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Oak Ridge National Laboratory and the University of Tennessee

Technology for Today and the Future

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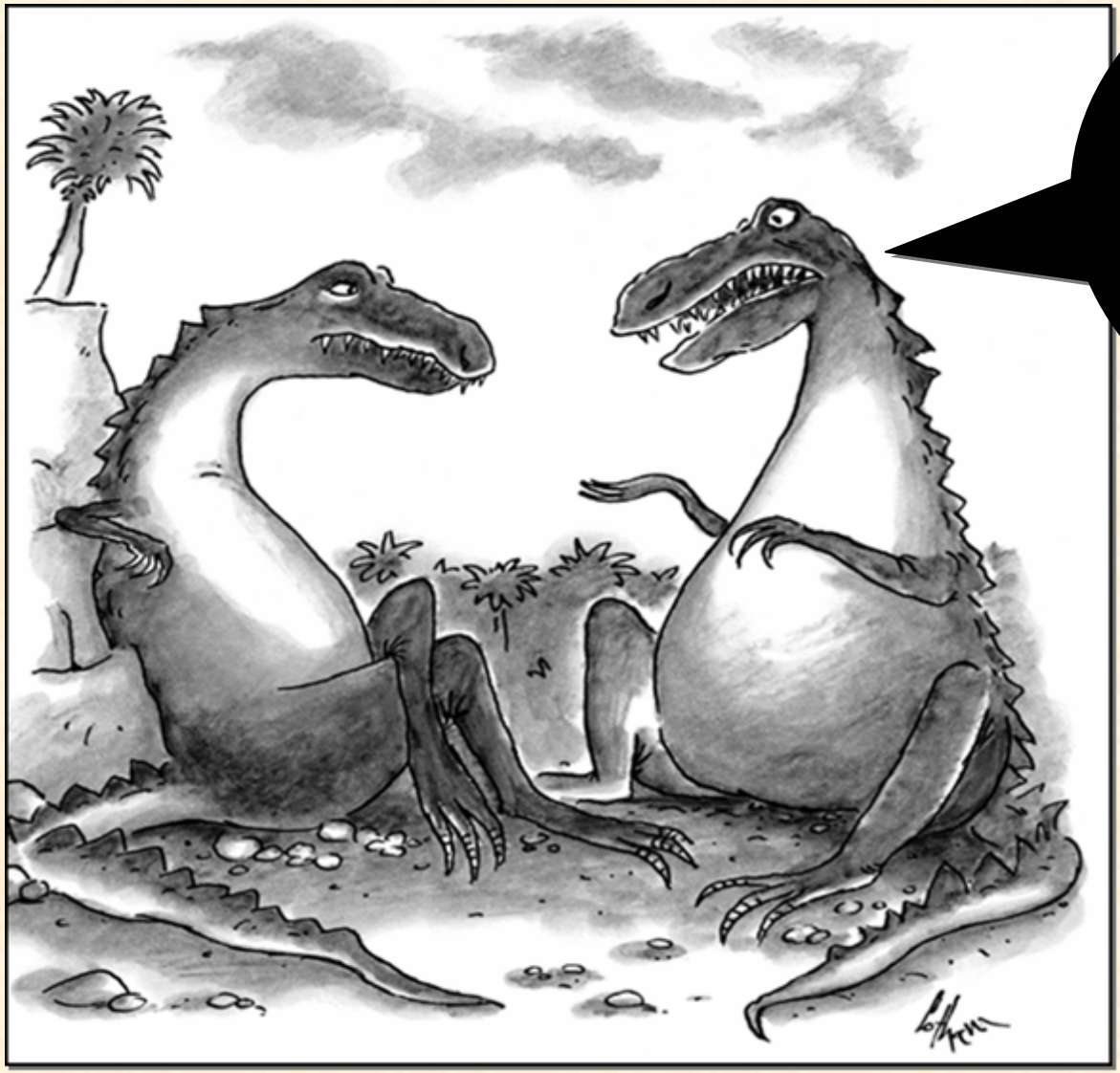
Oak Ridge, Tennessee

