

NIST: Promoting U.S. Innovation and Industrial Competitiveness

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Office of the Director
National Institute of Standards and Technology
Department of Commerce

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce



NIST: Did you know...

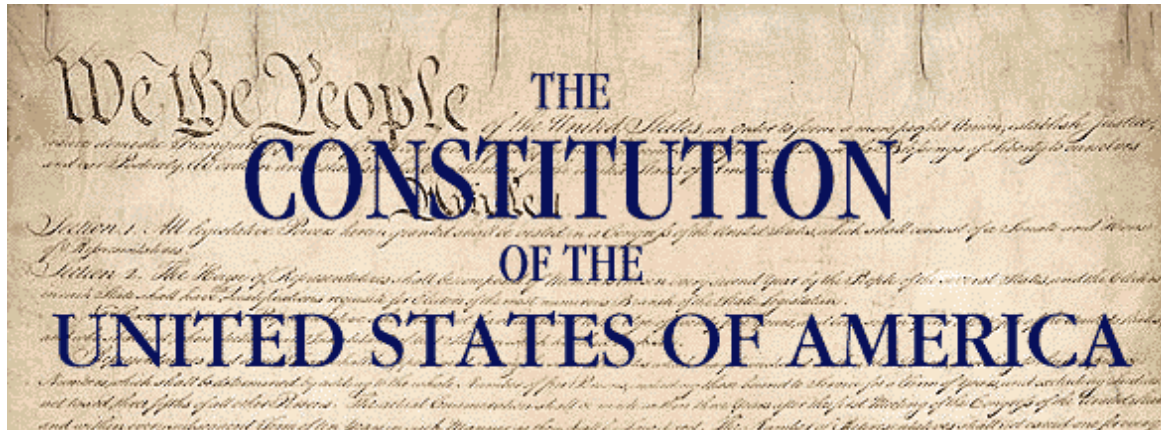
- NIST's weight and measures services provide the basis for *fairness and efficiency* of sales?
- About 2.6 billion times a day (30,000 per second), NIST's internet time service sets computer clocks and other networked devices?
- In the Army alone, 58,000 different types of equipment require NIST-traceable calibration?
- 10-15 % of the \$2 trillion spent on healthcare in the U.S. is associated with measurements – NIST's specialty?
- NIST led the development of performance standards for smoke detectors?
- Thousands of small manufacturers in 50 states and Puerto Rico rely on the NIST MEP program for hands-on technical and business assistance?



The History of Standards

“Uniformity in the currency, weights, and measures of the United States is an object of great importance, and will, I am persuaded, be duly attended to.”

George Washington, State of the Union Address, 1790

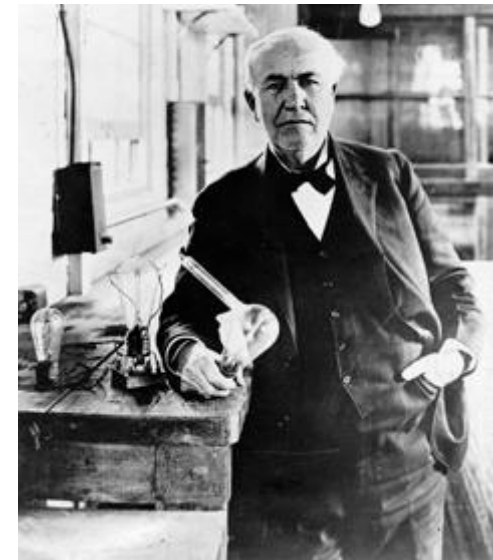


Article I, Section 8: “The Congress shall have the power to...*fix the standard of weights and measures*”

The Importance of Standards

National Bureau of Standards established by Congress in 1901

- Eight different “authoritative” values for the gallon
- Electrical industry needed standards
- American instruments sent abroad for calibration
- Consumer products and construction materials uneven in quality and unreliable



National Archives

Estimated that 80% of global merchandise trade is influenced by testing and other measurement-related requirements of regulations and standards

The Importance of Standards: Great Baltimore Fire

- The Great Baltimore Fire raged for two days in 1904 and destroyed over 1500 buildings covering an area of 140 acres; 1,231 firefighters were required to bring the blaze under control.
- One reason for the duration of the fire was the **lack of national standards in fire-fighting equipment**: At that time, there were over 600 sizes and variations of fire hose couplings in the United States.
- Firefighters from other jurisdictions responded but could not help because their hose couplings did not fit Baltimore's hydrants.
- In the aftermath of the fire, a national standard for fire hydrant and hose connections and a new city building code was adopted.



