



# Driving Innovation through Federal Investments at the Department of Energy

Presented by Secretary Ernest Moniz  
April 29, 2014

# Powering U.S. Defense

UNCLASSIFIED



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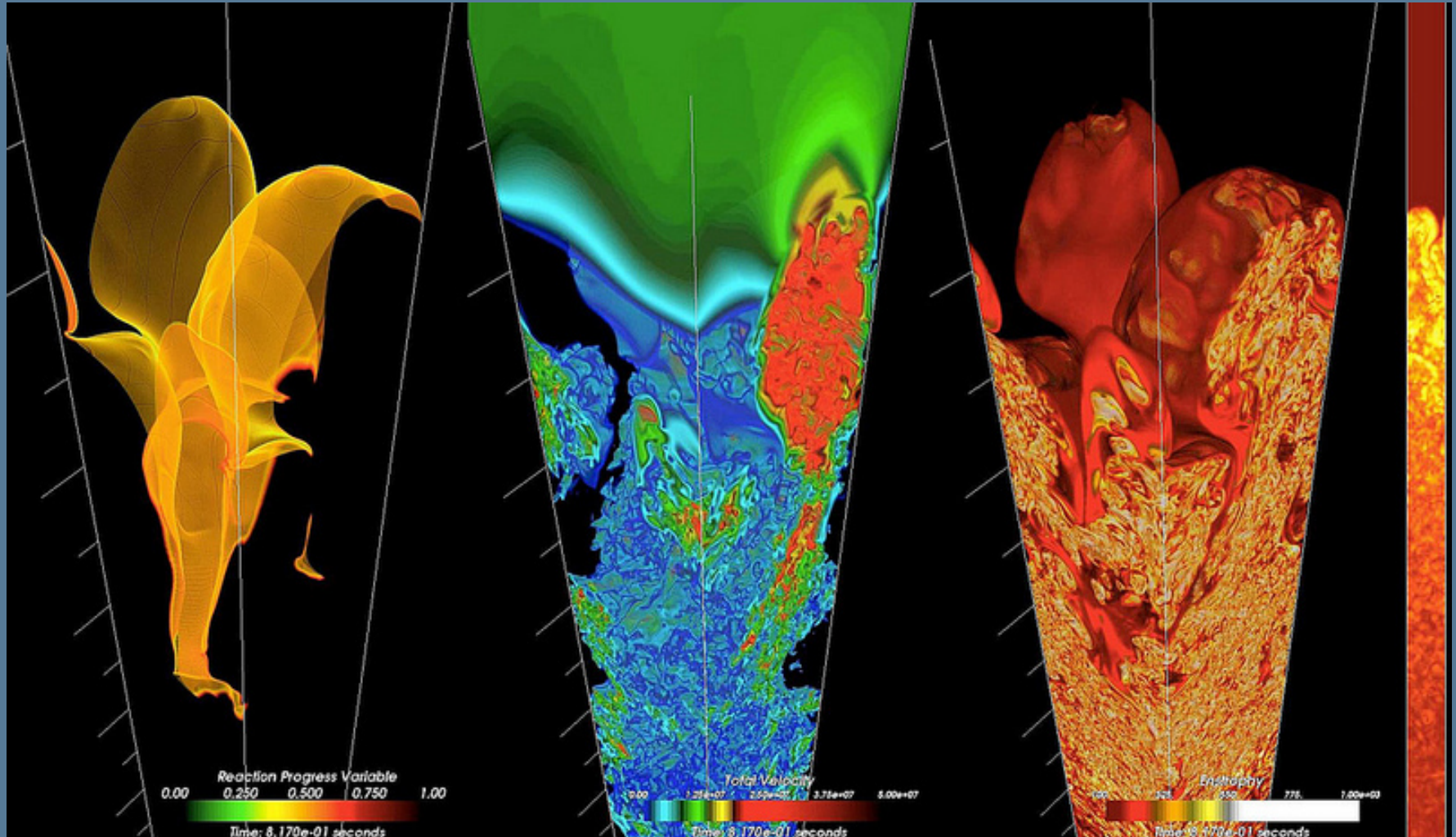
The B61 tactical thermonuclear gravity bomb



USS Nautilus, the world's first nuclear powered submarine (1954)

