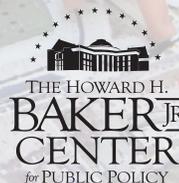




 **INSTITUTE FOR
NUCLEAR
SECURITY**

2012 Annual Report



**The 2012 Annual Report
of the
University of Tennessee
Institute for Nuclear Security**

Howard L. Hall and Natalie Manayeva

Front cover photo: UT students participating in a Y-12 hosted table top exercise in nuclear security. Photo courtesy of Y-12.

Rear cover photo: Student notes on a facility protection plan as part of UT Nuclear Engineering coursework.

January 6, 2013

UT Institute for Nuclear Security
The University of Tennessee
Knoxville, Tennessee 37996-2300 [USA](http://www.uts.edu)

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From the Director of the Institute

Dear colleagues and friends,

I'm extremely happy to share the first Annual Report of the UT Institute for Nuclear Security (INS) with you. Although we have been pursuing nuclear security as a campus thrust area for several years, this marks the completion of our first full year as an organization. We are joined in this effort by the Oak Ridge National Laboratory, the Oak Ridge Associated Universities, and the Y-12 National Security Complex.

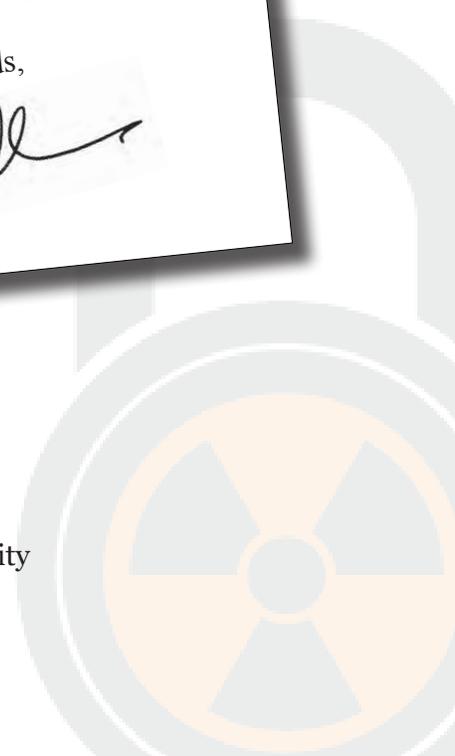
We've made remarkable progress, across our entire mission of teaching, research, and service. As you will read in the report in more detail, we have made significant improvements to the University's curriculum in multiple academic units, we've successfully expanded our research portfolio in nuclear security, and we have positioned the University and our partners as valued resources for addressing the global challenges of nuclear security.

As we move into our second year of operation, I am excited to see the growing impact of our work on some of the most difficult challenges facing humanity. I encourage you to either get or stay involved with us and help us continue to make the INS an effective resource with global impact.

Best regards,



Professor Howard L. Hall
UT Governor's Chair for Nuclear Security
Director of the UT Institute for Nuclear Security



About the Institute

The University of Tennessee Institute for Nuclear Security (INS) was formed by the University of Tennessee – Knoxville (UT) and began operating in January 2012. The INS is organizationally located within the Howard H. Baker Jr. Center for Public Policy.

The formation of this Institute builds on a traditionally strong relationship between the University and the federal facilities in east Tennessee that have major nuclear security missions. As these collaborations grew, it became obvious that the formation of a regional entity such as the INS would be necessary to help build greater efforts that cross many academic disciplines.

Oak Ridge National Laboratory (ORNL), the Y-12 National Security Complex (Y-12), and Oak Ridge Associated Universities (ORAU) joined with UT as charter members of the INS when it was formed.

The mission of the INS is to align the collective expertise and capabilities available within the membership to grow an internationally-recognized resource that plays a pivotal role in global nuclear security efforts by:

- Providing expertise to shape and support the national and international enterprises for nuclear security;
- Enhancing U.S. and international security by providing effective support for all aspects of the nuclear security mission — from policy analysis through research, education, training, and field activities; and
- Expansion of our contributions and reputation in these communities, and concomitant growth of the levels of funding and influence available to our membership.

INS serves as a facilitator for collaboration among its members to tackle multi-organizational, multidisciplinary work critical to national and global needs in nuclear security. This framework leverages the strengths of all of the members to address global challenges in the broad field of nuclear security in a more effective manner than any single partner can accomplish alone.

