NIST ... Enabling the Future

…Innovation, Trade, Security
… and Jobs

NIST enables the future...

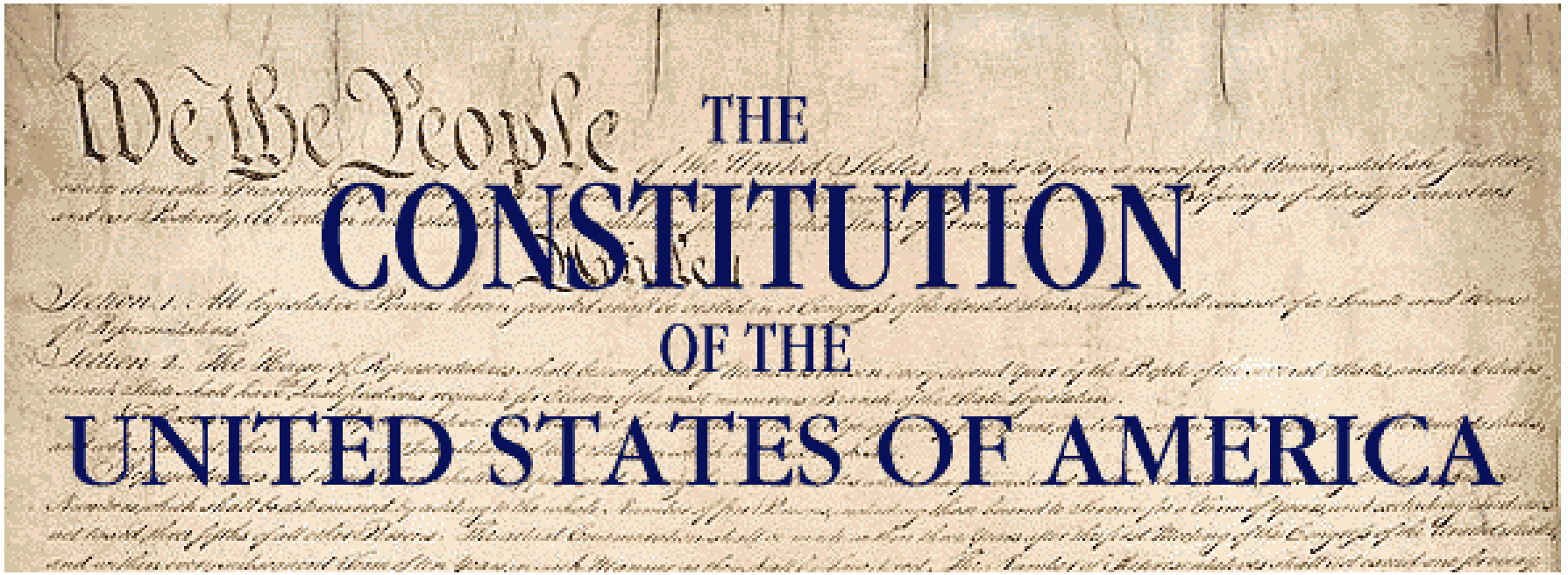
by strengthening the innovation infrastructure to:

- **advance manufacturing and services**
- **facilitate trade**
- **enhance public safety & security**
- **improve quality of life**

…and create jobs

...through effective partnerships with industry, academia, and other government agencies.

Constitutional authority in 1788

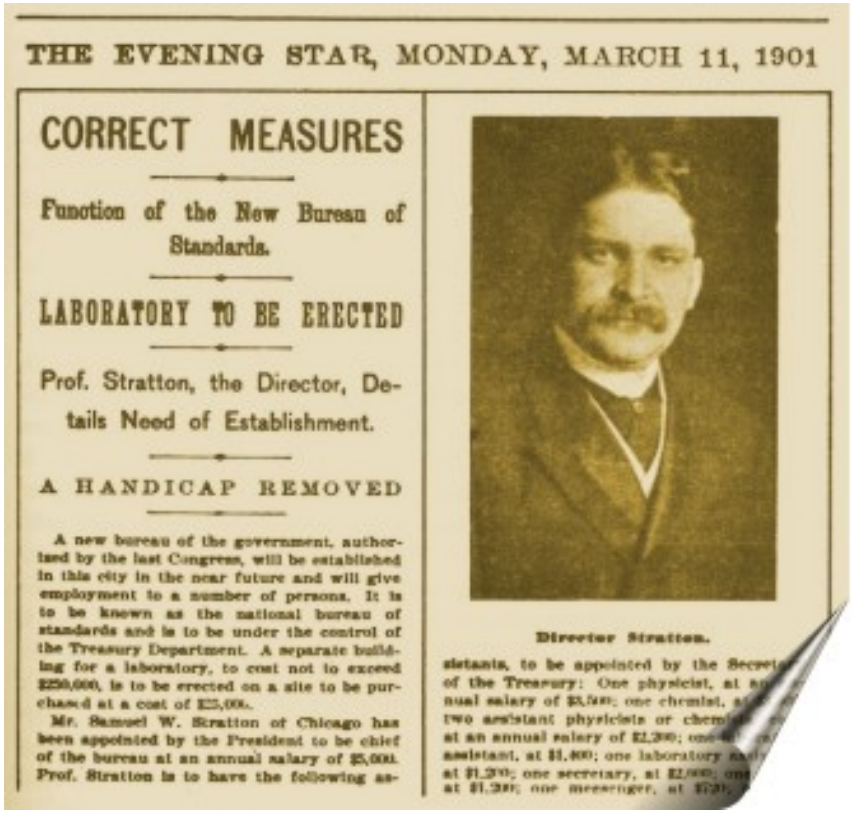


Article I, Section 8: The Congress shall have the power to …*coin money, regulate the value thereof, and of foreign coin, and fix the standard of weights and measures*

NIST (NBS) established in 1901

"It is therefore the unanimous opinion of your committee that no more essential aid could be given to manufacturing, commerce, the makers of scientific apparatus, the scientific work of the Government, of schools, colleges, and universities than by the establishment of the institution proposed in this bill."