# Core Capabilities

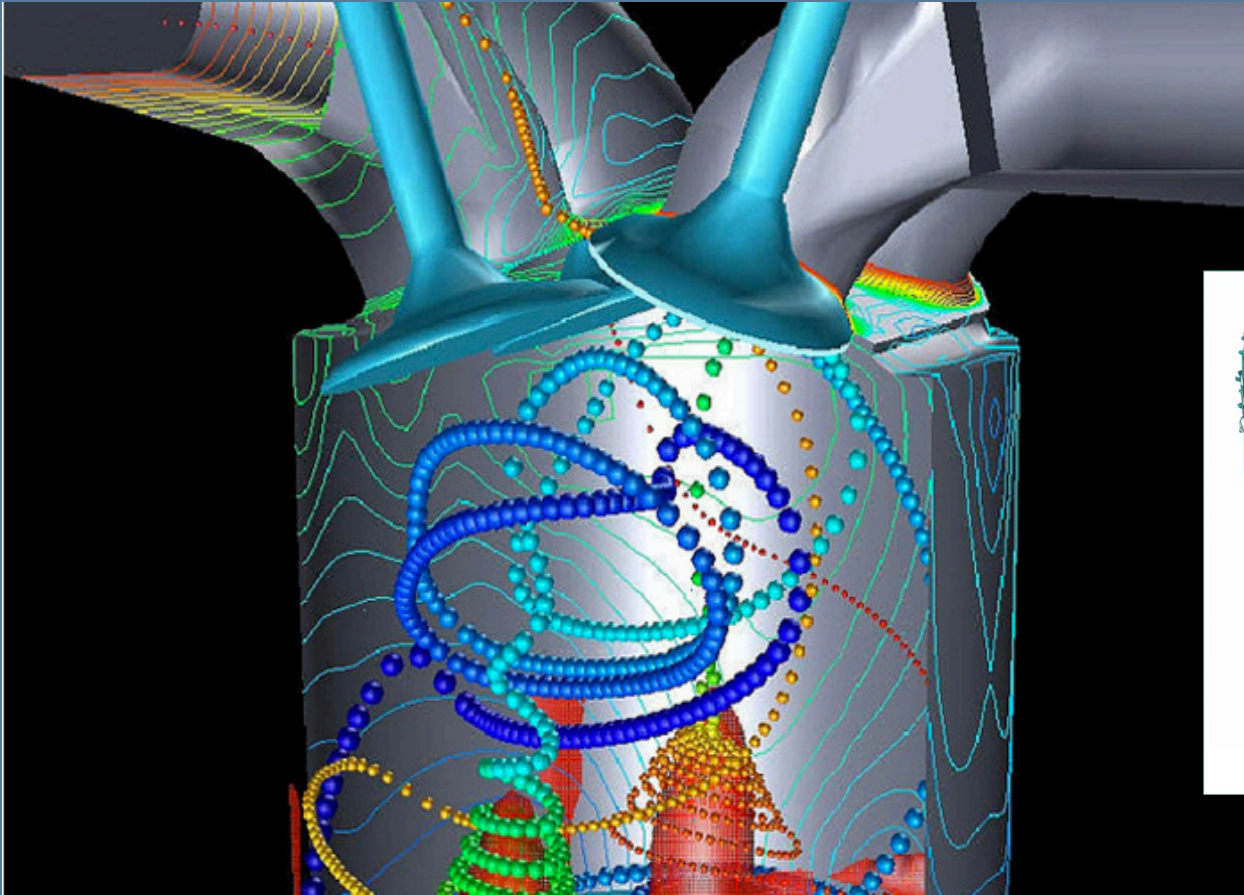
# Supercomputing



Visualizations of a supernova, developed at Argonne National Laboratory



# Supercomputing

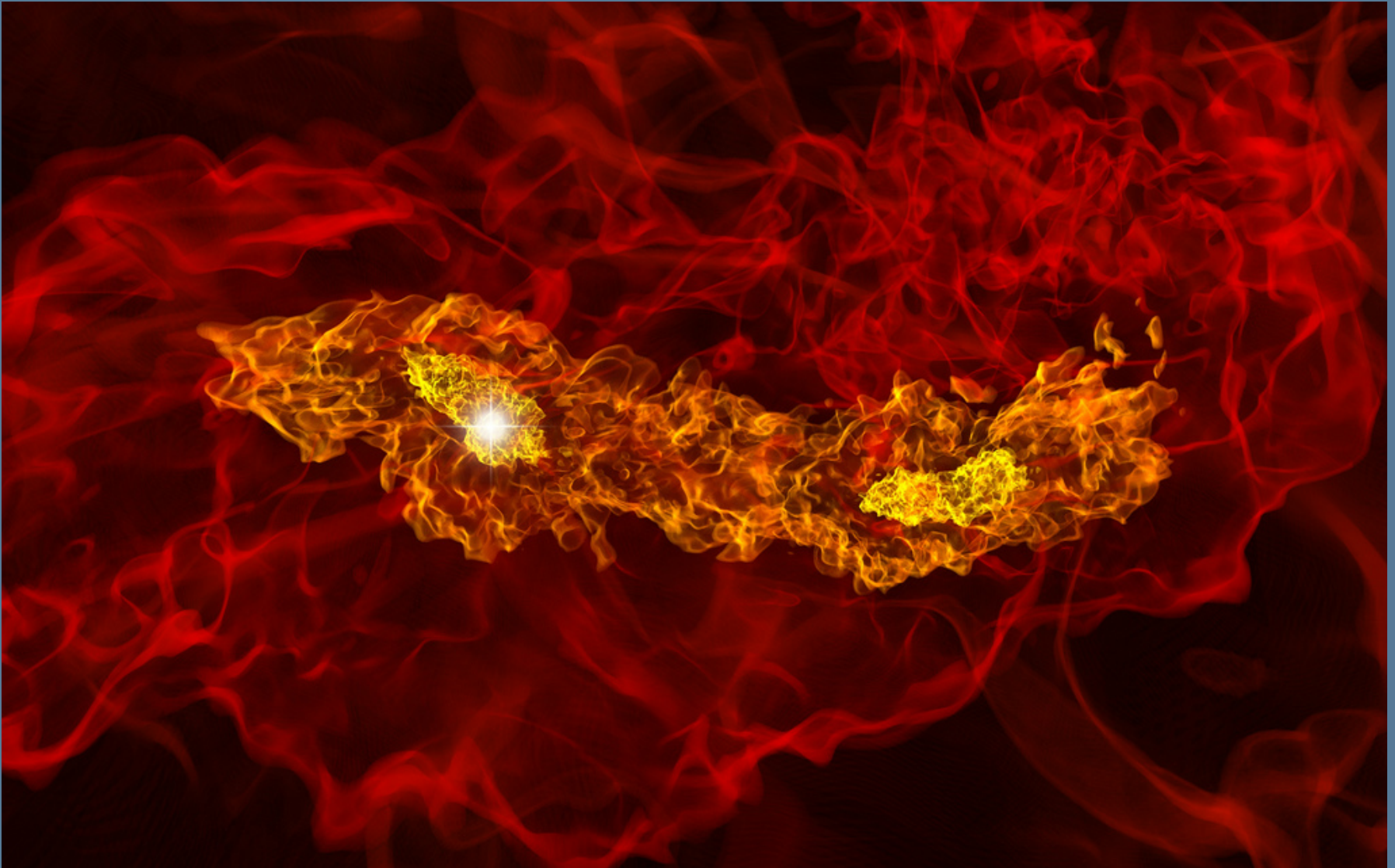


Simulation of internal combustion at Los Alamos National Laboratory



Resulted in development of highly efficient test engine by Cummins

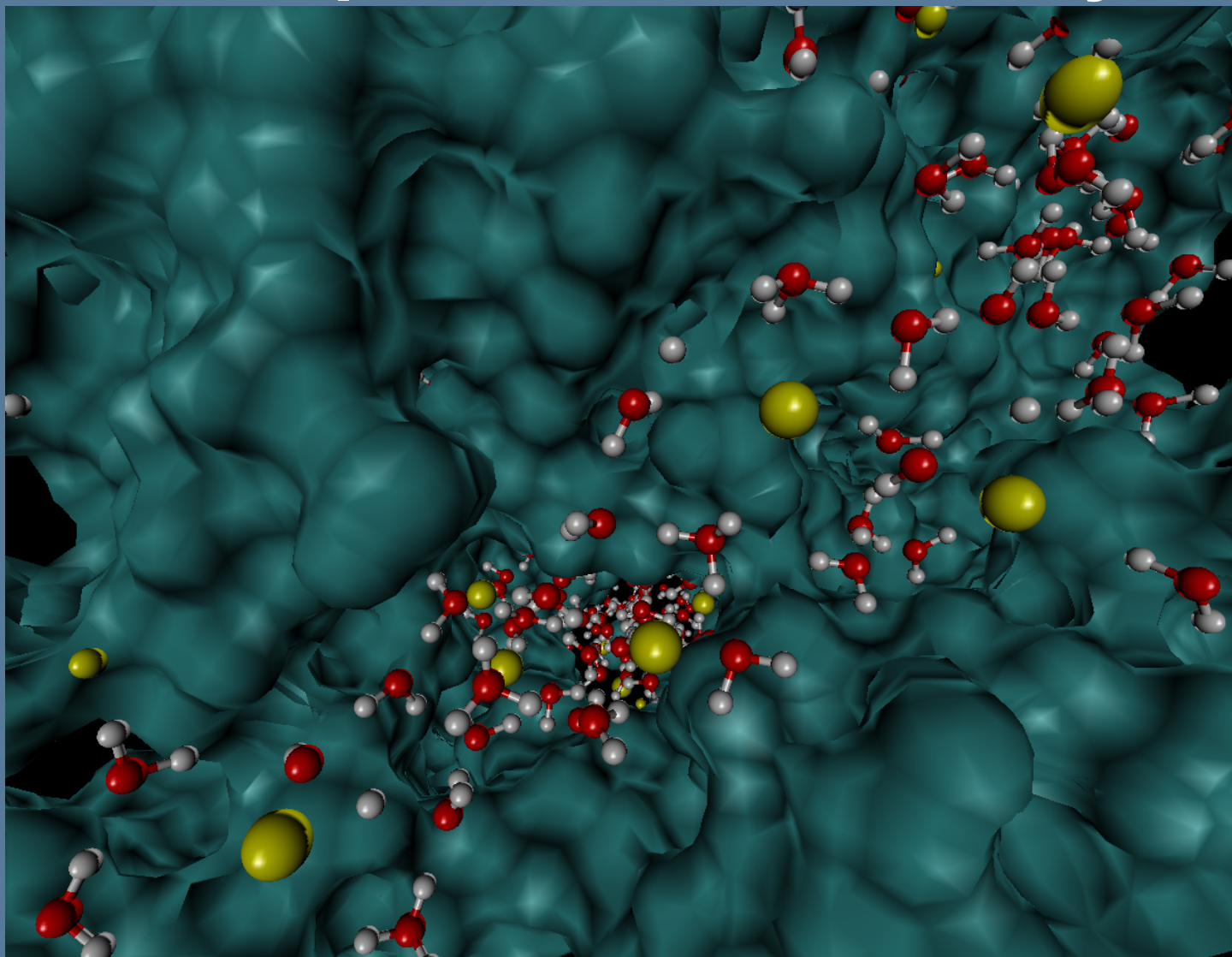
# Computational Modeling



Computer-simulated image shows the formation of two high density regions in the early universe at SLAC National Accelerator Laboratory



