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# NIST Laboratory Programs Strategic Planning

Laurie E. Locascio

Acting Associate Director for Laboratory Programs

# American Innovation and Competitiveness Act Requirement

(a) The Director of NIST, acting through the Associate Director for Laboratory Programs, shall develop and implement a comprehensive strategic plan for laboratory programs that expands-

- (1) interactions with academia, international researchers, and industry; and
- (2) commercial and industrial applications.

(b) To advance, through 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, the comprehensive strategic plan shall-

- (1) include **performance metrics** for the dissemination of fundamental research results, measurements, and standards research results to industry, including manufacturing, and other interested parties;
- (2) **document any positive benefits** of research on the competitiveness of the interested parties described in paragraph (1);
- (3) clarify the current **approach to the technology transfer** activities of NIST; and
- (4) consider recommendations from the **National Academy of Sciences**.

S. 3084

## One Hundred Fourteenth Congress of the United States of America

AT THE SECOND SESSION

*Began and held at the City of Washington on Monday,  
the fourth day of January, two thousand and sixteen*

### An Act

To invest in innovation through research and development, and to improve the competitiveness of the United States.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the “American Innovation and Competitiveness Act”.

(b) TABLE OF CONTENTS.—The table of contents of this Act is as follows:

Sec. 1. Short title; table of contents.  
Sec. 2. Definitions.

#### TITLE I—MAXIMIZING BASIC RESEARCH

Sec. 101. Reaffirmation of merit-based peer review.  
Sec. 102. Transparency and accountability.  
Sec. 103. EPSCoR reaffirmation and update.  
Sec. 104. Cybersecurity research.  
Sec. 105. Networking and Information Technology Research and Development Update.  
Sec. 106. Physical sciences coordination.  
Sec. 107. Laboratory program improvements.  
Sec. 108. Standard Reference Data Act update.  
Sec. 109. NSF mid-scale project investments.  
Sec. 110. Oversight of NSF major multi-user research facility projects.  
Sec. 111. Personnel oversight.  
Sec. 112. Management of the U.S. Antarctic Program.  
Sec. 113. NIST campus security.  
Sec. 114. Coordination of sustainable chemistry research and development.  
Sec. 115. Misrepresentation of research results.  
Sec. 116. Research reproducibility and replication.  
Sec. 117. Brain Research through Advancing Innovative Neurotechnologies Initiative.

#### TITLE II—ADMINISTRATIVE AND REGULATORY BURDEN REDUCTION

Sec. 201. Interagency working group on research regulation.  
Sec. 202. Scientific and technical collaboration.  
Sec. 203. NIST grants and cooperative agreements update.  
Sec. 204. Repeal of certain obsolete reports.  
Sec. 205. Repeal of certain provisions.  
Sec. 206. Grant subrecipient transparency and oversight.  
Sec. 207. Micro-purchase threshold for procurement solicitations by research institutions.  
Sec. 208. Coordination of international science and technology partnerships.

#### TITLE III—SCIENCE, TECHNOLOGY, ENGINEERING, AND MATH EDUCATION

Sec. 301. Robert Noyce Teacher Scholarship Program update.  
Sec. 302. Space grants.  
Sec. 303. STEM Education Advisory Panel.  
Sec. 304. Committee on STEM Education.

# Overarching Goal of NIST Strategic Planning

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- Shape the NIST of 2027
- Identify high-level priorities to best position NIST in 10 years
- Including what we will do, and how we will do it to maximize chances of our success

# Why Now?

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- We want to be purposeful and focused in an ever changing landscape of both federal funding and technical opportunities

# Pre-work

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- Technical landscape scan
- Interviews with NIST Senior Leadership
- Interviews with “Friends of NIST”
  - Former NIST Directors
    - Arati Prabhakar
    - Bill Jeffrey
    - Pat Gallagher
    - Willie May
  - Former VCAT members
    - Vint Cerf
    - Darlene Solomon

