

Welcome
to the
Metallurgy Division
and the
NIST Workshop on
Diffusion Challenges Associated with
Sustainable Energy Applications

March 25-26, 2009

Frank W. Gayle
Division Chief

NIST Snapshot

- Agency within the Department of Commerce
- 2,800 employees (1,500 technical staff)
- 1,000 associates
- Core Program: NIST Laboratories
\$440 M FY 2007 & 08
→ \$472 M FY 09 + \$220 M “stimulus”
- Manufacturing Extension Partnership
- Baldrige National Quality Award
- Technology Innovation Program

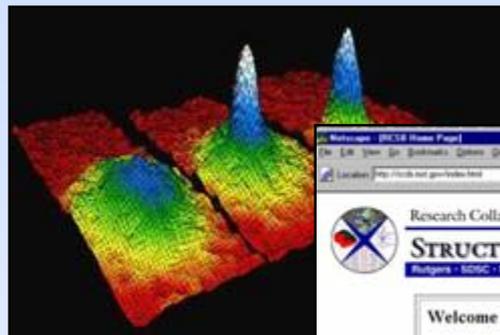


To promote U.S. innovation and industrial competitiveness
by advancing **measurement science**, **standards**,
and **technology**

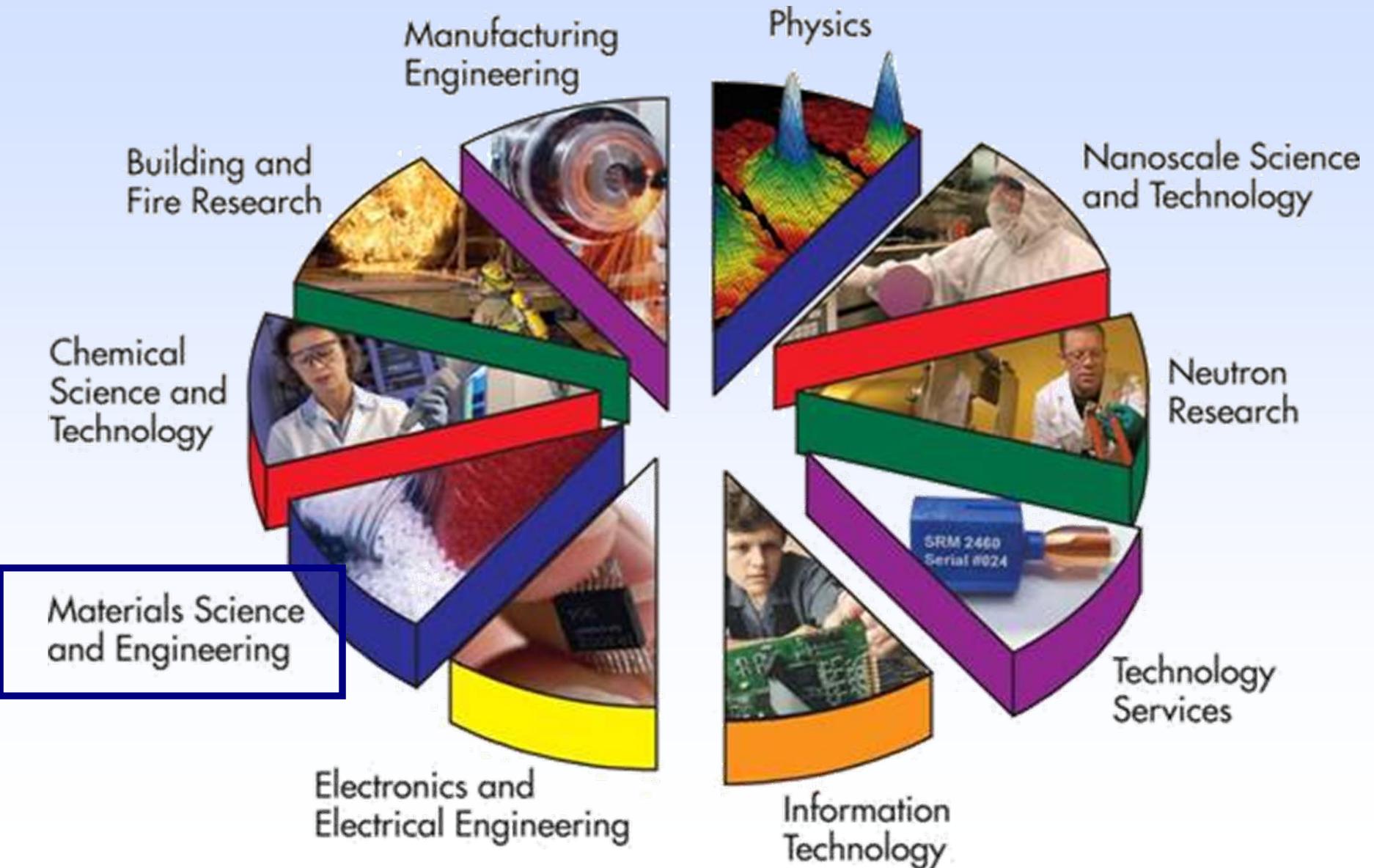
in ways that enhance economic
security and improve our quality of life.

