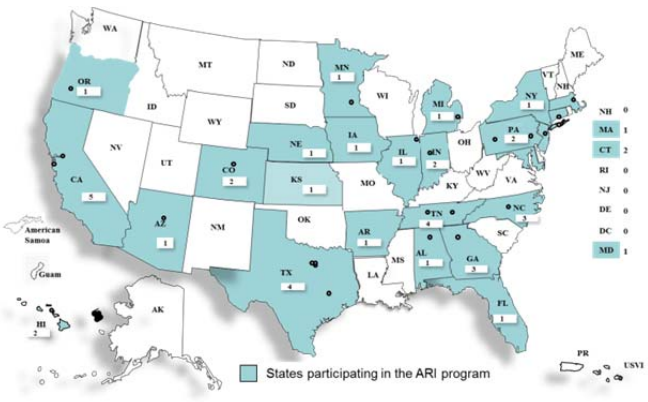
Academic Research Initiative

Tomorrow's Scientists Solving Grand Challenges

The Academic Research Initiative (ARI) is a university grants program executed by the Domestic Nuclear Detection Office (DNDO). ARI works to sustain a long-term commitment to basic research and coordinates efforts with other federally-sponsored research in industry and at the National Laboratories. The ARI engages the academic community to advance fundamental knowledge for radiological and nuclear threat detection emphasizing fundamental research to solve long-term, high-risk challenges, and develops human capital in nuclear science, engineering, and related fields.

Program Results

- Since inception in 2007, 77 grants have been awarded to more than 47 academic institutions.
- In 2013, the ARI sponsored 40 grants, supporting 154 students and involving an additional 94 students, which resulted in 51 journal publications.
- The ARI is currently funding 43 grants at 33 universities in 24 states.



Research Phase Structure:

- Single Investigator Awards: approximately $150,000/yr
- Multi-disciplinary Awards: approximately $350,000/yr
- Large Award: Not to exceed $1,000,000. All awards are made for a maximum duration of 5 years.

Areas of Emphasis

Science and Engineering of Radiation Detector Materials: High-risk, long-term research aimed at developing highly sensitive, selective, low-cost, rugged detector materials.

Science and Engineering of Alternative Neutron Detection Technologies: Investigation of neutron detection technologies that provide substantial improvements over existing ^{3}He technologies.

Science and Engineering of Radiation Detection System Concepts, Approaches, and Architectures: Exploration of radically new approaches to threat detection, leading to selective and sensitive sensors/detectors.

Science and Engineering of Shielded Special Nuclear Material (SNM) Detection Technologies, Signatures, and Sources: Investigation of advanced or enhanced nonintrusive inspection or active interrogation approaches to overcome the challenge of shielded SNM detection.

Expert Systems, Models, Algorithms, and Data Processing for Nuclear Detection Research: Innovative processing and analysis techniques and algorithms that lead to significant performance improvements facilitating mobile search/detection performance.

Science and Engineering of Nuclear Forensics Technologies: Investigation of advanced analytical techniques used to determine processing history and transit of pre-detonation nuclear materials.

For any questions about the ARI program, contact dndo.ari@hq.dhs.gov.

Ongoing Projects

Listed below are ongoing projects that DNDO is carrying out with universities.

