hazard Reduction (ACEHR), which is composed of 16 of the Nation's leading earthquake professionals, has reviewed and strongly endorsed these priorities. The agencies have agreed strongly on these priorities and intend to focus on addressing them, as resources are available, commencing in FY 2009. All but one of the priorities will by design require interagency cooperation and coordination, to underscore the importance of interagency cooperation as key to the success of the overall endeavor.

The agencies are each supporting the strategic priorities in a manner that is agency-appropriate. For FEMA, the President's budget request for FY 2009 supports the strategic priorities by including an increase for State assistance, which has historically been a vital part of NEHRP but has not been prominent in recent years. To help address strategic priorities, NIST has a significant increase in the FY 2009 request, under the auspices of the American Competitiveness Initiative, for development and implementation of Advanced Earthquake Risk Mitigation Technologies and Practices and further development of techniques for Evaluation and Rehabilitation of Existing Buildings. In keeping with its overarching mission of supporting fundamental science and engineering, NSF does not specifically direct funding to the NEHRP strategic priorities or to supporting the existing research infrastructure. Rather, NSF highlights the NEHRP priorities in its research solicitations, thus encouraging the researchers it supports to link their activities to the NEHRP priority areas.

NSF will encourage investigators to propose curiosity-driven basic research that could contribute toward the priority areas. Because of anticipated NEHRP budget reductions, USGS will focus on maintaining its ongoing NEHRP activities that include seismic monitoring and hazard assessment.

Questions submitted by Representative Phil Gingrey

Q1. How many researchers will NIST support in the expanded JILA? What is the annual value of the utility services provided to JILA by the University of Colorado?

A1. The proposed expansion will allow the number of graduate and post-doctoral students studying at JILA each year to increase from approximately 170 to 250. This represents approximately a 10 percent increase in the national training capacity for this critical field.

At JILA, there are currently 28 senior scientists (JILA Fellows), and approximately 125 graduate and 45 post-doctoral students. Of the JILA researchers, nine Fellows and six post-doctoral students are members of the NIST Quantum Physics Division. The remaining researchers are University of Colorado faculty and students funded by various State, federal and private sources.

The University of Colorado pays 50 percent of utility services provided to JILA. For reference, the utility costs from July 1, 2006 to June 30, 2007 for JILA totaled approximately $535 thousand and half was paid by the University of Colorado.

Q2. One of the new initiatives in your request is for implementation of a new program focused on the reducing inefficiencies in global supply chains. You state that one of your major goals will be the development of development roadmaps for standards "in target industry sectors." How will NIST determine which industry sectors to target?

A2. CNIST uses a variety of means to guide programmatic activities. In this case, a series of economic studies were performed by the Research Triangle Institute for NIST to assess the cost of inadequate inter-operability. These studies demonstrate that the U.S. loses billions of dollars due to lack of inter-operability. Market-specific losses include at least $1 billion per year for engineering data transfer in the auto-

motive sector,[1] $5 billion in the transportation sector (including automotive and aerospace)[2], and $15.8 billion in the construction sector.[3] These industrial sectors are targeted in this initiative based on the magnitude of their inter-operability losses.

[1] Inter-operability Cost Analysis of the U.S. Automotive Supply Chain (NIST Planning Report #99–1)

[2] Economic Impact of Inadequate Infrastructure for Supply Chain Integration (NIST Planning Report #04–2)

[3] Cost Analysis of Inadequate Inter-operability in the U.S. Capital Facilities Industry (NIST GCR 04–867, 2004)

ANSWERS TO POST-HEARING QUESTIONS

Responses by James W. Serum, Chairman, NIST Visiting Committee on Advanced Technology; President, Scitek Ventures LLC

Questions submitted by Chairman David Wu

Q1. Is NIST's current level of investment in cyber security adequate? What are the areas of cyber security in which NIST can have the greatest impact, given its specific competencies?

A1. Cyber security is critical to the economic and national security interests of the United States and NIST is essential to the success of our country's cyber security efforts with research programs that address topics as diverse as the development of measurement systems necessary to evaluate the efficacy of current cyber security strategies to developing the most advanced and secure quantum encryption technologies available. As part of the NIST's proposed budget growth under the ACI and now under the COMPETES Act, NIST has been working to grow its programs and capabilities in this essential area with initiatives submitted in FY07, FY08, and FY09. Unfortunately, NIST is chronically under funded and the full potential of NIST in these areas remains unrealized.

Increased investment would enable NIST to assist in the propagation of measurement software to assess the level of cyber-infection, botnet growth, spam, and other cyber-hazards found in computers connected to the Internet or on private corporate and government networks. There is no reason for NIST to compete with commercial sector companies in the production of anti-virus (or anti-malware) tools, but NIST can be very helpful in the development of metrics and measures of gross infections in computers in the government, private sector, and general user population. NIST can also be very helpful in analyzing risks associated with the aggregation of health and financial information and the protection of such information from unauthorized access and use. Given sufficient funding NIST is poised to have significant impact in a number of fundamental security technologies such as: cryptography, risk management, biometrics, tokens, industrial controls, operating system security, security protocols, authentication, and quantum encryption. In addition, NIST has experience in design usability of information systems and can establish broad based framework solutions that cut across independent, proprietary solutions. Furthermore, NIST has the strategic relationships with IT system developers and vendors to promote adoption of the research results.

Q2. How did NIST determine the size of the FY09 biotechnology initiative ($10 million)? Is this level of funding adequate? How should NIST identify the appropriate external strategic partners to work with in expanding its investments in the life sciences?

A2. NIST has for many years, recognized the importance of bioscience research as part of its overall Healthcare Program, however, as NIST is chronically underfunded and is simultaneously called upon to support critical measurement needs in a number of fields, the VCAT Bioscience/Healthcare Subcommittee considers the NIST funds available to target challenges in the Biosciences and Healthcare to be grossly inadequate and new funding is required. We, the VCAT, have worked closely with the NIST staff, with excellent synergy, to focus and direct research to areas of greatest need in bioscience. NIST has been working to ensure that their projected budget growth under the ACI is targeted to have maximum impact. As part of this planning process, NIST has determined that expanding their capabilities to address the measurements and standards needs of the biotech and life sciences communities is of key strategic importance. NIST has defined its role in the biosciences as leveraging its expertise in the quantitative physical and informational sciences to provide the measurement infrastructure necessary for enabling increased innovation in this area, and to provide confidence for measurements of complex biological systems. To develop a robust measurement capability, NIST has been reaching out to stakeholders that include government, industry, and academia (examples include: FDA, NIH, Pharma, Amgen, Genetech, Merck, the Institute for Systems Biology, California Institute of Technology, the Mayo Clinic, and other organizations) to identify critical measurement needs of the biosciences community. The FY 2009 initiative, *Measurements and Standards to Accelerate Innovation in the Biosciences,* reflects this input. It targets the need for quantitative, traceable measurements and standards for biomarkers, the ability to quantitatively make simultaneous multiplexed measurements of multiple biological molecules (including genes, proteins, RNA, etc.), and the informatics and computational tools and standards to manage

and manipulate the tremendous amounts of data generated by biological experimentation. Given the range of NIST budget growth in FY 2009 under the President's proposal and the other priority areas that also require additional resources, NIST leadership felt that the $10 million requested in the President's budget for this initiative would provide a sufficient amount of resources *to begin to acquire* the appropriate expertise and resources necessary for building up a foundation to meet anticipated future needs in biosciences measurement. We, the VCAT, agree that this is a good beginning but the amount should be significantly increased in coming years. It is our understanding that NIST plans additional growth in this area in the coming years.

As NIST expands investments in the life sciences, they plan to continue to work with stakeholders to continue our efforts in identifying other critical measurements and standards needs. As part of this planning process, NIST is working with the University of Maryland Biotechnology Institute to sponsor a meeting entitled "Accelerating Innovation in 21st Century Biosciences: *Identifying the Measurement Standards and Technological Challenges.*" The meeting will be held from October 20–22, 2008, at NIST and will be open to leaders from industry, academia, and government. Details of the meeting can be found at *http://www.cstl.nist.gov/Biosciences.html.* Input from this meeting and other outreach activities will form the basis of NIST's strategic plan for future program expansion in the biosciences. NIST intends to reach out intensively to a wide cross-section of the biosciences and health community to ensure that they are properly focused and resourced. VCAT has participated in this planning process and supports the activities as they are currently defined. External feedback will also be gained through a variety of one-on-one meetings as well as group contacts with key players in the field. We believe that this activity will indeed assist them in developing a comprehensive Strategic Plan and provide the foundation for greater investment in this critical area of measurement science.

Q3. In each of the last five years, NIST has spent approximately 20 percent of its research budget on nanotechnology, the highest percentage of all the agencies in the National Nanotechnology Initiative. Is this an appropriate level of investment in this one technology area? How is NIST ensuring that nanotechnology work is coordinated across labs?

A3. On the surface, a 20 percent investment in nanotechnology seems high. However, the VCAT Nanotechnology subcommittee has been deeply involved with the NIST staff during the past two years and we support the efforts underway. A deeper dive into applications of nanotechnology and the actual research being conducted at NIST supports their current level of research. The focus of a majority of research at NIST is the advancement and application of measurement science. This work relies increasingly upon advances at the nanoscale—one billionth of a meter—and smaller (the single atom, ion, photon, electron, etc.) It is a natural development as the capabilities and needs of science and industry have advanced, and it has been part of NIST's measurement science strategy before the term "nanotechnology" became commonly used.

The label nanotechnology is, in fact, a broad one, linked mainly to the size at which a material is being fabricated or examined. So it is relevant to multiple disciplines ranging from physics, chemistry, and materials science to electronics, building and fire research, and information technology. That also makes nanotechnology relevant to many scientific and engineering advances and industrial applications being pursued by the customers served by NIST—and makes NIST measurement-oriented contributions important to the nanotechnology revolution. This multi-disciplinary, multi-sector involvement explains the relatively high percentage of work at NIST that is classified as nanotechnology. It should be expected that a good percentage of NIST's work in nanotechnology also can be classified with other labels, such as "materials science" or "bioscience" or "electronics." This work is conducted and prioritized by current and future needs of industry, academia, and government for measurement-based advances. The National Nanotechnology Initiative is the overarching government effort to identify and address nanotechnology needs, and NIST's priorities are derived from this cooperative planning effort and supplemented by information provided by NIST's primary customers and potential customers in industry, academia, and government.

The *Nanotechnology: Discovery to Manufacture* initiative and the *Nanotechnology: Environment, Health, and Safety Infrastructure* initiative are two FY 2009 budget initiatives that tackle specific challenges in the development and manufacture of nano-devices, or products incorporating nanomaterials. Both of these initiatives were mapped out and planned after significant consultation and coordination with multiple stakeholders through interagency working groups, and technical work-

shops. Moreover, it fits into a multi-year matrix of phased investments in nanotechnology that NIST developed with the active involvement of leaders of all laboratories at NIST working on nanotechnology. The final decision about these planned, phased investments was made by the NIST Director.

