On September 14, 1954, President Dwight D. Eisenhower dedicated the newly completed National Bureau of Standards Radio Building to “the welfare of humanity—in America and throughout the world.”

- 1950 – Boulder raised funds to buy 217 acres of land for CRPL
- 1988 – NBS renamed NIST
Agencies of the U.S. Department of Commerce Boulder Laboratories

- National Institute of Standards and Technology (NIST)
  - 720 employees (federal and affiliates)

- National Oceanic and Atmospheric Administration (NOAA)
  - 1,070 employees (federal and affiliates)

- National Telecommunications & Information Administration (NTIA) Institute for Telecommunication Sciences (ITS)
  - 87 employees (federal and affiliates)
NIST Boulder Labs

- Electronics and Electrical Engineering Divisions
  - Electromagnetics
  - Optoelectronics
  - Quantum Electrical Metrology
- Physics Divisions
  - Time and Frequency
  - Quantum Physics (JILA)
- Materials Science and Engineering Division
  - Materials Reliability
- Chemical Science and Technology Division
  - Physical and Chemical Properties
- Information Technology Divisions
  - Mathematical and Computational Sciences
  - Statistical Engineering
Infrastructure -- the facilities to move and to house people, goods, raw materials, energy, and information.
Magnitude of U.S. Infrastructure

- Over 10% of GDP (over $1 T/yr) goes toward transportation
- U.S. Government alone spends > $50 B/yr on new buildings
- U.S. has over 2.5 M km of pipelines (oil, gas, ammonia, etc.). Many pass through very sensitive areas.
- Average age of offshore platforms is 20 years, with 400 over 40 years old
- Over 5 trillion T-km/yr of freight shipped by trucks, barges, and planes (issues with bridges, locks and vehicles)
Needs in Infrastructure

- Many systems are deteriorating, and we invest less than our global competitors.
- Many older systems are sensitive to sabotage.
- Systems are taken for granted, and criticized when they fail.
- Environmental impact becoming more visible.
- NIMBY > NOPE.
- Costs might be reduced and technology improved through innovation, but few funds for academia, industry in a rut.
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History of our Infrastructure Projects

- 1976 - Welds in Alaska Pipeline
- 1978 – Walkway Collapse in St. Louis
- 1983 – Study of Cost of Fracture ($99 B/yr in 1978)
- 1985 – Union Oil Explosion
- 1995 – Aqua Fria Siphon
- 1995 – Chemical Blender Explosion
- 2000 – Hoover Dam Turbines
- 2002 – Folsom Dam Gates
- 2002 – Repair of U.S. Capitol Dome
- 2004 – Properties of Pipelines
Impacts

- Alaska Pipeline began operation much earlier, and has operated safely
- Source of Walkway Collapse led to closer inspection of details
- Union Oil Explosion led to changes in code (29 CFR 1910) and more frequent inspections
- Aqua Fria Siphon problems led BoR to change the specifications for piping
- Architect of the Capitol has selected our repair recommendation over all others
- WTC investigation is already beginning to indicate many changes in codes and procedures
The Future

**Pipeline**
- Finish CTOA developments (effect of rate, study of welds, etc.)
- Develop better understanding of fracture propagation
- Transfer discoveries to industry and standards committees
- Some ideas that come out of this meeting?

**Hydrogen**
- Materials properties development (larger scale specimens)
- On-line database