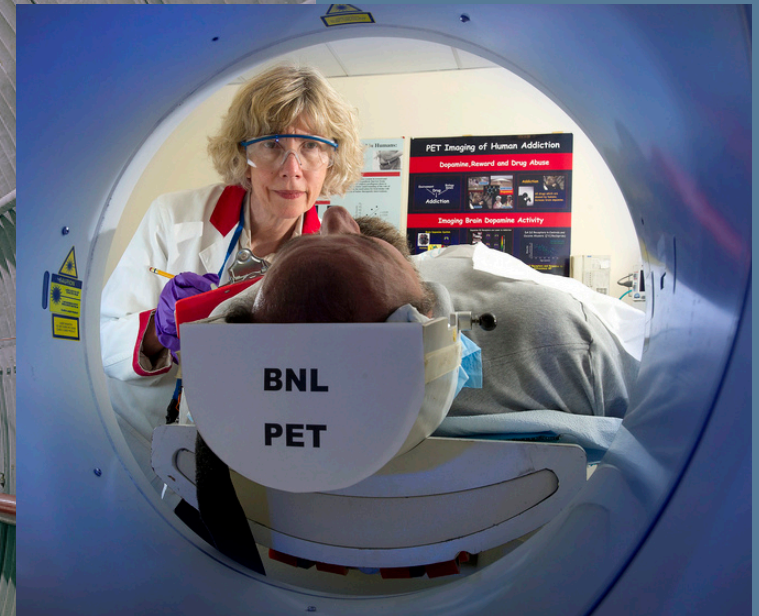
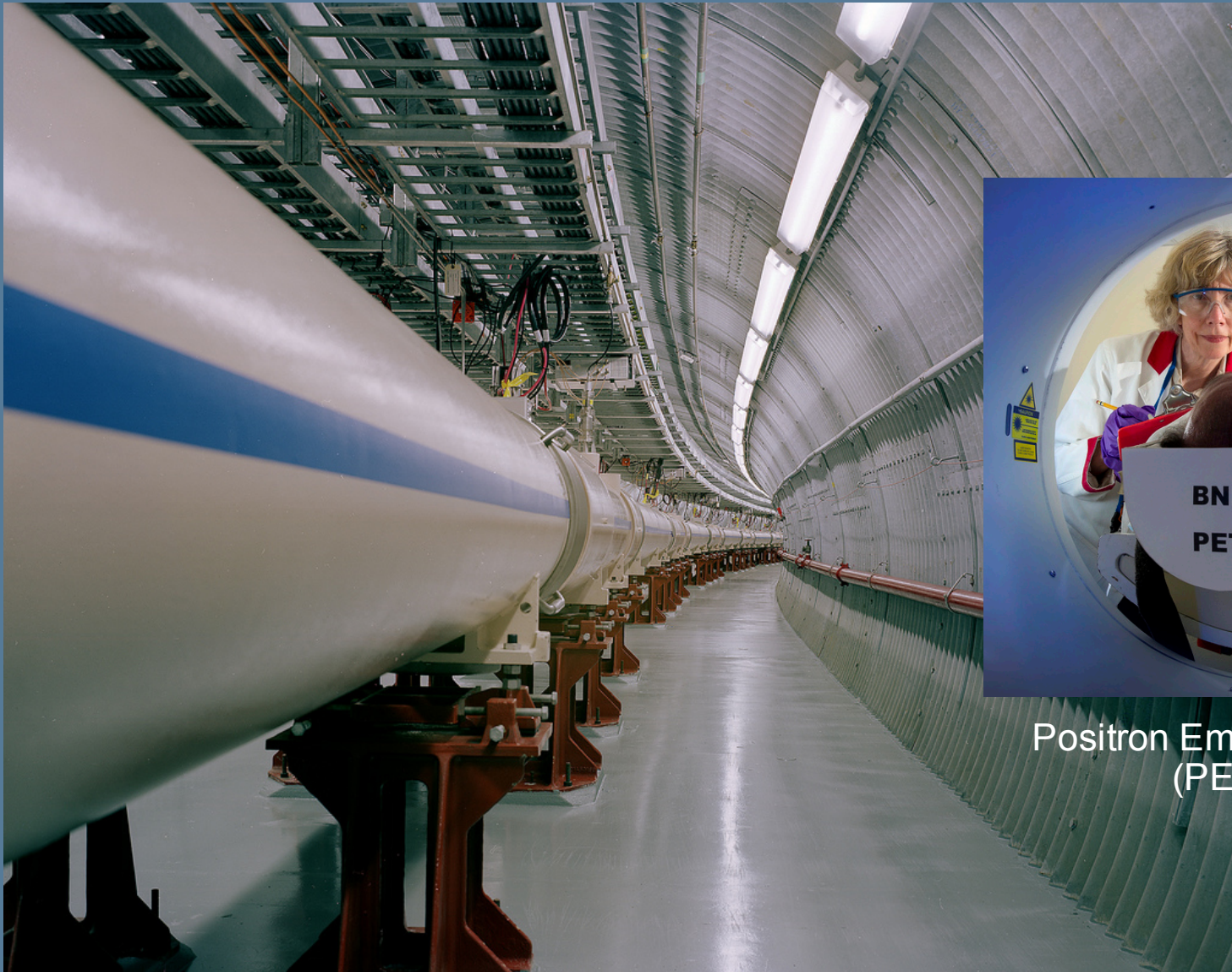
# Computational Chemistry



