

# Development of a Multidisciplinary Nuclear Security Education Program at Purdue University

Purdue University, USA

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# Jason Harris, Ph.D.



- Education
  - B.S. ( Biology), University of Tampa
  - M.S. (Nuclear Engineering), University of Illinois
  - Ph.D. (Health Physics), Purdue University
- Worked in private industry (RSO), nuclear power, national lab (LANL), instructor (Purdue), Idaho State University (2008-2015)
- Joined Purdue (again) in November 2015
- Head and Associate Professor, School of Health Sciences
- INSEN Chair, 2013-2015
- Director of the Center for Radiological and Nuclear Security (CRANS)
- Research Areas
  - Environmental and nuclear power health physics, radiation instrumentation, nuclear security (risk assessment, detection, safety/security interface)

# Purdue University



- Founded in 1869 – 150<sup>th</sup> celebration next year
- West Lafayette, Indiana, USA
- Undergraduates: 30,043
  - Engineering – 8412
- Graduates: 9,626
  - Engineering – 3,457
- Times Higher Education World University Ranking: 60 (2017), USA Public Institutions: 5



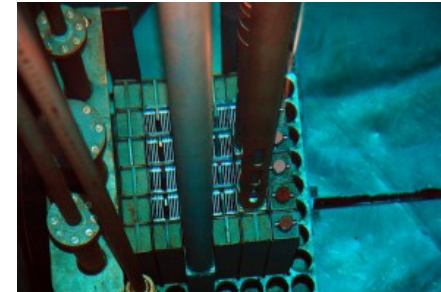
# Introduction

- In 2016, Purdue University embarked on several initiatives to build its programs in nuclear security.
- This commitment to develop and expand these programs has been aided by a number of opportunities.
  - Nuclear Security Education Program (NSEP) established within three Colleges (Engineering, Health and Human Sciences, and Liberal Arts) and three Schools (Nuclear Engineering, Health Sciences, and Political Science)
  - Creation of the Institute for Global Security and Defense Innovation (i-GSDI)
  - Establishment of the Center for Radiological and Nuclear Security (CRANS)
  - Various State and International level partnerships (US Department of State Partnership for Nuclear Threat Reduction (PNTR), US Department of Energy, IAEA)



# Educational Programs

- School of Health Sciences (College of Health and Human Sciences)
  - 16 tenured/tenure-track faculty (~70 total faculty and staff), 600 baccalaureate students, ~50 graduate students
  - Radiological Health Sciences (RHS)
    - Health physics, Medical physics, and Imaging Science.
    - 25 graduate students and 20 undergraduate students.
- School of Nuclear Engineering(College of Engineering)
  - 16 tenured/tenure-track faculty, 75 declared baccalaureate students, ~50 graduate students
    - Specialties in nuclear security and nuclear nonproliferation
  - PUR-1 research reactor (only reactor in state of Indiana)



Health Sciences



# Educational Programs

- Department of Political Science (College of Liberal Arts)
  - Faculty with specialization in arms control, nuclear nonproliferation, and terrorism/counter-terrorism
  - Master's in Public Policy (with specialization in security)
- Department of History (College of Liberal Arts)
  - Faculty with specialization in nuclear nonproliferation and security history
  - Contribute to Master's in Public Policy (with specialization in security)

# Nuclear Security Education Program (NSEP)



- Program offered through the US Department of Energy (DOE) Defense Nuclear Nonproliferation (DNN) Office of Radiological Security (ORS)
- Fifth university to be selected for program (Penn State University, Texas A&M University, MIT, Oregon State University)
- Develop and deliver courses and programs in nuclear security



