

Domestic Nuclear Detection Office

Nuclear Forensics Expertise Development: Transferring Knowledge to the Next Generation

July 9, 2014

Samantha K. Connelly

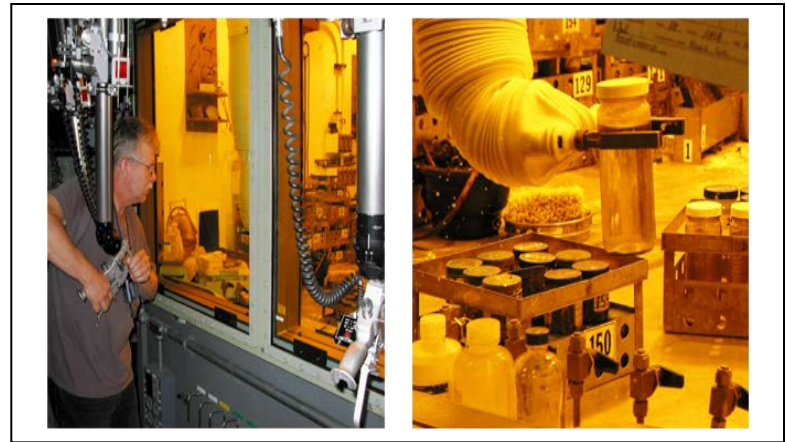
Program Manager



Homeland
Security

DHS Domestic Nuclear Detection Office

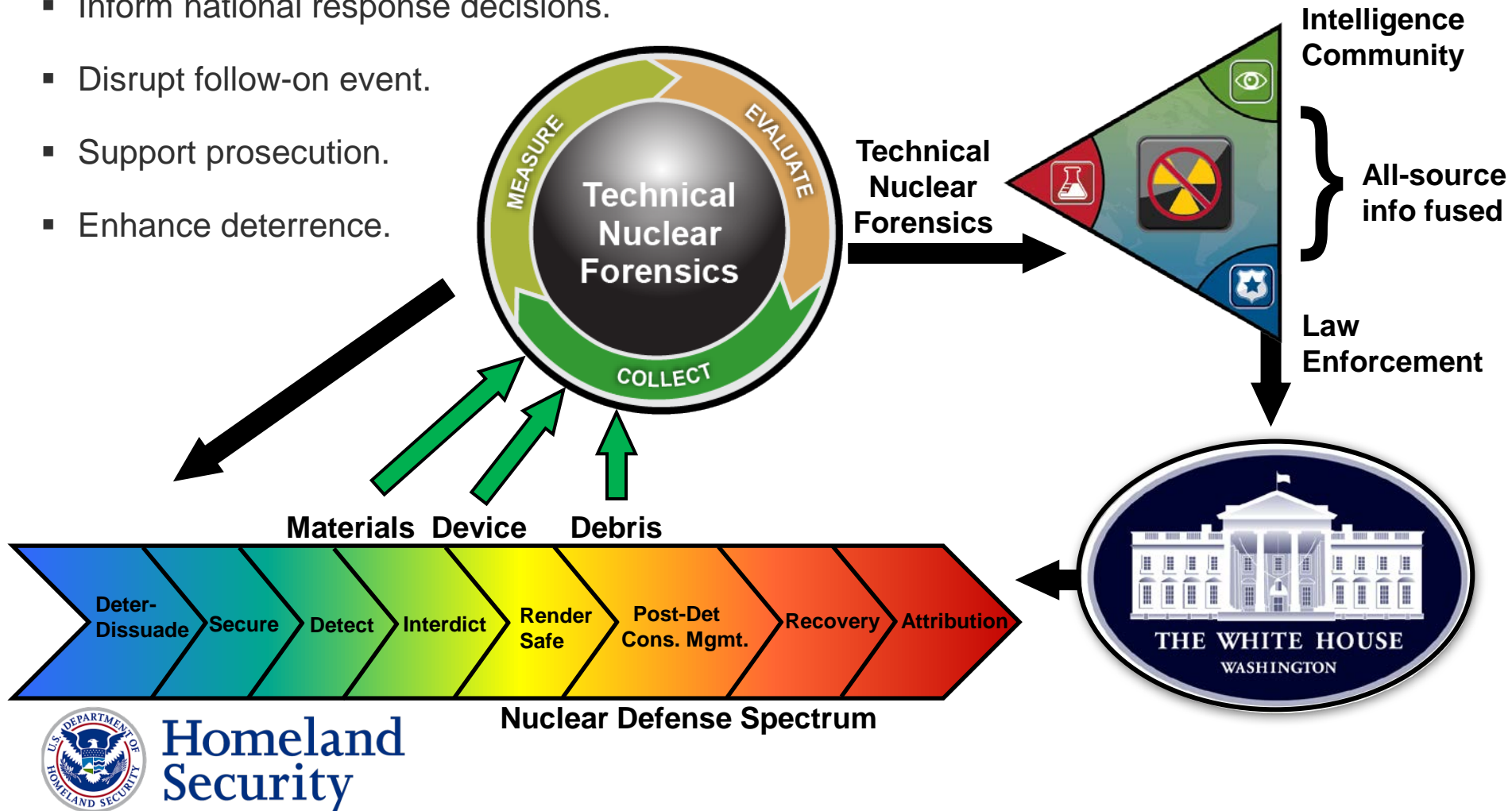
- Established by Presidential Directive in 2005-2006 and authorized in 2006 SAFE Port Act / 2010 Nuclear Forensics and Attribution Act
- **Mission:** Prevent nuclear terrorism.