## Interviews explored:

- Major Opportunities
- Risks
- Areas for investment, divestment
- NIST culture
- Leadership
- Indicators of success
- Advice to Commerce Secretary Ross

# Thought Leader Panel



**Paul Cohen**

DARPA Program Manager, Information Innovation Office (I2O)

- Dean, School of Computing and Information, University of Pittsburgh



**Drew Endy**

- Associate Professor of Bioengineering, Stanford University,
- One of initial founders of iGEM (internationally genetically engineered) competition



**Dean Garfield**

- President & CEO, Information Technology Industry Council



**Mike Holland**

- Executive Director, Center for Urban Science and Progress, New York University



**Lisa Porter**

- Executive Vice President, IQT Labs, In-Q-Tel
- Former IA

# Thought Leader Panel



# Technical Opportunities: Areas for Growth

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“Vertical”  
Capabilities



- Bioscience
- Quantum Science
- Internet of Things

“Horizontal”  
Capabilities



- Data and Artificial Intelligence/Machine Learning
- Systems-level Thinking
- Democratization of Measurement

# Past Three Year Programmatic Plans

## NIST Three-Year Programmatic Plan, FY 2014-2016

### 1 Introduction

The National Institute of Standards and Technology (NIST) promotes U.S. competitiveness by advancing measurement science, standards, and technology in ways that enhance the Nation's innovation and economic growth. This document summarizes the major roles for NIST in promoting national innovation and economic growth over the three-year period.

This Plan, first, describes NIST's mission and goals as well as the strategic framework upon which NIST will work with the Administration to address national priorities and research and technical capacity.

### 2 NIST Overview

Since 1901, NIST (known as the National Bureau of Standards) has been supplying the measurements and tools to help the Nation in the U.S. Department of Commerce, an executive research agency specifically focused on promoting innovation and its Innovation and Industry Services Program.

#### 2.1 NIST Mission and Goals

**Mission:** To promote U.S. innovation and industrial science, standards, and technology in ways that enhance the Nation's innovation and economic growth.

The following goals aim to ensure that NIST retains the capacity to carry out its key role in the Nation's innovation and economic growth.

#### Goals:

## NIST Three Year Programmatic Plan 2015-2017

### 1 Introduction

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This Plan, first, describes NIST's mission and goals as well as the strategic framework upon which NIST will work with the Administration to address national priorities and research and technical capacity.

### 2 NIST Overview and Programmatic Objectives

Since 1901, NIST (known as the National Bureau of Standards) has been supplying the measurements and tools to help the Nation in the U.S. Department of Commerce (DoC), an executive research agency specifically focused on promoting U.S. innovation and its Innovation and Industry Services Program.