I have addressed the question of NIST coordination and cooperation within NNI and across government and research organizations. The VCAT has also worked with NIST staff in creating an effective coordinating function within their own laboratories. Consistent with VCAT's recommendation in 2008, NIST has recently established a Nano-Information Council under the direction of CNST Director Bob Celotta to facilitate the coordination of nano-related work.

Questions submitted by Representative Phil Gingrey

Q1. You state in your testimony that the quality of strategic planning within NIST varies, but the agency has been largely successful in soliciting the views and needs of outside collaborators from industry. What areas need improvement?

A1. As indicated in my congressional testimony, during the past five years, VCAT has repeatedly emphasized the need for improved strategic planning throughout the NIST organization. We have observed a progressive improvement in their strategic planning process. In response to the planned budget doubling outlined in the American Competitiveness Initiative, NIST fully recognizes the need for a comprehensive strategic plan and has developed a strategic approach that is intended to establish the programs, plans, and infrastructure necessary to *more than double NIST's impact* on the economy. As part of this plan they indicate that they will:

1) Target research efforts on technologies that are set to drive innovation in the 21st century
2) Identify and address the critical measurement barriers to innovation.
3) Evaluate NIST's facilities to ensure adequate capacity and capabilities exist to meet current and projected industry and university needs.
4) Support academia and industry by enhancing the capabilities and capacity of NIST's User Facilities.
5) Develop an expanded federal tool set for support of technology innovation and industrial competitiveness.

One of the greatest challenges of strategic planning for NIST relates to the tremendous diversity of critical measurement research across a wide number of industrial sectors within their "mission." They must educate a broad number of employees to understand the strategic planning process and to make strategic planning pervasive across the entire organization. Not all NIST research should fit neatly into the strategic plan (by design to encourage basic innovation research) but the senior staff must carefully determine those projects that should fit into the strategic plan and assure that the direction and priorities of the projects meet the strategic goals and schedules.

Q2. In your testimony you warn that "ad hoc" studies may distract from the mission and vision of the agency. What evidence did the VCAT see that suggested this possible problem?

A2. The VCAT believes that NIST is significantly under funded in many areas relative to the importance of measurement science to the U.S. Economy and National Security. Project "initiatives" that are funded at a base level to get a technology program launched too often languish due to lack of funds in subsequent years. VCAT has consistently urged NIST to implement a stronger strategic planning process and they have made good progress in this area. A good strategic plan has goals and milestones of scientific accomplishment which industry depends on to be achieved. Diversions of resources and funds to "ad hoc" programs, however important, can impede ongoing programs that have critical strategic and economic importance. The VCAT has observed that NIST receives many "assignments" from Congress and the Executive Branch, including OMB that can take people and resources away from NIST's planned research programs. The point I was making in my testimony is that Congress and the Administration need to be aware of the potential for those assignments to distract from already agreed upon priorities, especially when additional resources are not provided in order to accomplish those tasks. For example, NIST has received numerous IT-related assignments that pertain to how federal agencies can improve the effectiveness and security of their operations. The World Trade Center Disaster and the Voting system and standards are other examples. Even when additional funds are added for these types of projects, NIST may spend significant por-

tions of their normal research funds to complete these important ad hoc projects. I should emphasize that we believe, in most cases that NIST is the appropriate organization for these research projects to be undertaken due to its measurement research expertise. However, they do have an impact on the effective implementation of their strategic programs and plans. Unless the agency receives funding to perform this work, its research-oriented priorities will suffer.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mary L. Good, George W. Donaghey Professor and Dean, Donaghey College of Engineering and Information Technology, University of Arkansas, Little Rock

Question submitted by Representative Phil Gingrey

Q1. Can you elaborate on the suggestion in your testimony that the Baldrige National Quality Award needs to be more closely aligned with NIST's strategic plan?

A1. "The Baldrige National Quality Award" has had a significant impact on companies and organizations that have followed the Baldrige guidelines and submitted nominations for the award. The value of this program is widely accepted. Strategically the Award program should mirror NIST interests in manufacturing, nanotechnology, science education, etc. It would provide great potential for meaningful interactions with these segments of the American enterprise that NIST can influence.

Appendix 2:

Additional Material for the Record

A.R.E. Manufacturing

Oregon Manufacturing Extension Partnership

A.R.E. Manufacturing, Inc. Empowers Their Employees Through Lean

Client Profile:
A.R.E. Manufacturing, Inc., located in Newberg, Oregon, specializes in utilizing high end CNC machining equipment to manufacture precision components. Since its foundation in 1980, A.R.E. Manufacturing, Inc. has grown from one lathe in a garage to over 60 employees operating mills, lathes, machining centers, turning centers, automated saws, tube benders and welders. The majority of A.R.E. Manufacturing, Inc.'s business supports the dental, recreation and marine industries.

Situation:
In 2004, A.R.E. Manufacturing, Inc. almost tripled in size due to the acquisition of another company's assets. However, A.R.E. Manufacturing did not have sufficient skills or controlled systems in place to effectively manage this growth. Due to these deficiencies, the organization lost much of its ability to manufacture products in any predictable or repeatable fashion. In a short period of time, employee morale decreased, quality dropped and manufacturing lead times increased. All of this resulted in loss of sales and an inability to maintain profitability. A.R.E. Manufacturing was losing its competitive edge and realized a change was needed. Their vision was to empower all of their employees to affect positive change that would impact the organization's sustainability. To do this, the company realized significant investment in training was necessary to increase employee skills and confidence. A.R.E. Manufacturing determined the Lean Enterprise business model best fit this vision but they did not posses the internal knowledge to train and develop their workforce in these philosophies and techniques. The company contacted the Oregon Manufacturing Extension Partnership (OMEP), a NIST MEP network affiliate, for assistance.

Solution:
In June of 2005, A.R.E. Manufacturing was awarded a Gateway grant to help fund a company needs assessment and basic training to begin its Lean initiative. While initial training was helpful, it became apparent to organizational leaders that the company was going to need significantly more training and implementation support to successfully transition the entire company. With additional grant awards, the company continued its transition with OMEP assistance, and:
-- All employees have received training and skills building in the application of Lean manufacturing principles. Many employees have received more advanced training in the areas of 5S, Value Stream Mapping, Set-up Reduction, Problem Solving and Leadership.
-- A.R.E. Manufacturing has transitioned from traditional departmentalized batch and queue processing to a cellular manufacturing approach. This has allowed the organization to build teams that utilize the skills developed in training to self manage their scheduling and implement real time improvements.
-- Shop floor best practices for equipment set-up and operation have been developed. These practices have been documented and are used as standard training procedure.
-- A.R.E. Manufacturing defined organizational key performance indicators and developed the tools necessary for tracking and monitoring performance. These metrics are used regularly to implement

countermeasures to keep the system predictable and repeatable.
-- Organizational communication has significantly improved due to open forums, daily toolbox meetings and weekly supervisor meetings. Managers and supervisors have taken on a leadership role and continue to develop through ongoing training and mentoring.

Results:
* Increased sales by $500,000.
* Realized $300,000 in cost savings due to improved practices and inventory reductions.
* Increased on-time delivery from 75 percent to 96 percent.
* Reduced customer returns by 43 percent.
* Invested over $150,000 in workforce training and skills development.
* Increased wages from $13.62 per hour to $15.54 per hour.
* Created 15 jobs.
* Improved employee involvement and morale.
* Achieved a more competitive and profitable position.

Testimonial:
"When the decision was made to transition to a Lean Enterprise, the Oregon Manufacturing Extension Partnership was chosen because they clearly offered a service superior to their competitors. Before using OMEP's services, we were aware that change was necessary, but never found the time to start the process. OMEP, with their very knowledgeable staff, has been a great catalyst to get the process moving and to keep it moving forward. OMEP's consultants have been a pleasure to work with and have shown a genuine interest in the success of the project. As can be seen by the "quantifiable gains" listed above, in just a short period of time the results have been excellent. We're excited about the start of our Lean journey and have learned that it is a continuously changing process. OMEP's continued involvement is vital to our success and the development of manufacturing practices necessary to compete in the global economy. I believe that OMEP's program is critical to the success of manufacturing in the State of Oregon. Domestic manufacturers provide living wage jobs and organizations such as OMEP are essential in keeping manufacturing alive and well in the United States."

Alvin Elbert, President

Ultradent Products Inc.

Utah Manufacturing Extension Partnership

Ultradent Cleans Up the Savings with Lean Manufacturing

Client Profile:
Ultradent has been committed to excellence and quality for the past 25 years. They are a small company with 400 employees at the facility located in South Jordan, Utah. Ultradent got its start as Dr. Dan E. Fischer began a quest to create more effective dental products. The popularity of Dr. Fischer's products was rapid because they were unique from anything else on the market, and they were very effective. Today Dr. Fischer is one of the most recognized personalities in the dental world. His company, Ultradent, manufactures and packages more than 1500 materials, devices, and instruments used by dentists, laboratories, government agencies, and universities. Ultradent also holds many patents and trademarks. They have become one of the first companies to manufacture syringe-packaged materials and have an injection molding facility to provide a variety of plastic devices for other companies. These products range from syringe tips, to components for artificial hearts, to stackable plastic trays.

Situation:
Ultradent became acquainted with the Utah Manufacturing Extension Partnership (MEP), a NIST MEP network affiliate, through a student that was taught at Brigham Young University by the MEP's Engineer, Dan Manning. When Ultradent's management started to discuss how they wanted to become more lean, the student referred Ultradent to the MEP.

Solution:
MEP's engineer, Dan Manning, went on site at Ultradent and conducted several lean classes for their employees. Ultradent management liked the information that their class was given, and they wanted to continue with the lean training. So they invited the MEP to move to the next lean step, which is a Value Stream Mapping. This involves implementing the lean concepts by finding the quickest and most efficient way to deliver each step of the manufacturing process. During the Value Stream Mapping, the MEP's Engineer and the Ultradent employees identified several areas where their processes could be sped up. In lean training, one of the most important concepts taught is that of Single Minute Exchange of Die (SMED) in which there are internal changes (when a specific machine must be shut down completely), and there are external changes (the prepping that can be done before the assembly line is shut down). Very few external changes were being performed at Ultradent, and this was one of the ways to speed the process up and help it become lean. For example, the team found that one point they changed the flavor of their teeth whitening formula from mint to watermelon. In order for the flavors not to mix, the assembly line had to be shut down, and the old pot had to be taken out and cleaned and then returned to its place. Then the platen, which expresses the formula out of the pot and into the syringes, also had to be cleaned. This platen was difficult and time consuming to wash. By applying lean principles, it was discovered that they could cut the changeover time from 72 minutes to 16 minutes by doing two things. First they used their external/prepping time more efficiently by having two pots so that one could be changed out immediately, and then the line could be shut

down for only a short time to install the clean pot. Then the line would start up and the dirty pot could be taken back and washed while the line was running again. Secondly, a plastic cover was created for the platen so that it could simply be discarded and thrown away when they desired to change flavors.

Results:
* Reduced changeover time in moving from one flavor to another by 78 percent, from 72 minutes to 16 minutes.
* Increased production of syringes by 27,000 per week.
* Achieved savings of $1,200 per week.
* Increased employee satisfaction.