NIST Products and Services Include

- **Measurement Research**
2,200 publications/year
- **Standard Reference Data**
100 types available
130 million datasets downloaded/year
- **Standard Reference Materials**
1,300 products available
33,000 units sold/year
- **Calibrations and Tests**
16,000 calibrations/year
- **Laboratory Accreditation**
800 accreditations
- **Technical Workshops**
8,000 participants/year
- **Standards Committees**
400 members, 1000 committees,
150 (co)chairs, 100 SDOs



Core Program - The NIST Laboratories



Materials Science and Engineering Laboratory (MSEL)



R.F. Kayser, Director



E.J. Amis, Deputy Dir.

111 technical staff
256 guest researchers
\$41.5M STRS Budget
\$50.6M Total Budget

Ceramics



D.L. Kaiser, Chief

Electronic & Optoelectronic
Materials
Characterization Methods
Data and Standards
Technology
Nanomechanical Properties

Materials Reliability



S. Hooker, Chief

Nanoscale Reliability
Structural Materials
Cell and Tissue Mechanics

Metallurgy



F.W. Gayle, Chief

Thin Film and Nanostructure
Processing
Magnetic Materials
Materials Performance
Thermodynamics and Kinetics

Polymers

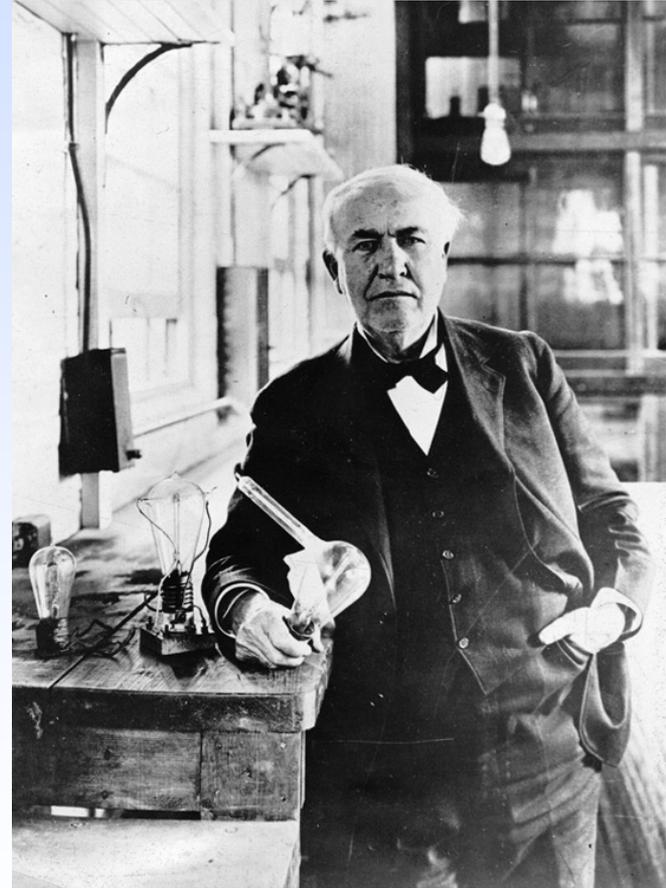


E.K. Lin, Chief

Characterization and
Measurement
Electronics Materials
Biomaterials
Nanostructured Materials
Processing Characterization
Combinatorial Methods