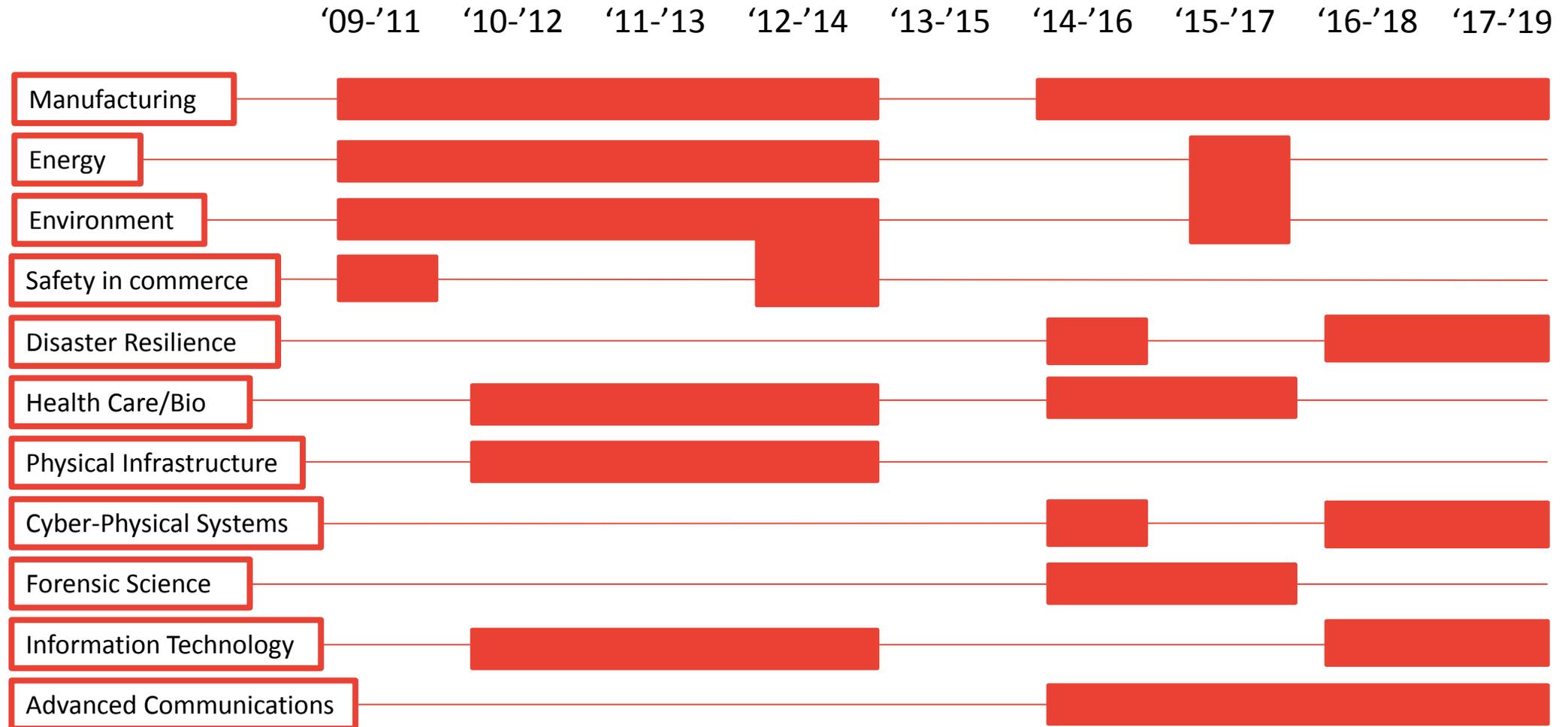
**Mission:** To promote U.S. innovation and industrial science, standards, and technology in ways that enhance the Nation's innovation and economic growth.

NIST plays a key role in the Department of Commerce's efforts towards its innovation goal of *one that is better at inventing, improving, and commercializing products and services*, and the programmatic objectives that support that goal.