House Committee on Coinage, Weights and Measures, May 3, 1900, on the establishment of the National Bureau of Standards (now NIST)



THE EVENING STAR, MONDAY, MARCH 11, 1901

CORRECT MEASURES

Function of the New Bureau of Standards.

LABORATORY TO BE ERECTED

Prof. Stratton, the Director, Details Need of Establishment.

A HANDICAP REMOVED

A new bureau of the government, authorized by the last Congress, will be established in this city in the near future and will give employment to a number of persons. It is to be known as the national bureau of standards and is to be under the control of the Treasury Department. A separate building for a laboratory, to cost not to exceed $250,000, is to be erected on a site to be purchased at a cost of $25,000.

Mr. Samuel W. Stratton of Chicago has been appointed by the President to be chief of the bureau at an annual salary of $5,000. Prof. Stratton is to have the following as-

Director Stratton.

sistants, to be appointed by the Secretary of the Treasury: One physicist, at an annual salary of $3,500; one chemist, at an annual salary of $3,000; two assistant physicists or chemists, at an annual salary of $2,000; one assistant, at $1,600; one laboratory assistant, at $1,200; one secretary, at $2,000; one messenger, at $720.

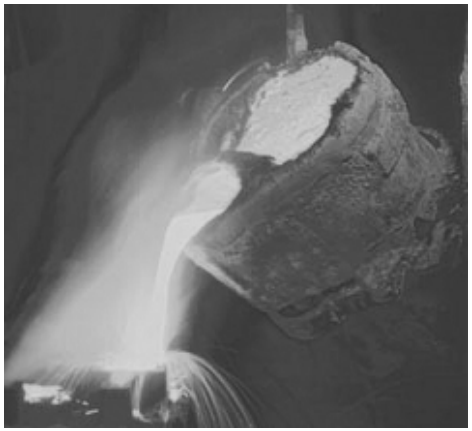
Early drivers for standards and measurements

1904

Out-of-town fire companies arriving at a Baltimore fire cannot couple their hoses to the hydrants. 1526 buildings razed.

1905

Standard samples program begins with standardized irons.

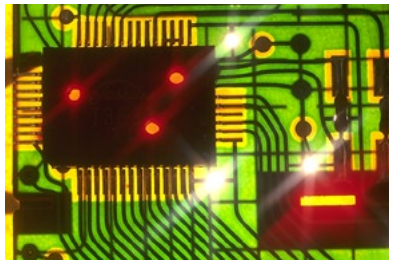


1912

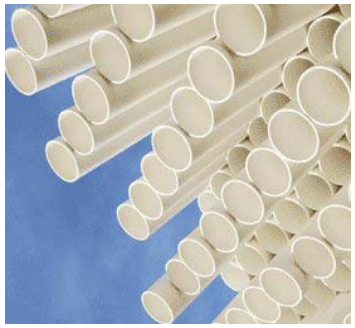
41,578 train derailments in the previous decade lead to NBS measurement and test program

NIST strengthens the innovation infrastructure to…

...advance manufacturing and services



semiconductor electronics

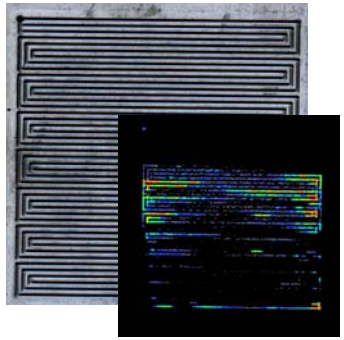


“lean manufacturing” of plastics

automobile manufacturing interoperability

pharmaceuticals

chemicals



fuel cell technology

healthcare

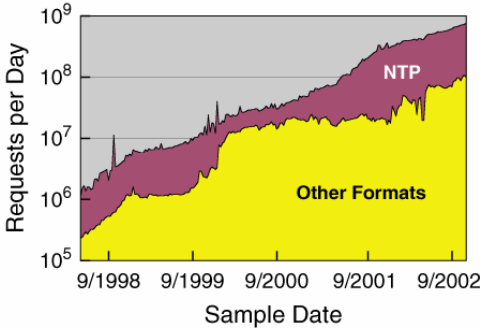
NIST strengthens the innovation infrastructure to…

…facilitate trade

secure automated banking

electric power metering

volume and flow standards



www.time.gov billions of hits daily

international standards to counteract TBTs

EU directive on in vitro diagnostic standards

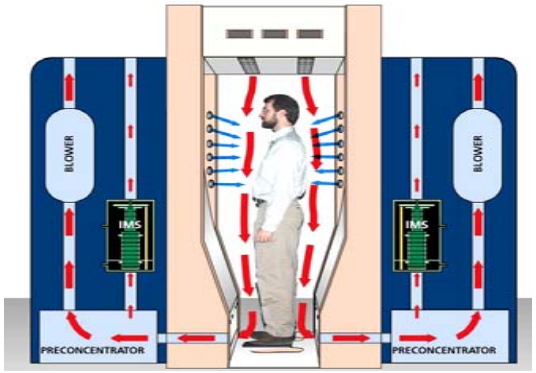
NIST strengthens the innovation infrastructure to…

...improve public safety and security

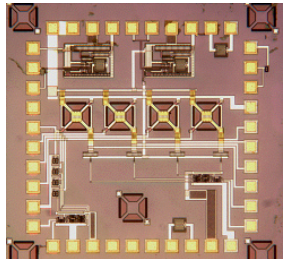
metal detectors

wireless interoperability among first responders

smoke detectors



Trace explosives detection



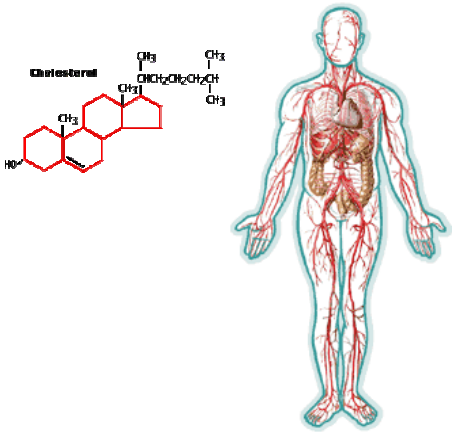
novel sensors to detect gases

altimeter calibration

standards for body armor

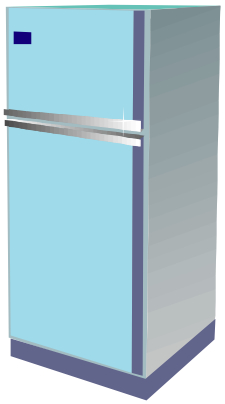
NIST strengthens the innovation infrastructure to…