Testimonial:
"The MEP has provided Ultradent with the knowledge and direction necessary to make small investments turn into very large savings. It is estimated that the investment in the SMED activity will pay itself off in only three weeks and it will continue to provide savings to our company."
Brent Drennan, Manufacturing Engineer

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

HVVi Semiconductors

Arizona Manufacturing Extension Partnership

HVVi Achieves Competitive Advantage with Help From Arizona MEP

Client Profile:
HVVi Semiconductors Inc. operates as a semiconductor company providing innovative technology that allows RF power transistors to function at high voltages comparative to existing technology. Since its inception in 2004, the company has been distinguished as a leading innovator to develop and commercialize high-frequency, high-voltage vertical field effect transistors (HVVFT) and has captured over 70 design concepts focused on serving customers for wireless-market applications such as radar, ISM (Industrial, Scientific, and Medical), broadcast and cellular base stations. The company employs 15 people at its facility in Phoenix, Arizona.

Situation:
HVVi realized that to sustain their success while competing with over 70 semiconductor companies globally, they would need to explore new products that have never been developed or challenged. Initially, HVVi wanted to set up training for their group to research new product options. The company enlisted the Arizona Manufacturing Extension Partnership (Arizona MEP), a NIST MEP network affiliate, to create a workforce development plan for their training program.

Solution:
Arizona MEP helped HVVi acquire a workforce training grant to be applied towards the research of cutting edge equipment. The training was focused on how to efficiently utilize the wafer fabrication equipment, which was then used to create the first Air Gap Dielectric wafer. Arizona MEP created a step-by-step training procedure and partnered with Arizona State University to supply the facility and equipment.

Results:
* Obtained grant funding for high impact research.
* Created 22 jobs.
* Achieved a more competitive and profitable position.

Testimonial:
"Without Arizona MEP's assistance, we would not have the flexibility and creativity to develop the wafer fab advantage we possess today."
Gary Hoshizaki, VP Business Development

MEP Growth Services
increasing manufacturers top line

EUREKA!
Winning Ways

Richards Industries

Giving new marketing prominence to an established in-house brand increased Richards sales for that line by 70%, just six months after their initial Eureka! Session. Now they're ready to do the same thing for another line.

Client Profile

Richards Industries is a leading provider of industrial valves for the chemical, petrochemical, pharmaceutical, and food processing industries. The company also supplies other sectors, including paper products, tire and rubber, machinery and electrical equipment, transportation equipment, and energy industries.

The company's leading product, the Jordan Valve, was created in the late 1940s. Based in Cincinnati with 150 employees, the business was incorporated in 1961 and remains privately held by the same owner, Gilbert Richards.

The company had grown 4-5% annually, and even more in the last few years. Yet its in-house process for generating and implementing new ideas for growth was undisciplined and undirected. A recent brainstorming session just prior to their Eureka! Winning Ways® engagement had developed more than 100 new ideas, but lacked a process and the discipline to kill those ideas that would not deliver the significant sales growth the company sought, and put into action those ideas that would. President Bruce Broxterman said, "We thought Eureka! Winning Ways would be a good follow-on to our internal brainstorming process. Instead, it replaced that process and set us on a new path that has changed the way we'll grow."

MEP's Initial Growth Services Offering: Eureka! Winning Ways

Building upon our success in helping manufacturers reduce their bottom-line costs through process improvements, MEP is now focusing on growth in top-line sales for manufacturers. Eureka! Winning Ways is the first of the MEP Growth Services to be introduced. Developed in partnership with Doug Hall of Eureka! Ranch in Cincinnati, Ohio, the program is the first scientifically based process to guide companies to systematically and significantly grow their businesses. Specifically, the program provides a disciplined methodology and analytical tools to create new ideas, discovery market opportunities for these ideas and efficiently drive the best ideas into development.

Idea Pursued

During their first Eureka! session, the Richards Team whittled down their ideas to seven that were worthy of final consideration, and ultimately chose one to pursue. Within their Jordan Valve line of pressure

- more -

regulators, temperature regulators, and pneumatic and electric control valves, the company realized it had a hidden gem. Its sanitary valve line had great potential for growth, given the emergence of the biotech markets. Sales of that line were solid, but the line had languished for several years, and the company thought it could dramatically grow and benefit from restaging. The company decided to pull out the sanitary valve line, rename it Steriflow, and develop it as a stand-alone line with its own product manager, product logo, identify, and focus.

Results

In a rapid three months, Richards restaged the Steriflow product line. A new product manager was appointed, and the Steriflow team produced new marketing materials, developed its own marketing and sales strategy, and re-segregated in-house reporting to identify and track Steriflow separate from Jordan. The new Steriflow was introduced to the market at the end of that three-month timeframe at the annual Interphex Conference & Exhibition for the pharmaceutical manufacturing industry, where it received a great reception.

Sales are up by 64% for Steriflow, and the 12-month running rate since the product's restaging remains well over 70% ahead of the previous year. The company also has several peripheral products on the drawing board to add to the Steriflow product line.

In addition, the company is already considering elevating another buried product line for the same process of restaging as Steriflow.

Reaction to Eureka! Winning Ways and MEP Growth Services

"This program brought a discipline and a process to our growth ideas, and taught us to look at our business differently. For us, breathing new life into our existing products has already proven to be cost-effective and financially impactful in ways we may never have considered. Eureka! Winning Ways has also taught us to be brutally honest with our ideas—to look at them critically and to invest our time and resources only into those that can truly, truly generate big returns."

"The 'Fail Fast, Fail Cheap' mantra has become cemented into our corporate culture already. Now we pursue ideas that seem worthwhile, and accept our failures as a valuable part of that process. From those failures, we learn and quickly move on, whereas before Eureka! Winning Ways we may have either never tried, or let ideas and projects languish that were never really going anywhere."

For More Information

Bruce Broxterman, President
Richards Industries
800-543-7311
bbroxterman@richardsind.com

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

Crest Products, Inc.

Kentucky Manufacturing Assistance Center

KMAC Helps Crest Lockdown SPC Program

Client Profile:
Crest Products is a high-volume, ISO-certified design, tooling, and production manufacturer of stamped metal fasteners such as lock washers, bolt retainers, locknuts, and washers for the automotive industry. Crest has 155 employees at their 100,000 square-foot facility in Lexington, Kentucky.

Situation:
Uptime of Crest stamping equipment was in the 45 to 60 percent range, and the company recognized that there was an opportunity for improvement. Run-time die repairs and maintenance contributed heavily to the low uptime of the equipment, wiith actual die changeover not substantially impacting machine uptime. Marco Budny, Crest Executive VP and General Manager, along with other Crest representatives, met with Jerry Duncan, the Senior Manufacturing Business Advisor for Kentucky Manufacturing Assistance Center (KMAC), a NIST MEP network affiliate, to discuss machine runtime opportunities and evaluate improvements and training for Crest's current Statistical Process Control (SPC) program.

Solution:
KMAC proposed a program to meet Crest's desire to further define its SPC program to provide a uniform application that is clear and concise, followed by professional training of users in several departments on the philosophy of SPC and how it is to be used at Crest to increase product quality and prevent defects from moving on to the next customer in the value stream. KMAC identified the following opportunities: 1) to enhance the current Crest SPC program by defining the conditions for application, the SPC methods to be applied, and the rules for operator corrective actions as related to SPC; and 2) to train employees in the application of the customized Crest SPC program.

Results:
* Reduced work-in-process and defect rate.
* Increased inventory.
* Improved employee skills and environment.
* Improved profit margin and customer satisfaction.
* Increased sales by $500,000.
* Retained sales of an important product line, currently at $15 million.
* Saved $40,000 in expenditures.
* Increased sales per employees.
* Created 2 additional jobs.

Increase competitive position

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

Testimonial:
"KMAC's experience and knowledge with the application of SPC was impressive and had a very positive impact on our overall operations. Their understanding and analysis of our production processes and customer service turned our SPC program, with minimal effort, into an effective and powerful program that will help keep our company moving forward."
Marco Budny, Executive Vice President / GM

Amfuel

Arkansas Manufacturing Solutions

Knowledge is the Key to a Safe Work Environment at Amfuel

Client Profile:
Amfuel is a major fuel cell supplier of the OEM aircraft and helicopter industry and provides fuel and liquid containment solutions for military applications. The company employs 23 people at its facility in Magnolia, Arkansas.

Situation:
Government inspectors who check the quality of the products asked Amfuel to provide verification that inspectors entering fuel cells were not at risk of exposure to unknown hazards. Inspections were put on hold until verification of a safe work environment could be established. This delay in inspections brought a multi-million dollar contract to a halt. Amfuel, after reviewing their program, policies, and procedures decided to strengthen their Confined Space Entry program and wanted to demonstrate that hazards were being managed safely. They contacted Safety & Environmental Associates, Inc. (SEA) for solutions who in turn contacted Scotty McKnight, Project Manager from Arkansas Manufacturing Solutions (AMS), a NIST MEP network affiliate, for assistance through the Technology Transfer Assistance Grant (TTAG) Program.

Solution:
AMS Project Manager, Scotty McKnight, worked with the company and the project team from SEA to complete the TTAG application. With the grant funding, the team worked with Amfuel to identify chemical components, conduct industrial hygiene monitoring, develop a written Confined Space Entry and Rescue program and present these solutions to the government committee of inspectors and scientist.

Results:
* Realized $5,000 in cost savings.
* Retained sales of $5.6 million.
* Improved safety program.
* Retained 40 jobs.

Testimonial:
"Thanks to the efforts of SEA and Arkansas Manufacturing Solutions we were able to achieve a strengthened safety program. The assistance of the TTAG grant helped us maintain our competitive edge in the marketplace. I would recommend your services to anyone in need of environmental, hygiene and safety solutions."
Scott Brice, Safety Director

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

C & H Specialists

Corporation for Manufacturing Excellence (Manex)

ISO and Continuous Improvement Implementation

Client Profile:
C&H Specialists, founded in 1982, provides manufacturing support in the fields of electromechanical assembly, sheet metal fabrication and frame construction. The company serves contract manufacturers in the electronics, computer, instrumentation, automotive, medical and telecommunications industries. C&H Specialists is located in Santa Clara, California, and currently employs 20 people.

Situation:
In order to stay competitive and produce quality products, C&H Specialists recognized the need to improve their on-time delivery performance and to increase their total productivity/person. With a limited knowledge in lean, C&H Specialists wanted a lean expert to provide an overview of lean to all employees, implement the 5S principles and provide immediate and measurable results on their bottom line. The company contacted the Corporation for Manufacturing Excellence (Manex), a NIST MEP network affiliate, for assistance.

Solution:
Manex delivered 5S training to three key areas but directed the majority of the focus on the Inspection/Shipping/Receiving area. A Management Center and Visual Factory Board were created to provide employees with metrics on their productivity. Not only would these tools help insure on-time deliveries but C&H Specialists would now realize even greater cost savings. "I was most impressed with the flexibility of Manex's program and tools", said Owner Dan Zulevic.

Results:
* Improved on-time delivery from 54 percent to78 percent in the first month.
* Expected increase in company-wide productivity by 30 percent in two quarters.
* Implemented Management Center.
* Implemented Key Performance Indicators.
* Empowered employees.
* Improved team building.