Science and Engineering of Radiation Detector Materials	University
Informatics Aided Design of Inorganic Scintillator Materials	Iowa State
Systematic Approach to Cadmium Zinc Telluride Material and Detector Development via Theory, Modeling, and Experimentation	Fisk
Energy Transfer Based Nanocomposites for Radiation Detection	Texas Arlington
Development of Improved Cadmium Manganese Telluride and Cadmium Zinc Telluride Detectors Through Optimized Growth Techniques (Collaborative)	Alabama A&M / Minnesota
Pioneering Crystal Growth of Large High-Resolution Scintillators for Gamma and Neutron Detection	Tennessee
Realizing High Performance Inorganic Scintillators at Low-Cost Through Segmentation (Collaborative)	Wake Forest /Fisk/Arkansas St.
Functionalization of Polymers with Fluorescent and Neutron Sensitive Groups for Efficient Neutron and Gamma Detection	Colorado School of Mines
Synthesizing Conjugated Polymers with High Scintillation Light Yield	California- Los Angeles
Trap-Triggered Organic Field Effect Transistor as Low-Cost, Uncooled, Highly Sensitive Solid-State Photodetectors for Radiation Sensing	Nebraska
Developing Low-Cost Scintillators with Excellent Energy Resolution	Tennessee
Low-Cost Glass Ceramic Scintillator Materials for Neutron and Gamma Ray Detection	Georgia Inst of Tech

Science and Engineering of Alternative Neutron Detection Technologies	University
New Detectors, Electronics, and Algorithms for Fast Neutron Spectroscopy for Improved Neutron/Gamma Discrimination	Michigan
Superheated Emulsions for Fast Neutron Detection in Active Interrogation Applications	Yale
Bulk Crystal and Thin Film Hexagonal Boron Nitride Neutron Detectors (Collaborative)	Kansas State/Texas Tech
Large-Area, Low-Power, High-Sensitivity Neutron Detection Using Thin Film Transistors and Flexible Substrates (Collaborative)	Texas- Dallas / Arizona State
Solid-State Large Area Thermal Neutron Detectors at a Low-Cost Fabricated via Electrophoretic Deposition of Boron in Etched Silicon	Rensselaer Polytechnic Institute
High Sensitivity Low-Cost Solid State Neutron Detection	Duke

Science and Engineering of Radiation Detection System Concepts, Approaches, and Architectures	University
Gamma Ray Imaging of SNM with a Liquid Xenon Time Projection Chamber	Yale
Advanced Gamma-Ray Imaging Using Complementary Information from Background Measurements and Visual Sensors	California- Berkeley
Electron Tracking for Advanced Gamma-Ray Imaging Applications	California- Berkeley
Radiological Source Detection and Tracking Based on Multi-Sensor Data Fusion	Florida

Science and Engineering of Shielded SNM Detection Technologies, Signatures, and Sources	University
Nuclear Materials Detection via Time-Encoded Differential Absorption and/or Differential Fluorescence	Hawai'i
Use of Laser Cooling to Extend the Peak Current and Duty Cycle of Microwave Thermionic Guns	Hawai'i
Nuclear Resonance Fluorescence and Polarization Asymmetry Measurements Using Gamma rays and Radiation Detector Development	Duke
Nuclear Data Measurement Using Gamma Rays	Duke/North Carolina A&T
Low-Dose Inspection with Monochromatic Gammas (Collaborative)	Massachusetts Inst of Tech/ Penn State /Georgia Inst of Tech
High Efficiency, Low-Cost Mobile-Fixed Sensors for Detection of Shielded SNMs	Purdue
All Optical Generation of MeV Photons for Nuclear Materials Detection	California- Los Angeles

Expert Systems, Models, Algorithms, and Data Processing for Nuclear Detection Research	University
Integrating Deterrence Theory and Analytics in the Global Nuclear Detection Architecture	Maryland- College Park
Improving Source Detection in a Changing Area Background	Colorado State

Science and Engineering of Nuclear Forensics Technologies	University
Experimental and Computational Assessment of Unique Trace Elements and Isotope Ratios in Plutonium from Depleted Uranium Irradiated in Fast Reactor Blankets	Texas Engineering Experiment Station
Recasting Nuclear Forensics Discovery as a Digital Library Search Problem	California- Berkeley
Structure Property Relationships of Metal Actinide Alloys	Georgia Inst of Tech
Advancing SNM Detection Through Novel Temporal Gamma-Ray Spectroscopy Instrumentation and Analytical Methods	Oregon State
Advancement of Nuclear Forensics	Notre Dame