… improve quality of life

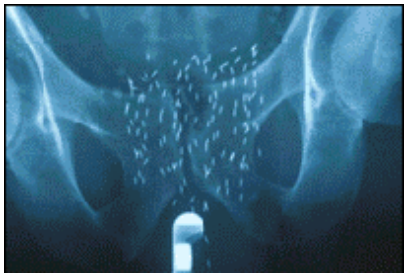


Improved clinical measurements

drinking water quality



database and measurements for alternative refrigerants

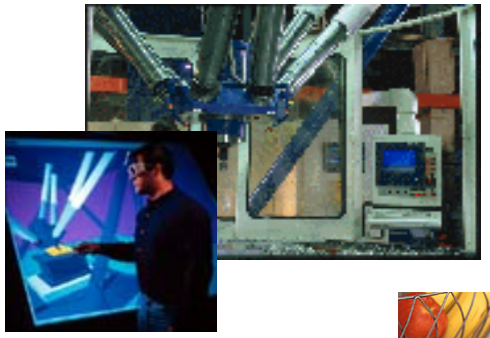


prostate and breast-cancer treatment

standards for sulfur in fossil fuels

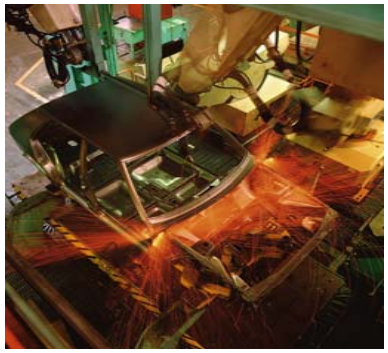
NIST serves a broad customer base…

Environmental Technologies



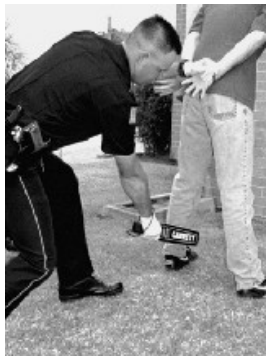
Manufacturing

Food and nutrition



Transportation

Pharmaceuticals



Law enforcement

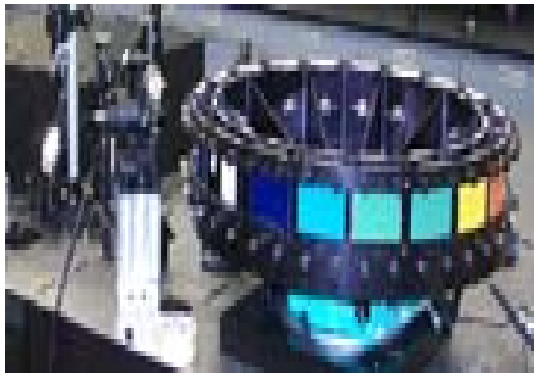
Biotechnology

Computer software and equipment

Construction

Microelectronics

…with many services and products



Calibration Services

NVLAP®

Laboratory Accreditation

Assistance for small manufacturers

Standard reference materials and data

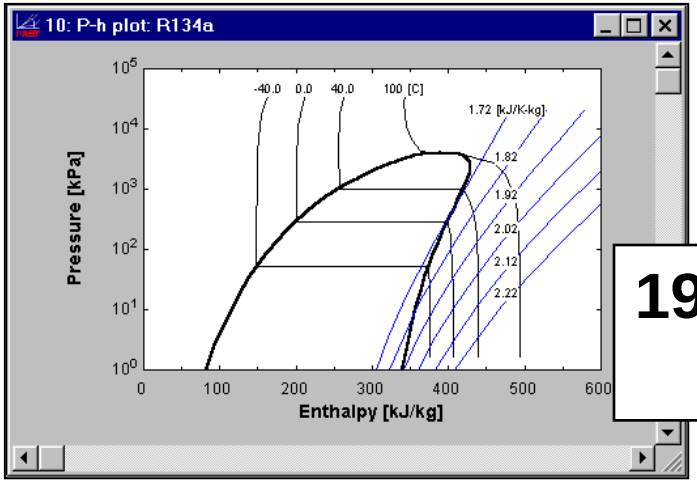
NIST™
Security Configuration
CHECKLISTS
http://checklists.nist.gov
CSD

Cybersecurity Best Practices

Quality Guidelines

Economic impact of NIST programs

1997 Radiopharmaceutical standards
97:1 benefit-to-cost ratio



1998 Alternative refrigerants
4:1 benefit-to-cost ratio

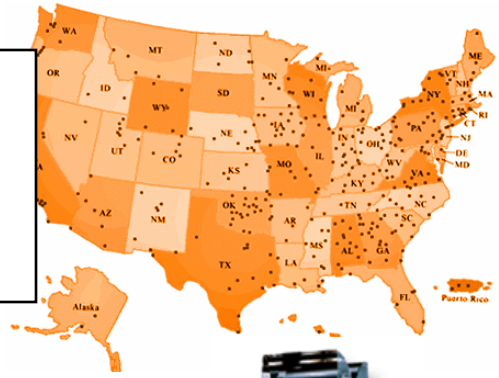
2000 Sulfur in fossil fuels
113:1 benefit-to-cost ratio

Economic impact of NIST programs (cont'd)