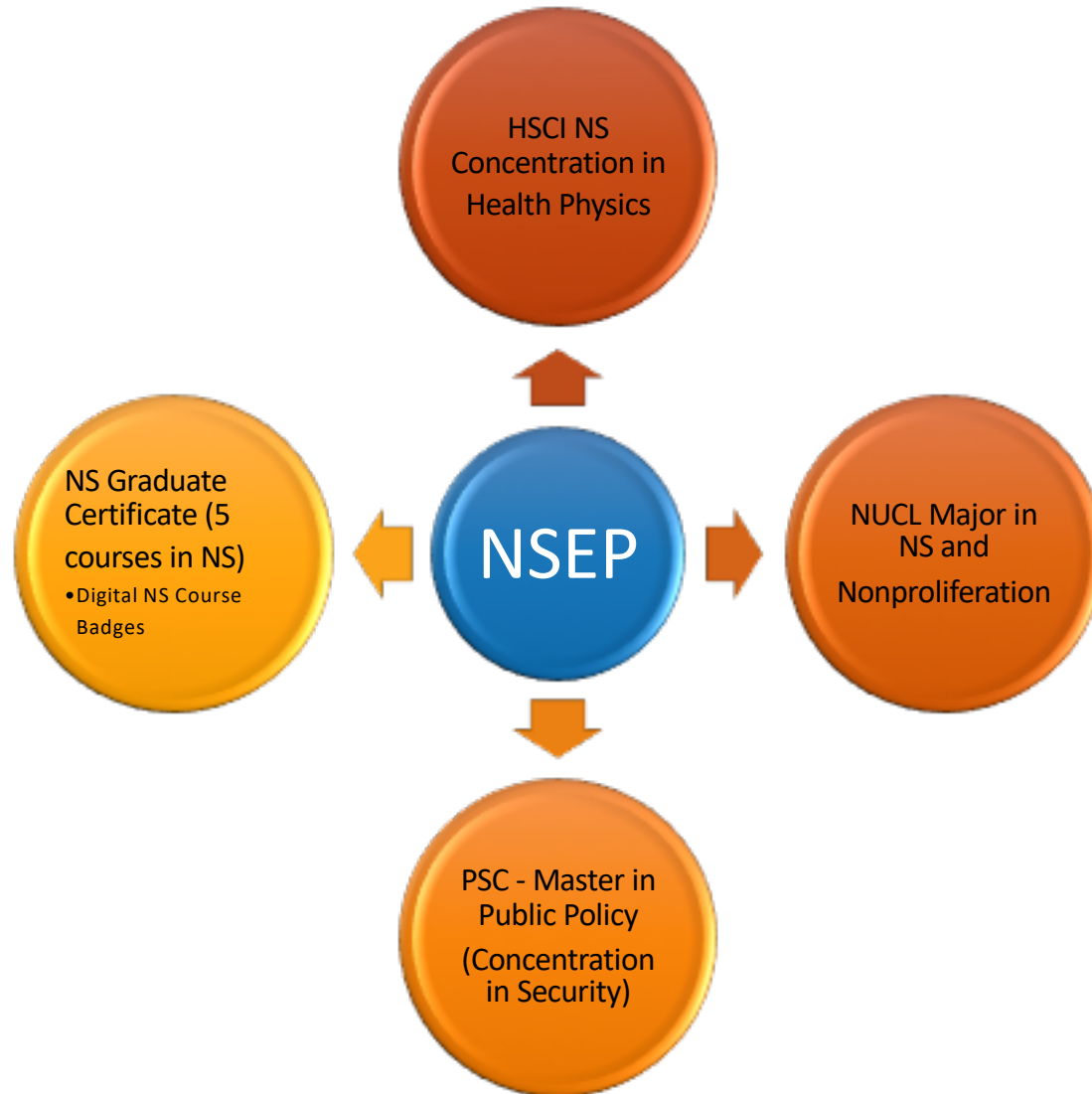
# Nuclear Security Education Program (NSEP)



- Creation of nine NSEP courses:
  - Political Science courses: Terrorism, Nuclear Strategy and Proliferation
  - Health Physics courses: Introduction to Nuclear and Radiological Source Security, Introduction to Nuclear Security Science, Alternative Technologies
  - Nuclear Engineering courses: Nuclear Detection Technologies, Nuclear Security System Design and Analysis, Nuclear Engineering Experiments
  - History courses: Nuclear Age
- Development of a nuclear security and safety concentration in the School of Health Sciences health physics baccalaureate program
- Development of a nuclear security and nonproliferation major in the School of Nuclear Engineering baccalaureate program
- Establishment of a nuclear security concentration in the soon to be established Master's program in security policy in the Department of Political Science
- Development of a graduate online certificate program in nuclear security and nonproliferation



# Nuclear Security Education Program (NSEP)



# Discovery Park

Discovery Park



- Complex of facilities that provides open, collaborative research environments where interdisciplinary projects are connected throughout Purdue, Purdue Research Park and the world.
- Institute for Global Security and Defense Innovation (i-GSDI) and the Purdue Policy Research Institute (PPRI)