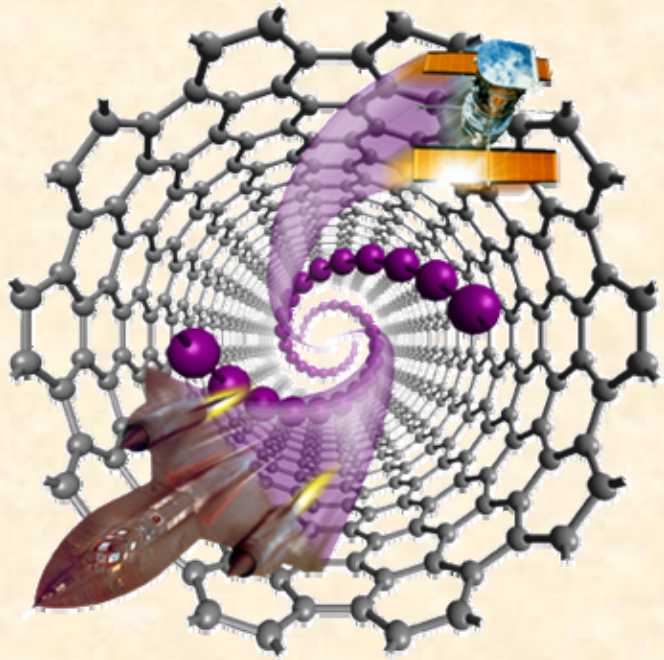

"All I'm saying is, now is the time to develop the technology to deflect an asteroid."

Today, ORNL is DOE's largest multipurpose science laboratory

- **$1.08 billion budget**
- **4,000 employees**
- **3,000 research guests annually**
- **Nation's largest unclassified scientific computing facility**
- **Nation's largest science facility: the $1.4 billion Spallation Neutron Source**
- **Nation's largest concentration of open source materials research**
- **Nation's largest energy laboratory**
- **$300 million modernization in progress**

Our aspiration:
Best lab in the world at what we do

- **Control of functionality at the nanoscale**
- **Leadership-class computing for the frontiers of science**
- **Integration of biology and ecology, based on the foundation of understanding molecular-level interactions**
- **Integration of science, technology, and thought leadership for energy**
- **Innovative solutions that improve national, homeland, and global security**



We have significant strengths in key areas

Radiological and nuclear weapons countermeasures

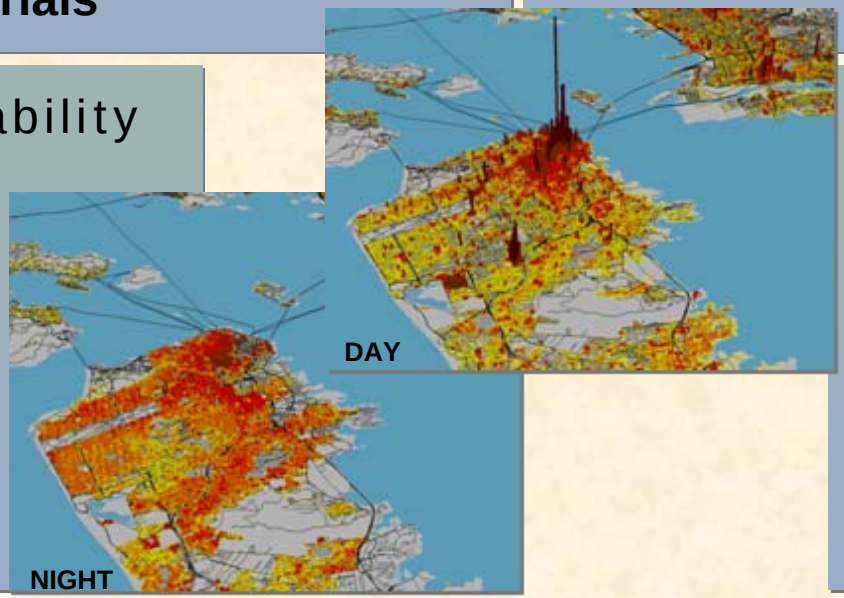
- **RDD attribution studies, forensics program development, and decontamination of the aftermath**
- **Active interrogation technologies**
- **Radiation detection technologies and new materials**

Chemical and biological

- **Mass spectrometry**
- **Bioinformatics**
- **Host-pathogen interactions**

Threat vulnerability testing and assessment

- **Geospatial science**
- **Plume/effect modeling**
- **Cybersecurity technology**



Crosscutting

- **Sensor technologies**
- **Knowledge discovery**

Significant advances in sensors and detectors

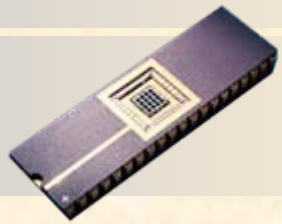
Block II Chemical-Biological mass Spectrometer Detector