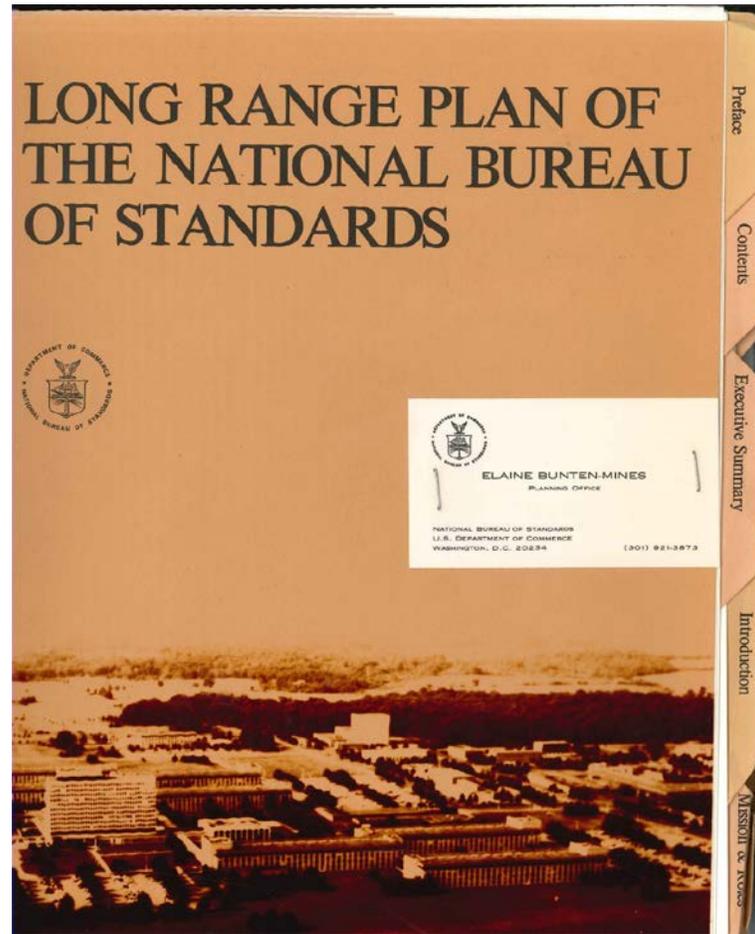
- Plans for **development of capabilities** and **priorities** prepared in Labs and discussed and collated at the NIST level
- Approach takes advantage of all the expert thinking in the Labs but misses that last step of commitment and buy-in across NIST