# Institute for Global Security and Defense Innovation (i-GSDI)



- Mission to converge Purdue's interdisciplinary resources to bring timely, responsive and transformative solutions to the most pressing security and defense challenges facing the nation and the world.
- Nuclear Security brought in through CRANS

A screenshot of the i-GSDI website homepage. At the top left is the "PURDUE UNIVERSITY Discovery Park" logo. To its right is the text "Institute for Global Security and Defense Innovation (i-GSDI)". Below the logo is a navigation menu with links for Home, About, Consortium, Partnerships, News, Events, Directory, Research Highlights, and Resources. The main content area is divided into three columns. The left column has a blue header "About the Institute" and an "Overview" section with text about global security threats and a question about world-class research universities. Below this are two buttons: "Defense Innovation at Purdue" and "Join the i-GSDI Consortium". The middle column features a large image of a satellite in space with the text "Leading the charge toward 'Continuous Offset' in defense and security" and "iGSDI Awards AI+ Rapid Innovation for Defense and Security Grants". The right column has a header "Research Highlights" and a sub-header "News | Research Papers". Below this is a news item titled "iGSDI Awards AI+ Rapid Innovation for Defense and Security Grants" dated May 15, 2018, with a link to "Read More about 'iGSDI Awards AI+ Rapid Innovation for Defense and Security Grants'".



# Purdue Policy Research Institute (PPRI)



- Aims to bring the talents of the university community to bear on global challenge issues, catalyzing new areas of research and enhancing the impact of that research.
- University faculty and students, especially in Political Science and History focusing on nuclear nonproliferation policy, terrorism, and counterterrorism, contribute to PPRI.

A screenshot of the Purdue Policy Research Institute website homepage. At the top, the Purdue University logo is on the left, and "Purdue Policy Research Institute" is on the right. Below the logo is a navigation menu with links for Home, About, Policy Research, Autonomous Transportation, Grand Challenges Research Initiatives, News, and Events. The main content area features a large image of a man and a woman in a meeting. Overlaid on this image is the text "Faculty and Students working on global challenges." and a sub-headline "PPRI aims to bring the talents of the University community to bear on global challenge issues, catalyzing new areas of research and enhancing the impact of that research." Below this is a "Discover How" button. At the bottom of the page are three featured research areas, each with a small image, a title, a brief description, and a "Learn More" or "Visit Site" button.

**PURDUE UNIVERSITY**  
**Discovery Park** | Purdue Policy Research Institute

Home About Policy Research Autonomous Transportation Grand Challenges Research Initiatives News Events

Faculty and Students working on global challenges.

PPRI aims to bring the talents of the University community to bear on global challenge issues, catalyzing new areas of research and enhancing the impact of that research.

Discover How

**AUTONOMOUS TRANSPORTATION**  
Our transportation system will likely undergo major transformation in the coming decades as technology allows us to move people and freight in safer and more efficient ways.  
Learn More

**DRONE REGULATORY RESEARCH**  
Drones are growing in popularity and varying in their use – this growth and evolution is progressing at a greater pace than the regulations needed to ensure safety and security.  
Learn More

**GRAND CHALLENGES RESEARCH**  
The Andrew W. Mellon Foundation supports a unique approach to global grand challenges research, scholarly publishing and communication at Purdue.  
Visit Site