Microcantilever sensors for detection of explosives and chemicals

AquaSentinel for water supply protection

RAMiTS for detection of chemical agents and other hazardous chemicals

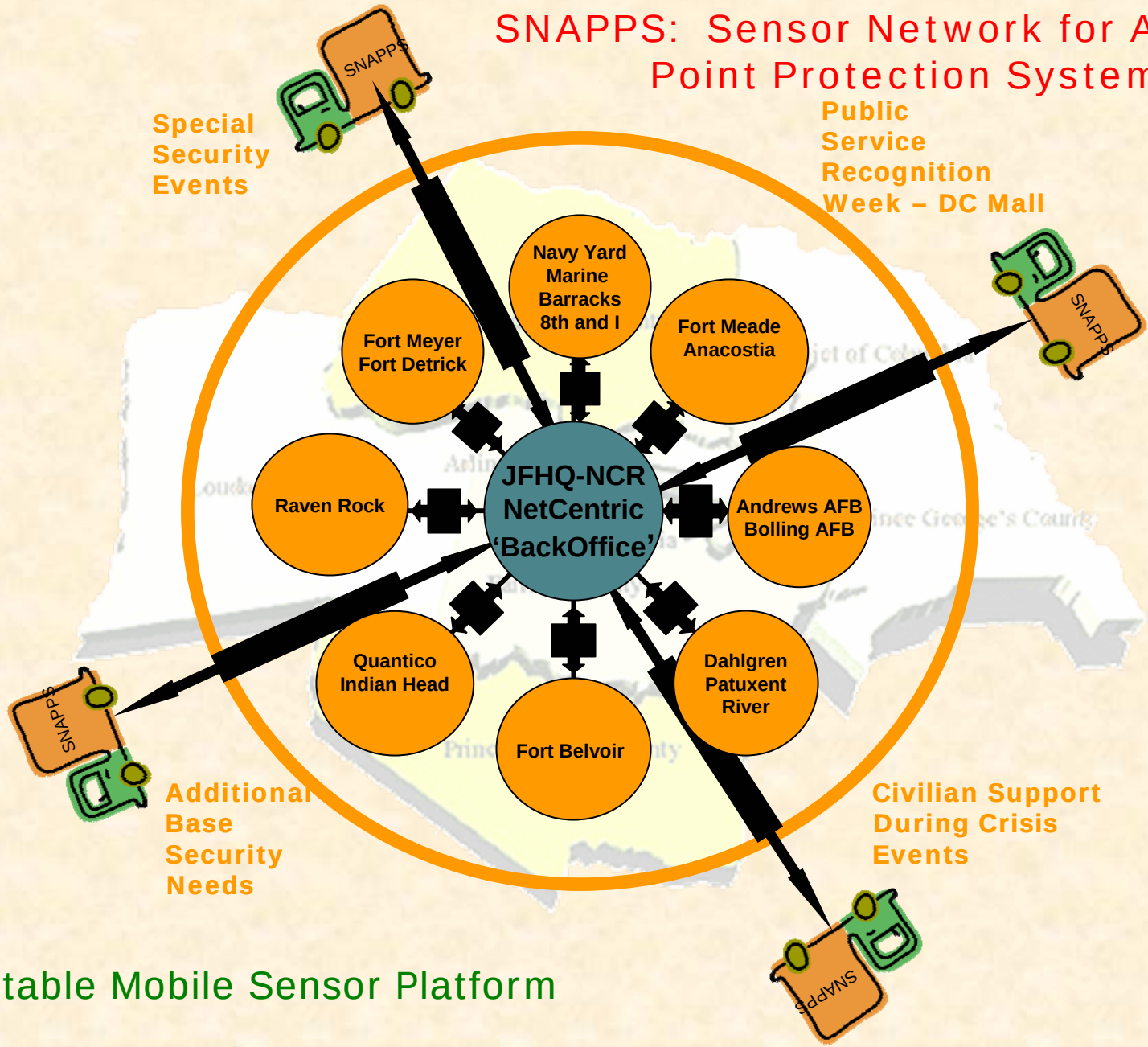
Biochip for detection of bacteria, viruses, and toxins



Forward Area Semi-Autonomous Robotic Tactical Detection & Decontamination

Advanced Technology Assessment

SNAPPS: Sensor Network for Area and Point Protection System



Re-locatable Mobile Sensor Platform

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

ornl

Summer Workshop
Net-Ready Sensors: The Way Forward

What: The National Institute of Standards and Technology (NIST), the Joint Program Executive Office, Chemical and Biological Defense (JPEO-CBD), and Oak Ridge National Laboratory (ORNL) are sponsoring a two-day workshop on "Net-Ready Sensors: A Way Forward."

