



# **National Institute of Standards and Technology - NIST FY 2014 Budget Overview -**

## **Working with Industry to Accelerate Innovation**

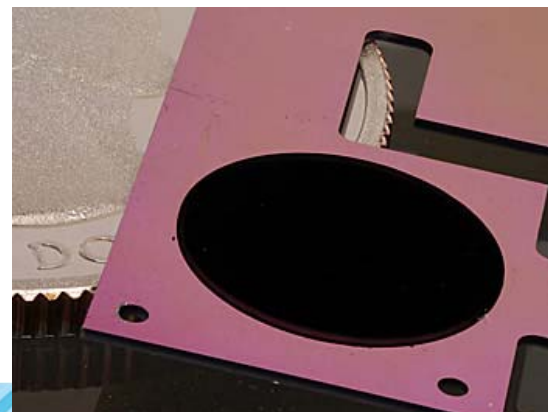
Dr. Patrick Gallagher

Under Secretary of Commerce for Standards and Technology

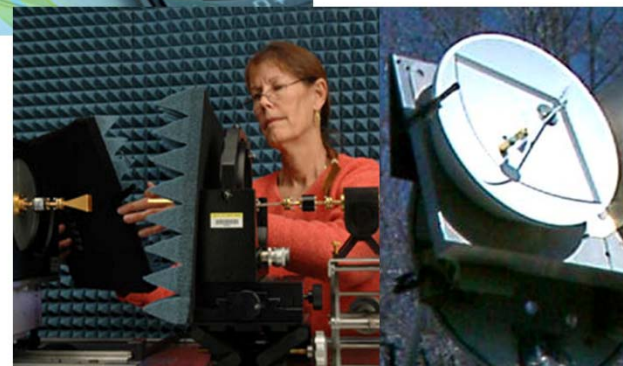
# NIST – Targeting Investments to Advance U.S. Innovation and Boost Economic Recovery

## FY 2014 Request Addresses Challenges in Key Priority Areas

- Advanced Manufacturing
- Cybersecurity
- Advanced Communications
- Cyber-Physical Systems
- Disaster Resilience
- Forensic Science
- Strengthening Technology Transfer



Credit: Tomlin/NIST



## NIST FY 2014 Budget Request Compared to FY 2012 Enacted (Dollars in millions)

	FY 2012 Enacted	FY 2013 CR (Annualized)	FY 2013 Enacted (with rescissions & sequester)	FY 2014 Request	+ / (-) Over FY 2012 Enacted
<b>STRS</b>	<b>\$567.0</b>	<b>\$570.5</b>	<b>\$577.9</b>	<b>\$693.7</b>	<b>\$126.7</b>
Laboratory Programs	518.0	521.1	TBD	616.8	98.8
Corporate Services	18.5	18.7	TBD	18.7	0.2
Stds Coord. and Spec. Prgs.	30.5	30.7	TBD	58.2	27.7
<b>ITS</b>	<b>\$128.4</b>	<b>\$129.2</b>	<b>\$133.0</b>	<b>\$174.5</b>	<b>\$46.1</b>
Advanced Manu. Tech. Consort.	0.0	0.0	13.5	21.4	21.4
Hollings Manuf. Ext. Prg.	128.4	129.2	119.5	153.1	24.7
<b>CRF</b>	<b>\$55.4</b>	<b>\$55.7</b>	<b>\$55.8</b>	<b>\$60.0</b>	<b>\$4.6</b>
Const. & Major Renovations	13.9	11.8	TBD	11.8	(2.1)
Saf. Cap., Maint., Maj. Repairs	41.5	43.9	TBD	48.2	6.7
<b>Total, NIST Discretionary</b>	<b>750.8</b>	<b>755.4</b>	<b>766.7</b>	<b>928.3</b>	<b>177.5</b>
<b>Mandatory</b>	<b>\$0.0</b>	<b>\$0.0</b>	<b>\$0.0</b>	<b>\$1,000.0</b>	<b>\$1,000.0</b>
Wireless Innovation Fund					0.0
National Network for Manufacturing Innovation	-	-	-	1,000.0	1,000.0
<b>Total NIST</b>	<b>\$750.8</b>	<b>\$755.4</b>	<b>\$766.7</b>	<b>\$1,928.3</b>	<b>\$1,177.5</b>