Testimonial:
"Manex taught us how to fish! This experience has been the single best morale booster this company has ever had. I can't wait to do my next project with Manex."
Dan Zulevic, Owner

ALROL of America, Inc.

Georgia Manufacturing Extension Partnership

Georgia Tech's EDI Department Helps ALROL of America, Inc., Expand Its Customer Base

Client Profile:
ALROL, a manufacturer of custom designed rubber rollers for the printing, packaging, textile, film, and foil industries was founded by Andreas Bruhwiler in 2003. After proving the durability, high wear resistance, and the rollers' dimensional stability during customers' processing operations in Switzerland, Andreas decided to start a new company in America to support Americal Superba, a major textile and carpet firm in Dalton, Georgia. ALROL employs 5 people.

Situation:
Shortly after launching ALROL of America, Bruhwiler realized his need for help in finding customers. Because ALROL did not have an existing customer base from which to launch a rigorous market penetration strategy, Andreas needed to target specific companies that he wanted to do business with and then try to meet with them. He also needed to locate qualified buyers and determine their sales potential in order to increase his customer base as well as profit. His attempts to network with local community colleges and business groups did not produce the key contacts and leads he desired. Andreas contacted the Georgia Manufacturing Extension Partnership (Georgia MEP) for assistance in locating new customers.

Solution:
Georgia MEP brought in Charles France, Manager of Marketing & New Product Development, from the Georgia Institute of Technology's Economic Development Institute (EDI). France recommended Bruhwiler develop a prospect profile he could use to identify companies that matched his profile but were unknown as ready buyers. France called upon one of EDI's contractors who handled lead generation. France and the contractor set-up a budget and developed a plan to research ALROL's target markets to locate qualified prospects. The consultants culled down a list of 13,500 suspects in Georgia, Tennessee, and Alabama within a 100 mile radius of Dalton to a more manageable list of 200 firms for Andreas, who was also ALROL's only sales person, to call on.

Results:
* Developed a schedule for converting "qualified" prospects.
* Scheduled 28 sales appointments.
* Developed new customer orders ranging from $4,000 to $8,000 per month for a new product ALROL helped develop.
* Developed a target marketing strategy.
* Expanded customer base.

Testimonial:

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

"The benefits of a well-defined and focused marketing research effort that preceded making sales calls became apparent to me early. Had I not contacted Georgia Tech, my initial course of action of developing networks within the immediate community would have taken much longer and would have resulted in a lower return on invested sales and marketing dollars."

Andreas Bruhwiler, Owner

Micron Manufacturing Co.

Michigan Manufacturing Technology Center

Micron Manufacturing Lowers Costs, Raises Opportunities with Set-Up Reduction

Client Profile:
Micron Manufacturing Co. produces small metal components for the automotive, hydraulic, gas and oil exploration, short-track racing and mass transit industries. The company employs 35 people at its facility in Grand Rapids, Michigan.

Situation:
Micron's screw machines convert 12-foot metal bars into large quantities of metal parts used in the inner workings of everything from automotive speedometers to wheelchair lifts. Once running, a screw machine is one of the most efficient methods for machining high volume product but usually requires highly complex, lengthy set ups before a production cycle can begin. Facing shortages in skilled machine operators, Micron's Plant Manager, Dan Vermeesch, was looking for ways to increase the efficiency of his highest-producing machines in hopes of reducing the need for additional staff and equipment. Lean manufacturing was not a new concept for Vermeesch, but when it came to set-up reduction, a partnership with the Michigan Manufacturing Technology Center (MMTC), a NIST MEP network affiliate, brought new ideas, and new profits, to the table.

Solution:
Micron was a long-time customer of MMTC's West Michigan Regional Office, The Right Place, Inc., and had worked with MMTC's senior facilitator Rick Fleming on a number of projects. "We had done some work on our own on 5S, workflow and other basic lean tools, but what we were looking for was a specific, in-house, set-up reduction program that we could replicate in any of our other four departments," said Vermeesch. "My goal was to cut the set-up time by 50 percent for a group of machines that run 70 to 75 percent of the product for that department." MMTC worked with Micron to document the set-up reduction process the team followed during the project. That process included videotaping set ups; identifying areas of waste; creating new, more-efficient, standard processes; and testing those ideas in practice. As a result, Micron radically changed its work process, such as working with its tooling suppliers to develop a standard design for the tools used in the screw machines. The company also began pre-setting the tools for the next job, outside the machine, while the machine is completing its current job. As a result of the project, Micron now also groups jobs into part families, so that parts made of the same metal are crafted on the same machine, eliminating the need to clean minute metal shavings between runs. "Eliminating the need to clean the machines between jobs not only has significantly reduced our set-ups, it has improved our quality," said Vermeesch.
Standardizing the set-up process was also a significant change. "We identified 52 steps needed for each set up, and among the four operators in the group, each had their own way of working through those steps, creating countless variations to the process," he said, noting that changing the order of the steps increased the set up time by 50 to 100 percent. Other improvements included the installation of easily adjustable stock stops, creating pegged tool boards for each machine that contained only the tools needed for that machine during set up, and standardizing the gauges used for set ups.

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

Results:
* Realized $37,000 in annual savings.
* Reduced set-up time by 73 percent.
* Eliminated 624 hours from set-up process.
* Anticipated reduction of screw machines from 20 machines to 8.

Testimonial:
"Increasing the efficiency of these key machines, which already carry such a large percentage of our business, allows us to reduce the overhead we have in some of these older machines without diminishing our capacity, and we can invest those savings into new technologies that will improve our quality, allow us to go after projects that require higher tolerances, and pursue new markets. That's a huge return on our initial $5,000 investment and a tremendous value for us."
Dan Vermeesch, Plant Manager

MANUFACTURING EXTENSION PARTNERSHIP
Success Stories from the Field

Standard Furniture Manufacturing Company (Frisco City)

Alabama Technology Network

Standard Furniture Benefits from Total Productive Maintenance Assistance

Client Profile:
Founded as a family-owned business in 1946, Standard Furniture is a manufacturer of designer home furnishings. Over the years the company has expanded and now has manufacturing plants in Bay Minette and Frisco City, Alabama. The company employs 450 people.

Situation:
Standard's management team realized that in order for the company to compete in the global company, they had to address the Lean philosophy and eliminate waste in its processes. The company had recently expanded its Lean implementation to include Total Productive Maintenance (TPM), which applies the waste elimination philosophy to the upkeep and maintenance of manufacturing equipment and machinery. Unable to conduct this training and assistance internally, the company looked to the Alabama Technology Network, (ATN), a NIST MEP network affiliate, and its Auburn University center for assistance.

Solution:
ATN evaluated a TPM Kaizen (continuous improvement) event at its Frisco City facility and the company agreed to try TPM using two of the most utilized machines in its plant. A week of intense hands-on training exceeded the company's expectations and improved the performance of the machinery. The assistance produced a stronger sense of ownership and pride among machine operators and reduced the amount of time maintenance personnel now spend on routine equipment operating issues.

Results:
* Increased sales by $500,000.
* Realized $45,000 in cost savings.
* Invested $300,000 in new equipment.

Testimonial:
"The TPM experience provided by the Alabama Technology Network really opened our eyes. Not only did it meet our initial hope, but it produced many side benefits that were not even anticipated."
Mike Bell, Vice President of Manufacturing

MEP Growth Services
increasing manufacturers top line

EUREKA!
Winning Ways

Transco Products Inc.

Transco's new product innovation could more than double its international market share and triple their sales in 5-10 years.

Client Profile

Transco produces fabricated components and services for the nuclear power industry. A privately held company with more than 100 employees, the company's manufacturing plant is located in Streator, Illinois. The company also provides installation services onsite for customers, and its metal reflective insulation for piping and equipment in nuclear power plants is considered the industry standard.

The company has experienced rapid sales growth over the last several years as domestic nuclear power plants aged and required capital improvements and retrofits. However, with these needs decreasing and the industry trends reversing, the company is realizing that this high growth rate could soon end. So, to maintain growth rates and ward off a growth 'canyon' that might emerge in the future, the company recognized the need to examine new opportunities beyond its current product lines. With Eureka! Winning Ways, Transco found the right process at the right time.

MEP's Initial Growth Services Offering: Eureka! Winning Ways

Building upon our success in helping manufacturers reduce their bottom-line costs through process improvements, MEP is now focusing on growth in top-line sales for manufacturers. Eureka! Winning Ways is the first of the MEP Growth Services to be introduced. Developed in partnership with Doug Hall of Eureka! Ranch in Cincinnati, Ohio, the program is the first scientifically based process to guide companies to systematically and significantly grow their businesses. Specifically, the program provides a disciplined methodology and analytical tools to create new ideas, discovery market opportunities for these ideas and efficiently drive the best ideas into development.

Idea Pursued

In its initial Eureka! session, the Transco team came up with 78 ideas, and pursued 3 that the system projected could be successful in the marketplace:

1) Redesign its core product to improve thermal efficiency and position the company to weather new potential competition internationally.
2) Develop a refueling outage management service, to provide timely and available maintenance and service when problems occur.

- more -

3) Develop a new product for the coal-mining industry, which utilizes the company's existing assets in a new market that seeks better sealing products. The company's experience in the nuclear power industry equips it to serve this new market from both product and regulatory-adherence perspectives.

After identifying the top ideas, the company worked with its growth coach to develop a Trailblazer Discovery action plan for each to quickly determine whether or not to proceed into development.

Results

Idea 1 for a redesigned core product is far along in the development process. Utilizing the E!WW directive to "fail fast, fail cheap," Transco is working with University of Illinois senior engineering students to design the product and manufacture it economically so that the product remains price competitive. The company hopes to launch the new product later in 2008, in time to benefit from the construction of new nuclear power plants in markets in Asia. Transco estimates that this new product could help it to more than double its international market share, and double or triple revenue in five to ten years.

Their second idea, for a refueling outage management service, was quickly explored with customers, who expressed little interest in it. While the idea died, its death was actually a victory for Transco. "Before Eureka, we may have held onto this idea for much longer than we should have, and wasted more resources," said Transco President Ed Wolbert. "This process was very useful to help us determine the metrics and decide quickly whether or not to leave an idea behind and move to the next."

Idea 3, to enter the coal-mining industry, continues to look promising as the company completes its development of the concept. The company may see $5-6 million in new revenue from the product annually.

Reaction to Eureka! Winning Ways and MEP Growth Services

"We hope to reload the process and our growth pipeline again soon. Even though we now have the knowledge to do this on our own, our IMEC growth coach provided a valuable stimulus to keep things on track and keep us going.

"Innovation had not been part of our operations-driven culture before this. But the program really delivered."

For More Information

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www.transcoproducts.com

MEP Growth Services: Eureka! Winning Ways®
Fact Sheet

Overview

For many years and to the great benefit of U.S. manufacturers, the Manufacturing Extension Partnership (MEP) has focused its efforts with client companies on process improvements. Services in the areas of Lean, Quality, Environmental and Workforce Systems have resulted in dramatic savings to the bottom line for companies. In FY2005 alone, a total of $1.3 billion in cost savings was achieved through MEP services with clients.

Building on these efforts, MEP is now delivering new services that address top-line growth for clients, specifically in new sales, new products, new markets, and new business models. These services will give companies the tools they need to not just survive but thrive in the global marketplace.