From NBS....to NIST

National Bureau of Standards



NIST Photo Gallery / Buildings on Old Campus
(Washington, D.C.) Exterior Views

National Institute of Standards and Technology



NBS moved from Washington, D.C. to Gaithersburg in 1966

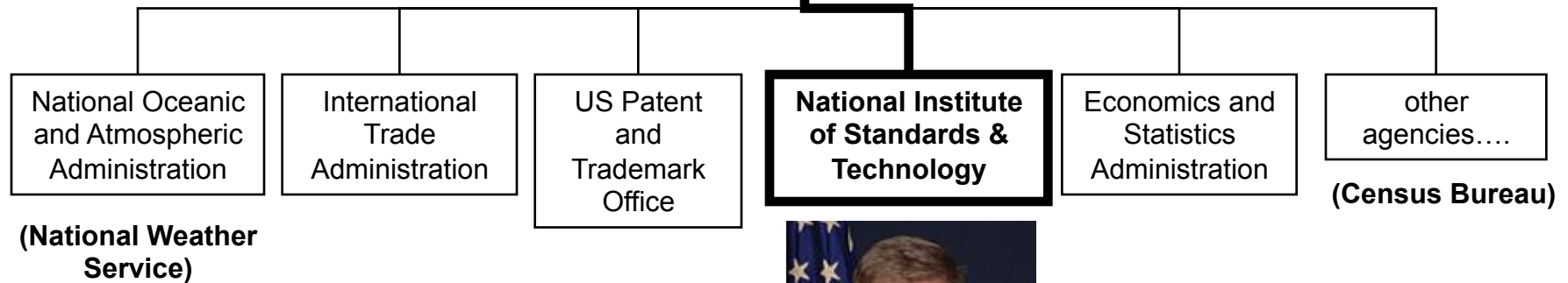
NBS became NIST in 1988

NIST is part of the Department of COMMERCE



John Bryson
Secretary of Commerce

Confirmed on
October 21, 2011



Pat Gallagher
Director and
Under Secretary of Commerce for Standards and Technology

Confirmed as the 14th
Director of NIST on
November 5, 2009

NIST's Mission

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*



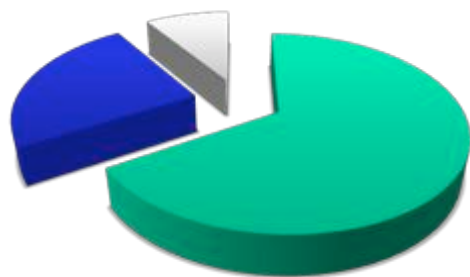
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NIST: Basic Stats and Facts