Where: ORNL's campus in **Oak Ridge, Tennessee**

When: August 2-3, 2006

The Net-Ready Sensors Workshop will provide an opportunity for developers and subject matter experts to share their interests in the DoD's development of **net-centric CBRN sensor architectures**. This will be an unclassified workshop. The agenda will include presentations and discussions on plug and play standards for sensor networks, sensor data standards, commercial offerings for net-centric sensor applications, and sensor network research.

The Workshop organizers are David Godso, of JPEO-CBD, Bryan Gorman, of ORNL, and Kang Lee, of NIST.

Interested parties wishing to participate in the workshop should contact one of the organizers (see below) by 1 July 2006. Attendance will be limited to 40 participants.

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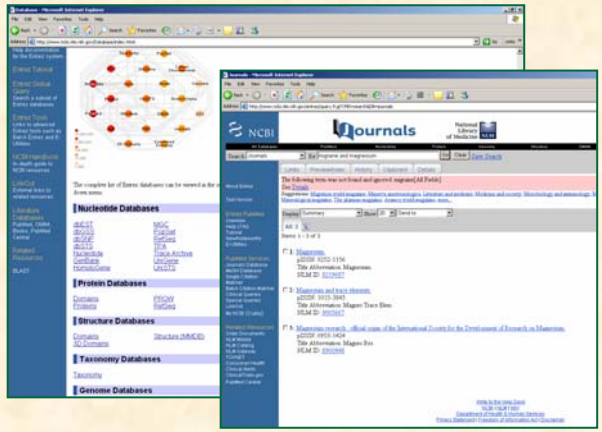
Knowledge Discovery from Text: A Success Story

Biomedical Journals

Low Cross-reference within disciplines

PubMed Archives

Online Archive of Medical Journals



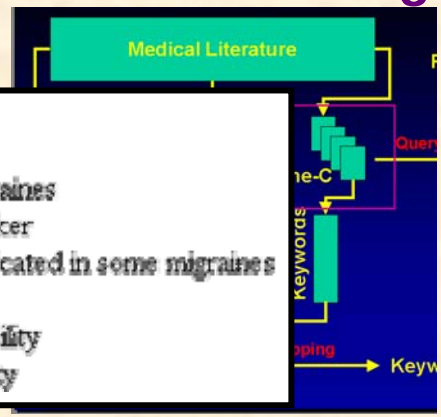
Question:

What causes migraine headaches?

Text Analysis and Mining

Extracted evidence from titles of articles in the biomedical literature

- stress is associated with migraines
- stress can lead to loss of magnesium
- calcium channel blockers prevent some migraines
- magnesium is a natural calcium channel blocker
- spreading cortical depression (SCD) is implicated in some migraines
- high leveles of magnesium inhibit SCD
- migraine patients have high platelet aggregability
- magnesium can suppress platelet aggregability



Swanson, 1987
Swanson et al., 1991, 1994, 1997

Example from Hearst, 1999

New Hypothesis:

Magnesium Deficiency leads to Migraine

(**New** medical knowledge)