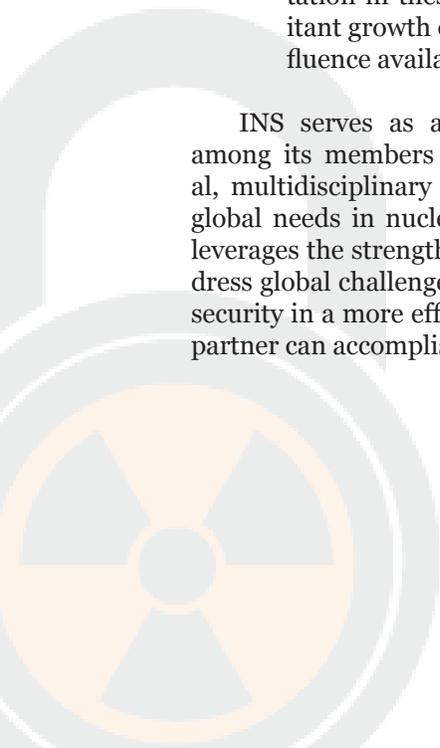
What do we mean by “Nuclear Security?”

There are a number of perspectives on what constitutes the field of nuclear security. The narrow view is that it is predominantly concerned with physical security of nuclear materials — the “guns, guards, and gates” model. We respectfully disagree.

INS advocates a much broader view of the activities that fall under “nuclear security.” In our usage, we mean it as a field that encompasses all the activities that support the following objectives:

- Nuclear or radiological materials and devices are not diverted to illicit or malicious purposes.
- Potential threat materials are secured or replaced where feasible so as to reduce opportunities for malicious use.
- Nuclear weapons and related technology are appropriately controlled and monitored.
- The proliferation of nuclear weapons or other nuclear/radiological threats is discouraged, detected, and/or dissuaded.
- Systems that support the peaceful uses of nuclear energy are increasingly proliferation resistant.
- Efforts to acquire or use nuclear/radiological threats by malefactors are anticipated, stopped, investigated, and effectively countered.
- Consequences of radiological or nuclear incidents, including attacks, are mitigated or minimized through prior planning and engineering, as well as effective response, emergency management, and remediation.

This broader interpretation of nuclear security is critically necessary to nurture the interdisciplinary approach needed for an effective and sustainable nuclear security framework, both domestically and around the world.



Goals and objectives of the Institute

The INS was established partly in recognition of the fact that the ability to sustain efforts in nuclear security is eroding as the population of skilled personnel in this field declines, yet the national/global need for expertise and new capabilities in this area is growing. It also creates an opportunity to establish deeper and more effective partnerships between academia, government, and industry to address these daunting challenges. Specifically, the Institute seeks to achieve the following goals:

- Marshal and coordinate the collective resources of the members to more effectively solve important global security needs,
- Enable better and broader collaborations, particularly among the members,
- Develop an intellectual leadership position in shaping the national and international dialogue on nuclear security policy and

practice,

- Communicate the Institute's remarkable synergy in nuclear security capabilities both among the members as well as to potential sponsors, and
- Enhance the ability of the members to engage in activities that attract and educate the next generation of experts in this field.

The objectives of the Institute are to:

- Define and develop new educational/training programs to meet global needs in nuclear security,
- Shape the avenues of diplomacy and public policy for greater effectiveness in achieving global nuclear security objectives,
- Further the development of interdisciplinary scientific research and development for nuclear security applications,
- Foster excellence in the expertise of the Members that support better intelligence and operational capabilities for global nuclear security, and
- Solve real-world challenges in nuclear security.

The Charter Members of the Institute are:

- The University of Tennessee,
- The Howard H. Baker Jr. Center for Public Policy,
- Oak Ridge National Laboratory,
- The Y-12 National Security Complex, and
- Oak Ridge Associated Universities.



The Baker Center Rotunda



Who are our constituencies?

The Institute formalizes and enhances existing partnerships among Charter Members and provides avenues for additional partnership collaboration opportunities on nuclear security activities and projects. Moreover, INS enhances the stature and capabilities of its members both individually and as a whole in the field of nuclear security with the goal of achieving broad recognition as a center of excellence.