Since inception — **Returns from just 6 % of ATP portfolio:**

- **$17 billion in economic benefits**
- **8 times total ATP investment**

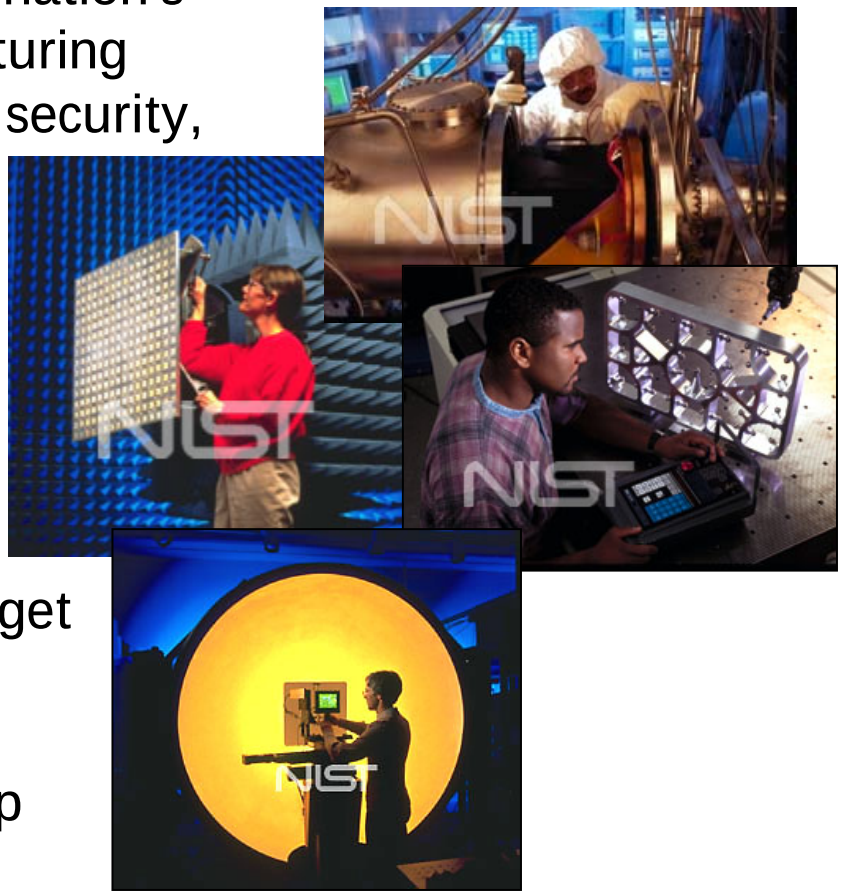
2003 Manufacturing Extension Partnership
$4.1 billion new & retained sales
50,315 jobs created & retained



Since 1988 Baldrige National Quality Program
$25 billion in economic benefits
207:1 benefit-to-cost ratio

NIST mission and assets today

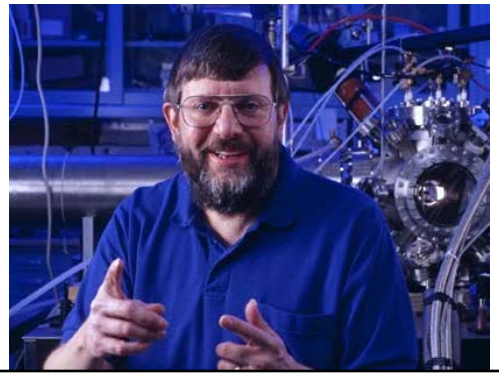
NIST's mission is to strengthen the nation's innovation infrastructure for manufacturing and services, trade, public safety and security, quality of life, and jobs.



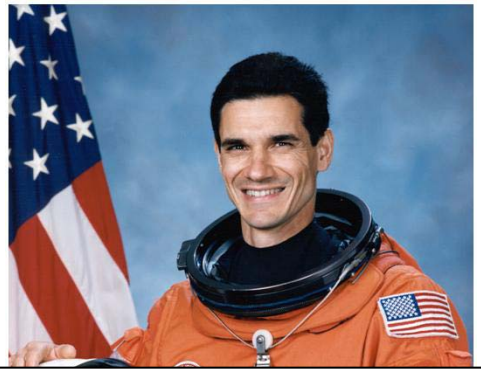
NIST assets include:

- 3,000 employees
- 1,600 associates
- $858 million FY 2005 operating budget
- NIST Laboratories
- Advanced Technology Program
- Manufacturing Extension Partnership
- Baldrige National Quality Award

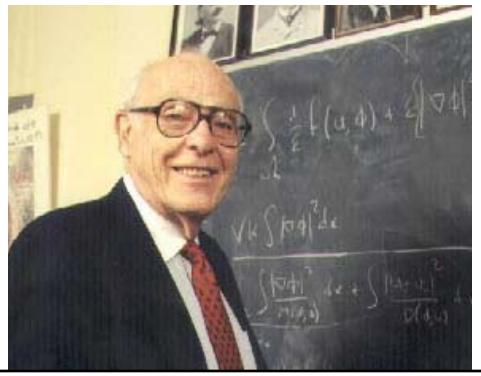
NIST has... ...world-class staff



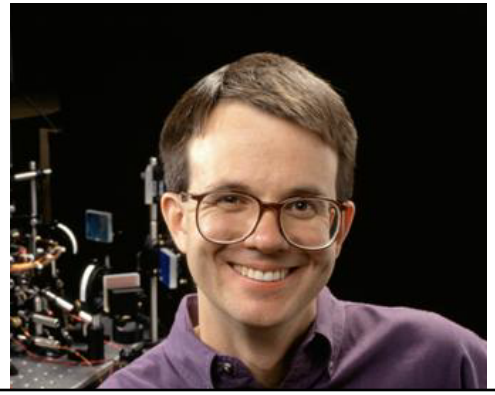
Bill Phillips
1997 Nobel Prize in Physics



Greg Linteris
2 Space Shuttle missions



John Cahn
1998 National Medal of Science



Eric Cornell
2001 Nobel Prize in Physics

Anneke Sengers
2003 L'Oréal-UNESCO Women in Science Award

Debbie Jin
2003 MacArthur Fellowship

NIST has… ...unique research facilities

Advanced Measurement Laboratory (2004)

Advanced Chemical Sciences Laboratory (1999)

NIST Center for Neutron Research

NIST has…

...strong partnerships

Partnerships with industry, academia, and other government agencies have been an integral part of NIST culture since 1901.