# NIST FY2014 Scientific and Technical Research Services Program Increases

## 1. Advanced Manufacturing Activities (+\$50M)

- Measurement science and data infrastructure for advanced materials (Materials Genome Initiative) (+\$10M)
- Supporting manufacturing with emerging technologies (+\$20M)
- Precision measurements for manufacturers (+10M)
- Measurement science to enable the integration and use of smart manufacturing (+\$10M)



## 2. Cybersecurity R&D and Standards (+\$15M)

## 3. Advanced Communications (+\$10M)

## 4. Cyber-Physical Systems (+\$10M)

## 5. NIST Centers of Excellence (+\$20M)

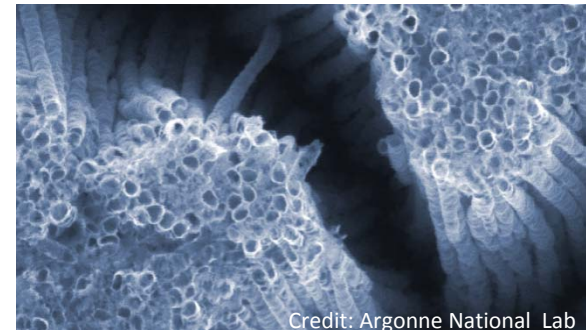
## 6. Health Information Technology (+\$3M)

## 7. Challenges in Forensic Science (+\$5M)

## 8. Disaster Resilience (+\$5M)

## 9. National Strategy for Trusted Identities in Cyberspace (NSTIC) (+\$8M)

## 10. National Initiative for Cybersecurity Education (NICE) (+\$1M)



Credit: Argonne National Lab



Credit: Shutterstock

# NIST and Manufacturing : Building Prosperity through Innovation (+\$50.0M STRS, +\$46.4M ITS)

**This set of initiatives will catalyze innovations, develop measurements, and provide technical resources to promote the global competitiveness of U.S. manufacturers and aspiring start-ups.**

America's future prosperity depends on our Nation's innovation performance

- U.S. manufacturing is worth about \$1.8 T (12.2% of US GDP)
- High-value-add manufacturing provides the best strategy for maximized return on investment
- China leads U.S. in high-technology exports and the percentage of value added manufacturing is increasing



NIST will expand relevant research and enhance public-private partnerships to strengthen U.S. manufacturing capabilities

- Advanced Materials Modeling and Simulation, Precision Measurements, Nanomanufacturing, Biomanufacturing, and Smart Manufacturing \$140.8M (+\$50M)
- Advanced Manufacturing Technology (AMTech) Consortia +\$21.4M
- Manufacturing Extension Partnership including new Manufacturing Technology Acceleration Centers \$153M (+25.0M)



# Cybersecurity R&D and Standards (+\$15M)

This initiative will support NIST's work to improve the security and interoperability of our national cyberspace infrastructure, accelerate the development and adoption of cybersecurity standards, and support the leading edge work of the National Cybersecurity Center of Excellence.

Cybersecurity is vital to our economic and national security

- \$200B of e-commerce transactions in 2011
- Interconnected networks of computers are essential for life critical functions (air-traffic control, factory operation, etc.)

NIST will accelerate and expand:

- Cybersecurity research and development efforts (\$8M)
- Efforts to develop and promulgate cybersecurity standards nationally and internationally (\$2M)
- Work at the National Cybersecurity Center of Excellence to achieve near-term cybersecurity solutions for the Nation (\$5M)



# Measurement Science to Support Advanced Communications Networks (+\$10.0M)

**This initiative will enable the development and deployment of next generation and emerging communication technologies critical to the growth of the U.S. economy.**

Rapid advances in communications technology have fundamentally changed the way we work and live:

- These advantages come with significant challenges that may adversely impact our Nation's ability to reap the civilian and economic benefits
- National security and public safety rely on advanced communications



NIST through a joint Center with NTIA will:

- Develop new measurement tools and capabilities essential for industry to generate and measure the next-generation of complex, high-speed data signals
- Support the development and operation of the 700MHz Public Safety Broadband Demonstration Network, allowing testing, evaluation and deployment of technologies



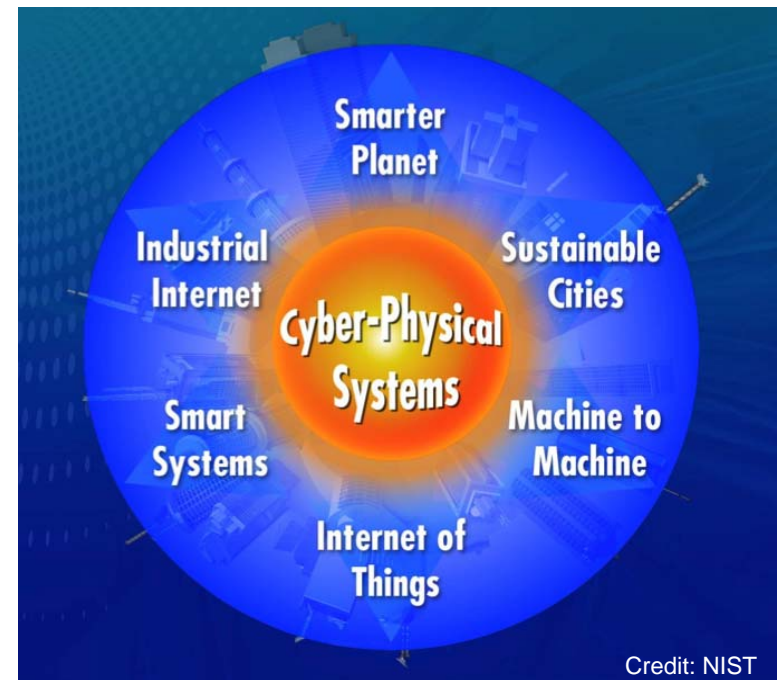
# Measurement Science for Cyber-Physical Systems (+\$10.0M)

This initiative will improve the predictability, safety, and security of cyber-physical systems in advanced manufacturing, networking, and information technology for complex systems.

- The convergence of networking technology with manufactured products is enabling a new generation of “smart” systems.
- These Cyber-Physical Systems (CPS)—are driving innovation in a broad range of industries (automotive, telecommunications, etc).
- Current expectations for CPS, including 24/7 availability and 100 percent reliability, cannot be met today.

NIST will focus on three areas critical to the predictability and safe and secure operation of CPS:

- Model-based diagnostics and prognostics
- Time synchronization
- Cybersecurity





## NIST Centers of Excellence (+\$20.0M)

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**This initiative will accelerate innovation through enhanced knowledge transfer and strengthening of regional innovation clusters which will increase the long-term competitiveness of industries throughout the United States.**

- NIST's ability to impact innovation and competitiveness in the rapidly changing environment will be greatly enhanced by regional presences in innovation clusters.
- Co-locating measurement science capabilities in hubs of innovation will help accelerate tech development.

### NIST will

- Create multidisciplinary centers of excellence in critical areas of emerging technology leveraging the measurement science of NIST with leading researchers in academia and industry
- More rapidly meet industrial needs with local presence
- Leverage multidisciplinary capabilities of Centers back into NIST core activities



# Healthcare Information Technology (+\$3.0M)

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**This initiative will support NIST's work with government agencies and industry partners to advance the security and efficacy of Electronic Healthcare Record (EHR) storage and transmission.**

To encourage more widespread adoption of Health-IT technology, the US HITECH Act, gives NIST a role in

- Supporting standards and testing; voluntary certification programs; and providing pilot testing of standards and implementation specifications.
- Much of NIST work in this space was supported by ARRA

NIST is requesting an additional \$3M to improve interoperability of EHRs in coordination with ONC.

