National Laboratory / University Partnerships
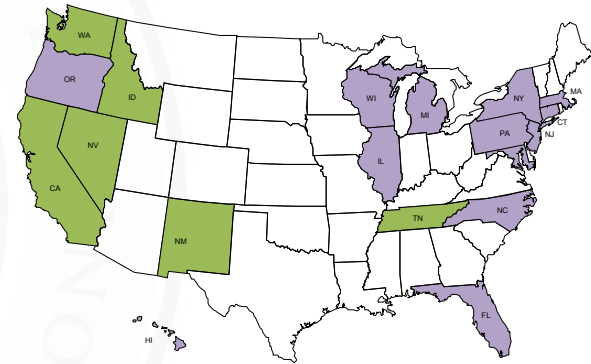
Marek Flaska
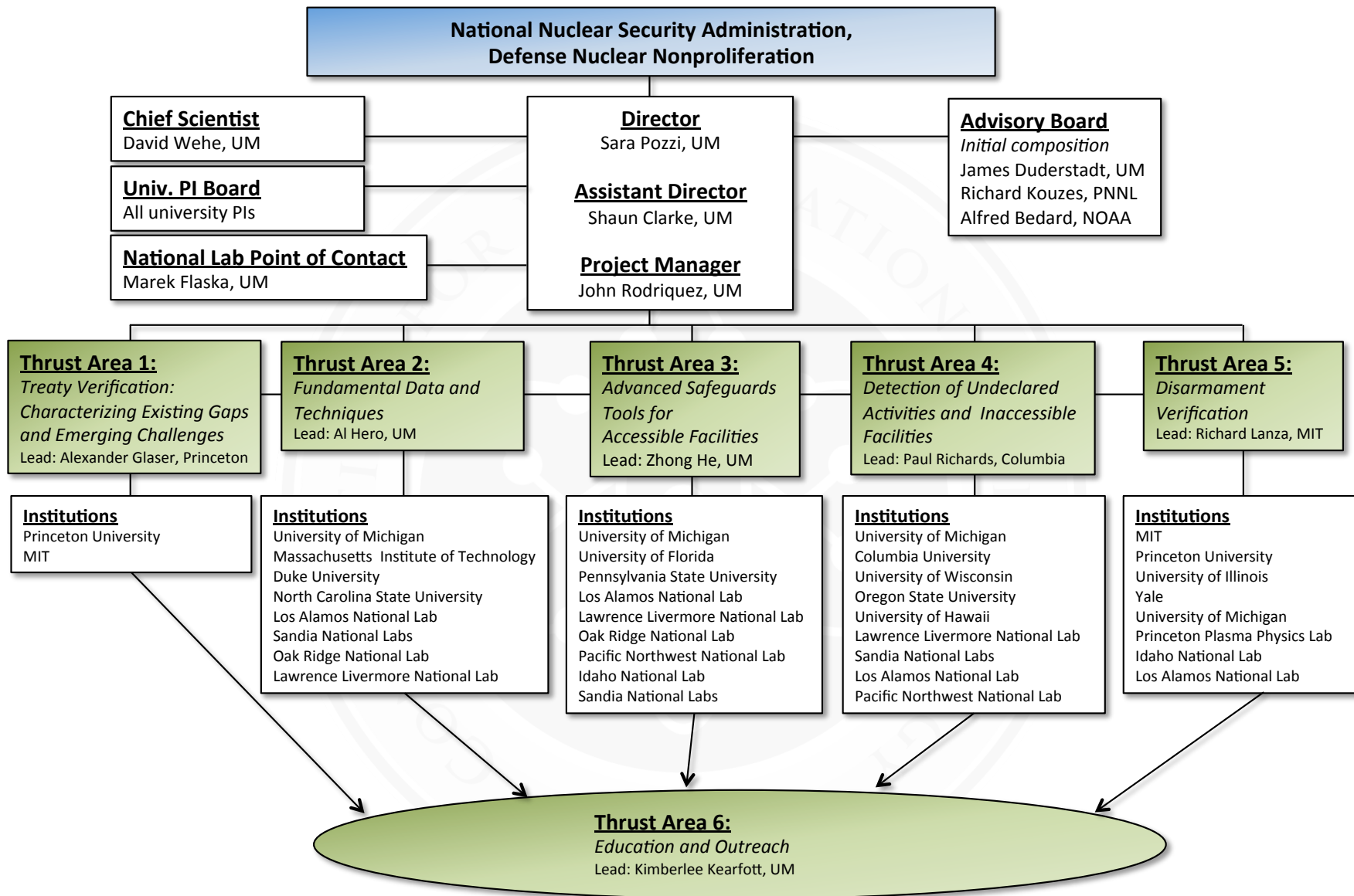
University of Michigan