Early NIST: Founded 1901

- Established by Congress in 1901
- Eight different “authoritative” values for the gallon
- Nascent electrical industry needed standards
- American instruments sent abroad for calibration
- Consumer products and construction materials uneven in quality and unreliable



National Archives

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.

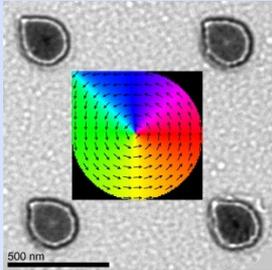


1912

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

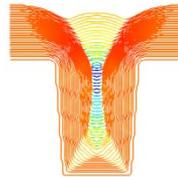
Magnetic Materials

Nanomagnetics



Sensors

Magnetic Applications



Materials Performance

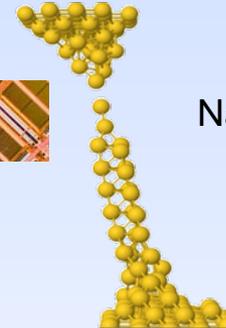
Sheet Metal Forming

Pipeline Safety for the Hydrogen Economy

Mechanical Performance – Extreme Conditions

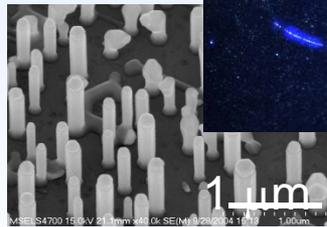
Nanomechanics: Atomistics

Hardness Standardization – Rockwell, Vickers, Knoop

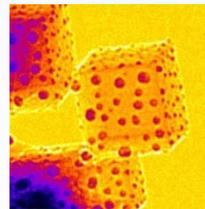


Thin Film & Nanostructure Processing

Nanostructure Fabrication Processes

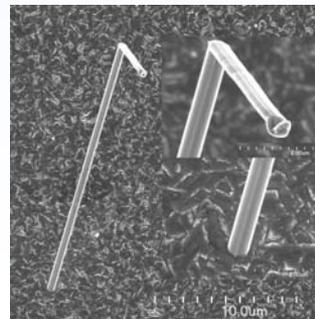


Microscopy Methods



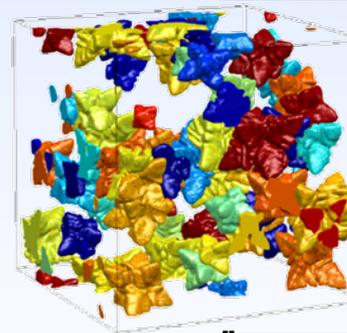
Hydrogen Storage

Surface & Growth Stress Measurement

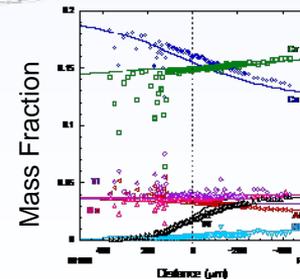


Thermodynamics and Kinetics

Microstructural Modeling



Thermodynamic & Kinetic Data and Models



Lead-free Surface Finishes, Tin Whiskers