As of this writing, the INS has 19 faculty members on the campus affiliated with the Institute, representing the following academic units:

- Department of Nuclear Engineering,
- Department of Physics and Astronomy,
- Department of Political Science,
- Department of Materials Science and Engineering,
- Department of Chemistry,
- Department of Chemical Engineering,
- Department of Industrial and Systems Engineering,
- Howard H. Baker Jr. Center for Public Policy,
- College of Law, and
- College of Business.

Furthermore, many participating staff from our partner organizations also hold adjunct or joint faculty status with the University.

The internal constituencies for INS include staff/faculty/students across the members, seeking to engage more of the collective capabilities in the members in this mission area. Our internal audience grows with continued outreach and collaborative efforts, and participants are drawn from a wide variety of disciplines.

Externally, the INS presents a uniform brand and a “common umbrella” for our collective capabilities to sponsors and decision makers. This serves to both better inform potential sponsors about our value as well as to maximize sponsor access to the Institute’s unique capabilities.

The INS’s uniform brand and joint set of capabilities make it a unique asset to a wide range of external audiences, including the U.S. Departments of Energy and Defense as well as policy analysts and decision makers within the Intelligence Community. Additionally, the INS’s broad array of policy and technical expertise offer extensive insight that a variety of policy makers and mission agencies can utilize as critical nuclear security issues are examined.



UT graduate students in the Nuclear Engineering Physical Security class.

Organization and structure

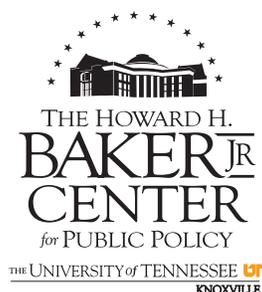
Organizationally, the INS functions as a campus-wide organized research unit and is sited within UT's Howard H. Baker Jr. Center for Public Policy. Institute activities are also conducted at all Members locations, as appropriate to each specific activity. INS reaches across the many UT disciplines and academic departments that can contribute to the nuclear security field. INS fosters nuclear security-related research, development, service, teaching, and related scholarly activities. INS facilitates the development of enhanced educational capabilities for nuclear security within the academic units of UT and more broadly via collaborations with and dissemination through the ORAU membership.

As a partnership, ORNL, Y-12, ORAU, and UT are in a unique position for solving crucial problems in global nuclear security. Collectively, the members of the INS bring together close organizational ties, geographic co-location, and access to working nuclear facilities – including reactors, accelerators, hot cells, and special nuclear materials, all engaged in nationally and globally relevant work.

All INS operations and programming are directed by Dr. Howard Hall, UT/ORNL Governor's Chair for Nuclear Security. Management of specific INS projects at each partner site is vested within the partner's management system.

An Advisory Board of Directors, drawn from the Member organizations, is established to provide guidance to the INS Director and to support INS operations. The INS Board of Directors consists of the INS Director (H. Hall), the Director of the Howard H. Baker Jr. Center for Public Policy (M. Murray), and Member representatives (UT: Wes Hines, Brandon Prins; ORNL: Alan Icenhour, Ted Sherry, Larry Satkowiak, Jim Sumner, Bill Toth, and Patrick Lynch; Y-12: Chris Clark, Gerald DeVault, Joe Stainback, and Chris Robinson; ORAU: Eric Abelquist, Arlene Garrison, and Cathy Fore). Voting members of the Board include Hall, Murray, Satkowiak, DeVault and Abelquist.

The Board serves in both an advisory and advocacy capacity, assisting the director in: establishing the overall strategy and direction for all activities associated with INS; maintaining cognizance of all activities and providing appropriate oversight; identifying and seizing new opportunities that enhance the INS's value and mission; identifying and resolving issues that could affect INS success; fostering collaboration between INS partners; and representing the INS to the various communities of interest. The Board meets on an approximately monthly basis to review INS activities and advise the INS Director.



Thematic structure of the INS

INS focuses its efforts in five principal thematic areas, which are referred to as the “pillars” of INS. Our concept of a systems approach to nuclear security is designed specifically to encourage crosscutting efforts and collaborations between academia, government, the private sector, and the public. The INS is fostering a long-term comprehensive approach in its work that is informed by the “whole of government” and “whole of society” concepts advanced for addressing nuclear security concerns.