mflaska@umich.edu

Outlook

- CVT forms diverse, geographically distributed team with outstanding research capabilities and well-established collaborations.

- **One of the main CVT objectives is to create / educate the next generation of nuclear-nonproliferation experts.**

  – More than 60 B. S., M. S., and Ph. D. graduates with talent, training, and commitment in the fields of nonproliferation and safeguards with strong ties to the national laboratory system.

National Nuclear Security Administration, Defense Nuclear Nonproliferation

Chief Scientist
David Wehe, UM

Univ. PI Board
All university PIs

National Lab Point of Contact
Marek Flaska, UM

Director
Sara Pozzi, UM

Assistant Director
Shaun Clarke, UM

Project Manager
John Rodriquez, UM

Advisory Board
Initial composition
James Duderstadt, UM
Richard Kouzes, PNNL
Alfred Bedard, NOAA

Thrust Area 1:
Treaty Verification: Characterizing Existing Gaps and Emerging Challenges
Lead: Alexander Glaser, Princeton

Thrust Area 2:
Fundamental Data and Techniques
Lead: Al Hero, UM

Thrust Area 3:
Advanced Safeguards Tools for Accessible Facilities
Lead: Zhong He, UM

Thrust Area 4:
Detection of Undeclared Activities and Inaccessible Facilities
Lead: Paul Richards, Columbia

Thrust Area 5:
Disarmament Verification
Lead: Richard Lanza, MIT

Institutions
Princeton University
MIT

Institutions
University of Michigan
Massachusetts Institute of Technology
Duke University
North Carolina State University
Los Alamos National Lab
Sandia National Labs
Oak Ridge National Lab
Lawrence Livermore National Lab

Institutions
University of Michigan
University of Florida
Pennsylvania State University
Los Alamos National Lab
Lawrence Livermore National Lab
Oak Ridge National Lab
Pacific Northwest National Lab
Idaho National Lab
Sandia National Labs

Institutions
University of Michigan
Columbia University
University of Wisconsin
Oregon State University
University of Hawaii
Lawrence Livermore National Lab
Sandia National Labs
Los Alamos National Lab
Pacific Northwest National Lab

Institutions
MIT
Princeton University
University of Illinois
Yale
University of Michigan
Princeton Plasma Physics Lab
Idaho National Lab
Los Alamos National Lab

Thrust Area 6:
Education and Outreach
Lead: Kimberlee Kearfott, UM

Thrust Area VI:
Education and Outreach

- CVT Research Fellowships
  - Undergraduate Fellowships
  - Graduate Fellowships
  - Post-doctoral Fellowships
  - Faculty Sabbatical Fellowships
  - National Laboratory Expert Fellowships
- Career Development
  - Fellows Career Development
  - Fellows Transition to National Laboratories
- New and Enhanced Academic Courses
  - New Course Development
  - Certificates of Public Policy
- Outreach
  - Workshops, Summer Schools, and Conferences
  - Underrepresented Minority Summer Undergraduate Research Opportunities Program
  - Institute of Nuclear Materials Management Student Chapters

Gamma Spectrometer

Neutron Multiplicity Counter

Plutonium Source

Gross Neutron Counter
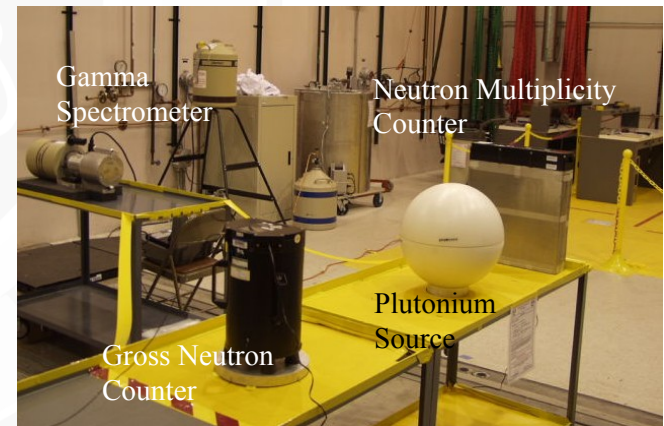
National-Lab Partnership with Universities