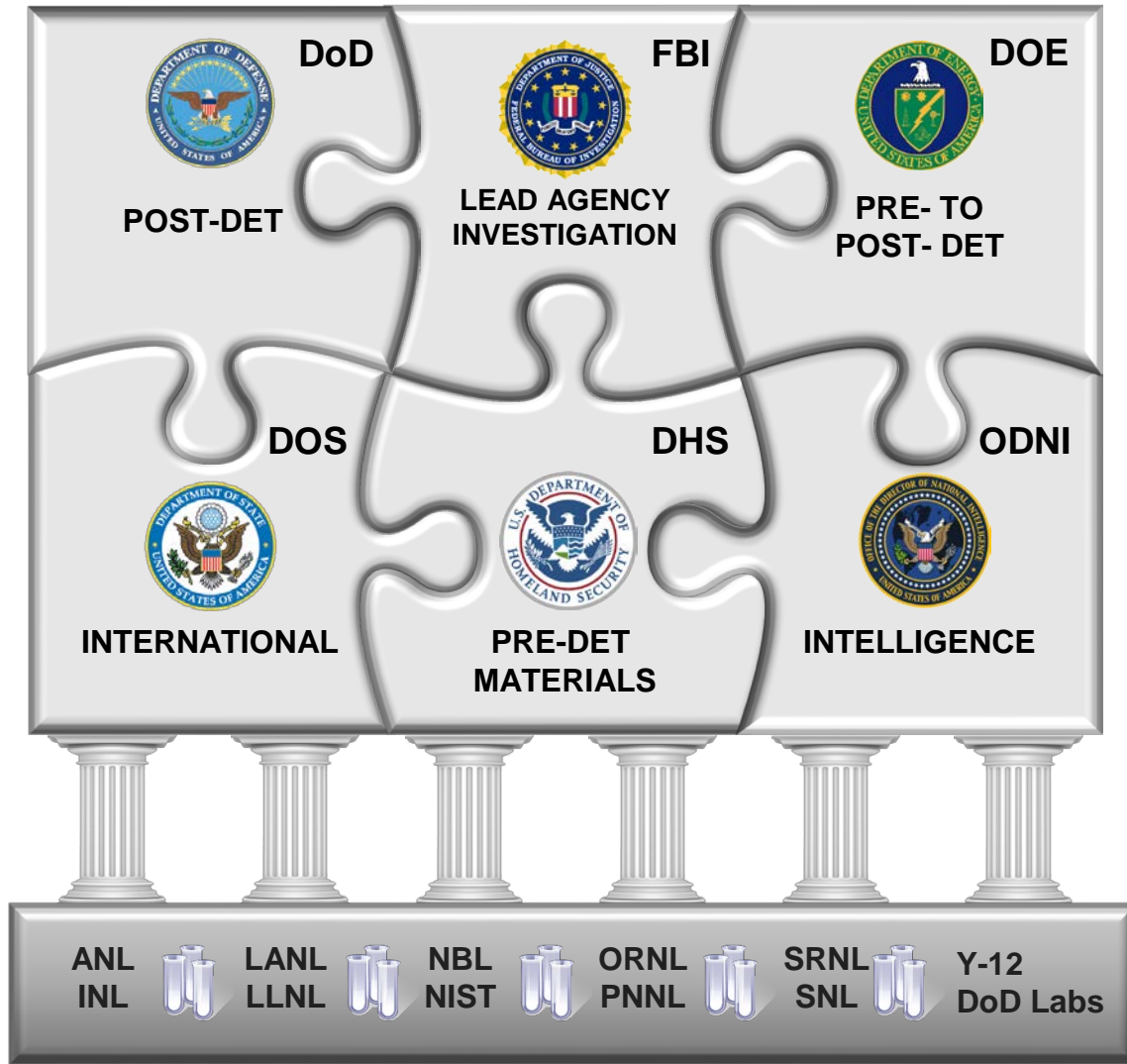
“I continue to believe that nuclear terrorism remains one of the greatest threats to global security. That’s why working to prevent nuclear terrorism is going to remain one of my top national security priorities as long as I have the privilege of being President of the United States.”– President Obama (National Defense University, 2012)