ILLINOIS

JILA NIST CU

University of Colorado

CARB

UNIVERSITY OF MARYLAND

THE UNIVERSITY of WISCONSIN MADISON

NCCOS NOAA NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
science for coastal communities

AdvaMed
Advanced Medical Technology

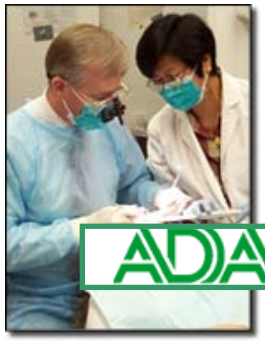
Penn
University of Pennsylvania

AIAG

ASTM INTERNATIONAL
Standards Worldwide

ITRS

INTERNATIONAL TECHNOLOGY ROADMAP FOR SEMICONDUCTORS



USCAR

AMERICAN INDUSTRY / GOVERNMENT EMISSIONS RESEARCH
AIGER
Cooperative Research and Development Agreement

NIST has…

...strong partnerships

Agilent Technologies

DOW
Living.
Improved daily.

Ford

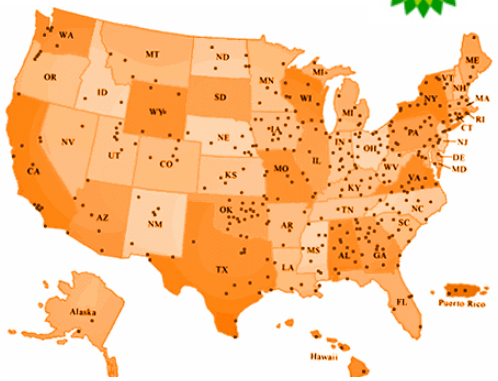
Pfizer

GM

IBM

bp solar

intel



THE 100 BEST RESOURCES FOR SMALL BUSINESS
DANIEL KEHRER BizBest

NCMS Manufacturing Trust

VLSI Standards Incorporated

Homeland Security

National Institutes of Health

United States Department of Health & Human Services

NASA

Department of Energy

Department of Defense

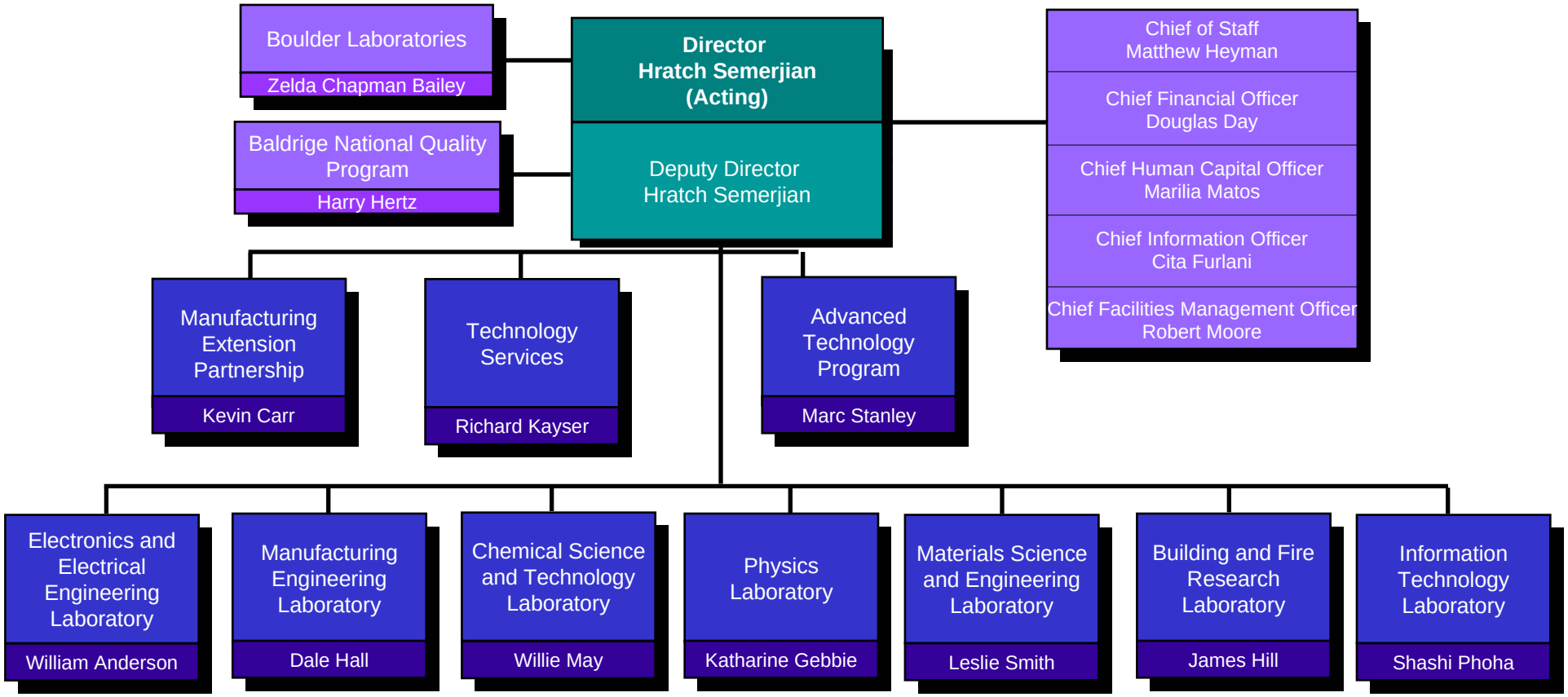
United States Environmental Protection Agency

Department of Justice

National Cancer Institute

THE NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

NIST Organization Chart



National Innovation Agenda

- **Foster development of industry-led standards for manufacturing**
- **Stimulate high-risk research**
- **Create Innovation Extension Centers for small manufacturers**

"Innovate America"
National Innovation Initiative Report
Council on Competitiveness (December 2004)

Bottom line: “Innovate or abdicate”

America’s enterprises, educational institutions, labor and public sector organizations and citizens must make innovation – across all sectors of business, society and government – the underlying strategic priority for ensuring the nation's economic strength and security.