Ramadan et al., 1989

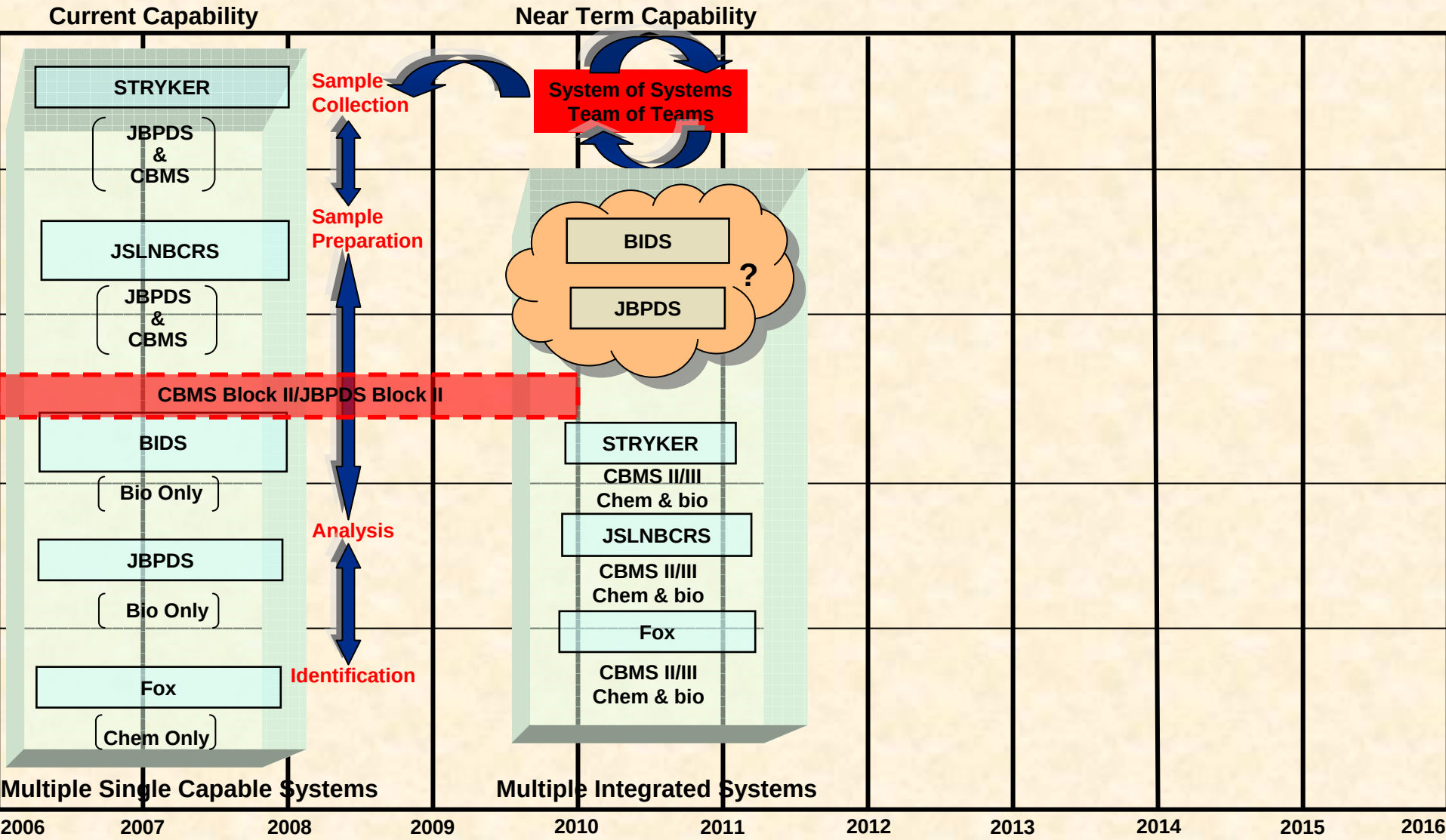
Confirmed by Experts

Hypothesis Generation: ***"Chains of causal implication within the medical literature can lead to hypotheses for causes of rare diseases"***