Policy, Law, and Diplomacy

This pillar seeks to assure that negotiated agreements and national priorities reflect the most current understanding of the issues arising at the intersection of technology and policy. Nuclear security is especially challenging in this regard, as the proliferation of nuclear weapons or the malicious use of nuclear threats can span an incredibly broad range of capabilities and intents – from individual actors or opportunistic terrorists through concerted, long-term efforts backed by the resources of nation-states.

Education and Training

This pillar brings the INS resources together to address the need to ensure that the people in the nuclear security community are well trained, creative, and that the human side of the nuclear security enterprise is sustainable.

Science and Technology

Fundamental science discoveries that create transformative technology applications in nuclear security are critical to the long-term success of nuclear security. These include new operational systems, new understandings of the threat space, and new methods of discerning or discovering threats. Our consortium views technology development as a critical force multiplier to assure that the global nuclear security architecture is a robust and cost-effective as possible.

In general, INS does not function as an organizational “overlay” for research proposals that are best performed by single organizations. If the research is not collaborative between academic units or partner organizations, INS largely does not interfere with the direct connection between the sponsor and the performing unit other than perhaps to maintain some cognizance for other possible oppor-

tunities. As a result, INS tends to focus on large, complex proposals that are beyond the abilities of a single investigator.

Operational and Intelligence Capabilities

This pillar focuses on initiatives in improving operational capabilities (military and civilian) as well as intelligence systems in the nuclear security field that support the effective mitigation and monitoring of potential threats. Appropriately cleared researchers and students bring added insights to these challenges, as well as gaining greater perspective on the real-world needs for guiding their research and educational missions. As would be expected, much of this work is performed by our partner organizations, although our faculty and students at both our partner locations and on the UT campus conduct fundamental research that supports this pillar.