Nuclear Forensics: Process and Priorities

- Trace origin of materials to help identify and close smuggling networks.
- Inform national response decisions.
- Disrupt follow-on event.
- Support prosecution.
- Enhance deterrence.

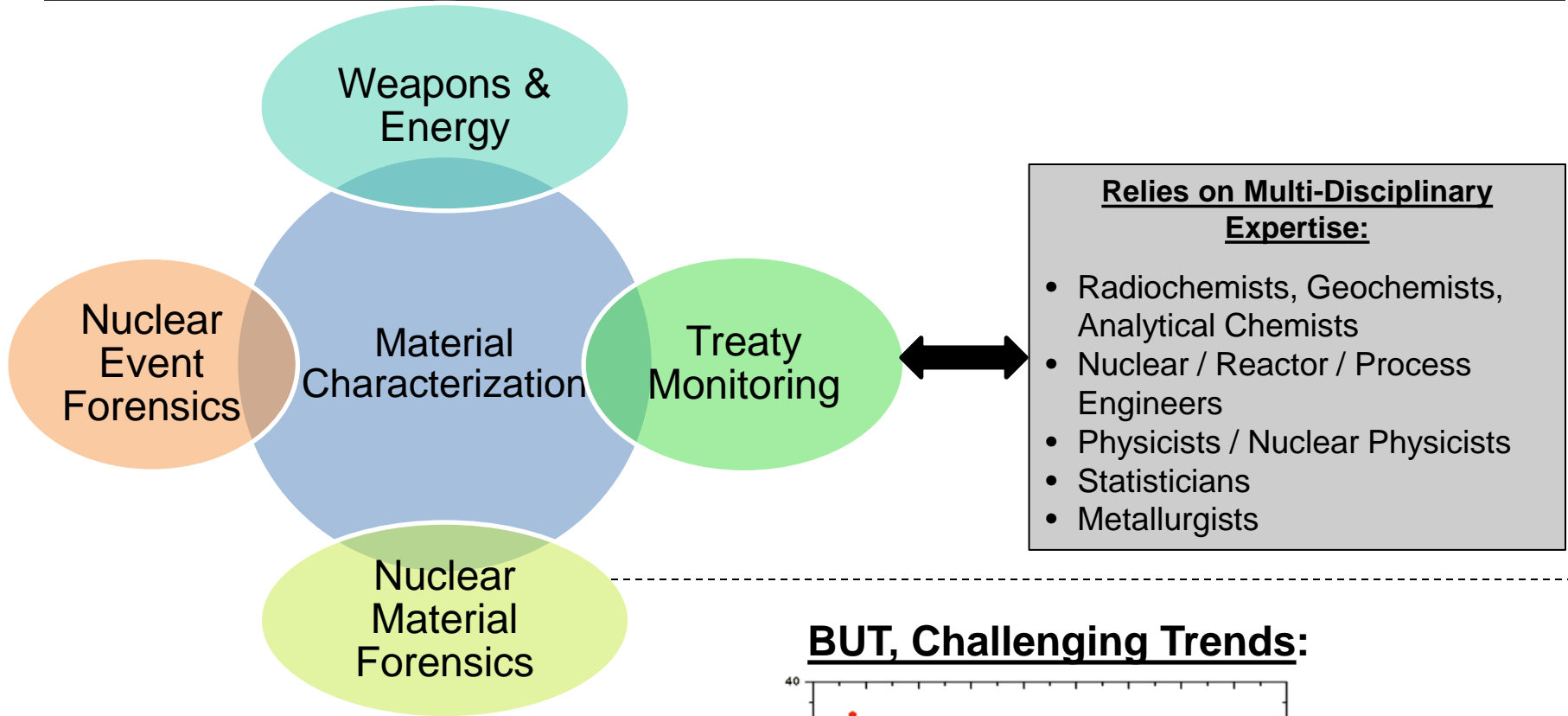


President and Congress → Whole-of-Government Approach

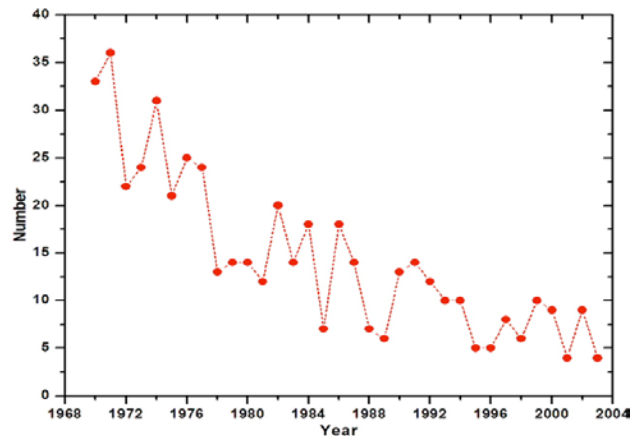


Homeland Security

Nuclear Forensics Expertise



BUT, Challenging Trends:



NNFEDP: A Model for NF Expertise Development

Key elements of the National Nuclear Forensics Expertise Development Program (NNFEDP):

- Strategic Academic to Career Pathway
- Undergraduate → Graduate → Post-Doctoral Fellowships
- University Programs
- Scientist-Student Mentoring



**Homeland
Security**

Academic Pathway to a Nuclear Forensics Career

Undergraduate
Scholarships,
Summer School

Post-doctoral
Fellowships

Junior Faculty
Awards



NF Career

← **Nat'l Lab Mentoring** →

Graduate
Fellowships,
Internships

University
Education
Awards

Multi-Year
R&D Projects

**National Nuclear Forensics Expertise
Development Program**

Nuclear Forensics Undergraduate Programs

- **Goals:** Increase awareness, recruit students into graduate studies, develop student and university relationships with labs
- NF Undergraduate Scholarship Program:
 - 5 scholars/year
 - Practicums conducted at 10 different national labs; dedicated mentoring
 - Scientific report and presentation
- NF Undergraduate Summer School:
 - University/national laboratory partnership
 - 10 students/year, six weeks
 - Classroom + laboratory work