Eureka! Winning Ways® is the first of a series of MEP product offerings in this Growth Services area, focused on helping companies increase sales. In partnership with renowned inventor Doug Hall of Eureka! Ranch, MEP has developed this program that applies proven methods for large corporations to America's manufacturers who often have limited resources to focus on growth and idea development.

The program's goal is to help clients discover measurably smarter choices for growth and to rapidly move those ideas into implementation via a systematic process. Rather than haphazard brainstorming, Eureka! Winning Ways is a structured program for discovering, defining, developing, and delivering ideas that have a high likelihood of measurable success.

Program Development

Eureka! Winning Ways is the result of a partnership between MEP and Doug Hall, the CEO and Founder of Eureka! Ranch. The Ranch serves as an invention and research think tank specializing in the creation of new products and services for corporate clients that include American Express, Ford, Nike, Walt Disney, AT&T, Johnson & Johnson, Mattel, and Pepsi-Cola. The structured process that has been used successfully with these companies serves as the foundation for Eureka! Winning Ways. Now we are bringing this approach to MEP clients.

Program Methodology

Eureka! Winning Ways is a disciplined process that systematically and efficiently guides participants into developing ideas and then filtering the ideas to identify those with the highest probability of success in the marketplace, as benchmarked against thousands of existing successful innovations. Sixty times more effective than classic brainstorming, Eureka! Winning Ways couples idea engineering with data-driven screening and filtering through a system that has 88% reliability in forecasting the probability of success for the ideas generated.

Trained MEP staff known as "Growth Coaches" then guide clients through an action-planning process in which the company will develop and test the idea. The process guides clients to quickly assess the risks and the potential in the marketplace, and then proceed with implementation of those ideas that have the highest probability of success.

Program Components

MEP delivers Eureka! Winning Ways as a multi-faceted engagement with clients, with three elements:

1. Eureka! Winning Ways working sessions, including the Eureka! Session itself, in which the client management team, customers and partners come together to create growth ideas, and an Action-Planning Session to develop a plan for research, testing, market review and analysis of the top ideas;
2. Coaching over a 30-day period by an MEP certified Growth Coach to support the corporate team in its discovery phase; and
3. Access to and coordination with local and national resources to aid in market research, prototyping, acquiring funding, and other development efforts.

At the end of the engagement, clients will decide whether or not to proceed with implementation of their new idea, and may also be ready to "re-load" their pipeline with additional top-rated ideas. Eureka! Winning Ways provides an ongoing process and pipeline for companies to discover and develop new ideas and move them quickly into implementation.

Local MEP centers may offer additional services within their Eureka! Winning Ways service, including additional coaching, more in-depth product development support, and other resources to further aid their clients in the process.

Program Rollout

Eureka! Winning Ways completed its pilot testing and refinement at the end of March 2007. Each of the pilot companies is today in various stages of new product and service rollout that the workshop initiated, and MEP will track their results, as well as the results of subsequent client companies, to monitor and measure the impact on sales and growth that client companies achieve.

In April 2007, MEP trained its first set of Growth Coaches to deliver the new product to companies, and additional training sessions are scheduled throughout the summer. More than 100 Growth Coaches will be certified to provide services throughout the country through MEP-affiliated centers.

Doug Hall is continuing his commitment and passion for the program by speaking at local MEP events across the U.S. over the next 18-months. His "Made in the USA" tour will encourage manufacturers to explore choices for growth and serve as a kick-off event for local centers to introduce the new Eureka! Winning Ways offering. The schedule of events is available at www.mep.nist.gov.

Future Products

While rolling out Eureka! Winning Ways, MEP is also proceeding with additional offerings in Top-Line Growth, including technology applications for new products, international market opportunities and more. These complementary product offerings will provide clients with the full range of support to grow multiple aspects of their business.

For More Information

Contact Mark Troppe at mtroppe@nist.gov or 301-975-5745.

Michigan Client List

Company Name	Address	Emp	County	FCD
Extreme Tool & Engineering	999 Production Dr	25	Gogebic	1
H B Carbide Co	4210 Doyle	120	Montmorency	1
Harbor Industries Inc	100 Harbor Dr	250	Charlevoix	1
Ironwood Plastics Inc	1235 Wall St	115	Gogebic	1
Jacquart Fabric Products	1238 Wall St	100	Gogebic	1
L E Jones Co	1200 34th Ave	202	Menominee	1
Lloyd-Flanders Industries Inc	3010 10th St	341	Menominee	1
Loadmaster	100 W 11th Ave	30	Dickinson	1
Lohmann Woodcarving Co.	Rte. 1, Box 28	5	Baraga	1
Magline Inc	503 S Mercer St	143	Bay	1
Manistique Papers Inc	453 S Mackinac Ave	165	Schoolcraft	1
Maples Sawmill Inc	2736 W Chard Rd	12	Mackinac	1
Marble Arms	420 Industrial Park Dr	25	Delta	1
Peninsula Powder Coating Inc	128 Hemlock St	14	Baraga	1
Pettibone/Traverse Lift, LLC	1100 Superior Ave	150	Baraga	1
Pioneer Surgical Technology	375 River Park Cir	50	Marquette	1
Precision Edge Inc	415 W 12th Ave	100	Chippewa	1
R W Fernstrum & Co	1716 11th Ave	26	Menominee	1
Reality Kitchen and Bath	29 US 41 West	20	Marquette	1
Superior Welding	W5704 Old US 2 Road No 43	20	Delta	1
Tawas Tool Co Inc	980 Aulerich Rd	75	Iosco	1
Vio, Inc.	100 North Front Street	174	Marquette	1
A A R Mobility Systems	201 Haynes St	90	Wexford	2
Amstore Master Builders	540 Danforth	150	Ottawa	2
Automatic Spring Products	803 Taylor	250	Ottawa	2
Avon Automotive	603 7th St	350	Wexford	2
Avon Rubber & Plastics N Amer (HQ)	805 W 13th St	20	Wexford	2
Avon Rubber & Plastics North America	210 E 7th St	215	Wexford	2
B & P Manufacturing	8051 East Boon Road	49	Wexford	2
Besser-Lithibar	13521 Quality Dr.	125	Ottawa	2
Bessey Tool & Die	617 Ten Mile Road NW	20	Kent	2
Best Packaging, Inc.	1300 W Randall	48	Ottawa	2
Borg Warner ETS (Kysor Cooling Systems)	1100 Wright St	250	Wexford	2
Bradford Co.	13500 Quincy	200	Ottawa	2
Bristol Myers Squibb	725 E Main	250	Ottawa	2
Burnside Industries LLC	6830 Grand Haven	34	Ottawa	2
C G Plastics Inc.	5349 Rusche Dr. NW	25	Kent	2
Cadillac Casting	1500 Fourth Ave	280	Wexford	2
Cadillac Fabrication Inc	1340 Marty Paul	20	Wexford	2
CG Automation & Fixture Inc.	5352 Rusche Dr. NW	24	Kent	2

Michigan Client List

Company Name	Address	Emp	County	FCD
Dake Corp.	724 Robbins	85	Ottawa	2
DeWys Manufacturing	15300 Eighth Ave.	95	Ottawa	2
FIAMM Technologies Inc	1550 Leeson Ave	180	Wexford	2
Frankfort Manufacturing Co	1105 Main St	38	Benzie	2
GHSP	1250 S Beechtree	243	Ottawa	2
GM Wood Products	PO Box 266	2	Newaygo	2
Great Lakes Diecast	701 W Laketon	200	Muskegon	2
Harbor Industries Inc.	14130 - 172nd Ave.	200	Ottawa	2
Hayes Lemmerz International	5353 Wilcox St	225	Muskegon	2
Hilite International	2001 Peach	250	Muskegon	2
ITW Drawform Inc.	500 Fairview	250	Ottawa	2
Izzydesign	17237 Van Wagoner	150	Ottawa	2
J & M Machine Products Inc.	1821 Manor Dr.	75	Muskegon	2
JMS of Holland, Inc.	101 E Roosevelt	15	Ottawa	2
Knoll Group	2800 Estes	400	Muskegon	2
Lake Michigan Wire Technology	2833 Leon St	32	Muskegon	2
Metal Standard Corp.	286 Hedcor	50	Ottawa	2
MetalWorks Inc.	902 Fourth St.	235	Mason	2
Michigan Rubber Products Inc	1200 8th St	480	Wexford	2
Nicholas Plastics Inc.	11700 - 48th Ave.	275	Ottawa	2
Nucraft Furniture Co.	5151 West River Dr. NE	200	Kent	2
Port City Machine & Tool Co.	560 E Broadway	35	Muskegon	2
Rexair Inc	230 7th St	350	Wexford	2
Structural Concepts Corp	888 Porter Rd	200	Muskegon	2
Techno-Coat Inc.	861 E 40th St.	75	Ottawa	2
Trans-Matic Manufacturing Co.	300 E 48th St.	282	Ottawa	2
Uniform Color Co.	942 Brooks	150	Ottawa	2
Advance Packaging Corp.	4459 40th St SE	200	Kent	3
Applied Textiles	555 - 76th St. SW	115	Kent	3
Autocam Corp.	4070 East Paris SE	270	Kent	3
BISSELL Homecare, Inc.	2345 Walker NW	355	Kent	3
Blackmer-A Dover Co.	1809 Century SW	300	Kent	3
Burke E. Porter Machinery Co.	730 Plymouth NE	190	Kent	3
Butterball Farms Inc.	1435 Buchanan SW	200	Kent	3
Byrne Tool & Die	316 Byrne Industrial Dr. NE	15	Kent	3
Citation Corp	3359 Kraft Ave SE	200	Kent	3
Clipper Belt Lacer Co.	1995 Oak Industrial Dr. NE	80	Kent	3
Crystal Flash	1754 Alpine NW	150	Kent	3
Custom Profile Inc.	2535 Waldorf Ct. NW	94	Kent	3
D & M Metal Products Co.	4994 West River Dr. NE	50	Kent	3