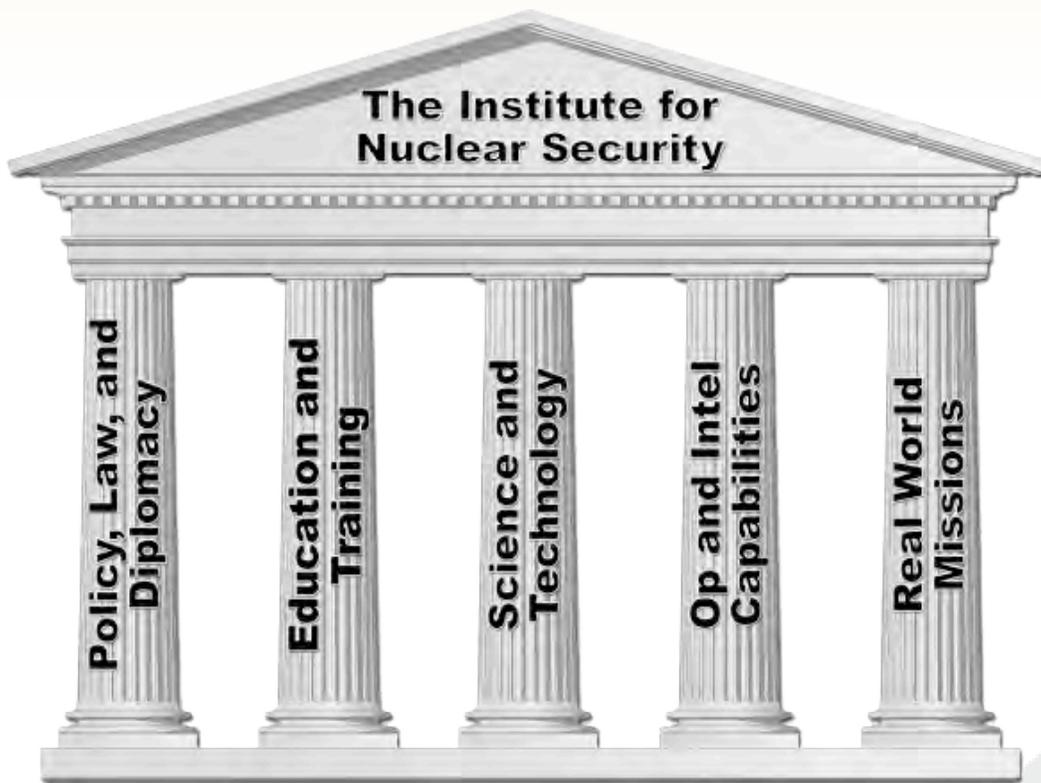
Real World Missions

Likewise, our ORNL, Y-12, and ORAU partners lead our consortium’s support to real mission activities of the US Government. This includes providing experts for IAEA inspections, mounting complex materials recovery operations, providing state-of-the-art analysis and serving as technical experts to diplomatic engagements, or supporting law enforcement investigations into nuclear smuggling or nuclear terrorism. These activities also render unique insights for our R&D and educational approaches, assuring that these activities remain highly relevant to the needs of the global nuclear security community.

Integrating The Pillars

The critical component in sustaining the relevance of our efforts is the sharing of insights from one pillar to another. For example, experience gained in the science and technology work of the INS should improve operational capabilities of our partners, which makes for more effective real world missions. Lessons from the integration of those technologies and their application inform our education programs, and may raise policy considerations that warrant in-depth study. Through the INS and routine meetings of our working Board of Directors drawn from all our partner organizations, we share these insights on a regular basis.

The “Pillars” of INS



Teaching, scholarship, and programs

The INS educational objective is to create the next generation of leaders and specialists in nuclear security for the world. To accomplish this, INS is establishing a robust set of collaborative projects in nuclear security that create needed educational and training offerings across multiple academic units at UT and among the INS members, building on the collective expertise and capabilities of the Institute. This leverages the success of the existing graduate certificate program in nuclear security in the Department of Nuclear Engineering, which already heavily engages ORNL and Y-12 in the University's graduate education efforts.

INS has fostered, developed, and/or added new courses (or significant modifications) to the academic offerings of the University in the topical area of nuclear security. These classes are now drawing increasing numbers of students across the academic spectrum to this field (and to the University).

INS faculty and staff are working on developing a robust nuclear security education programs on UT campus and across Membership. These efforts span multiple academic units and programs, and although initially focused on the graduate program, are also beginning to influence the undergraduate curriculum as well.

As UT is a research-intensive university, the development of a robust and impactful research portfolio is an important success metric for the INS.

UT is also Tennessee's land grant university, and hence has a firm commitment to teaching, research, and service across the university. As a result, fostering research, development, service, teaching, and related scholarly activities across the membership is a core function of INS.

INS focuses on those activities that capitalize on partnership and collaboration among the member organizations of INS. INS also supports enhanced educational capabilities for nuclear security within the academic units of the UT, and more broadly through the ORAU membership.

The Department of Nuclear Engineering

The Department of Nuclear Engineering offers a graduate certificate in nuclear security science and analysis. The program is designed primarily for students seeking specialization in nuclear security science with emphasis on current or aspiring members of the nuclear security community, including those areas with an emphasis on arms control, treaty verification, nonproliferation, international nuclear security issues in both civilian and military contexts, nuclear threat detection, and principles of nuclear intelligence assessment. Additionally, this program prepares graduate students to engage in the research and development of new tools and processes related to nuclear security science and analysis.

We are supporting the development and implementation of the following new coursework as a part of a major evolution of the certificate curriculum for Academic Year 2013.

NE 531 Global Nuclear Security Culture

Principles and best practices in nuclear security, nuclear safety, and nuclear materials safeguards ("3S") culture with an emphasis on developing and expanding nuclear power-producing states. Introduction to relevant international conventions and agreements such as the Nonproliferation Treaty, the role of the International Atomic Energy Agency, and the key milestones for nations seeking to develop a peaceful nuclear power program.

NE 533 Physical Security for High-Consequence Facilities

Design criteria and performance basis that make up a physical security program for high-consequence and critical environments. Introduction to security design and engineering technology forming the basis behind detection, delay, and response elements of security systems. Elements of risk, system evaluation, site and security surveys, and the legal basis for protection. Evaluative methodologies common to academia and industry will be applied.

NE 534 Physical Security Vulnerability Assessment

Evaluation of threat basis, facility characterization, and asset determination. Students will engage in field surveys, perform interviews, and gather open-source information which provides the background information necessary to evaluate system effectiveness from a quantitative perspective. Evaluative and analytical approaches necessary to perform physical security vulnerability assessments and development of models designed to predict the effectiveness of systems.