Computational chemistry at Pacific Northwest National Laboratory



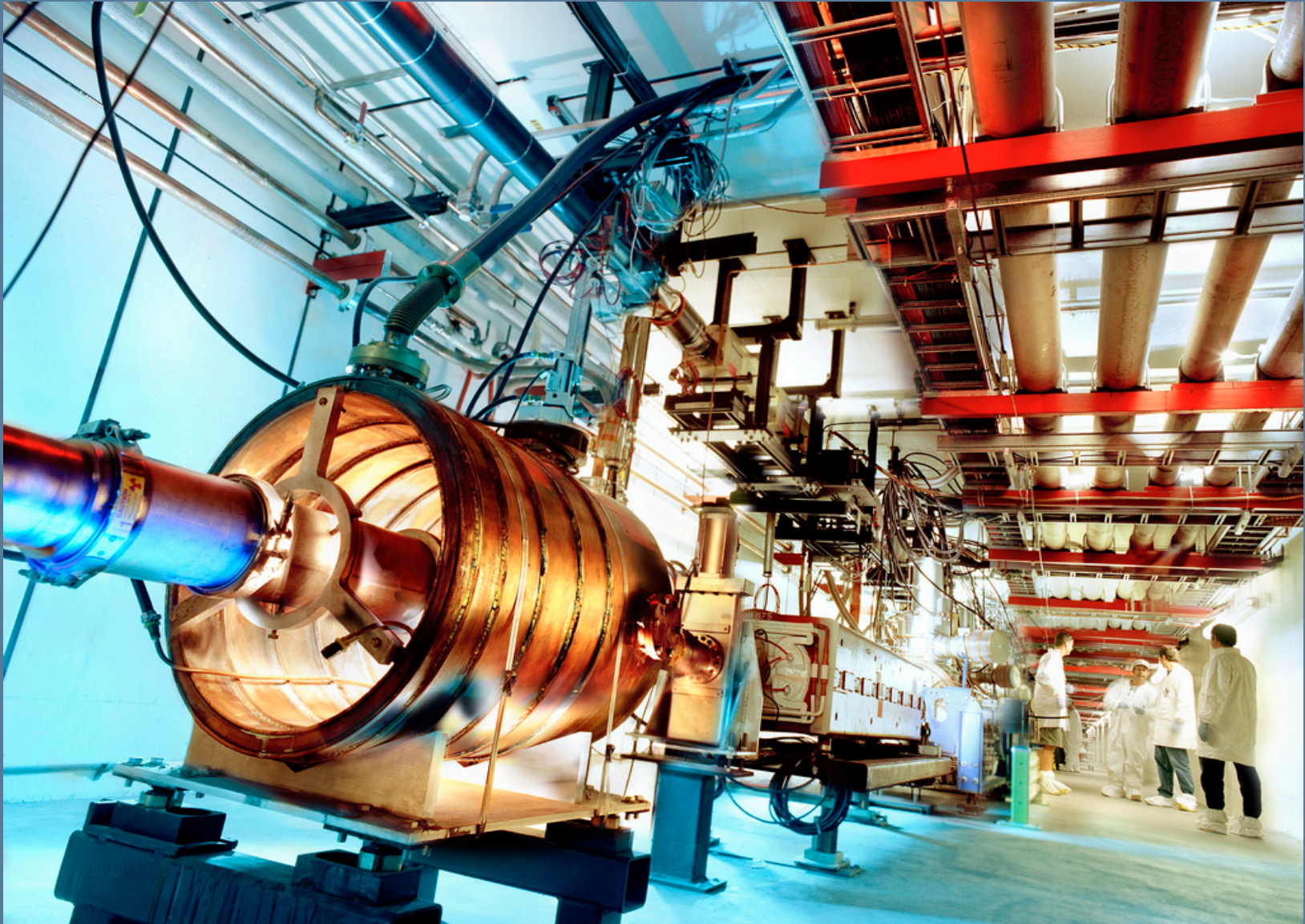
# Particle Accelerators



Positron Emission Tomography (PET) imaging



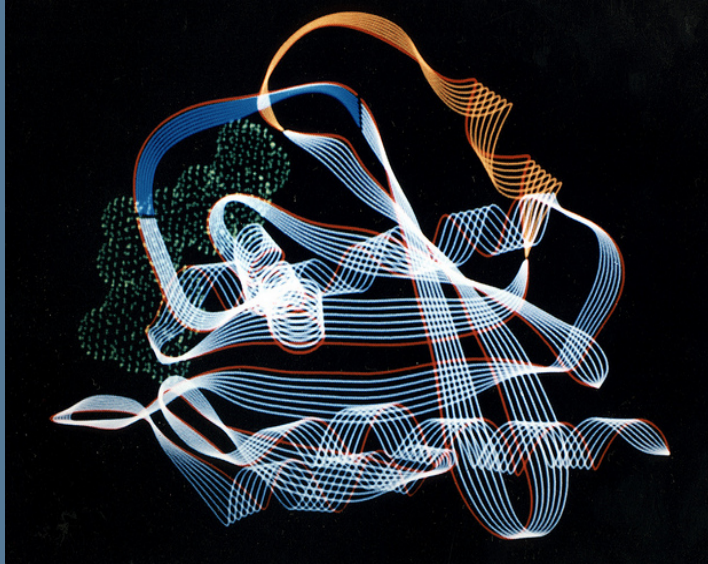
# Particle Accelerators



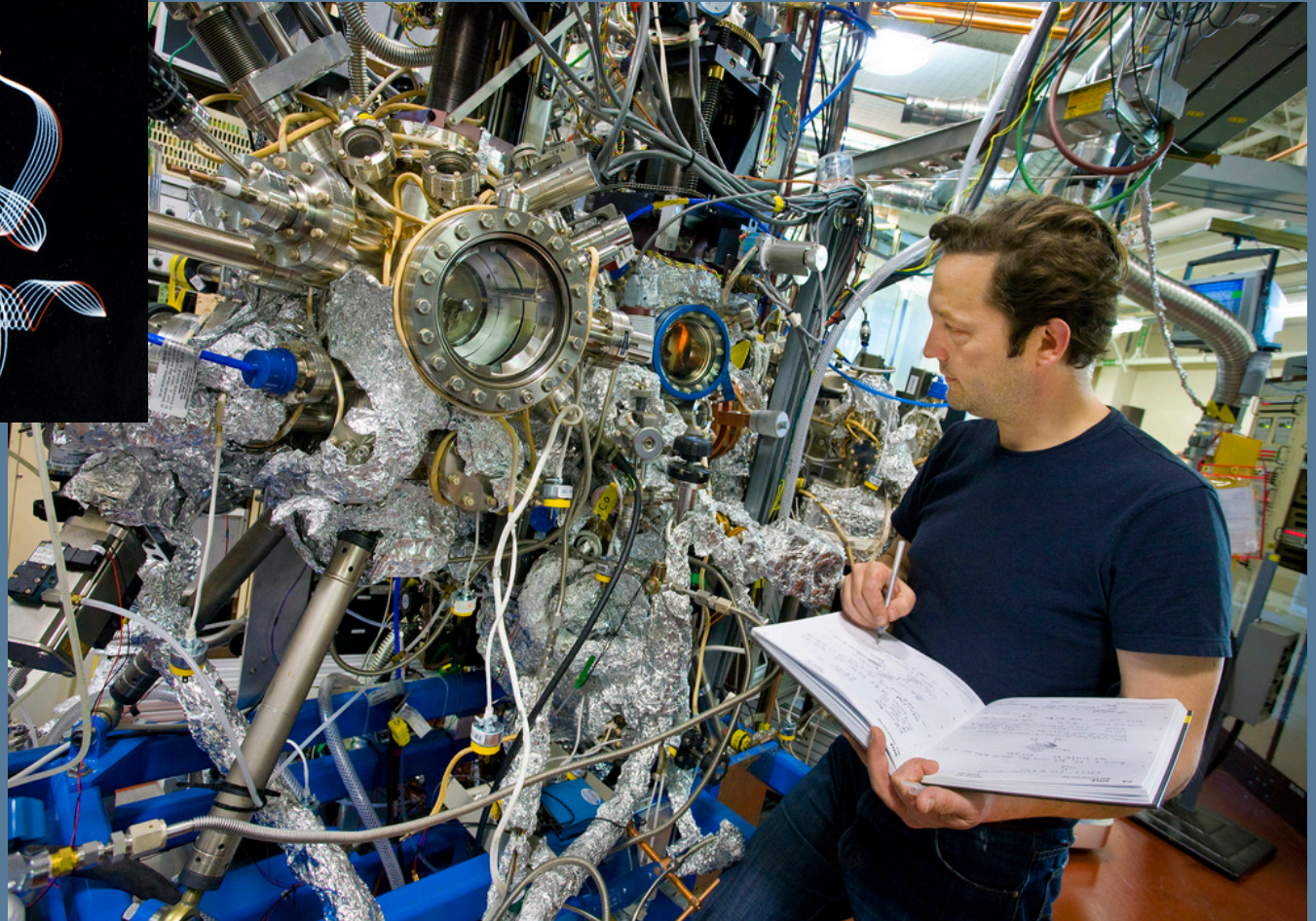
Fermilab's Main Injector Accelerator



# X-Ray Light Sources

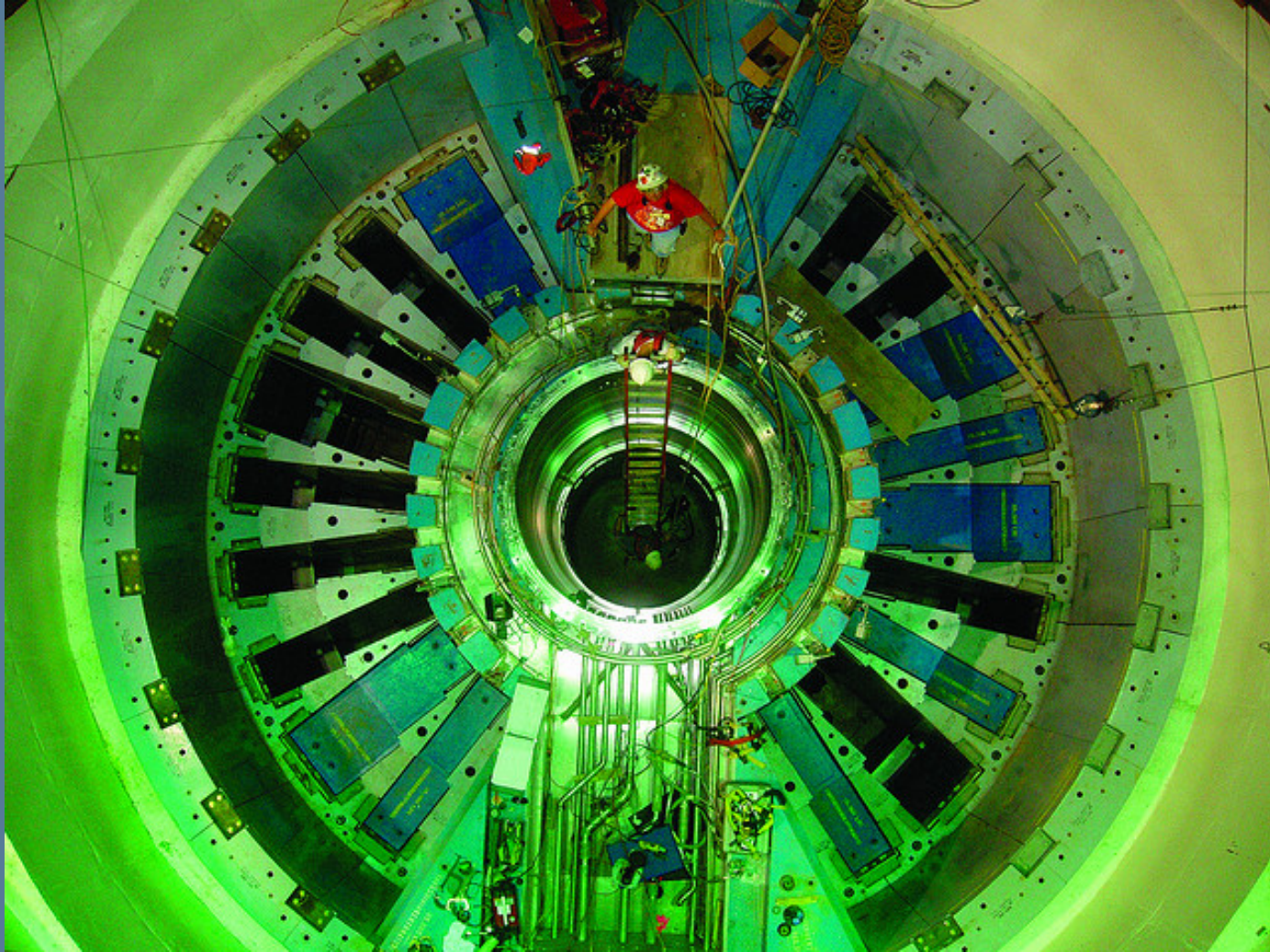