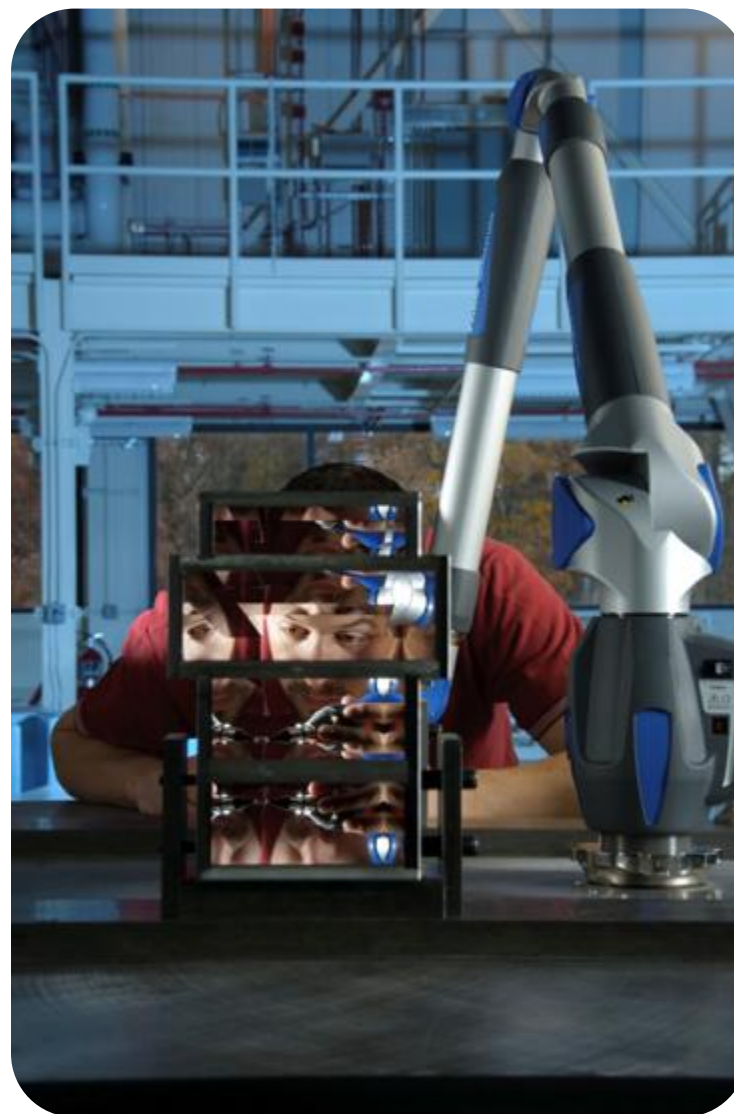
Major assets

- ~ 3,000 employees
- ~ 2,800 associates and facilities users
- ~ 1,600 field staff in partner organizations (Manufacturing Extension Partnership)
- Two main locations: Gaithersburg, Md., and Boulder, Colo.
- Four external collaborative institutes: basic physics, biotech, quantum, and marine science

FY 2011 Appropriations \$750M



- Scientific and Technical Research Services
- Industrial Technology Services
- Construction of Research Facilities



NIST has...

... Two Main Campuses

Gaithersburg, MD



©Robert Rathe

Boulder, CO



©Geoffrey Wheeler

NIST has...

...Four Joint Institutes



JILA

NIST + University of Colorado

**Institute for Bioscience &
Biotechnology Research**

NIST + University of Maryland



Joint Quantum Institute (JQI)

