Oak Ridge National Laboratory and the University of Tennessee

Technology for Today and the Future

John C. Doesburg
Associate Vice President for Research, University of Tennessee
Director, Homeland Security Programs, Oak Ridge National Laboratory
Director, UT-ORNL Center for Homeland Security

June 2006
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

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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

Special Security Events

Public Service Recognition Week - DC Mall

Additional Base Security Needs

Civilian Support During Crisis Events

JFHQ-NCR NetCentric BackOffice

Fort Meyer
Fort Detrick

Fort Meade
Anacostia

Navy Yard
Marine Barracks
8th and I

Andrews AFB
Bolling AFB

Quantico
Indian Head

Dahlgren
Patuxent River

Fort Belvoir

Raven Rock

Legend

Bases w/SNAPPS (Rad/Chem Video/Met GPS/WIFI)

SNAPPS Xport System

Re-locatable Mobile Sensor Platform

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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.

Contact Information

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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?

Extracted evidence from titles of articles in the biomedical literature

New Hypothesis:
Magnesium Deficiency leads to Migraine
(New medical knowledge)

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 the 21st 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

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Current Capability

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Near Term Capability

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| BIDS |

| JBPDS |

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Multiple Single Capable Systems

Multiple Integrated Systems

Strategic Roadmap for Genetically Engineered Threat Detection

Current Capability

- STRYKER
  - JBPDS & CBMS

JSLNBCRS

- JBPDS & CBMS
- BIDS (Bio Only)
- JBPDS (Bio Only)
- Fox (Chem Only)

Multiple Single Capable Systems

Near Term Capability

- System of Systems Team of Teams
- Sample Collection
- Sample Preparation
- Analysis
- Identification

- BIDS
- JBPDS

Multiple Integrated Systems

Future Capability

- Sample Collection
- Sample Preparation
- Analysis
- Identification

- CBMS Block II/JBPDS Block II
- Initial Capability to Detect Genetically Engineered Threats
- Endemic Diseases/NTAs
- Multi Functional Support Concept (Single Detector)
  (*CB Detection Future)

- National Threat Agent Signature Database

- Proteomics
- Computational bioinformatics
- Micro fluidics
- Lab-on-Chip

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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
Oak Ridge National Laboratory

Questions?