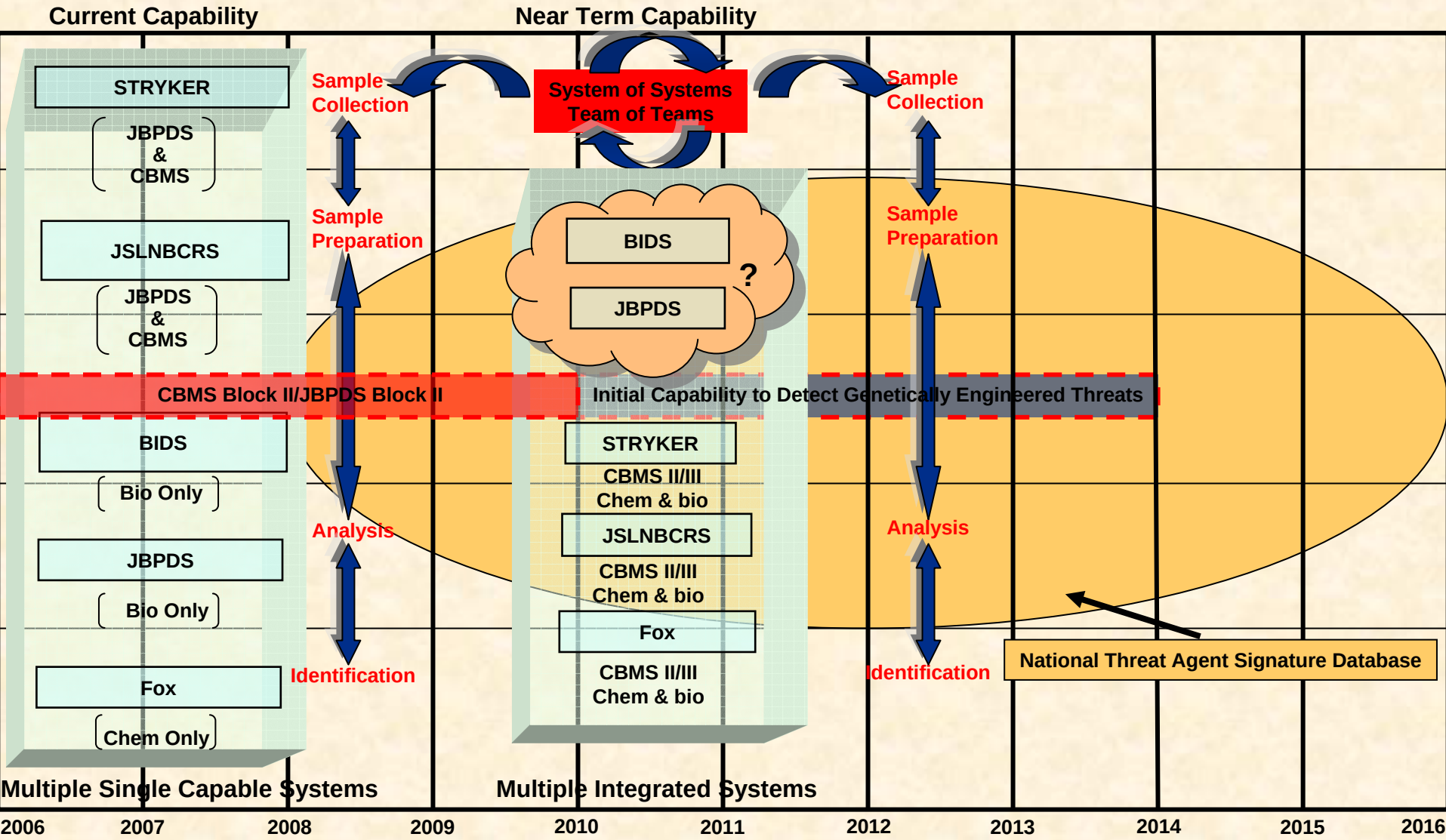
Pursuing The Challenges of The Future - Detection of Genetically Modified Organisms

- **A System of Systems approach to the detection of chemical and biological agents with a focus on genetically engineered organisms (GMOs)/genetically engineered threats (GETs)**
  - **A true National/Grand Challenge – could be the Manhattan Project for the21st Century**
- **Pulling together world-class researchers, Oak Ridge National Laboratory and UT faculty**
- **ORNL Laboratory Agenda Item – significant laboratory directed research and development (LDRD) funding**