Michigan Client List

Company Name	Address	Emp	County	FCD
Davidson Plyforms Inc.	5505 - 33rd St. SE	165	Kent	3
Detroit Diesel Remanufacturing-North	4232 Brockton Dr. SE	160	Kent	3
Digital Tool & Die Inc.	2606 Sanford SW	18	Kent	3
Distinctive Machine Corp.	3520 Three Mile NW	10	Kent	3
Fastco Industries Inc.	2685 Mullins Ct. NE	100	Kent	3
GR Spring & Stamping, Inc.	706 Bond NW	220	Kent	3
Grand Rapids Controls Company LLC	825 Northland Dr. NE	450	Kent	3
H & L Advantage	3500 Busch Dr.	55	Kent	3
Hadley Products Corporation	2851 Prairie SW	30	Kent	3
Haviland Enterprises	421 Ann NW	125	Kent	3
Home Design Studios	2215 - 29th St. SE, Ste. B-4	3	Kent	3
Irwin Seating Co.	3251 Fruit Ridge NW	450	Kent	3
J.S. Die & Mold Inc.	8505 Piedmont Ind. Park Dr. SW	50	Kent	3
Jackson Products Inc.	5801 Safety Dr. NE	268	Kent	3
Klise Manufacturing Co.	601 Maryland NE	56	Kent	3
L D I Inc.	4311 Patterson SE	200	Kent	3
Lasers Unlimited Inc.	4600 - 36th St. SE	10	Kent	3
Litehouse, Inc.	1400 Foreman	90	Kent	3
MB Tech Autodie	44 Coldbrook NW	450	Kent	3
Micron Manufacturing Co.	1722 Kloet NW	35	Kent	3
Monarch Hydraulics Inc.	1363 Michigan NE	180	Kent	3
N-K Manufacturing Technologies Inc.	1134 Freeman SE	90	Kent	3
Northwest Tool & Die	2980 Three Mile NW	80	Kent	3
Oliver Products Co.	445 Sixth St. NW	215	Kent	3
Paragon Die & Engineering Co.	5225 - 33rd St. SE	160	Kent	3
Paulstra, CRC	460 Fuller NE	450	Kent	3
Precise Engineering	683 Lincoln Lake SE	50	Kent	3
PURforms Inc.	615 Chatham	16	Kent	3
Rapid-Line Inc.	1475 Gezon Pkwy. SW	80	Kent	3
Root-Lowell Manufacturing Co.	1000 Foreman	125	Kent	3
Sara Lee Bakery	210 - 28th St. SE	250	Kent	3
Sassy Inc.	2305 Breton Industrial Dr. SE	50	Kent	3
Sparks Belting Co.	3800 Stahl SE	79	Kent	3
Specialty Heat Treating Co.	3700 Eastern SE	50	Kent	3
Steelcase Inc.	4360 - 52nd St. SE	300	Kent	3
Studio Ink Corp.	837 Godfrey SW, Ste. A	14	Kent	3
Suspa Inc.	3970 Roger B. Chaffee Dr. SE	170	Kent	3
Terryberry Co.	2033 Oak Industrial Dr. NE	110	Kent	3
TrimQuest	2710 North Ridge Dr.	150	Kent	3
Valley City Plating Co.	3353 Eastern SE	60	Kent	3

Michigan Client List

Company Name	Address	Emp	County	FCD
Wolverine Tool & Engineering	5641 West River Dr. NE	35	Kent	3
Aircraft Precision Products	185 Industrial Pkwy	65	Gratiot	4
Alcotec Wire Co	2750 Aero Park Dr	130	Grand Traverse	4
Allied Motor Products Co	201 S. Delaney Rd	12	Shiawassee	4
Big Rapids Components	300 N Bronson Ave	300	Mecosta	4
Boride Engineered Abrasives	2615 Aero Park Dr	30	Grand Traverse	4
C & R Machine Co., Inc.	58 Northland Dr.	5	Kent	4
Century Inc	2410 W Aero Park Ct	100	Grand Traverse	4
Coding Products/ITW Workholding	111 W Park Dr	200	Kalkaska	4
Cone Drive Operations Inc	240 E 12th St	250	Grand Traverse	4
CPM Century Extrutions	2412 W Aero Park Ct	6	Grand Traverse	4
D H Baker Dental	2531 Aero Park Dr	35	Grand Traverse	4
Die-Namic Danti Tool	1270 Agricola Drive	44	Saginaw	4
Dow Corning Corp	2200 W Salzburg Rd	275	Midland	4
Falcon RME	120 Waldo Ave	11	Midland	4
Federal Screw Works	2270 Traversefield Dr	8	Grand Traverse	4
Glastender, Inc.	5400 North Michigan	109	Saginaw	4
Grand Traverse Plastics	5780 Moore Rd	160	Grand Traverse	4
Great Lakes Stainless Inc	1305 Stepke Court	12	Grand Traverse	4
Hi-Tech Optical Inc	3139 Christy Way	25	Saginaw	4
Ingersoll C M Systems Inc	3505 Centennial Dr	150	Midland	4
International Engineering & Mfg Inc	6054 N Meridian Rd	100	Midland	4
Kalkaska Screw Products Inc	775 Rabourn Rd NE	25	Kalkaska	4
Kennametal	2879 Aero Park Dr	57	Grand Traverse	4
Leelanau Industries	6052 E Traverse Hwy	32	Grand Traverse	4
Master Precision Molds Inc	866 E Fairplains St	48	Montcalm	4
Midland Compounding & Consulting	3802 James Savage	12	Midland	4
Northland Tool Corp	1661 Northern Star Dr	18	Grand Traverse	4
Orchid Unique	6688 Dixie Hwy	90	Saginaw	4
Powell Fabrication & Mfg Co	740 E Monroe Rd	20	Gratiot	4
R J G Associates (RJG, Inc.)	3111 Park Dr	60	Grand Traverse	4
Randell Manufacturing Inc	520 S Coldwater Rd	400	Isabella	4
Renosol Systems LLC	505 Hoover St	272	Clare	4
Robinson Industries Inc	3051 W Curtis Rd	212	Midland	4
Sara Lee Bakery Co	2314 Sybrant Rd	450	Grand Traverse	4
T E Technology Inc	1590 Keane Dr	32	Grand Traverse	4
TPI Powder Metallurgy Inc	12030 Beaver Rd	30	Saginaw	4
Traverse City Products Inc	501 Hughes Dr	96	Grand Traverse	4
Wayne Wire Cloth Products Inc	200 E Dresden St	90	Kalkaska	4
World Magnetics Co	810 Hastings St	25	Grand Traverse	4

Michigan Client List

Company Name	Address	Emp	County	FCD
Acra Cast Inc	1837 1st St	15	Bay	5
Attentive Industries Inc	528 Kelso St	6	Genesee	5
Bobier Tool Supply	G-4163 Corunna Road	35	Genesee	5
Carbone Of America Corp	900 Harrison St	75	Bay	5
CFI Medical Solutions	14241 N Fenton Rd	100	Genesee	5
CIGNYS Corporation	68 Williamson St	120	Saginaw	5
DanaherMotion	628 N Hamilton St	300	Saginaw	5
Extreme Precision Screw Products	1838 Remell St	18	Genesee	5
Fernco Inc	300 S Dayton St	165	Genesee	5
Fullerton Tool Co Inc	121 Perry St	112	Saginaw	5
Genesee Packaging	2010 N Dort Hwy	250	Genesee	5
Macarthur Corp	3190 Tri Park Dr	50	Genesee	5
Mark VII Machine Inc	102 S Tuscola Road - M15	7	Bay	5
Means Industries-Vassar	872 E Huron Ave	150	Tuscola	5
Micron Precision Machining Inc	3860 E Washington Avenue	28	Saginaw	5
Modern Machine Co	1111 S Water St	24	Bay	5
Monroe Truck Equipment	2400 Reo Dr	80	Genesee	5
Montague Tool & Manufacturing	11533 Liberty St	37	Genesee	5
SC Johnson & Son, Inc.	4868 Wilder Rd	300	Bay	5
Schmald Tool & Die Inc	4206 S Saginaw St	35	Genesee	5
Security Packaging	3301 S Dort Hwy	220	Genesee	5
Soroc Products Inc	4349 S Dort Hwy	60	Genesee	5
U S Fence	3200 Robert T. Longway Blvd	165	Genesee	5
Webasto Product North America, Inc.	15083 North Road	120	Genesee	5
Accu-Mold Inc.	7622 S. Sprinkle Rd	15	Kalamazoo	6
Burr Oak Tool, Inc.	405 W South St.	300	St. Joseph	6
Eimo Tooling and Technology	14300 Portage Rd	92	Kalamazoo	6
Lasco Bathware	888 W Broadway St	200	St. Joseph	6
Lawrence Industries Inc	139 Mariette St	13	Allegan	6
National Standard	1631 Lake Street	120	Berrien	6
Pro Services Inc.	8132 Merchant Place	16	Kalamazoo	6
Vaupell Midwest Molding & Tooling	485 Florence Rd	115	St. Joseph	6
Advance Packaging Corp	2400 E High St	62	Jackson	7
Advance Turning & Manufacturing	4005 Morrill Rd	56	Jackson	7
Alphi Manufacturing Inc	576 Beck St	170	Hillsdale	7
Autocam Corp.	1511 George Brown Dr	85	Calhoun	7
Blissfield Manufacturing Co	626 Depot St	137	Lenawee	7
Brazeway Inc	2711 E Maumee St	150	Lenawee	7
Bronson Precision Products	404 Union St	170	Branch	7
Cobra Motorcycle Mfg Inc	240 Uran Street	28	Hillsdale	7

Michigan Client List

Company Name	Address	Emp	County	FCD
Contour Tool & Machine Inc	2393 Research Dr	6	Jackson	7
Dexter Research Center Inc	7300 Huron River Dr	67	Washtenaw	7
Dexter Stamping Co	69 Enterprise Dr	45	Washtenaw	7
Diversified Precision Products	6999 Spring Arbor Rd	30	Jackson	7
Dowding Industries Inc	449 Marilin Ave	150	Eaton	7
Eagle Picher - Hillsdale Tool & Mfg HQ	135 E South St	300	Hillsdale	7
Elm Plating Co	1319 S Elm Ave	70	Jackson	7
GAMPCO	200 W Main Street	59	Hillsdale	7
General Products Corp.	2400 E South St	130	Jackson	7
General Scientific Corp	77 Enterprise Dr	45	Washtenaw	7
Great Lakes Foam Technologies	104 W. Main Street	23	Jackson	7
Great Lakes Industry	1927 Wildwood Ave	60	Jackson	7
Hi-Lex Controls Inc	152 Simpson Dr	499	Hillsdale	7
Hi-Lex Controls, Inc.	15780 Steger Industrial Drive	180	Lenawee	7
Kellogg Crankshaft Co Inc	3524 Wayland Dr	74	Jackson	7
KRT Precision Tool & Manufacturing Co	1300 Mitchell St	5	Jackson	7
MacSteel	3100 Brooklyn	357	Jackson	7
MAG-TEC Casting Corp	2411 Research Dr	30	Jackson	7
Melling Tool Co	2620 Saradan Dr	250	Jackson	7
Michigan Seat Co	2313 Brooklyn Rd	400	Jackson	7
Miller Tool & Die Co	829 Belden Rd	90	Jackson	7
Nyloncraft, Inc.	1640 East Chicago Rd	243	Hillsdale	7
Orchid MACDEE	13800 Luick Dr	48	Washtenaw	7
PDF Mfg Inc	11000 Cedar Knoll Dr	5	Jackson	7
Production Saw & Machine Inc	9091 S Meridian Rd	65	Jackson	7
Pro-Face America (Formerly Xycom)	750 N Maple Rd	225	Washtenaw	7
Protomatic Inc	2125 Bishop Circle W	30	Washtenaw	7
Rapids Tumble Finish Inc	1607 Hults Dr	32	Eaton	7
Rives Manufacturing Inc	4000 Rives Eaton Rd	43	Jackson	7
RTD Manufacturing	1150 South Elm	41	Jackson	7
S & A Products	935 Anderson Rd	58	Hillsdale	7
SKD Automotive Group	260 Gaige St	350	Hillsdale	7
Southern Michigan Tool & Machine Inc	282 Industrial Dr	26	Hillsdale	7
Sparton Electronics Corp	2400 E Ganson St	150	Jackson	7
Sweepster Attachments LLC (Paladin)	2800 Zeeb Rd	155	Washtenaw	7
TAC Manufacturing	4111 County Farm Rd	290	Jackson	7
TC Sports	7251 Ford Highway	26	Lenawee	7
Tech Tooling Specialties Inc	1708 S Airline Dr SE	16	Jackson	7
Technique Inc	2427 Research Dr	25	Jackson	7
The Cardinal Group	230 Jay St	59	Branch	7