Backbone of the normal gas protein, as determined by x-ray diffraction





# Neutron Scattering Sources



The Spallation Neutron Source chamber at Oak Ridge National Laboratory



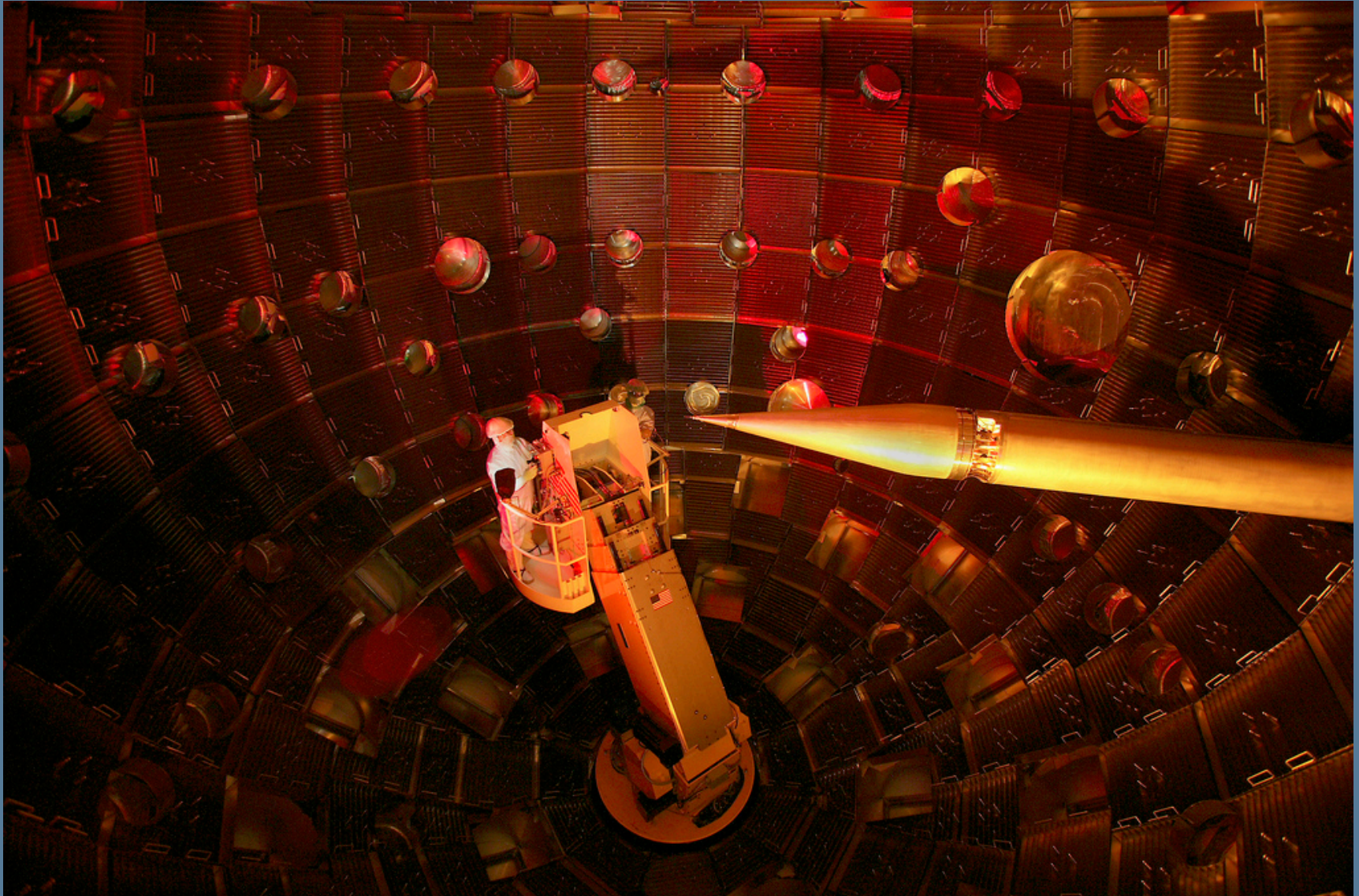
# High Energy Particle Detectors



Superconducting Solenoid installed at Jefferson Lab



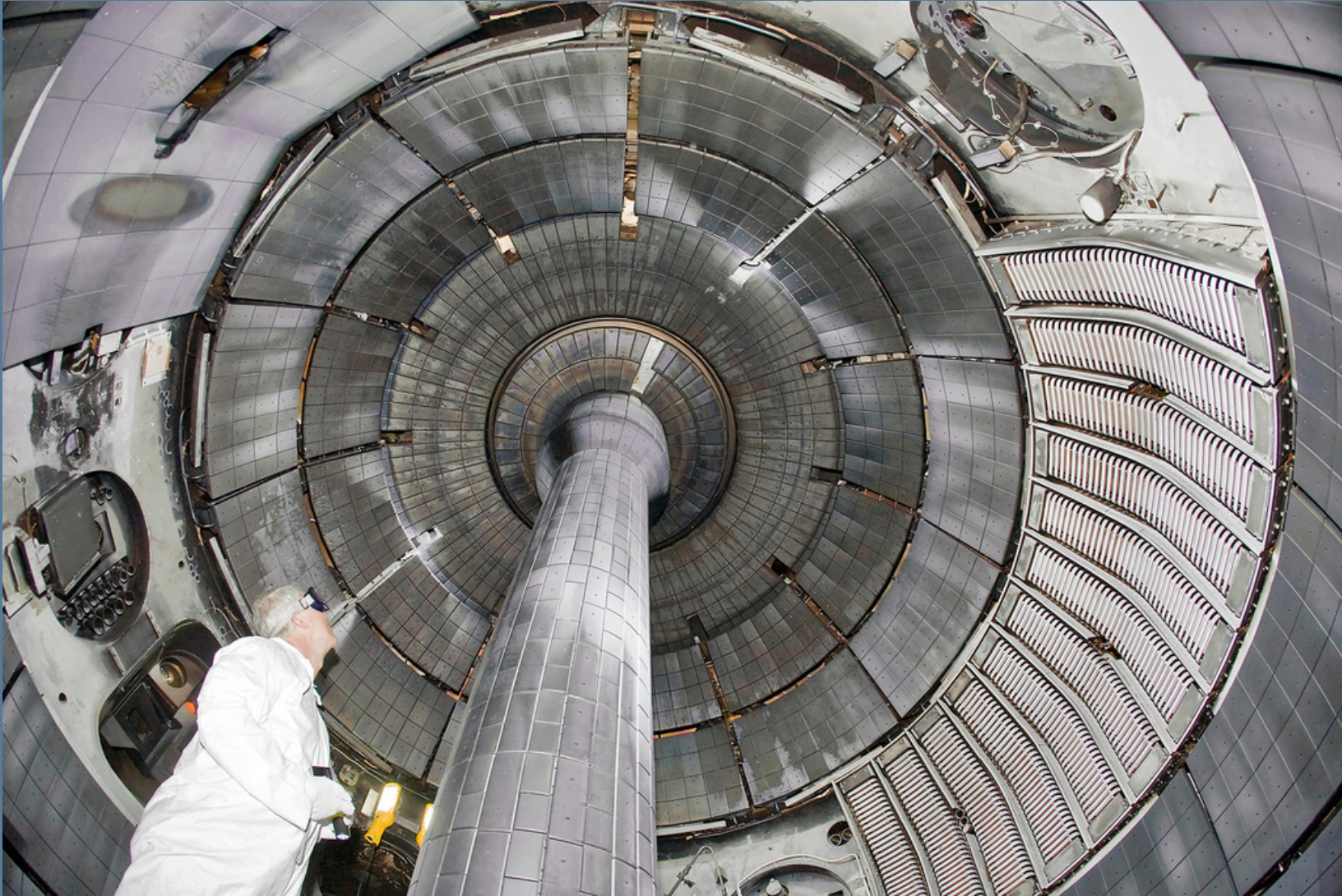
# Fusion Research



National Ignition Facility target chamber at Lawrence Livermore National Laboratory 13