NIST will:

- Develop use-case scenarios for EHR and device interoperability
- Identify appropriate vocabularies that can be used for encoding semantics
- Design and implement test methods
- Validate these test methods



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## Forensics (+\$5.0M)

**This initiative will enhance scientific validity of forensic evidence and investigation impacting crime laboratories and criminal courts across the United States.**

Public trust in the justice system relies on the validity and certainty of evidence submitted.

NIST and DOJ recently signed an MOU that will pave the way for strengthening forensic science in the U.S.

NIST will:

- Administer technical guidance groups to develop discipline-specific guidance that will become publicly available and be considered for endorsement by the “National Commission on Forensic Science” (announced 2/2013)
- Develop measurement tools to enable reliable and accurate forensic practice
- Strengthen uncertainty measurements for existing forensic methods



Credit: NIST

# Measurements to Support Disaster Resilience and Risk Reduction (+\$5.0M)

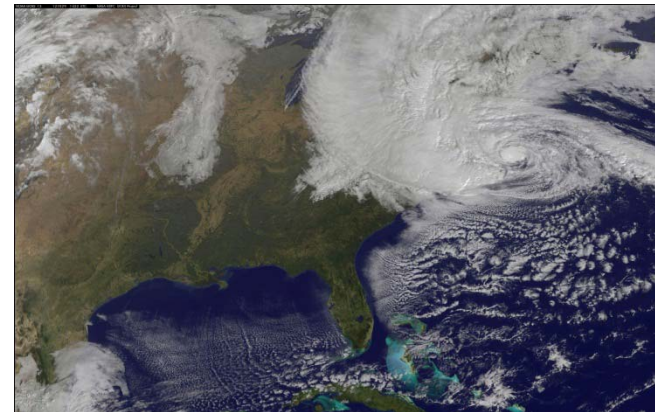
This initiative will provide critically needed metrics, tools, and standards to increase the resilience of our Nation's buildings and communities to damage from earthquake, windstorms, and wildfire.

U.S. communities can, and do, suffer catastrophic losses due to hurricanes, tornadoes, wildfires, and storm surge:

- National Hurricane Center ranked Sandy as the second costliest U.S. hurricane since 1900
- Critically needed data, metrics, tools, and standards do not exist to enable communities to prepare and recover rapidly from these disasters

NIST will accelerate the development and adoption of standards and codes for resilience by:

- A national resilience framework and associated model resilience standards and policies, as well as a private sector-led National Model Resilience Standards Panel
- Addressing R&D gaps in the measurement science tools needed for ensuring disaster resilience of structures under extreme weather events



**Superstorm Sandy**

*Source: NASA*



**Amarillo, TX wildfire**

*Credit: Joe Gamm Photography*

# National Strategy for Trusted Identities in Cyberspace \$24.5M (+\$8.0M)

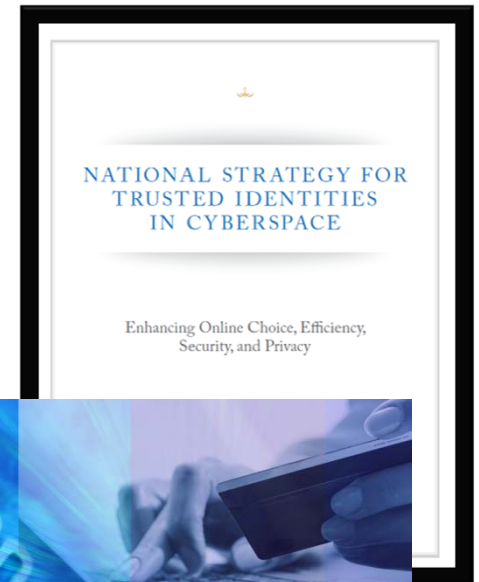
This initiative will support the President's *National Strategy for Trusted Identities in Cyberspace* by funding pilots to incentivize the private sector and state and local governments to lead delivery of NSTIC solutions and collaborate across sectors.

The lack of secure, trusted identities online is an increasingly exploited cybersecurity threat which also hinders growth and innovation in the Internet economy.