NIST + University of Maryland + NSA

Hollings Marine Laboratory

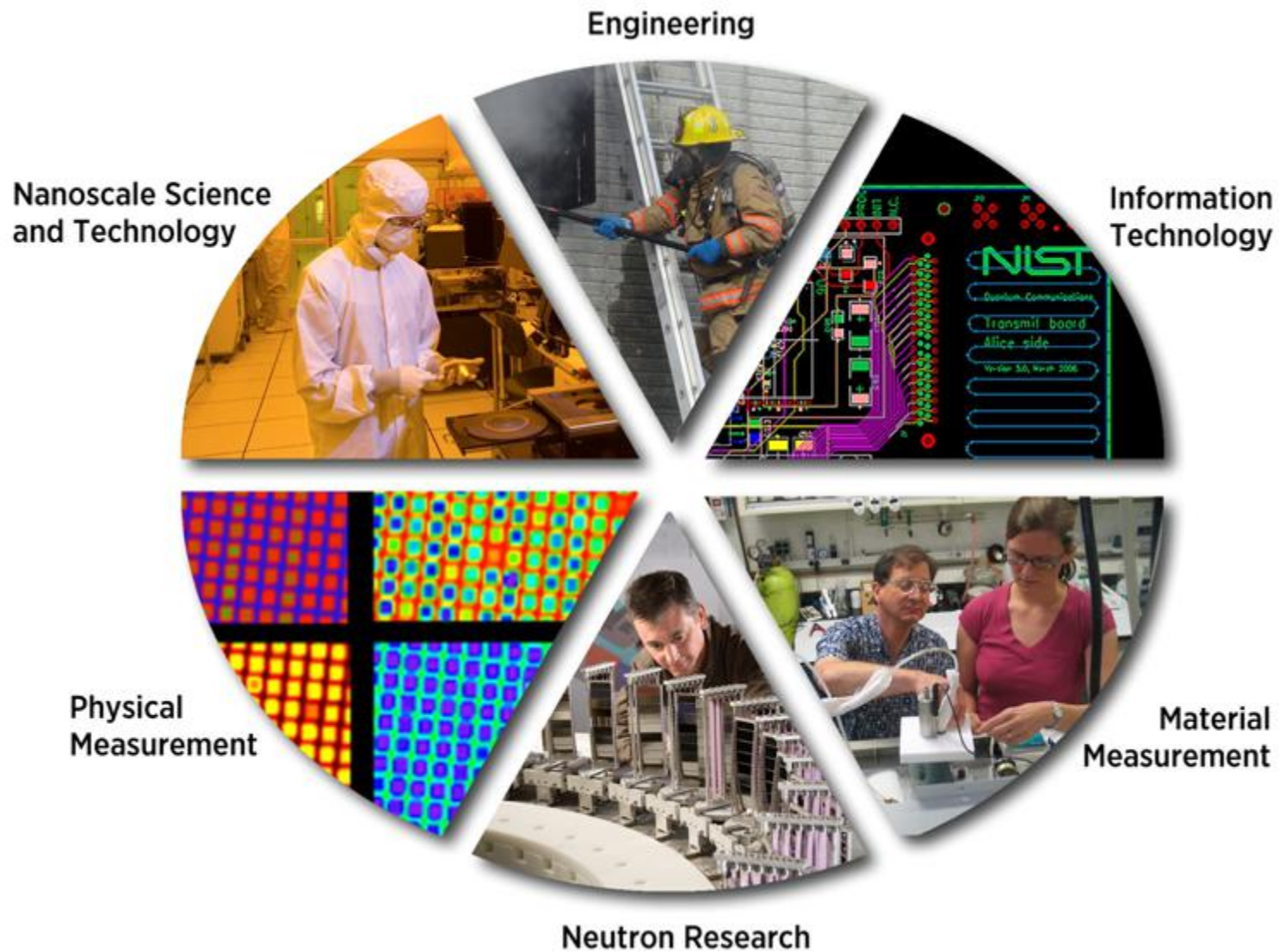
NIST + NOAA + South Carolina

+ College of Charleston

+ Medical University of South Carolina



NIST Laboratories and User Facilities



NIST Products and Services

Measurement Research

- ~ 2,200 publications per year

Standard Reference Data

- ~ 100 different types
- ~ 6,000 units sold per year
- ~ 25 million data downloads per year
- ~ 3 billion website hits per day for NIST Internet Time Service



© Robert Rathe



Standard Reference Materials

- ~ 1,300 products available
- ~ 31,000 units sold per year

Calibration Tests

- ~ 18,000 tests per year

Laboratory Accreditation

- ~ 800 accreditations of testing and calibration laboratories

NIST has ...

... world-class staff



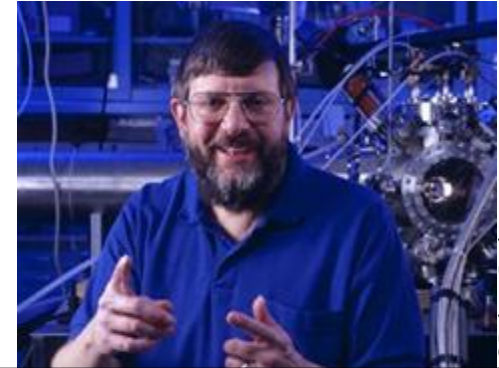
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Jan Hall
2005 Nobel Prize
in Physics



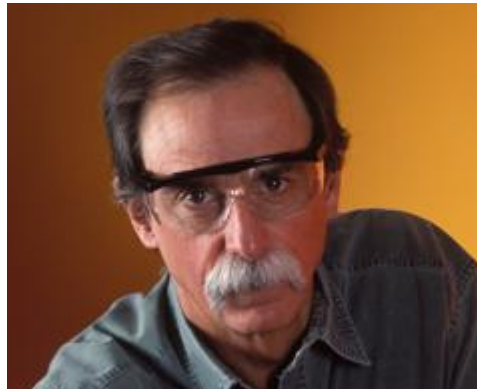
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Eric Cornell
2001 Nobel Prize
in Physics



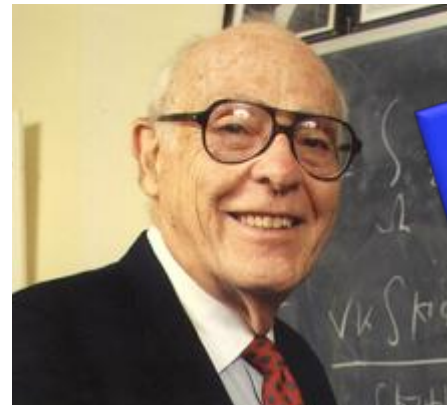
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Bill Phillips
1997 Nobel Prize
in Physics



© Geoffrey Wheeler

David Wineland
1998 National Medal
of Science



John Cahn
2007 National Medal
of Science

Announced July 6, 2011:
Cahn is the recipient of
**Kyoto Prize in Advanced
Technology** for his
fundamental contributions
to materials science



NIST Has...