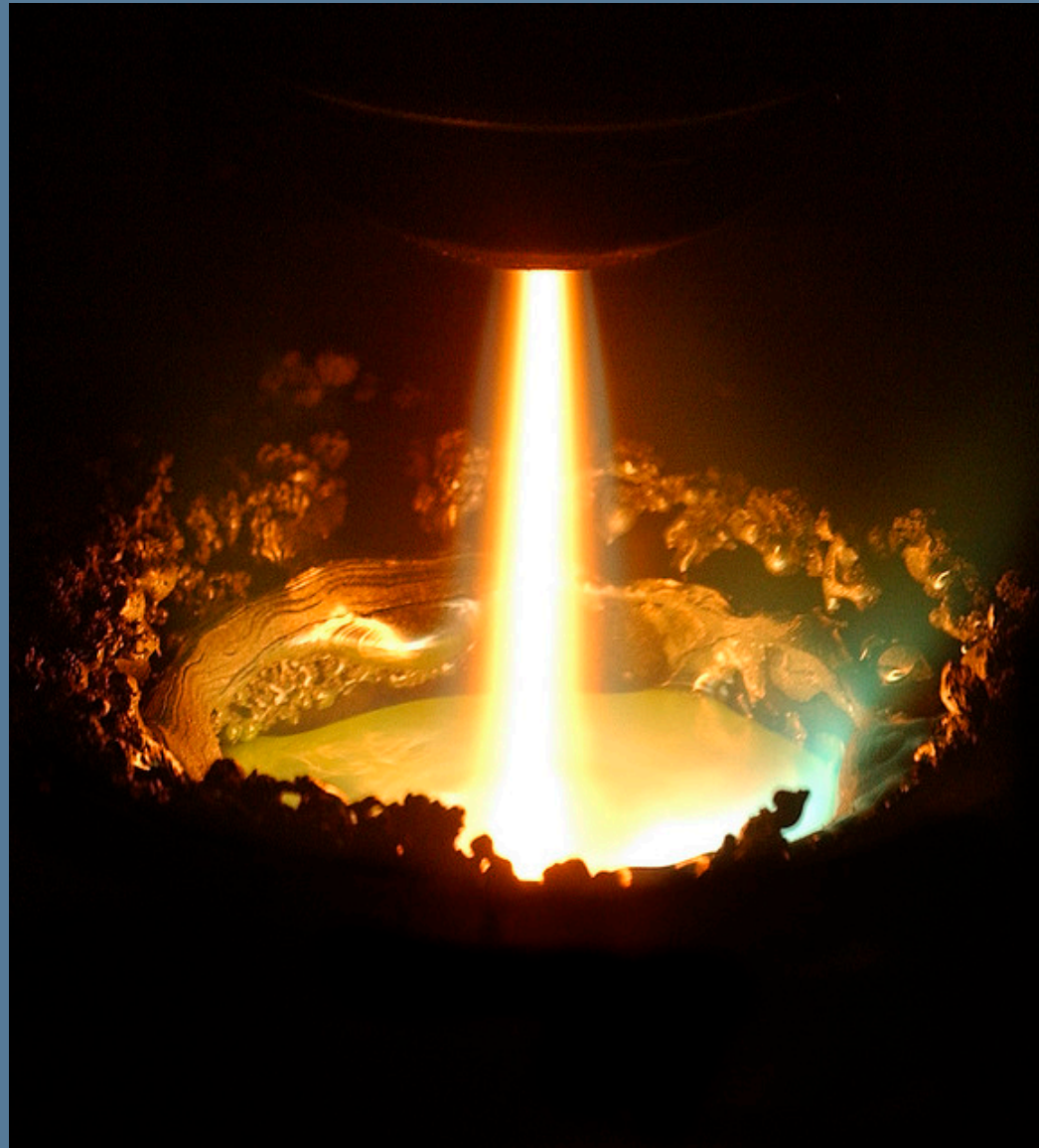


# Fusion Research



National Spherical Torus Experiment at Princeton Plasma Physics Laboratory

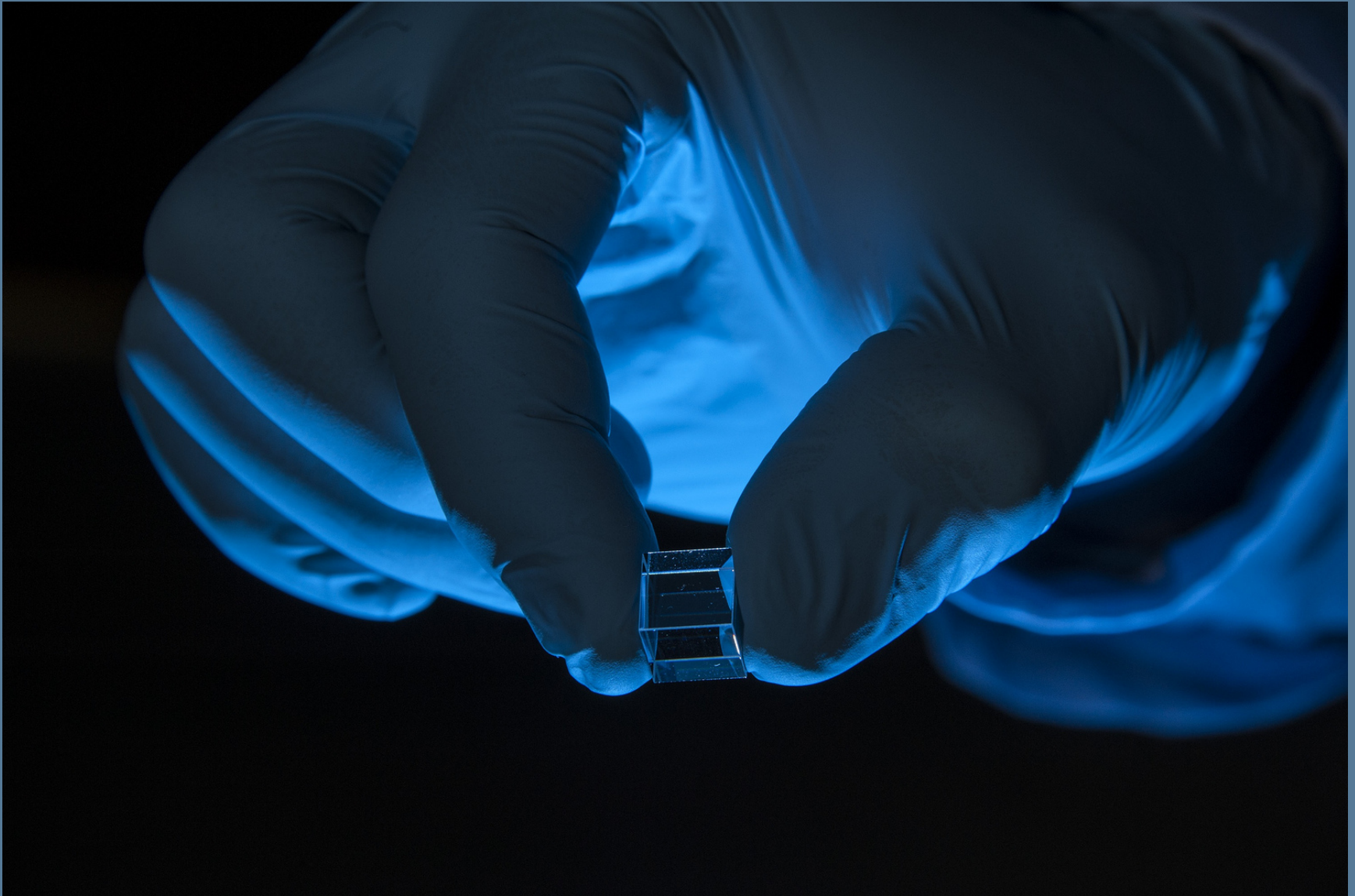
# Critical Materials



Retech plasma furnace used in Ames Laboratory's Materials Preparation Center



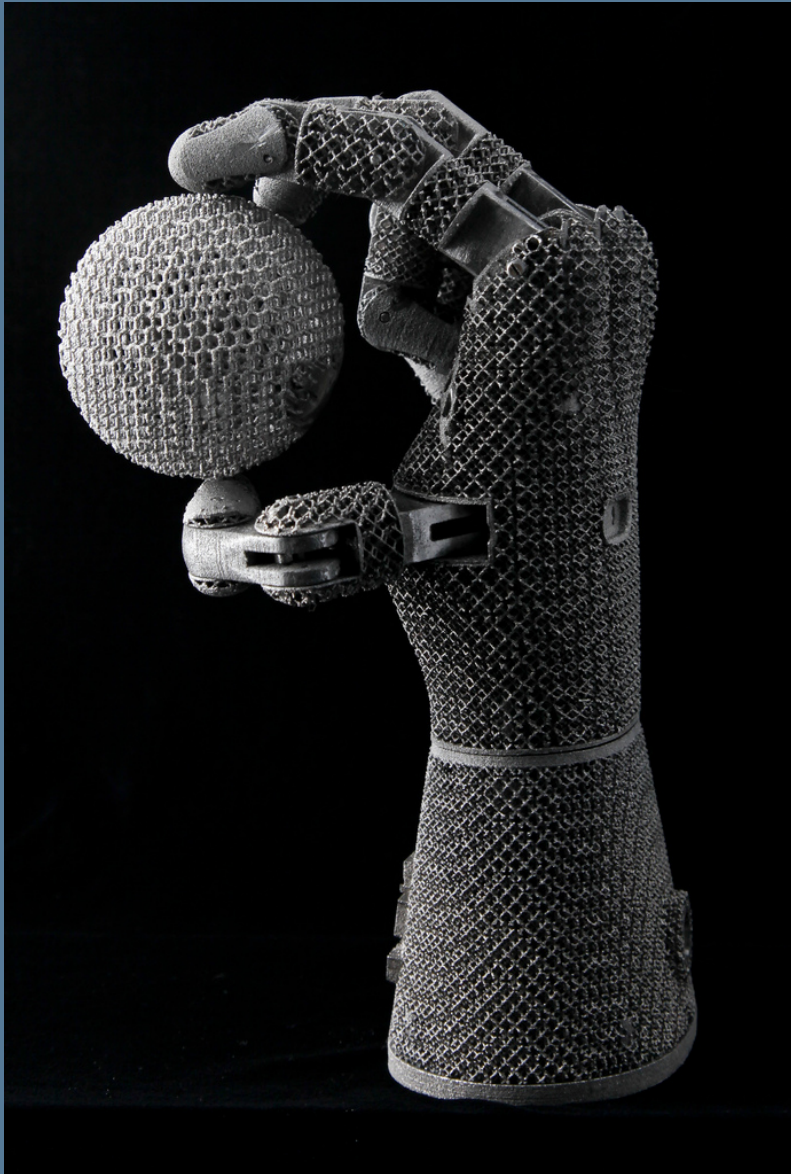
# Advanced Materials for Radiation Detection



Researchers at Savannah River National Laboratory are developing photonic crystals for enhanced radiation detectors <sup>16</sup>



# Additive Manufacturing



Robotic hand fabricated at Oak Ridge National Laboratory using additive manufacturing technology

# Technologies Being Developed and Accomplishments

# Competitive Solar Generation



A First Solar associate at the company's Ohio manufacturing plant, which uses technology developed at the National Renewable Energy Laboratory