- NSTIC is a direct Presidential response to these challenges – focused on catalyzing a voluntary industry driven Identity Ecosystem to raise levels of online trust.

NIST will:

- Fund additional pilot programs that demonstrate innovative frameworks to provide a foundation for the Identity Ecosystem
- Expeditiously tackle barriers that have impeded strong identity solutions in the past



Credit: K Talbot/NIST and Shutterstock

## National Initiative for Cybersecurity Education (+\$1.0M)

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This initiative will support the *National Initiative for Cybersecurity Education* by enabling NIST to continue to support DHS through FY2014 in order to ensure successful implementation of key elements of the initiative.

Cybersecurity education programs benefit from the output of NIST research in practical ways by informing the development of cybersecurity curricula and expanding the knowledge of our Nation's cybersecurity workforce.

NIST will:

- Coordinate with DHS, other Federal agencies and industry to facilitate the ongoing development and implementation of NICE



# Advanced Manufacturing Technology Consortia (AMTech) (+\$21.4M)

This initiative will support R&D in advanced manufacturing and strengthen long term U.S. leadership in critical technologies leading to sustainable economic growth and job creation.

Manufacturing drives innovation, but U.S. leadership is at risk

- Germany, Korea and Japan have more R&D-intensive manufacturing sectors than U.S.
- AMTech bridges a critical early-stage funding gap
- AMTech supported by the *President's Council of Advisors on Science and Technology* and the *NIST Visiting Committee on Advanced Technology*

AMTech Supported Consortia will:

- Support basic and applied research on long-term precompetitive technology developments
- Convene stakeholders from across the innovation lifecycle to create the infrastructure necessary for more efficient technology transfer



# Manufacturing Technology Acceleration Centers (M-TACs) (+\$25.0M)

This initiative establishes M-TACs through the Hollings Manufacturing Extension Partnership (MEP) to provide specialized services for manufacturers

U.S. small and mid-sized manufacturers are a critical segment of our economy:

- Comprise 90% of all U.S. manufacturers
- Play a growing role in technology innovations in product development and process improvement
- MEP's *Next Generation Strategy* involves specialized programs to promote areas such as technology acceleration, supply chain reinforcement, and sustainability for small and mid-sized manufacturers

NIST will establish M-TACs to:

- Provide technology acceleration support to U.S. small and mid-sized manufacturers
- Serve as national centers of expertise aligned with industry associations, trade groups and OEMs
- Develop new approaches and establish/reinforce supply chain networks



Credit: Heritage Global Partners



# National Network for Manufacturing Innovation (+\$1.0B in mandatory funding)

## A network of institutes will develop and diffuse transformative capabilities for long term competitiveness of U.S. manufacturing

U.S. Manufacturing must continue to innovate in order to remain competitive in high-value add manufacturing:

- Ensuring America's lead in high value manufacturing requires a major investment now
- National need to bridge the gap separating basic technology R&D and early stage proof-of-concept efforts from system development and production processes

Working with other agencies and partners in universities and industry, NIST will:

- Create a network of competitively-selected co-funded regional institutes, forming the National Network for Manufacturing Innovation
- Ensure that good research ideas generated in the U.S. are translated into major advances in industrial production capabilities