Strategic Roadmap for Genetically Engineered Threat Detection



Strategic Roadmap for Genetically Engineered Threat Detection



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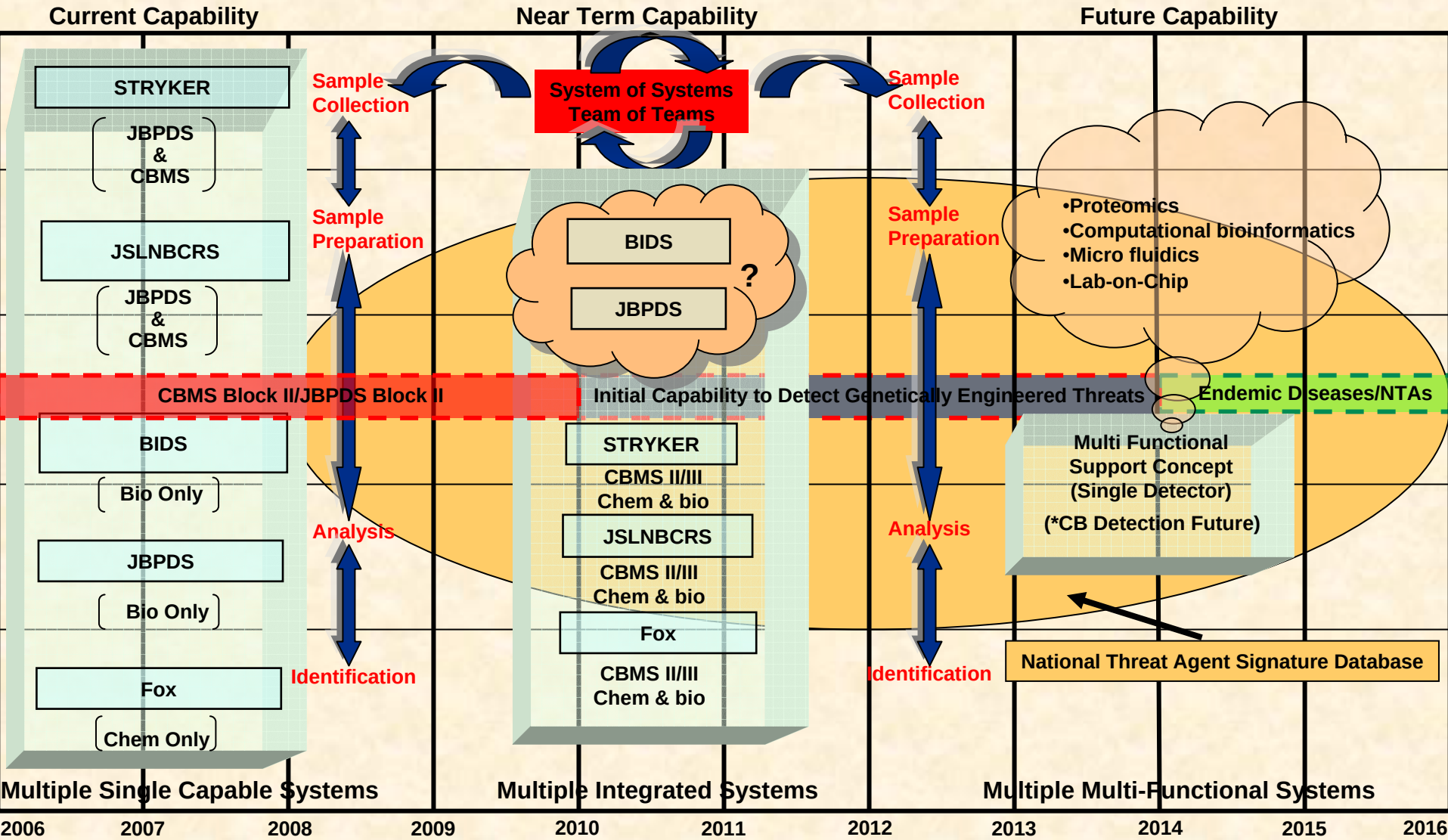

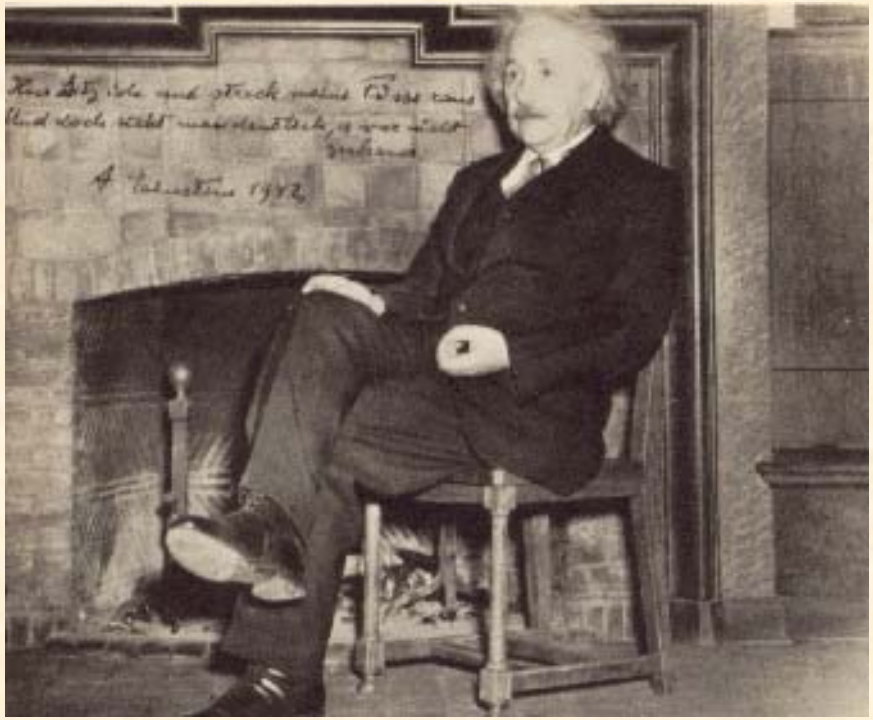

“Imagination is more important than knowledge …”

“The important thing Is not to stop questioning …”

“If we knew what it was we were doing, it wouldn’t be called research, would it?”