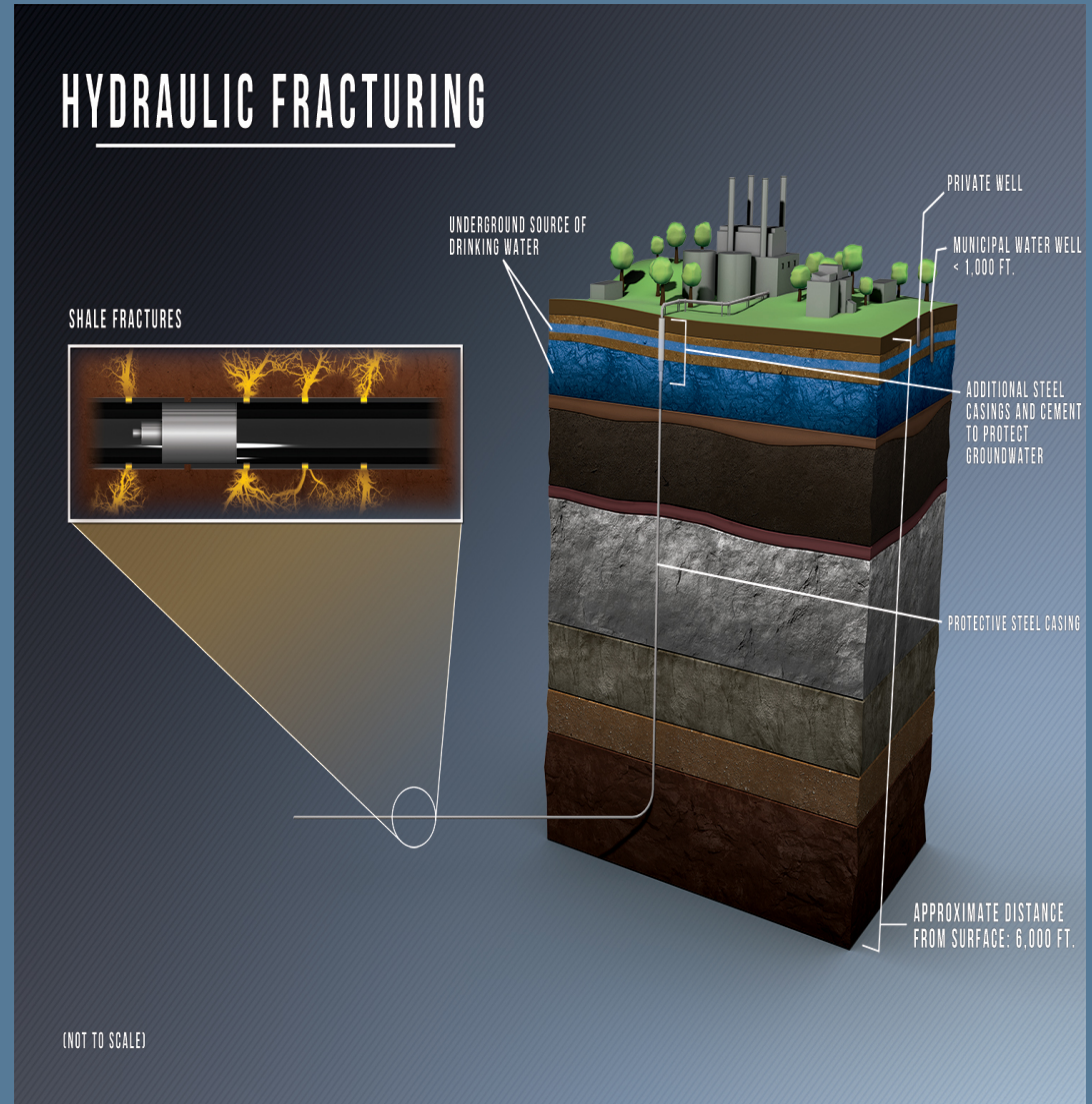
*Courtesy of First Solar*



# Shale Gas Revolution

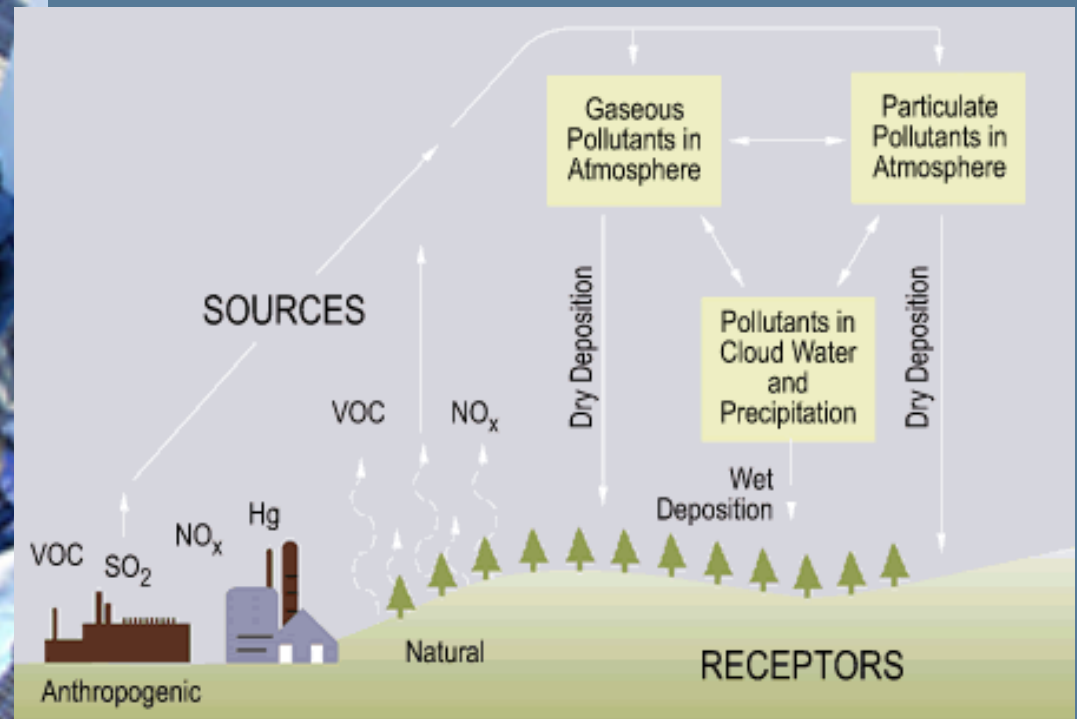
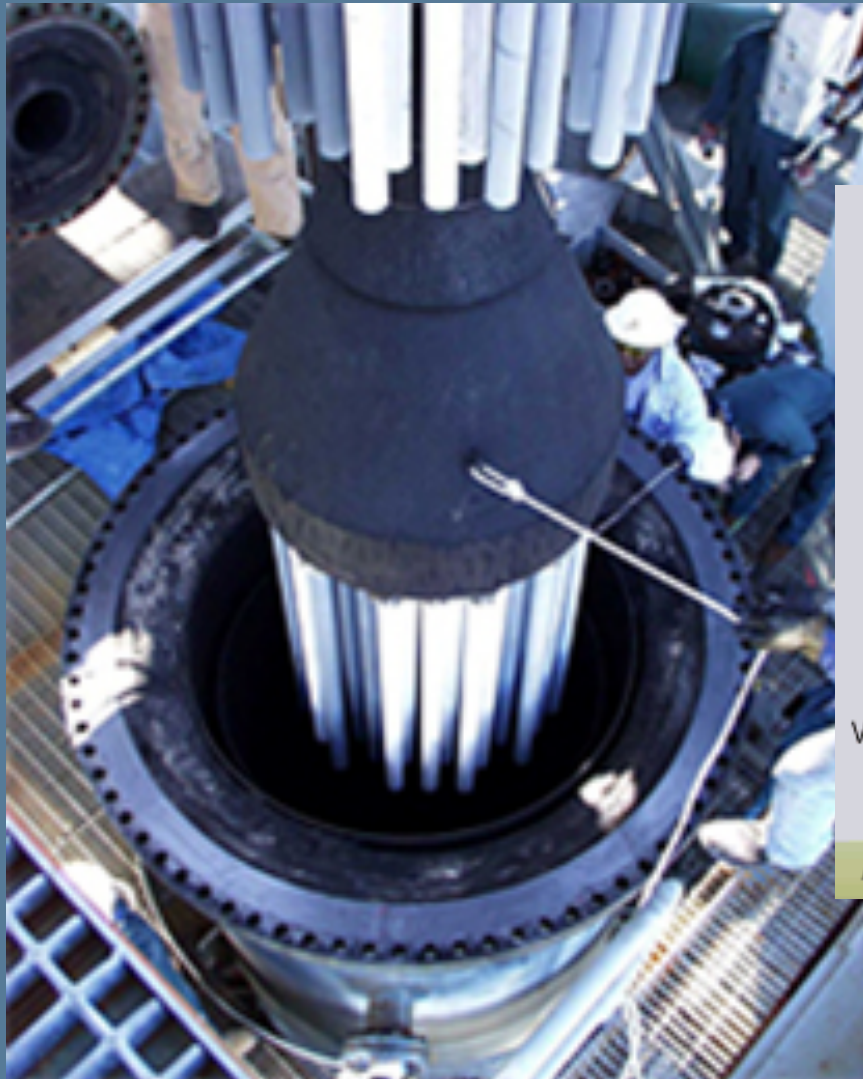