- The university participants will execute research projects in collaboration with the DOE national laboratories, including:

  - Brookhaven National Lab (BNL)
  - Idaho National Lab (INL)
  - Lawrence Berkeley National Laboratory (LBNL)
  - Lawrence Livermore National Laboratory (LLNL)
  - Los Alamos National Laboratory (LANL)
  - Oak Ridge National Laboratory (ORNL)
  - Pacific Northwest National Laboratory (PNNL)
  - Princeton Plasma Physics Laboratory (PPPL)
  - Sandia National Laboratory (SNL)

Laboratory scientists will bring relevant expertise to the consortium by partnering in research with university professors, researchers, post-docs, and graduate students and by mentoring CVT fellows during summer internships.

The Role of Students in Consortium

- <u>Students will play a central role</u> in interdisciplinary research projects <u>led by faculty and laboratory experts in the consortium.</u>

- Research projects will be conducted by universities in conjunction with the national laboratories

  - Existing collaborations will be the foundation of joint research activities and new collaborations will be formed.

- Direct <u>student involvement</u> will be an <u>integral component</u> of the CVT research effort.

National Laboratory Expert Fellowships

The CVT universities will invite national laboratory experts to spend time on campus and participate in activities such as:

(i)   presenting invited seminars and lectures,

(ii) serving on graduate-student committees, , and(or)

(iii) teaching a short course on a topic of interest to verification technology and policy.

Career Development

- The CVT's strong link to the national laboratories will ensure a <u>seamless transition</u> for many of the graduating fellows to a career in the national laboratory system.

- The national laboratories participating in our collaboration already have programs, such as Directors' Post-Doctoral Fellowships, that will ensure that the best talent is retained and transitioned to the national laboratories.

Collaboration Success

Institution name	Prior NNSA funding (# of projects, $)	Number of PhDs transitioned to National Labs in the past 10 years	Number of Current NNSA-funded Projects with National Labs
University of Michigan	24 ($12.25 M)	24	4
Massachusetts Institute of Technology	1 ($6.5 M)	15	0
Princeton University	11 ($5.7 M)	33	
Columbia University	2 ($1.5 M)	4	1
North Carolina State University	10 ($2.94 M)	5	1
University of Hawaii	2 ($400 k)	1	0
Pennsylvania State University	3 ($3.68 M)	13	5
Duke University	2 ($250 k)	1	1
University of Wisconsin	1 ($690 k)	23	0
University of Florida	3 ($1.75 M)	12	4
Oregon State University	2 ($2.37 M)	16	8

Current Projects Involving National Laboratories

Institution	Project Title	Collaborating National Laboratory
University of Michigan	Energy-Angle Correlations in Spontaneous- and Induced-Fission Neutron Emissions	LANL
	Digital Fast Neutron Detection System for Simultaneous Time Correlation and Spectrometry	SNL
	Measurement and Characterization of Nuclear Material at Idaho National Laboratory	INL
Princeton University	Dynamic Compression of Earth and Planetary Materials Using Omega	LLNL
	Fundamental Issues in the Interaction of Intense Lasers with Plasma	LLNL
Columbia University	Investigation of Data-Intensive Discovery Methods for Seismic Monitoring	SNL
North Carolina State University	Development of a Program of Nuclear Forensics Research and Education at NCSU	ORNL
	Development of High-Speed Monte Carlo Simulations of Radiation Sensors in Mixed Neutron-Gamma Fields	SNL, ORNL
University of Hawaii	US IMS Station Operation and Management	SNL
Penn State University	Super-Resolution in Remote Sensing by Quantum Phase Amplification	LLNL
	Nuclear Security Education Program	PNNL
Duke University	Compressive Sensing & Deep Learning for Analysis of Hyperspectral Imagery	LLNL
University of Florida	Radiation Detection for Nuclear Security Summer School	PNNL
	Organic Photodetectors for Scintillator Radiation Detection Applications	PNNL
Oregon State University	Feasibility and Safety Assessment for Advanced Reactor Concepts Using Vented Fuel	INL
	High Performance Research Reactor Hydro-Mechanical Fuel Test Program	INL
University of Illinois	Radiation Sensor Network Data Collection in an Urban Setting	LANL