# Priorities ID-ed in previous Three Year Plans- from 2009-



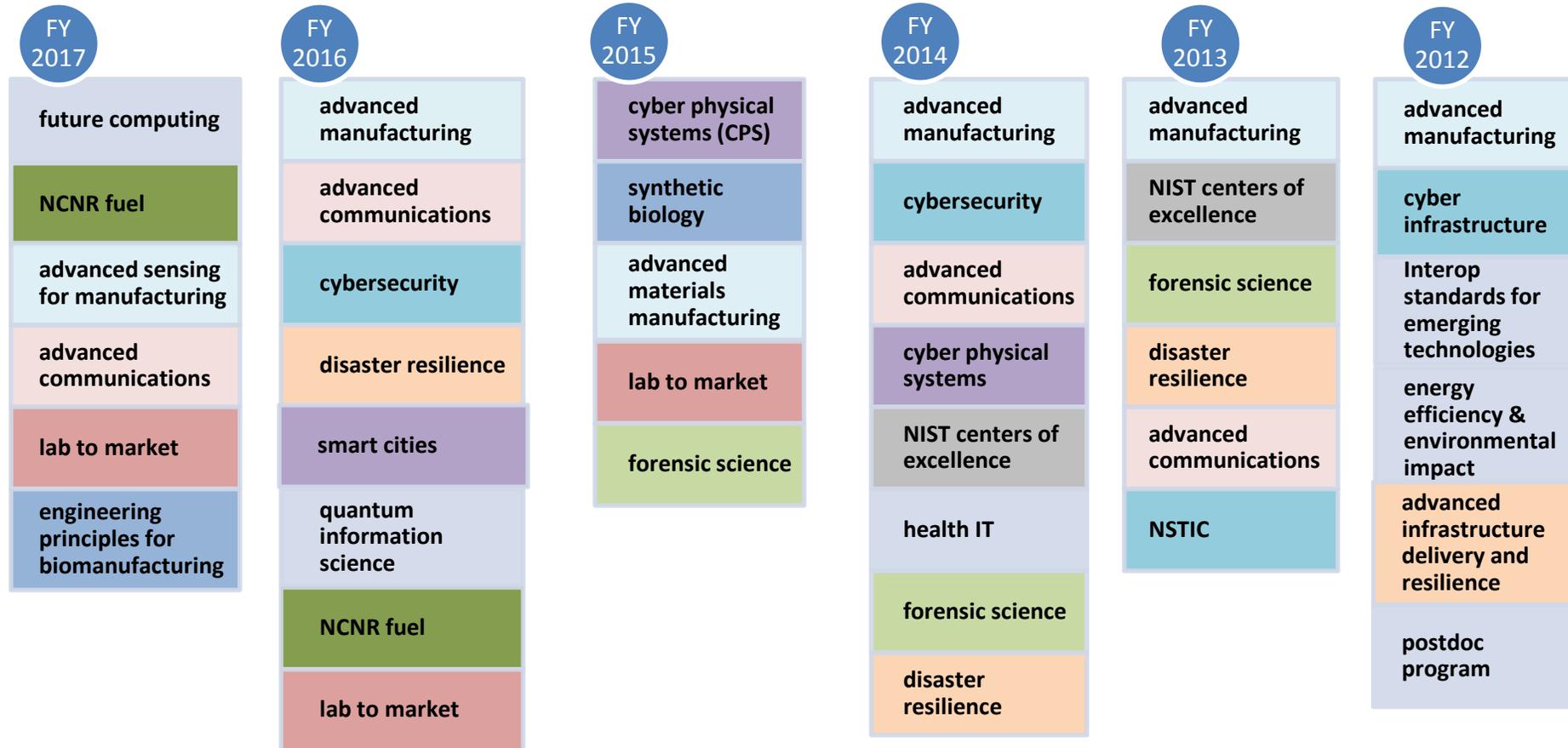
**11 priorities identified**

# Trends ID-ed in historical plans



- Increasingly complex models
- Tools for handling large databases
- Systems analysis
- Complexity of engineering decision making; robotics
- Man-machine interactions; human factors
- Sensors on a chip
- Biotechnology