Council on Competitiveness (2004)

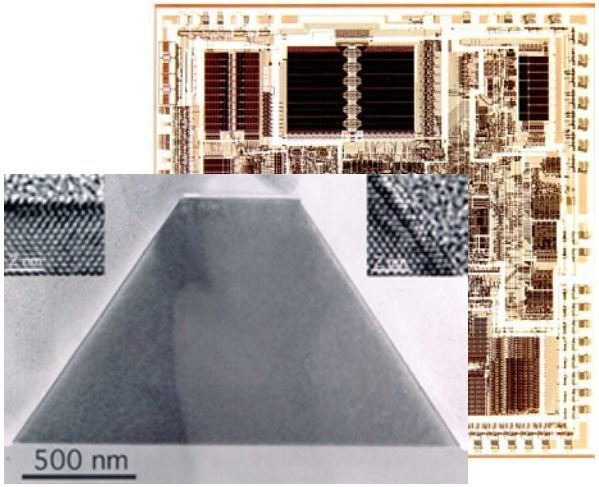
“… we live in a competitive world ... We shouldn't take our preeminence as the world's greatest economy for granted. We've constantly got to make sure the economic environment here is strong. We've got to make sure that we're innovative.”

President G.W. Bush (April 5, 2004)

NIST enables innovation in...

milli electronics
vacuum tubes & discrete transistors
1900 - 1960
copper, glass, barium, germanium

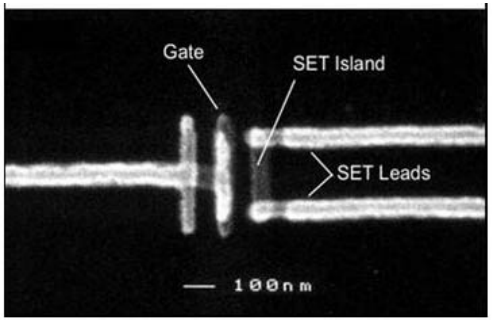
First neon signs



micro electronics
integrated circuits
1960 - 1990
silicon, aluminum

s*ingle crystal silicon critical dimension artifact*

...electronics

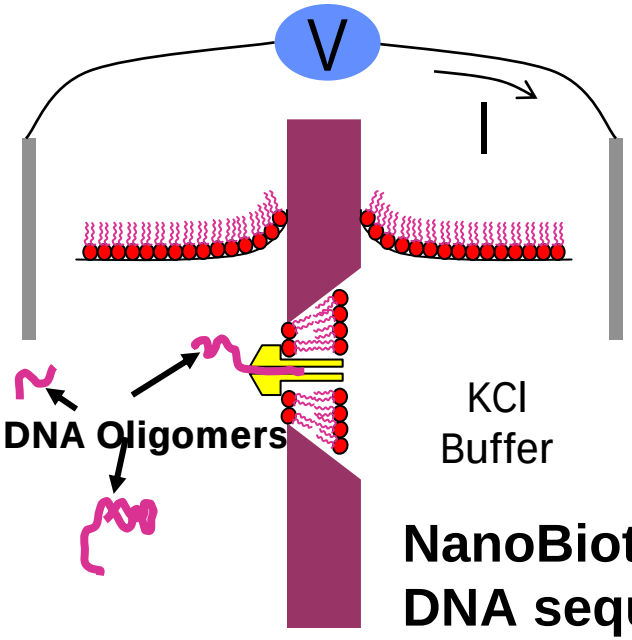


nano electronics
integrated circuits
1990 - 20xx
silicon, copper, exotic dielectrics, single molecules, ...

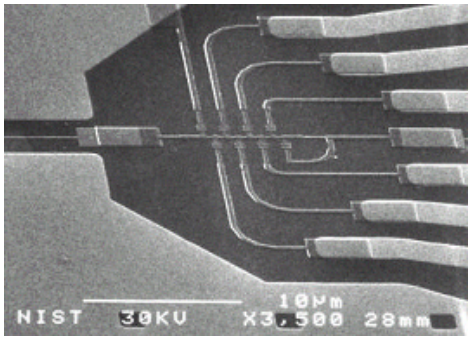
NIST *single electron tunneling device*

NIST enables innovation in…

...nanotechnology

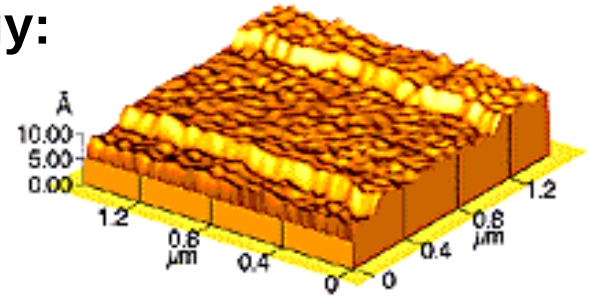


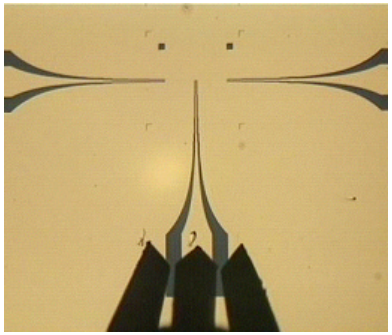
NanoBiotechnology: DNA sequencing through nanopores