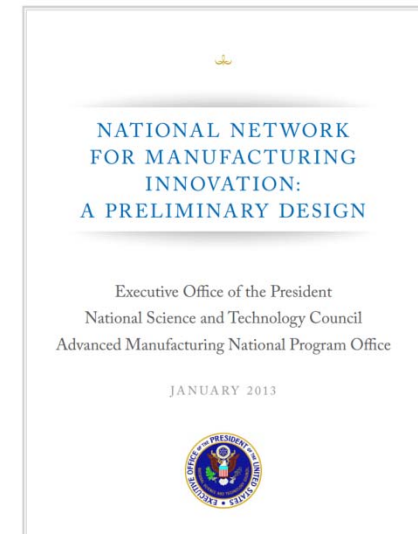


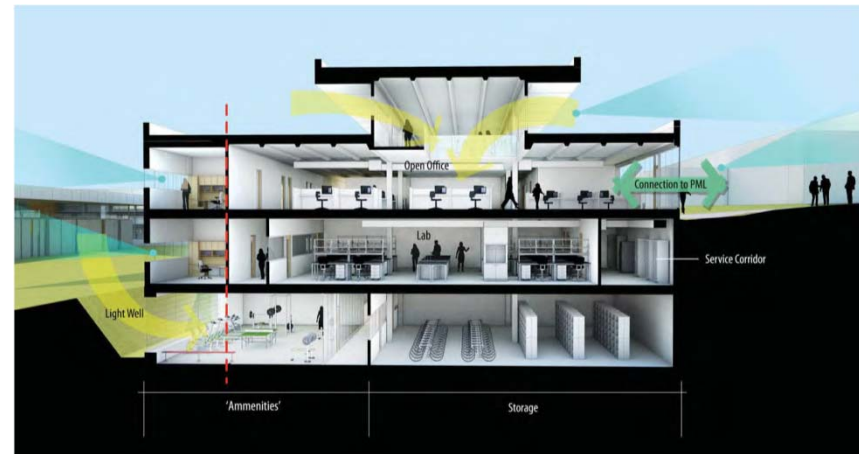
Image credit: B. Young, NIST

# NIST FY 2014 Construction of Research Facilities Requests (\$60.0M CRF, +\$4.6M)

These funds expedite maintenance and repair of facilities and reduce the impact of facility deficiencies on laboratory projects

## Boulder Building 1 Renovation

- Multi-year project initiated in FY 2010
- Allows the continuation of the phased renovation of the Building 1 wings
- Improves safety of existing facilities



## Safety, Capacity, Maintenance and Major Repairs (SCMMR) (\$+4.6M)

- Reduce backlog of repair projects
- Expedite the maintenance of facilities that have a high impact on staff and visitor safety
- Enable or maintain building environmental conditions required for meeting scientific requirements



Credit: NIST



## **Additional Program Descriptions**

# Advanced Manufacturing: *Measurement Science and Standards to Support Emerging Technologies (+\$20.0M)*

This initiative will position manufacturers to overcome barriers to the high volume production of transformative materials and products based on emerging trends in nanotechnology and biotechnology

Barriers exist for full commercial exploitation of manufacturing processes integrating emerging technologies

- Lack of nanomanufacturing and nanomaterial characterization tools means significant delay and high cost of product development
- Lack of measurements to characterize the environmental, health, and safety risks of engineered nanomaterials
- Biotechnology medicines are the fastest growing category of health care spending, but manufacturing processes are not optimized

NIST will:

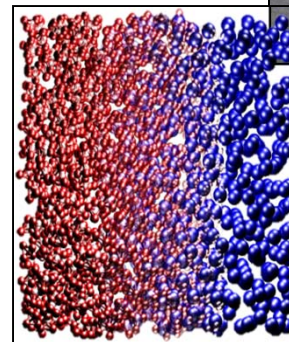
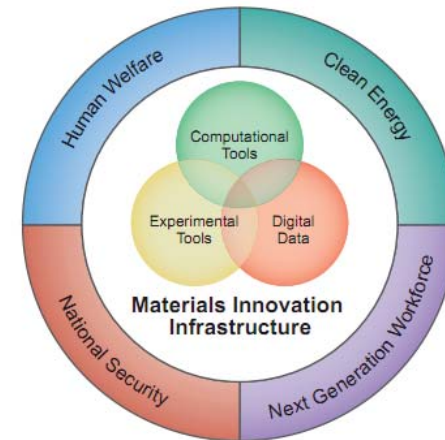
- Characterize manufactured nanomaterials to enable accurate assessment of health and environmental risks
- Develop innovative measurement methods to ensure product quality during high-speed processing of nanocomposite systems
- Better tools to determine safety and efficacy of biopharmaceuticals including characterization of 3-D protein structure and glycosylation
- Support new manufacturing paradigms that use cells as factories



# Advanced Manufacturing: *Measurement Science and Data Infrastructure for Advanced Materials (+\$10.0M)*

This initiative will enable and accelerate the creation and manufacture of innovative, advanced materials via the integration of modeling and simulation, experimental tools, and digital data/informatics.