...Strong Partnerships

Industry



Agilent Technologies



Universities



Nonprofits



International Technology Roadmap for Semiconductors



Government



NIST Infrastructure...Paving the Way to Innovation

The equivalent of research “roads and bridges” the industrial and scientific communities need to develop and commercialize new technologies



- Groundbreaking research tools that foster **new fields**—quantum information, nanotechnology, bioscience
- Better **measurement methods** to ensure quality
- **Performance measures** for accurate technology comparisons
- **Standards** to assure fairness in trade

NIST Provides Innovation Infrastructure to...

...facilitate trade



secure automated banking



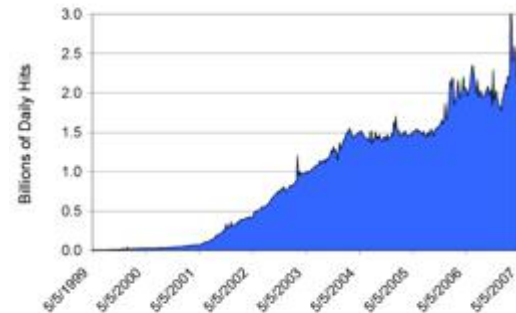
integrity of financial transactions



volume and flow – measurement based



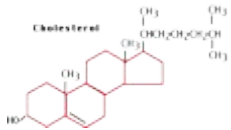
electric power metering



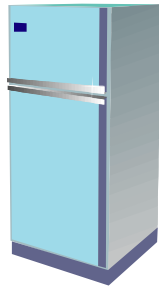
**www.time.gov
billions of hits daily**

NIST Provides Innovation Infrastructure to...

... improve quality of life



cholesterol standard
reference material



database and
measurements
for alternative refrigerants



medical tests, prostate and breast cancer
treatment



drinking water
quality



standards for sulfur
in fossil fuels

NIST Provides Innovation Infrastructure to...

...improve public safety and security

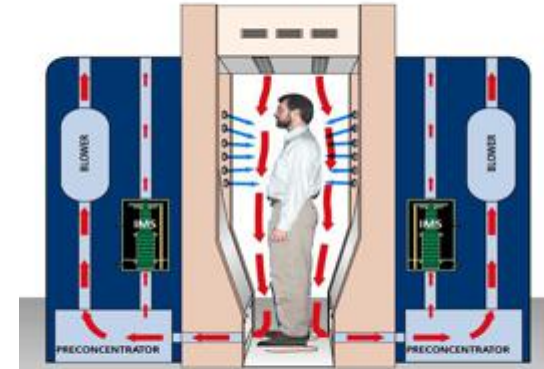


metal detectors

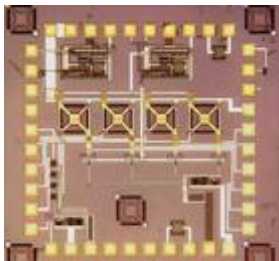
wireless
interoperability
among first
responders



smoke
detectors



trace explosives
detection portal



novel sensors to
detect gases



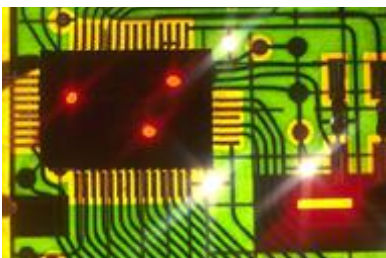
altimeter calibration

standards for
body armor



NIST Provides Innovation Infrastructure to...