Laboratory (Primary Contact)	Principal Investigators/Student Mentors (area of expertise)
Los Alamos National Laboratory (Dr. Morag Smith)	Dr. Robert Haight (nuclear data), Dr. Patrick Talou (nuclear data), Dr. Morgan White (nuclear data), Dr. Martyn Swinhoe (safeguards), Dr. Howard Menlove (safeguards), Dr. Karen Miller (safeguards), Dr. Steven Tobin (safeguards), Dr. Jesson Hutchinson (Nevada Nuclear Security Site), Dr. Gregg McKinney (Monte Carlo codes), Dr. Howard Patton (earth sciences), Dr. Dale Anderson (earth sciences), Dr. Joseph Pilat (national security)
Lawrence Livermore National Laboratory (Dr. Jenni Pruneda)	Dr. Stephen Payne (new detection materials), Dr. Natalia Zaitseva (new detection materials), Dr. Nerine Cherepy (new detection materials), Dr. Annie Kersting (geophysics), Dr. Ramona Vogt (fission-chain modeling), Dr. Adam Bernstein (detection), Dr. Michael Kristo (nuclear forensics), Dr. Leslie Nakae (nuclear security), Dr. Richard Wheeler (homeland security), Dr. Ching-Yen Wu (nuclear physics), Dr. Lee Davisson (geochemistry), Dr. Paul Rockett (nonproliferation), Dr. Bradley Sleaford (global security), Dr. August Droege (global security), Dr. William Walter (seismology and infrasound), Dr. Arthur Rodgers (seismoacoustics)
Sandia National Laboratories (Dr. Robert Tachau)	Dr. Peter Marleau (neutron detection), Dr. Erik Brubaker (neutron detection), Dr. Scott Kiff (neutron detection), Dr. Chris Young (seismology), Mr. Darren Hart (infrasound), Mr. Kyle Jones (seismoacoustics)
Oak Ridge National Laboratory (Dr. David Williams)	Dr. Robert McElroy (safeguards), Dr. Michael Dunn (nuclear data), Dr. Luiz Leal (nuclear data), Dr. Seth McConchie (detection and imaging), Dr. Michael Whitaker (international safeguards), Dr. Vladimir Protopopescu (inverse problems)
Idaho National Laboratory (Dr. David Chichester)	Dr. David Chichester (safeguards), Dr. Ryan Clement (detector development), Dr. Steve Piet (reactor physics analysis), Dr. Edward Seabury (detection instruments development), Dr. Darin Snyder (isotope geochemist), Dr. Scott Thompson (active interrogation), Dr. Matthew Watrous (analytical chemist)
Lawrence Berkeley National Laboratory (Dr. John Valentine)	Dr. John Valentine (nuclear physics), Dr. Mark Amman (electrical engineering), Dr. Paul Barton (detectors), Dr. Gregory Bizarri (scintillators), Dr. Edith Bouret (materials), Dr. Dan Chivers (gamma imaging), Dr. Lucian Mihailescu (imaging), Dr. Richard Russo (laser interactions), Dr. Thomas Schenkel (ion-solid interactions), Dr. Kai Vetter (gamma imaging)
Pacific Northwest National Laboratory (Dr. Sandy Thompson)	Dr. Richard Kouzes (detection), Dr. Carolyn Seifert (detection and imaging), Dr. McIntyre (radio-xenon detection)
Princeton Plasma Physics Laboratory (Prof. Robert Goldston)	Prof. Robert Goldston (zero-knowledge verification)

Description of NL Projects

- Please provide brief description of project(s)

- The projects will be shared with CVT students through CVT website

- New collaborations are encouraged!

CVT Collaboration Success

Do you have additional ideas how to profit from the availability of extremely gifted students? Please share your ideas!