# Recent priorities reflected in budget requests

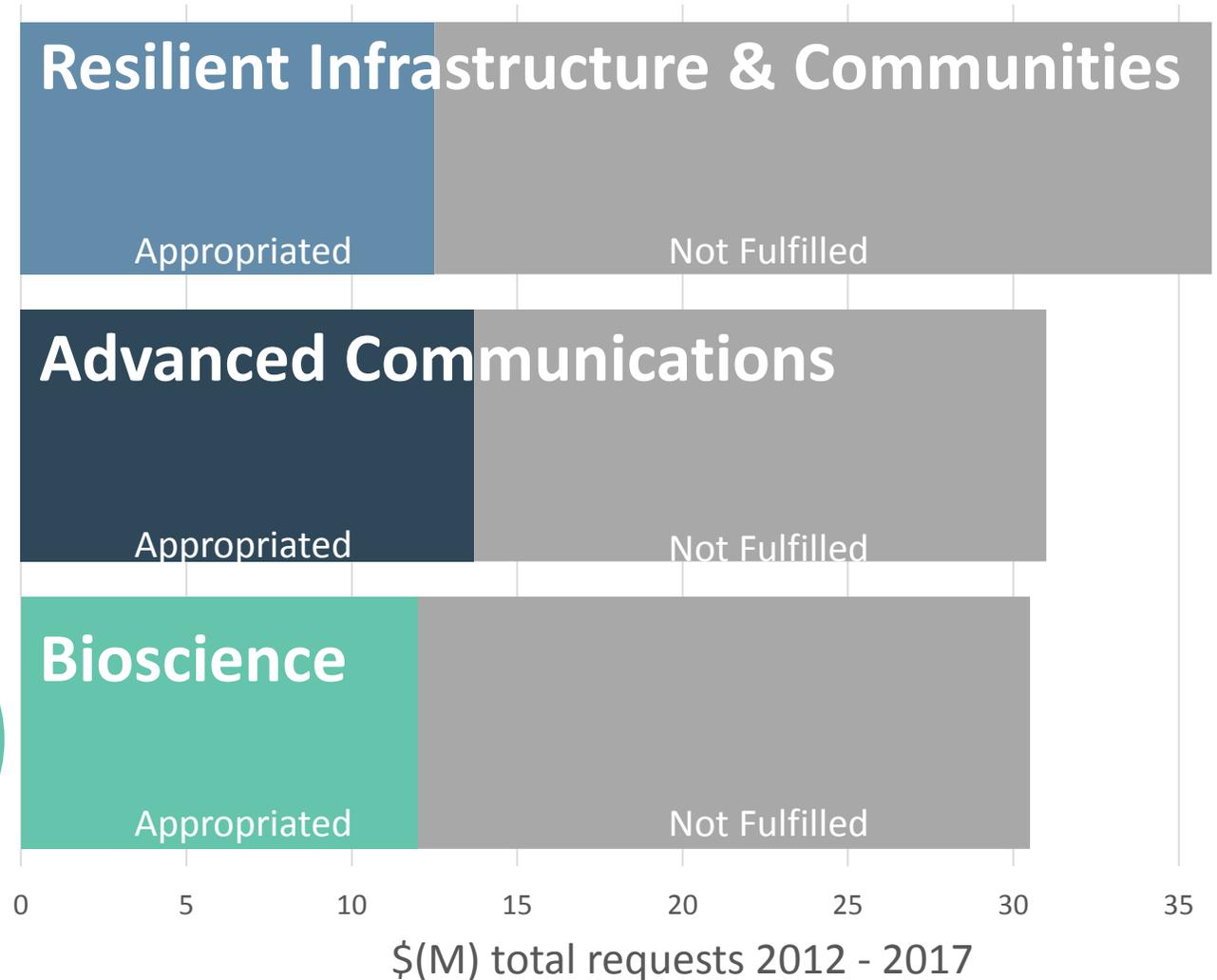
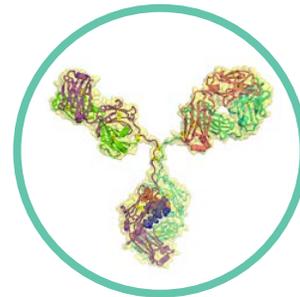
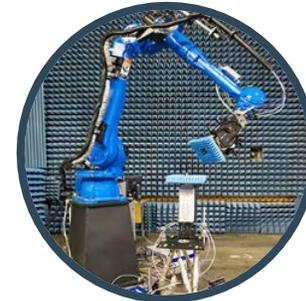
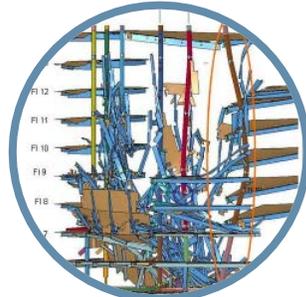


NIST Laboratory Budget Initiatives (Requests) by Fiscal Year

# Room for more growth

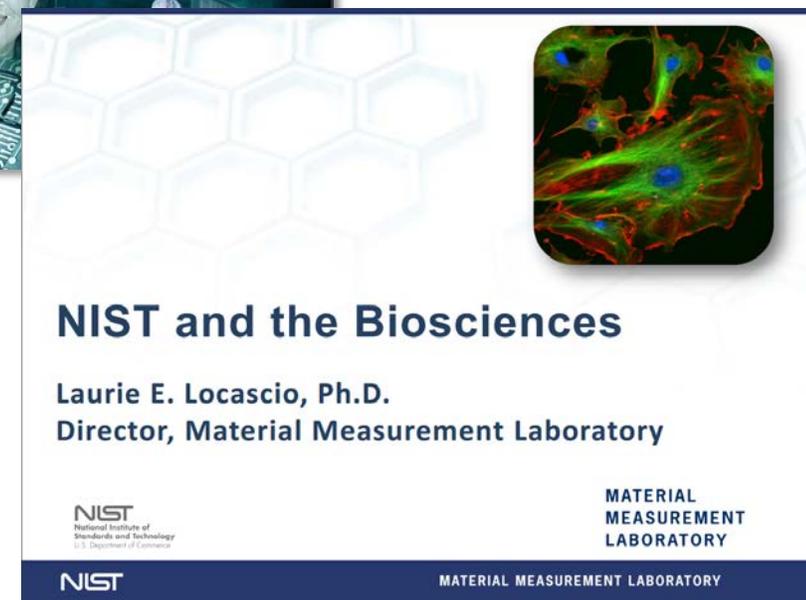
NIST has made great progress, but there's more to be done.