Michigan Client List

Company Name	Address	Emp	County	FCD
TNG Technologies (was NWD International)	599 W Chestnut St	50	Lenawee	7
Turkey Creek Inc	7251 Ford Hwy	27	Lenawee	7
Wolverine Metal Specialties, Inc.	1013 Thorrez Rd	60	Jackson	7
Alpha Technology Corp	251 Mason Rd	250	Livingston	8
American Compounding Specialties	200 Veterans Dr	20	Livingston	8
Asahi Kasei Plastics North America Inc	1 Thermofil Way	117	Livingston	8
Atmosphere Annealing Inc HQ	209 W Mount Hope Ave	20	Ingham	8
Atmosphere Annealing Inc	209-1 W Mount Hope Ave	175	Ingham	8
Bharat Forge America	2807 S Martin Lthr Kng Jr Blvd	200	Ingham	8
Eberspacher North America Inc	2035 Orndorf Dr	215	Livingston	8
Franchino Mold & Engineering	5867 W Grand River Ave	101	Ingham	8
Inalfa Roof Systems	10350 N Holly Road	160	Genesee	8
Lansing Tool & Engineering Inc	1313 S Waverly Rd	23	Eaton	8
Machining Center Inc	5959 Ford Ct	68	Livingston	8
Magna Electronics	10410 N Holly Rd	140	Genesee	8
Magna Powertrain	3140 Spanish Oak Dr	100	Ingham	8
Micro Gauge Inc	7350 Kensington Rd	165	Livingston	8
Orchid Stealth Orthopedic Solutions	1489 Cedar St	85	Ingham	8
Saylor-Beall Manufacturing Co	400 N Kibbee St	50	Clinton	8
Symmetry Medical Inc	5212 Aurelius Rd	35	Ingham	8
Technical Directions, Inc.	1210 Oakbrook Drive	3	Oakland	8
TG Fluid Systems USA	740 Advance St	219	Livingston	8
Transtar Autobody Technologies	2040 Heiserman Rd	60	Livingston	8
Tri-State Hospital Supply Corp	301 Catrell Dr	200	Livingston	8
Wedge-Mill Tool Inc	7771 Kensington Ct	31	Livingston	8
A J Damman Co	2868 Bond St	130	Oakland	9
Ace Controls Inc	23435 Industrial Park Dr	100	Oakland	9
Adaptive Technologies Corp	985 Troy Ct	31	Oakland	9
Atlas Copco Tools and Assembly System	2998 Dutton Rd	100	Oakland	9
Automation & Modular Components	10301 Enterprise Dr	50	Oakland	9
Avon Broach & Production Co	1089 John R Rd	20	Oakland	9
Cadillac Products Inc	5800 Crooks Rd	200	Oakland	9
Comau Pico Industries	2800 W 14 Mile Rd	230	Oakland	9
Deco Engineering, Inc.	4850 Coolidge Hwy	455	Oakland	9
Delta Tooling Co	1350 Harmon Rd	280	Oakland	9
Fisher Corporation	1625 W Maple	254	Oakland	9
FormTech Industries LLC	2727 W 14 Mile Rd	350	Oakland	9
Fraser Fab & Machine Inc	1696 Star Batt Dr	25	Oakland	9
FTE Automotive USA Inc	4000 Pinnacle Ct	200	Oakland	9
Gates Rubber Company	2975 Waterview Dr	80	Oakland	9

Michigan Client List

Company Name	Address	Emp	County	FCD
Heller Machine Tools	1225 Equity Dr	43	Oakland	9
KMT Robotic Solutions, Inc.,	1255 Harmon Rd	80	Oakland	9
Lyon Gear & Machine Inc	4371 Territorial Rd	135	Oakland	9
Metalmerchants of Michigan	2691 Leach Road	7	Oakland	9
Ralco Industries Inc	2720 Auburn Ct	62	Oakland	9
Suburban Tool	4141 N Atlantic Blvd	50	Oakland	9
Su-Dan Plastics (Corp)	1853 Rochester Industrial Ct	60	Oakland	9
Total Door (an Openings Company)	40 West Howard Street	54	Oakland	9
TSM Corp	1175 N Opdyke Rd	60	Oakland	9
United Solar Ovonic Corp	3800 Lapeer Rd.	250	Oakland	9
Universal Tube Inc	2607 Bond St	250	Oakland	9
Vicount Industries Inc	24704 Hathaway St	55	Oakland	9
Wolverine Carbide Die Co	2613 Industrial Row Dr	40	Oakland	9
Advanced Accessory Systems	50701 Birch Lane	260	Macomb	10
Black River Manufacturing Inc	2625 20th St	133	St. Clair	10
Byrnes Tool Co Inc	870 Whitney Dr	15	Lapeer	10
G & G Industries Inc	50665 Corporate Dr	30	Macomb	10
Huron Tool & Engineering Co	635 Liberty St	54	Huron	10
Joint Production Technology	15381 Hallmark Ct.	32	Macomb	10
M K Chambers Co	2251 Johnson Mill Rd	232	Lapeer	10
MAG Powertrain	2555 20th Street	200	St. Clair	10
Mueller Brass Co	2199 Lapeer Ave	95	St. Clair	10
Mueller Impact Co	2409 Wills St	380	St. Clair	10
Northern Industrial Manufacturing Corp	41000 Executive Dr	30	Macomb	10
Oetiker Inc	3305 Wilson St	100	Sanilac	10
Ontario Die Company of America	2735 20th St	65	St. Clair	10
Romeo Rim Inc	74000 Van Dyke Rd	150	Macomb	10
St Clair Plastics Co	30855 Teton Pl	120	Macomb	10
St Clair Systems Inc	12427 31 Mile Rd	26	Macomb	10
TransNav Inc USA	30860 Sierra Dr	120	Macomb	10
Vogel Industries Inc	901 Chartier	140	St. Clair	10
A B Heller Inc	1235 Holden Ave	120	Oakland	11
Advance Engineering Co	12025 Dixie	100	Wayne	11
Argent Automotive Systems Inc	41016 Concept Dr.	120	Wayne	11
Assembly Technology & Test Inc	12841 Stark Rd	150	Wayne	11
Bolton Conductive Systems	1164 Ladd	60	Oakland	11
Chrysan Industries Inc	14707 Keel St	20	Wayne	11
DADCO	43850 Plymouth Oaks Blvd	100	Wayne	11
E & E Manufacturing Co Inc	300 Industrial Dr 400	310	Wayne	11
Erin Industries Inc	902 N Pontiac Trl	25	Oakland	11

Michigan Client List

Company Name	Address	Emp	County	FCD
FCI Automotive	39200 Ford Road	365	Wayne	11
Globe Tech, LLC	101 Industrial Dr	23	Wayne	11
Harada Industry of America	22925 Venture Dr.	78	Oakland	11
Herkules Equipment Corp	2760 Ridgeway Ct	38	Oakland	11
J & J Machine Products Co	12734 Inkster Rd	27	Wayne	11
J C Gibbons Manufacturing Inc	35055 Glendale St	20	Wayne	11
Lake Erie Products	12955 Inkster Road	35	Wayne	11
LOC Performance Products Inc	13505 N Haggerty Rd	160	Wayne	11
McLaren Performance Technologies Inc	32233 8 Mile Rd	100	Wayne	11
Michigan Seamless Tube LLC	400 McMunn Street	221	Oakland	11
Molded Materials Inc	44650 Helm Ct	60	Wayne	11
National Time & Signal Corp	28045 Oakland Oaks Ct	60	Oakland	11
Odyssey Electronics Inc	12886 Fairlane St	76	Wayne	11
Oxbow Machine Products Inc	12777 Merriman Rd	30	Wayne	11
Parker Hannifin Corp	900 Plymouth Rd	67	Wayne	11
Perceptron Inc	47827 Halyard Dr	240	Wayne	11
PSI	11845 Mayfield	84	Wayne	11
Richard Tool & Die Corp	29700 WK Smith Drive	75	Oakland	11
Roush Performance	28156 Plymouth Rd	85	Wayne	11
Shiloh Industries	7295 N Haggerty Rd	200	Wayne	11
Spring Engineering & Manufacturing Corp	7820 N Lilley Rd	86	Wayne	11
Standard Die & Fabricating Inc	12980 Wayne Rd	35	Wayne	11
Superior Controls	14925 Galleon Ct	65	Wayne	11
Talent Industries Inc	12950 Inkster Rd	15	Wayne	11
Toyoda Machinery USA Corp	51300 Pontiac Trl	155	Oakland	11
Transglobal (fmr) Transportation Design	13000 Farmington Rd	100	Wayne	11
Wagon Automotive Inc	28025 Oakland Oaks Ct	80	Oakland	11
ZF Sachs Automotive of America	15811 Centennial Drive	112	Wayne	11
Apollo Plating	15765 Sturgeon St	140	Macomb	12
AV Tool & Engineering Inc	35146 Automation Dr	13	Macomb	12
C B S Boring & Machine Co Inc	33750 Riviera Dr	150	Macomb	12
Ceratizit Michigan	11350 Stephens Rd	115	Macomb	12
CIGNET	24601 Capital Blvd	135	Macomb	12
Crown Group Inc Headquarters	2111 Walter P Reuther Dr	158	Macomb	12
Deluxe Stamping & Die Co	6690 Sterling Dr N	75	Macomb	12
E & E Engineering Inc	7200 Miller Dr	59	Macomb	12
Eclipse Mold Inc	23155 Fifteen Mile Road	165	Macomb	12
Enterprise Automotive Systems	21445 Hoover Rd	250	Macomb	12
Euro Tech Industries, LLC	24300 Capital Blvd	25	Macomb	12
Gagnier Products/R K M Inc	10151 Capital St	26	Oakland	12