...advance manufacturing and services



**semiconductor
electronics**



**“lean manufacturing” of
plastics**



**Manufacturing
equipment
interoperability**



pharmaceuticals



chemicals



**fuel cell
technology**



healthcare

NIST Addressing Critical National Needs: Manufacturing

Smart and sustainable manufacturing

- Develop measurement science and technology for smart & sustainable manufacturing across the entire life cycle of manufactured products and services
- Enable more agile, efficient manufacturing through measurement science for next generation robotics and automation and new processes, such as additive manufacturing



NanoManufacturing

BioManufacturing

NIST Addressing Critical National Needs: Buildings and Physical Infrastructure

Building and Fire Safety Investigations

- WTC, Providence, Charleston, Joplin, Japan

Construction Integration and Automation

- Metrics, modeling

Disaster Resilient Structures and Communities

- National Earthquake Hazards Reduction Program, Wildland-Urban Interface fires, chemical/biological/radiation protection

Fire Protection Technologies

- Smoke detectors, firefighting techniques

Sustainable Infrastructure Materials

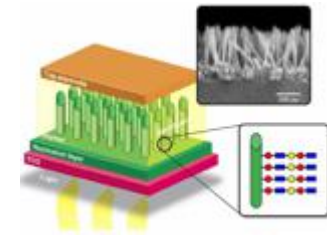
- Service life prediction, SPHERE, computer modeling



NIST Addressing Critical National Needs: Energy

Advanced Alternative Energies: Solar Energy

- Develop new measurement instrumentation and techniques for measuring the characteristics of and efficiency of third-generation photovoltaics.



Net-Zero Energy Buildings (buildings that produce as much energy as they consume)

- Enable energy use reductions through improved measures and intelligent building systems.
- Enable the development and use of sustainable materials, components, and systems.



Standards for National Priority Critical Infrastructures: Smart Grid Interoperability

- Working collaboratively, develop a framework and measurement tools for interoperability of Smart Grid devices and systems.



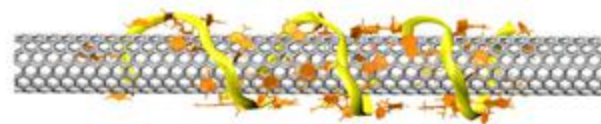
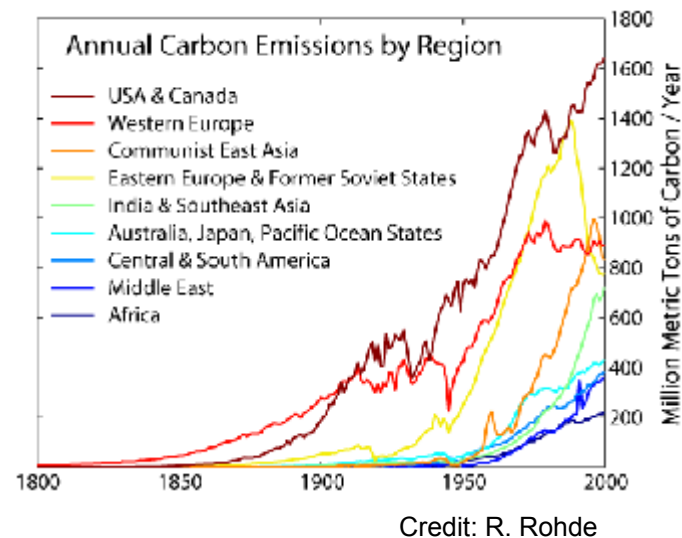
NIST Addressing Critical National Needs: Environment

Greenhouse Gas (GHG) Measurements and Climate Change

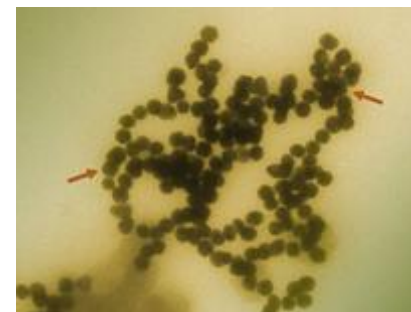
- Provide the measurement tools and standards to enable accurate, reliable, and consistent measurements of GHG sources and sinks
- Develop SI-traceable ground, air, ocean, and space-based climate measurements to assess GHG mitigation efforts

Nanomaterial Environmental Health and Safety (NanoEHS)

- Establish essential measurement science and develop & disseminate measurement technology for determining physical and chemical properties and toxicity of nanomaterials and products that incorporate nanomaterials



Roxbury, Jagota/NIST



A. Keene, USFDA

NIST Addressing Critical National Needs: Healthcare

Standards for National Priority Critical Infrastructures: Health Information Technology