NanoElectronics: manipulation of paired electrons

NanoMetrology: atomic scale dimensional standard





NanoMagnetics: precessional switching in spin valve devices

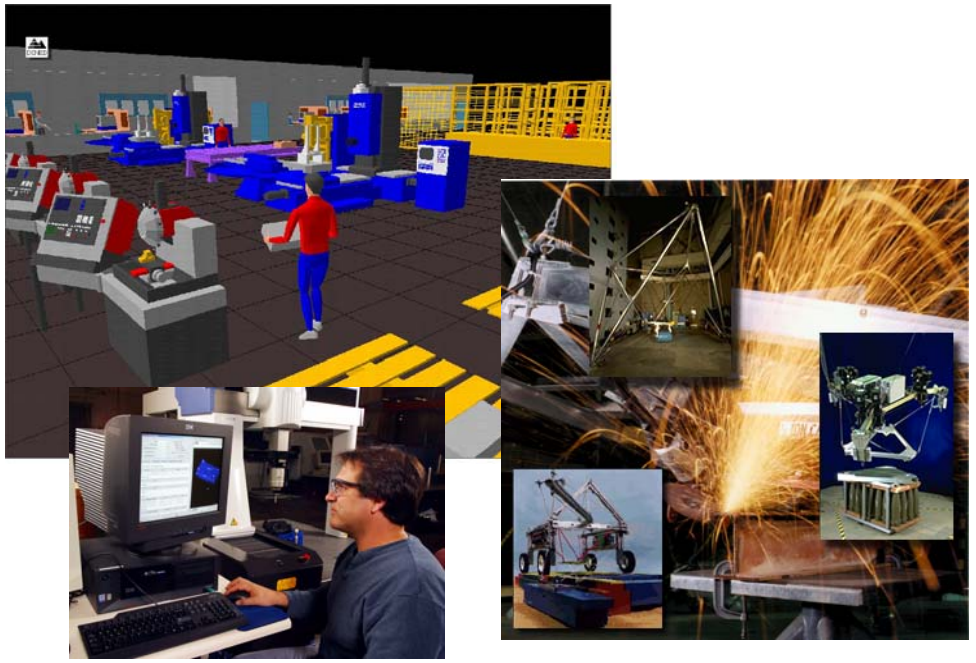
NIST enables innovation in...

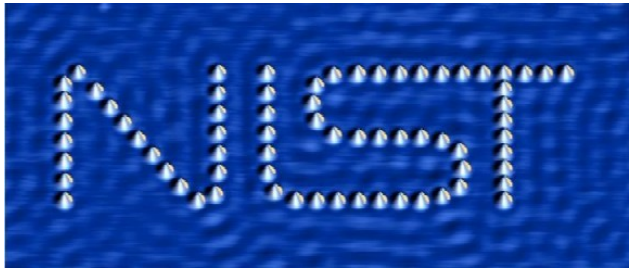
...manufacturing

1920

Experimental cotton mill

2004 Simulation technology for manufacturing operations





20xx

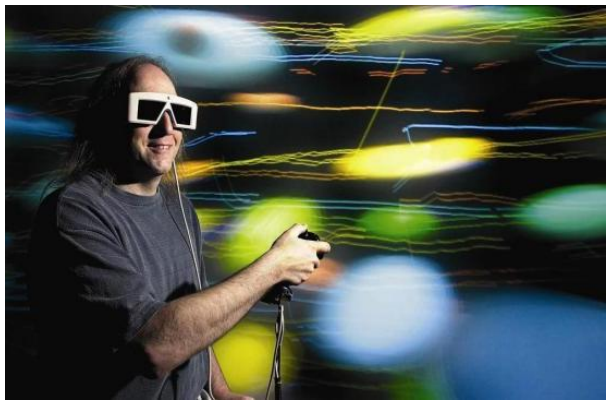
Automated and optimized assembly of single atom constructions

Testbeds

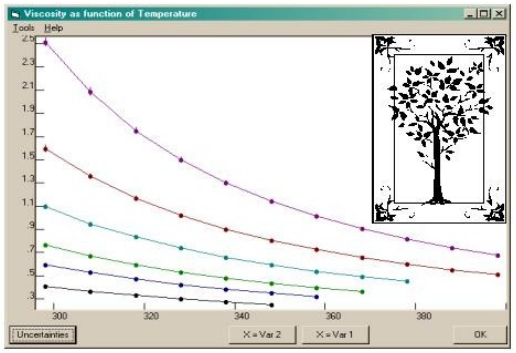
Interoperability and data exchange

NIST enables innovation in…

…information technology



immersive visualization



Guided Data Capture Software

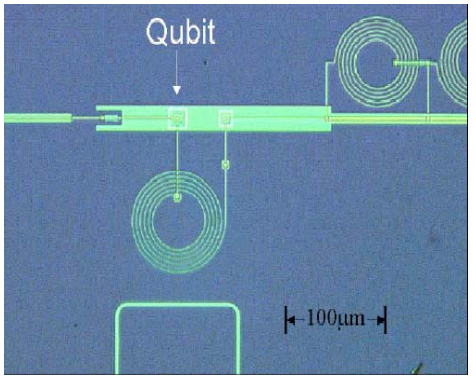
NIST Security Configuration CHECKLISTS http://checklists.nist.gov CSD

AES
A Crypto Algorithm for the Twenty-first Century . . .