- Several areas have yet to reach critical mass.
- New areas are emerging



# Case Studies: Bioscience and IT R&D

- In June 2015, VCAT looked at NIST's Bioscience program and our Information Technology R&D
- Revisit those program areas
  - Are we making progress?
  - Has the landscape changed?



# Bioscience Recommendations

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VISITING COMMITTEE ON ADVANCED TECHNOLOGY  
National Institute of Standards and Technology

2015 Annual Report

Visiting Committee on Advanced  
Technology  
of the  
National Institute of Standards and  
Technology

U.S. Department of Commerce

*March 2016*

**VCAT**

1. recruit bioscience research staff and increase visibility in bioscience
2. commended on refocusing of IBBR into biotherapeutics measurement; recommend consideration of research to support screening technologies for protein quality assurance and quality control
3. leverage already strong relationships with leading academic institutes into additional technological capacity in areas like biochemistry, biotechnology, and computer science
4. continued investment in the biosciences is important; VCAT will monitor NIST's biosciences portfolio to ensure the research remains on the forefront of bioscience innovation and is relevant to the biotechnology industry

# IT Research Recommendations

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VISITING COMMITTEE ON ADVANCED TECHNOLOGY  
National Institute of Standards and Technology

2015 Annual Report

Visiting Committee on Advanced  
Technology  
of the  
National Institute of Standards and  
Technology

U.S. Department of Commerce

*March 2016*

**VCAT**

1. continue maintaining close partnerships with industry, standards and academic partners, both domestic and international
2. explore ways to collaborate and engage with the small to mid-size organizations; consider similar partnerships to NCCoE around IT testing for security, compliance and interoperability
3. develop stronger ties with IT innovation hubs
4. NIST must remain a world-class IT organization; needs budget to utilize emerging technologies, meet the demands from other labs and research areas, implement best practices, and attract and train staff at the pace of IT innovation
5. continue to ensure that it has the technical capacity necessary to address the emergent challenges of (Internet of Things and Cyber Physical Systems) including security, privacy, reliability, and interoperability concerns

# Organizational Opportunities: a more flexible organization

- Converging technical fields, rapidly evolving application areas require more flexibility
- How does NIST cross stovepipes?
- How does NIST start and stop strategic programs?

## NIST ORGANIZATION CHART



# Organizational Opportunities: a more collaborative organization

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- Where should we build our capabilities?
- Should we take risks of branching out into new locations?
- What do the next generation of partnership models look like?



# NIST's Values

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- **Perseverance:** We take the long view, planning the future with scientific knowledge and imagination to ensure continued impact and relevance for our stakeholders.
- **Integrity:** We are ethical, honest, independent, and provide an objective perspective.
- **Inclusivity:** We work collaboratively to harness the diversity of people and ideas, both inside and outside of NIST, to attain the best solutions to multidisciplinary challenges.
- **Excellence:** We apply rigor and critical thinking to achieve world-class results and continuous improvement in everything we do.

Future state

Trust in measurement



Trust in technology

Trust in science

# We seek your input

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Are the strategic priorities NIST has identified the right ones?

- Are there measurement gaps?
- Does it seem to fit in NIST's sweet spot?
- Can we impact the field with the right investment?

Does the VCAT see any areas being more pressing than others?

Do any topics seem to be missing?

How can we best make these changes in the current environment?

Do you have advice on approaches NIST should take to establishing the capabilities needed to address these needs?

How far out should an organization like NIST be planning- what is long term?

How much of the budget is placed into high risk research in the various fields?