- Support progress toward a nationwide healthcare information infrastructure

Biomedical Measurements to Support Disease Diagnosis and Treatment

- Develop the measurement science and reference materials to improve the accuracy, reproducibility, and efficacy of measurements used in medical diagnostics and imaging
- Develop the measurement science and standards to support manufacturing and regulatory approval of biologic drugs

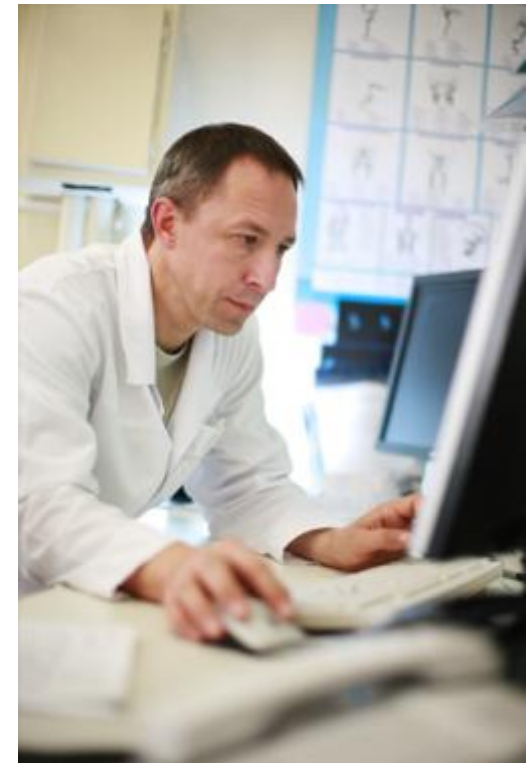
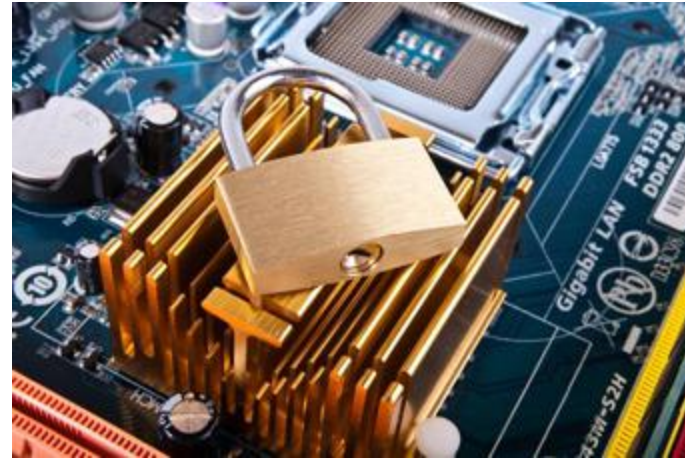


Image: Shutterstock, ©Konstantin Sutyagin

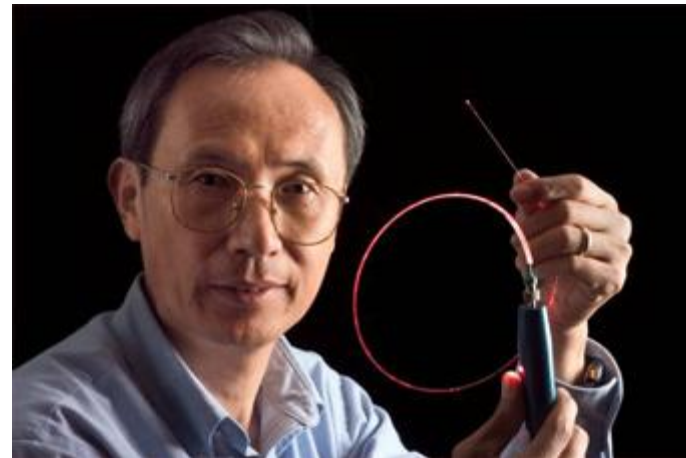
NIST Addressing Critical National Needs: Information Technology

Scalable cybersecurity for emerging technologies and threats

- Improved cryptographic capabilities
- Stronger assurance of online user identities
- Easier-to-use security mechanisms
- Increased use of security automation technology
- Security measurement for large-scale systems
- Secure adoption of cloud computing, electronic voting, other emerging technologies



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The result: a broad impact on everyday life

- Advancing manufacturing and services
- Helping ensure fair trade
- Improving public safety and security
- Improving quality of life



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Thank You for Your Attention & WELCOME TO NIST!

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