- In the same way that silicon in the 70s led to the modern IT era, advanced materials could fuel multibillion dollar industries in energy, national security, and human welfare.
- This effort will provide critical links needed to realize the vision of the *Materials Genome Initiative (MGI)*, aimed at accelerating industrial innovation by significantly reducing the timeline from discovery to commercial deployment for new materials.
- NIST will support the MGI and enable advanced materials by developing:
  - Computational and validated databases, data assessment tools, and standards
  - Modeling and simulation tools
  - Mechanisms for exchange of information



**Atomistic simulations of materials used in automotive light-weighting**

# Advanced Manufacturing: *Smart Manufacturing* (+\$10.0M)

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This initiative will provide U.S. manufacturers with foundations for optimizing production and quality.

Smart Manufacturing refers to production systems at the equipment, factory, and enterprise levels that integrate cyber and physical systems to enable innovative production, products, and systems of products. This requires infrastructural advances to enable:

- smart operations systems to monitor, control, and optimize performance
- systems engineering-based open architectures and standards, and
- embedded and/or distributed sensing, computing, communications, actuation, and control technologies

## NIST will:

- Develop measurements and standards for a **quality measurement system** focusing on automated in-process quality monitoring and control
- Develop a testbed which integrates a systems architecture framework and an open standards platform for **facilitating the simultaneous engineering of the computational (cyber) and physical elements of manufacturing systems**



# Advanced Manufacturing: *Precision Measurements for Manufacturers (+\$10.0M)*

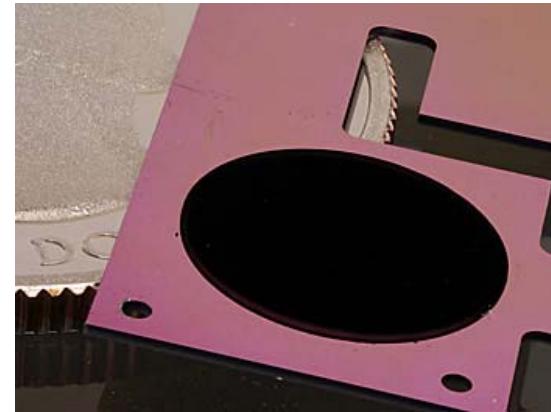
**This initiative supports a new paradigm in self-calibration capabilities for U.S. manufacturers**

New self-calibrating measurements are important:

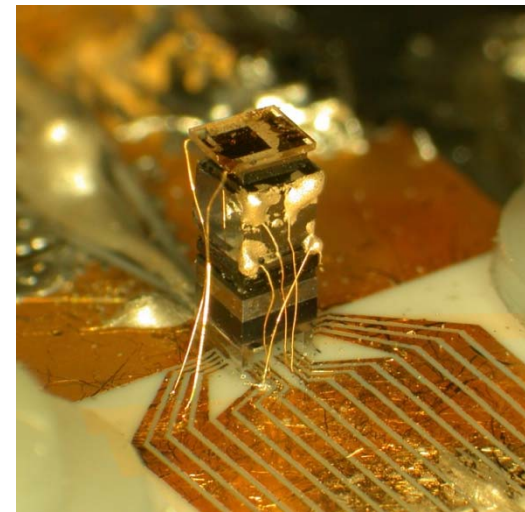
- Current methods for calibrating machinery and assessing quality can introduce cost and time delays
- Applies to virtually all manufacturing processes
- New precision measurement capabilities would provide competitive advantage to U.S. manufacturers

**NIST will:**

- Leverage initial successes, i.e. miniature atomic clocks, into a range of measurements (electrical quantities, pressure, temperature)
- Provide on-chip reference measurements to improve the quality and reliability of manufacturing processes



Credit: Tomlin/NIST



Credit: NIST