# Center for Radiological and Nuclear Security (CRANS)

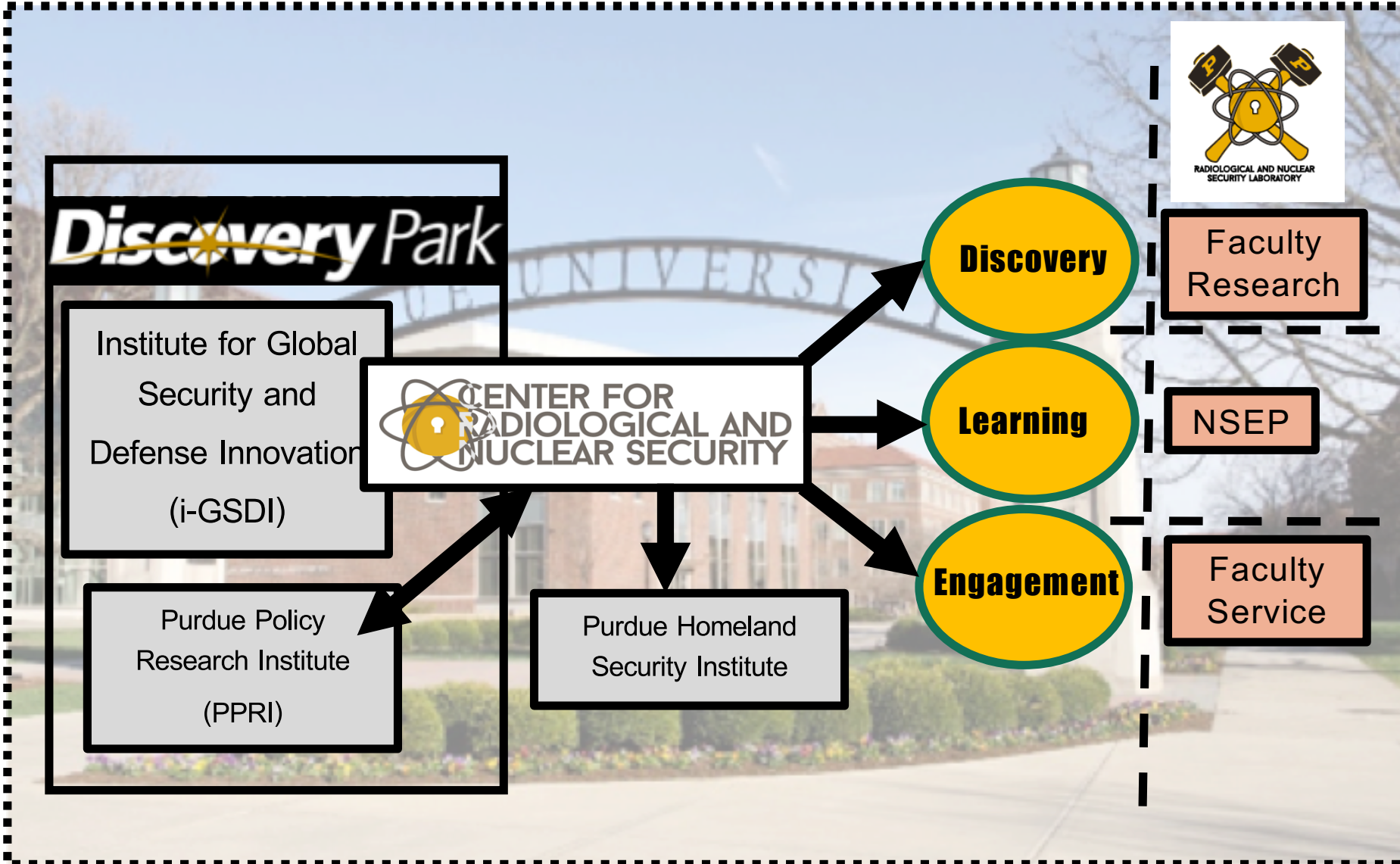


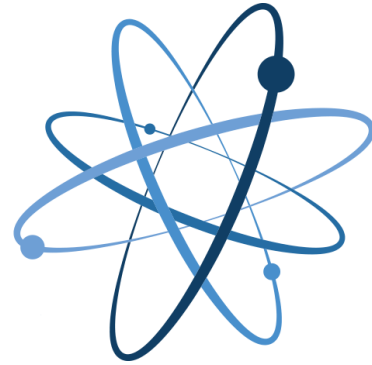
- Established in 2018
- The Mission of CRANS is “To advance learning, discovery, and engagement in the security of nuclear and radiological materials and in the reduction of nuclear and radiological threats for the purpose of protecting human health and the environment.”
- Formed to develop a nuclear security education and research program at Purdue University
- Bring together various constituencies across Purdue and beyond with interests in nuclear security (broadly)



- CRANS takes a broader view of nuclear security by supporting activities in the following areas:
  - Preventing the use of nuclear or radiological materials or devices for malicious purposes.
  - Developing detection technologies and systems for nuclear security.
  - Reducing the opportunities for malicious use of potential threat materials through security or replacement.
  - Controlling and monitoring of nuclear weapons and related technology.
  - Supporting peaceful uses of nuclear energy that are increasingly proliferation resistant.
  - Preventing, detecting, and countering nuclear/radiological threats
  - Mitigating and minimizing the consequences of radiological or nuclear incidents.
  - Developing and implementing effective response, emergency management, and remediation from radiological or nuclear incidents and accidents.

# Multidisciplinary Program in Nuclear Security





**Thank You!**

**Questions?**