“Summer students study nuclear forensics at MU”
Kansas City Star // 07/08/2012



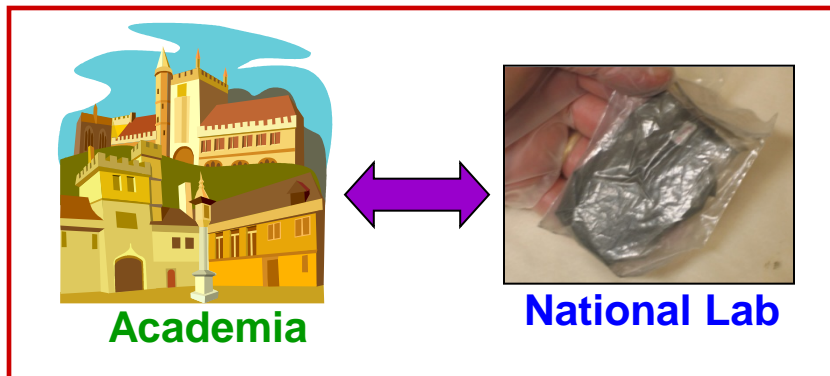
**Homeland
Security**

Nuclear Forensics Graduate Programs

- **Goals:** Encourage students to pursue doctoral degrees in radiochemistry and other NF-related disciplines and encourage universities to invest
- Nuclear Forensics Graduate Fellowship Program
 - Successful to date – excellent candidates – 20 total fellows/year
 - 23 participating universities
 - Tuition, stipend, travel, publishing, lab practicums, post-grad service
- Seaborg Institute Nuclear Science Summer Internship Program
 - Lawrence Livermore & Los Alamos National Labs; 10-15 students/year
- Graduate Mentoring Assistance Program



**Homeland
Security**



Nuclear Forensics Post-graduate and University Programs

- Post-Doctoral Fellowships at National Labs
 - **Goal:** Encourage PhD's to enter workforce; provide career track for Grad Fellows
 - 13 post-docs at 8 different labs
- NF Junior Faculty Award Program
 - **Goal:** Recruit, promote, and retain highly qualified personnel for teaching and research
 - 5 current awards
- NF Education Award Program
 - **Goal:** Encourage universities to develop sustainable interdisciplinary programs in NF-related disciplines in partnership with national labs
 - 4 current awards
- NF Minority Serving Institution Collaboration Award Program
 - **Goal:** Strengthen science/engineering programs at Minority Serving Institutions and enhance partnerships with other U.S. universities and national labs



Progress Summary

- Support to over 300 students and faculty and 23 universities since 2008, in close partnership with 11 national labs
- Undergraduate programs spreading awareness and feeding graduate programs
- 19 new Ph.D. nuclear forensic scientists into the workforce; on track to meet near-term milestone of 35 new PhD's by 2018
- NF-related academic programs strengthened at 14 universities nationwide through direct support – broad impact
- University-lab collaboration growing; mentoring has flourished
- International collaborations beginning
- Continual assessment underway



Key Lessons Learned: Model Strategy

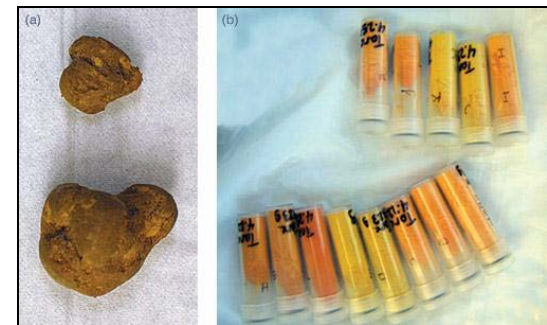
- Appropriate expertise needs be recruited & retained to ensure a credible, enduring nuclear forensics capability
 - Guiding objective: Establish a seamless pipeline from academia into an attractive career in nuclear forensics
 - Identify specific expertise needs in workforce and target recruitment
 - Whole-of-government involvement ensures integrated approach

- Diversified, coordinated approach is best – academic pathway spanning undergraduates, graduates, post-docs, and faculty at universities and labs
 - Use undergraduate-level initiatives and outreach to raise awareness
 - Focus efforts at graduate/post-doctoral/university levels – most direct and broadest impact for investment
 - University and faculty commitment key to long-term program sustainability



Key Lessons Learned: Model Implementation

- Interdisciplinary approach focused on fundamental science with strong links among students, academic departments, universities, and national labs
 - Develop cadre of students with solid base in fundamental sciences and develop core academic programs at universities – specific forensic expertise will be learned “on-the-job” through practical experience
 - Closely align and link student and university research efforts with national priorities, projects, and existing cadre of expert nuclear scientists
 - Hands-on experience is key – practical student internships and focused collaborative applied research
- Implement mentoring across all aspects of program – critical knowledge transfer from experts to next generation
- Unique and significant opportunity to help your country prevent nuclear terrorism – emphasize in publicizing your program – **Good Marketing**



Questions?



**Homeland
Security**