Michigan Client List

Company Name	Address	Emp	County	FCD
Gilco Inc	16000 Common Rd	110	Macomb	12
Hercules Welding Products	11478 Timken Ave	30	Macomb	12
Industrial Control Repair	28601 Lorna Ave	84	Macomb	12
J D Plating Co Inc	25428 John R Rd	28	Oakland	12
Lear Corp	23750 Regency Park Dr	130	Macomb	12
Luckmarr Plastics Inc	35795 Stanley Dr	46	Macomb	12
Lunar Industries Inc	34335 Groesbeck Hwy	25	Macomb	12
Maxitrol Co	23555 Telegraph Rd	80	Oakland	12
Milco Manufacturing Co	2147 E 10 Mile Rd	160	Macomb	12
Modern Hard Chrome Services	12880 E 9 Mile Rd	60	Macomb	12
Mopec, Inc.	21750 Coolidge Hwy	50	Oakland	12
Noble Metal Processing (HQ)	28207 Van Dyke Ave	300	Macomb	12
Obara Corporation USA	11478 Timken Avenue	36	Macomb	12
Omega Plastics Inc	24401 Capital Blvd	75	Macomb	12
PCS Company	34488 Doreka Dr.	115	Macomb	12
Progressive Metal Manufacturing Company	1300 Channing St	100	Oakland	12
R J L Systems Inc	33955 Harper Ave	6	Macomb	12
SET Enterprises Inc. (HQ)	30500 Van Dyke Avenue	50	Macomb	12
Stilson/Die-Draulic	15935 Sturgeon St	30	Macomb	12
Sturdy Grinding & Machining Co	22814 Macomb Industrial Dr	20	Macomb	12
Visioneering Inc	31985 Groesbeck Rd	80	Macomb	12
Webster Engineering Co	28141 Groesbeck Hwy	15	Macomb	12
Welform Electrodes Inc	2147 Kenney Ave	60	Macomb	12
3M Company (Abrasive Manufacturing)	11900 E Eight Mile Rd	98	Wayne	13
Detroit Chassis LLC	6501 Lynch Rd	175	Wayne	13
DTE Energy Services EES Coke	PO Box 18309	140	Wayne	13
Electro Optics Manufacturing	4459 13th St	5	Wayne	13
Global Titanium Inc.	19300 Filer St	40	Wayne	13
International Specialty Tube Corp	6600 Mt. Elliott	98	Wayne	13
Mercury Manufacturing Company	1212 Grove St	95	Wayne	13
Riverfront Plastic Products	780 Hillsdale St	83	Wayne	13
Tompkins Products	1040 W Grand Blvd	70	Wayne	13
Axle Alliance Company	13400 W Outer Dr	82	Wayne	14
Ballard Power Systems	15201 Century Dr	100	Wayne	14
CL Automotive LLC	13000 Oakland Pkwy	150	Wayne	14
Double Eagle Steel Coating Co	3000 Miller Rd	150	Wayne	14
Micro Rim Corp / Advanced Pattern & Mold	221 Victor Ave	16	Wayne	14
Milton Manufacturing	301 E Grixdale	36	Wayne	14
Severstal North America (Rouge Steel Co)	3001 Miller Rd	75	Wayne	14
Trenton Forging Co	5523 Hoover St	95	Wayne	14

Michigan Client List

Company Name	Address	Emp	County	FCD
Visteon	16630 Southfield	30	Wayne	14
Adaptive Materials	4403 Concourse Dr	113	Washtenaw	15
Advanced Heat Treat Corp	1625 Rose St	22	Monroe	15
AGC Automotive Americas R&D, Inc.	1401 South Huron Street	83	Washtenaw	15
Ammex Plastics LLC	725 Ternes Dr	13	Monroe	15
Archway Marketing Services	7525 Cogswell	175	Wayne	15
Aztec Manufacturing Corp	15378 Oakwood Dr	73	Wayne	15
Bawden Industries Inc	29909 Beverly Rd	7	Wayne	15
Control Gaging Inc	5200 Venture Dr	36	Washtenaw	15
Creative Automation Inc	4843 Runway Blvd	30	Washtenaw	15
Designers Edge Inc	20 West 5th Street	7	Monroe	15
Diamond Electric Manufacturing	110 Research Pkwy	100	Monroe	15
Euclid Machine & Manufacturing Co Inc	29030 Northline Rd	13	Wayne	15
Federal Screw Works	34846 Goddard Rd	150	Wayne	15
Future Tool & Machine, Inc.	28900 Goddard Road	65	Wayne	15
GFG Instrumentation	1194 Oak Valley Dr # 20	50	Washtenaw	15
Hauser Inc	6860 Memorial Hwy	10	Monroe	15
Header Products Inc	11850 Wayne Rd	135	Wayne	15
J A C Products Inc	255 S Industrial Dr	255	Washtenaw	15
Lake City Industries Inc	36485 S Huron Rd	60	Wayne	15
Lakewood Machine Products Co	12429 Maxwell Rd	17	Monroe	15
Lear Corporation	5200 Auto Club Road	275	Wayne	15
Lincoln Park Boring Co	28089 Wick Rd	28	Wayne	15
MACSTEEL-Monroe formerly North Star	3000 E Front St	392	Monroe	15
MedArray, Inc.	3915 Research Park Drive	3	Washtenaw	15
Midwest Products Finishing Co	6194 Section Rd	236	Monroe	15
Milan Cast Metal Corp	13905 N Sanford Rd	26	Washtenaw	15
Milan Metal Systems	555 Platt Rd	142	Monroe	15
Motor City Plastics Co	14487 Stowell Rd	15	Monroe	15
Murray Grinding Inc	5441 Sylvia St	14	Wayne	15
National Galvanizing LP	1500 Telb St	114	Monroe	15
Peterson & Co	27040 Princeton St	44	Wayne	15
Picometrix	2925 Boardwalk St	65	Washtenaw	15
Pioneer Metal Finishing Corp.	525 Ternes Dr	136	Monroe	15
Plastech Engineered Products	9800 Inkster Rd	330	Wayne	15
Quality Container	1236 Watson St	100	Washtenaw	15
SoloHill Laboratories Inc	4370B Varsity Dr	4	Washtenaw	15
Systrand Manufacturing Corp	19050 Allen Rd	185	Wayne	15

COMMENTS ON NIST TECHNOLOGY INNOVATION PROGRAM (TIP)

ROBERT D. "SKIP" RUNG
PRESIDENT AND EXECUTIVE DIRECTOR
OREGON NANOSCIENCE AND MICROTECHNOLOGIES INSTITUTE (ONAMI)

Introduction

Chairman Wu and Members of the Committee, thank you for the opportunity to comment on a matter that touches a subject of great passion for me and also, I believe, of great importance for the continued economic and social health of our nation.

Success at science-based innovation—the current cutting edge of which just happens to be called "nanotechnology"—is critical for U.S. economic competitiveness, for the supply of jobs with sufficiently high productivity to offer wage levels Americans have come to expect, and for the prosperity that pays for all the social goods, such as health and education, we would like to keep intact for future generations.

Oregon Nanoscience and Microtechnologies Institute, Oregon's first Signature Research Center, has so far received $37M from the Oregon Innovation Council because they know that success in the global competition for jobs and prosperity completely depends on a traded sector that wins through innovation—fueled by research and entrepreneurship. And that is the dual mission of ONAMI—growth in scientific research by means of deep inter-institutional and industry collaborations, and job growth at Oregon employers commercializing that research. I think we're an interesting case. We are a small state, but have arguably the world's most powerful collection of industrial "small tech" R&D assets—Intel and HP's top research sites, FEI, Invitrogen—Molecular Probes. But we have no wealthy private university and are not a traditional venture capital hot spot. Still, we know for certain that our research quality and creative ideas are competitive with anyone's, and therefore we should be able to grow our entrepreneurial sector.

Thus, one of ONAMI's core activities—coupled with our own set of user facilities—is a commercialization fund that makes grants to bridge the very real gap between what research agencies pay for and what "pencils out" for investors. We have so far enabled three very promising microtechnology spin-out companies and four nanotechnology spin-out companies.

It is interesting that today, in contrast to 30 years ago, most high-risk and disruptive innovation—not just technology research, but getting to market—takes place in small companies, many of them venture-backed startups. Venture money originating in pension funds, university endowments and the bank accounts of high net worth individuals turns out to be more patient and risk-tolerant than corporate cash, and large companies increasingly innovate by acquisition and open technology sourcing—from small companies. This is why there needs to be intense focus on making U.S. nanotechnology entrepreneurs successful; understanding and addressing the myriad hurdles and challenges they face. For example, a $2M regulatory compliance cost that is easily absorbed by a Fortune 500 company is a deal killer for the entrepreneur who's inventing our future.

Specific to nanotechnology, then, what are the hurdles? They include the greater expense and time required for proof-of-concept demonstration, comparatively high capital requirements, the need for convenient access to specialized facilities and expertise, and often very complicated technology licensing situations. And this is not to mention the growing burden of regulatory compliance and related uncertainty. Investors see these things as risks and act accordingly. For all these reasons, the appetite of venture capital for nanotechnology has turned out to be less than many hoped and expected. This may not necessarily be the case overseas as hungry global competitors such as China place a higher relative value on economic development.

To address these hurdles, the *Bayh-Dole Act* has enabled universities to own and out-license federally funded research results, and in the process provide an incentive to faculty inventors. The NNI has established 13 user facilities at universities—with no recent additions, and the national labs have various access mechanisms, though they are mostly geared for publishable research and expensive for business to use. SBIR and STTR are vital programs and a lifeline for many innovative small businesses, including for our own lead nanotechnology spin-out, Crystal Clear Technologies. The new Technology Innovation Program (TIP) is an important "next level up" opportunity that has the potential to accelerate commercialization of disruptive technology by small- and medium-sized American businesses which will need to demonstrate significant excellence, competitiveness and commitment to win one of these prestigious awards.

Comments Specific to TIP

Based on my reading of the authorizing law (P.L. 110–69, Sec. 3012), I believe the TIP program will be a significant improvement over the ATP program which it supersedes. First, it concentrates funding where it is most needed and most likely to result in commercialization—in small and medium businesses. Second, it allows research institutions to lead proposals, which in some cases will be the most effective mechanism—particularly when a new company with significant participation and backing from the institution is being launched. As a state technology program, we are glad to see the requirement for TIP to cooperate and coordinate with us. We greatly look forward to this, and in fact are happy to say that TIP director Marc Stanley will be visiting Oregon later this month to talk about the program with our business and investment community.

TIP retains two very important and attractive aspects of the ATP. First, the awards are large enough to enable significant projects. Second, the proposal and decision process is fast. I hope that the contracting and disbursement phases will be rapid as well, since time is very precious to innovative businesses striving for success in a very competitive world. Thus the ratio of proposal effort to potential reward is more favorable than is the case with Phase I SBIR and STTR awards. (I strongly encourage the Committee to consider of raising the size of these awards, as I know Chairman Wu has suggested.)

From the point of view of a small, innovative business trying to commercialize risky but disruptive technology, I do see some TIP requirements that could prove daunting, so I suggest that the Committee discuss these and consider possible modifications to the program as experience is gained.

The main concern is the 50 percent or greater cost share requirement (i.e., maximum 50 percent federal share, all sources). Small or medium businesses will have great difficulty finding these funds unless they are already highly profitable. An idea to consider is some form of sliding scale where the federal share can perhaps be higher for smaller businesses and/or for award amounts that are well below the maximum request levels.

A related concern, again for smaller and investor-backed businesses, is the requirement that alternative project funding be sought—unsuccessfully. In order to fund their required 50 percent or greater share of total project cost, small businesses will almost always need some form of alternative funding from investors or customers—and the program seems to say that this should not be possible! Perhaps this matter simply needs some language clarification. The overarching point, however, is to consider the realistic funding environment for small businesses, and to make sure that participation in the TIP program is not unreasonably out of reach for them.

To summarize, I am very glad to see that the TIP program has been established and funded in FY08. I encourage its continuation, improvement in the light of experience, and increased funding in future years.

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