Prototype drill bit used for an experiment in Sandia National Laboratory's Hard-Rock Drilling Facility





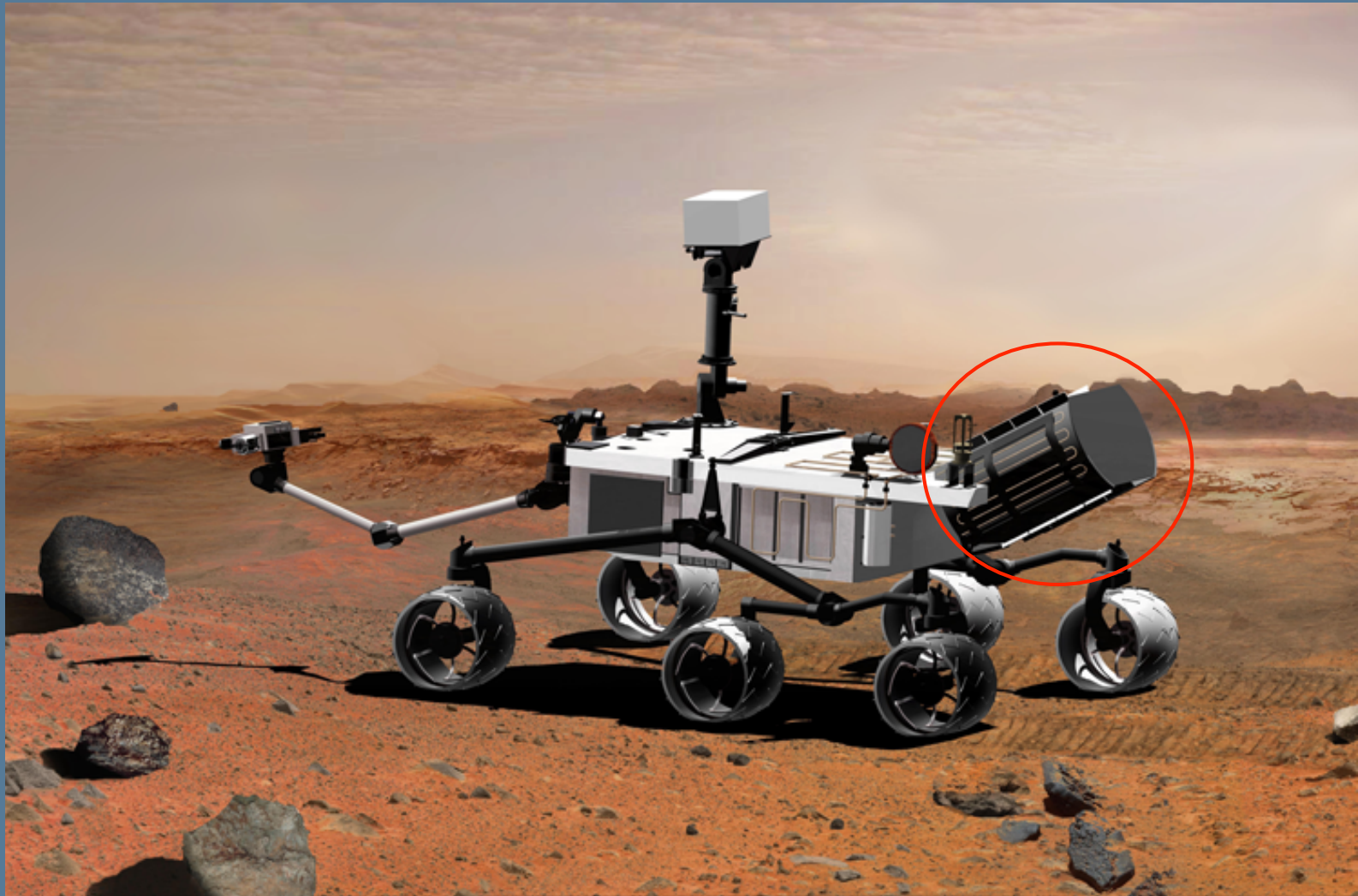
# Advanced Emissions Controls



Acid Rain Cycle

Candle Filter System at the National Energy Technology Laboratory

# Space Exploration



Mars Rover, Curiosity, powered by the Multi-Mission Radioisotope Thermoelectric Generator Advancement designed at Idaho National Laboratory

Photo courtesy of NASA/JPL-Caltech



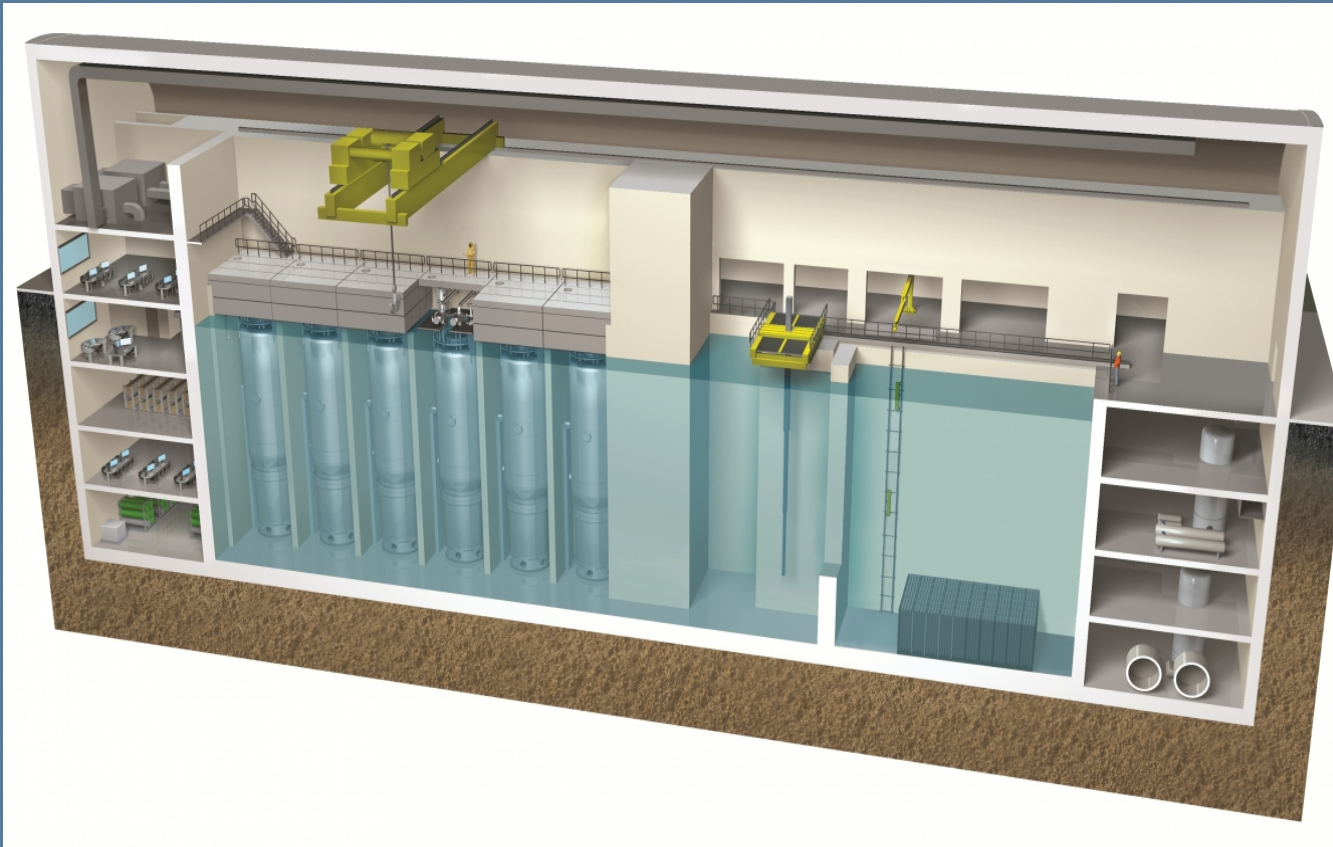
# SuperTruck Initiative



Supercomputing simulations at Oak Ridge National Laboratory led to the UnderTray System, dramatically reducing drag and increasing fuel mileage



# Small Modular Nuclear Reactor



NuScale Nuclear Power Reactor

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# Carbon Capture & Storage



Carbon capture technology testing at the National Carbon Capture Center located in Wilsonville, Alabama

# Smart Grid Technologies

*The Smart Grid Can Deliver*

**BENEFITS**

- Enhanced energy security
- Reduced greenhouse gases
- Improved urban air quality
- Increased grid asset utilization

**"Valley Filling" (Energy for PHEVs)**

Hours of day

Category	Value (Relative)
CO <sub>2</sub> Emissions	High
Urban Emissions	Medium
Electricity Sales	Low
Infrastructure Requirements	Medium
Utility Rates	High

Public Transport National Laboratory