"Working closely with industry"

128 bit key: *NIST@100NIST@100*

95285ac3f244a6ef4a466b03d7af1275
b8f8e0db1f14c9d33e72d598f12a14fc

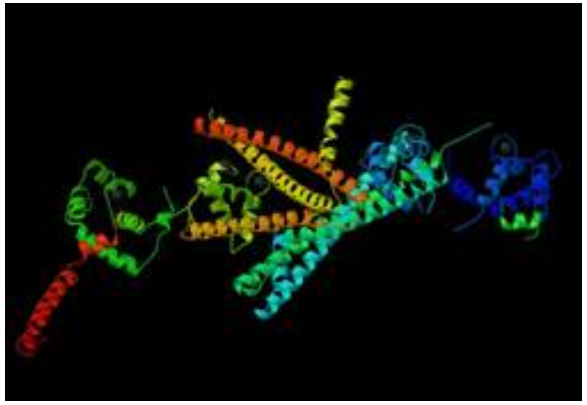


Quantum computing

NIST Chemistry WebBook

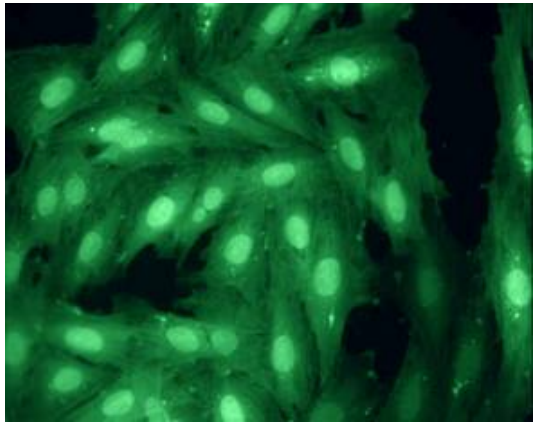
NIST enables innovation in

…bioscience and health care

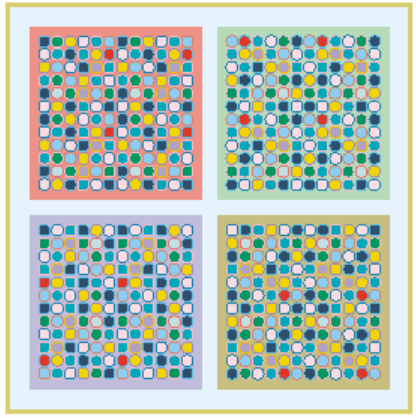


NIST Standard Reference Material 2921 helps diagnose heart attacks.

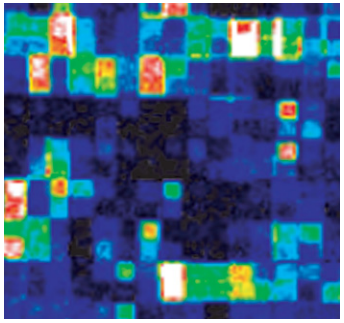
PDB
PROTEIN DATA BANK



Tissue Engineering: Quantitative microscopy verifies response of indicator cells.



Standards for microarrays promise to bring order to gene expression profiling.



Affymetrix's GeneChip microarray

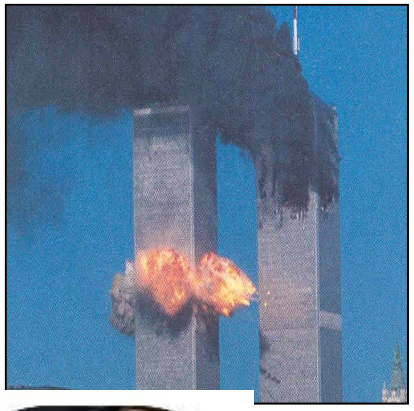
NIST enables innovation in

…public safety and security

Measurements and standards infrastructure that ensures the accuracy, reliability, and security of systems critical to public safety and homeland security

Develop, compare, and test new technologies.
Enable safe and effective response to incidents.

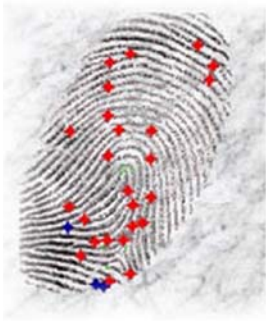
World Trade Center Investigation



mail irradiation

gas mask performance standards

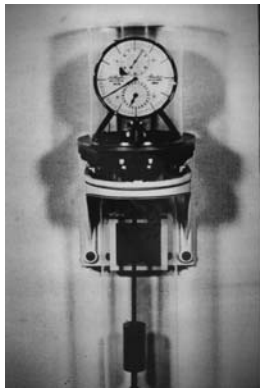
biometrics



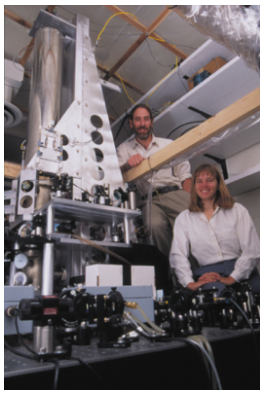
DNA standards

NIST enables innovation in... ...standards

pendulum clock
1 s in 3 years
(1904)

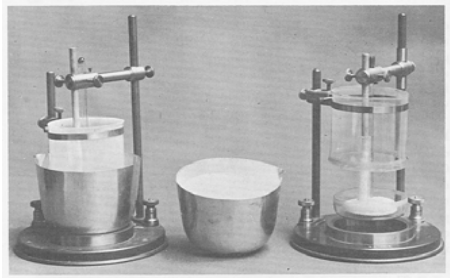


second

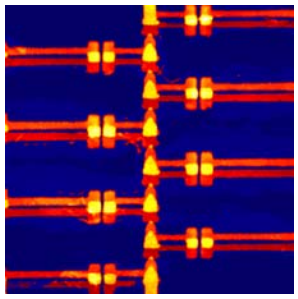


NIST F1
atomic clock
1 s in 30 million
years
(1999)

silver voltameter
current standard
(1910)

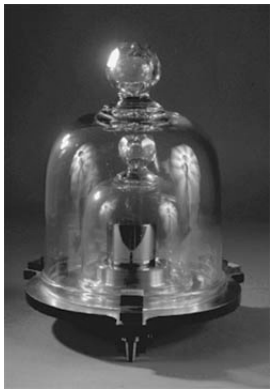


ampere



single
electron
counter
(20xx)

physical artifact
(1889)



kilogram

electronic
kilogram
(20xx)

NIST enables the future...

by strengthening the innovation infrastructure to:

- **advance manufacturing and services**
- **facilitate trade**
- **enhance public safety & security**
- **improve quality of life**

…and create jobs

...through effective partnerships with industry, academia, and other government agencies.