Albert Einstein

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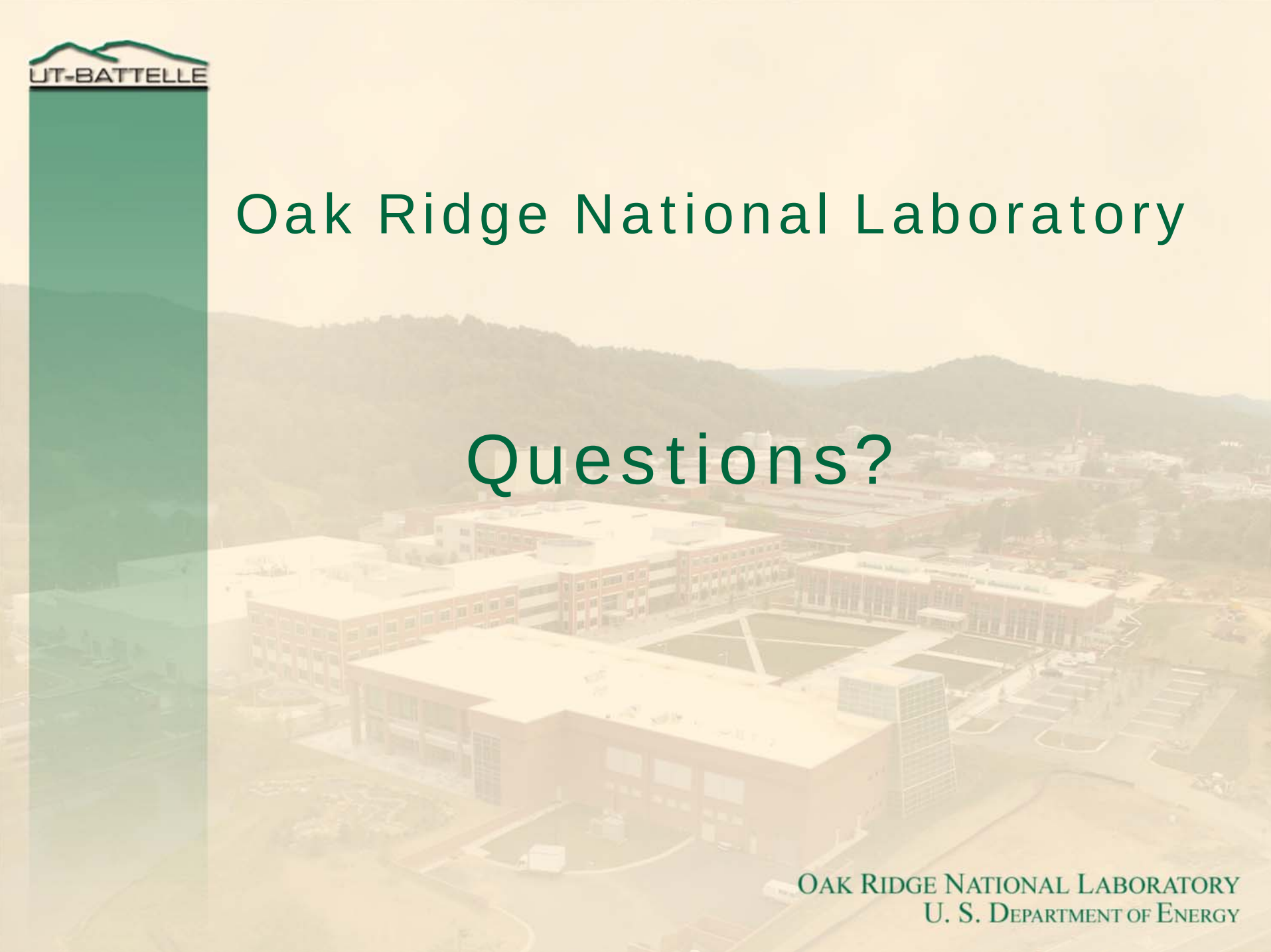
Questions?



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U. S. DEPARTMENT OF ENERGY