NE 535 Nuclear Chemistry and Radiochemistry

Introduction to nuclear and radiochemistry. Principles of radioactive decay, radiochemical separations, and ra-

Teaching, scholarship, and programs

radiochemical measurements. Nuclear cross-sections and isotope production methods. Applications of nuclear and radiochemical techniques in medicine, environment, and industrial applications.

NE 536 Export Control and Nonproliferation

Principles and regulatory frameworks for controlling sensitive nuclear technology. US and European export control regulations and governance, international export control and nonproliferation considerations for nuclear technology trade in the global context. Best practices resources such as the International Atomic Energy Agency, the Nuclear Supplier Group, and other organizations. Case studies in export control violations relevant to nuclear proliferation.

NE 537 Human Reliability in Nuclear Systems

Methodology for assessing and managing human reliability factors in nuclear systems. Issues in human reliability and human sources of error in nuclear systems performance. Indicators and issues in identifying and minimizing the impact of human actions (accidental or deliberate) adverse to successful operation in nuclear systems and nuclear materials security.

NE 635 Nuclear Forensics

Introduction to nuclear forensics. Principles of isotopic signatures and their origins, ultra-trace radiochemical separations, and isotope measurements via nuclear counting and mass spectrometry. Forensic assessment methods for nuclear materials and post-detonation debris analysis. Applications of nuclear forensics in interdicted

materials and crisis response scenarios.

The Department of Political Science

Partnering with Nuclear Engineering and the Howard H. Baker Jr. Center for Public Policy, the Department of Political Science (PoliSci) has transformed their Masters in Public Administration program into a Masters in Public Policy and Administration (MPPA) degree, with the option to tailor the curriculum into a global security studies track.

The MPPA is a professional degree program designed to prepare men and women to assume responsible positions in the public service and the not-for-profit sector through a program of study that integrates the theory and practice of public administration and public policy analysis. The program aspires to produce graduates who are literate in the field of public administration, have the skills to be effective managers of organizational resources, and possess the analytical abilities to be creative problem solvers.

The MPPA degree is a 30 semester credit hour (SCH) program, and to fulfill the requirements of the global security track students are required to fulfill 9 SCH out of the total 30 SCH from the coursework in global security studies. The MPPA program began in the fall semester of 2012.

Prior to the development of the MPPA pro-



UT graduate students in the Nuclear Engineering Nuclear Security Science and Analysis class. Photo courtesy of Y-12.

Teaching, scholarship, and programs

gram, however, the Political Science Department, the Baker Center, and the UT Institute for Nuclear Security collaborated to develop a special seminar as a centerpiece course in the PoliSci global security related curriculum. This course, co-taught by Professor Brandon Prins and Ambassador Thomas Graham, focuses on the strategies, contexts, and tactics associated with development of complex international treaties. The class concludes with an extended mock international convention on establishing a Middle East Nuclear Weapons Free Zone, with class participants representing various nation-states in the region. The description of that course follows:

POLS 410 Nuclear Non-Proliferation and Treaty Negotiation

The Trinity test of an atomic bomb at Alamogordo, New Mexico in 1945 signaled simultaneously mankind's hope for unlimited power to drive civilization into the future, but also the fear of unleashing a weapon that could extinguish in a few minutes time all the efforts of human society. Today, such destructive power in the hands of terrorists and rogue states concerns leaders and scientists worldwide. This course is fundamentally about such weapons. Students are exposed to many critical issues in nuclear security, including U.S. and global efforts to control nuclear weapons and technology and the international regimes intended to arrest proliferation.

The Department of Chemistry

In 2012, Y-12 requested that UT re-institute the Chemistry Department radiochemistry class as a special offering. The following class was jointly organized by Nuclear Engineering and Chemistry departments, and taught by Prof. George Schweitzer (Chemistry) in the 2012 Summer Session. It is intended that this class will become a standing offering.

CHEM 505 Special Topic: Radiochemistry

Introduction to nuclear and radiochemistry. Principles of radioactive decay, radiochemical separations, and radiochemical measurements. Nuclear cross-sections and isotope production methods. Applications of nuclear and

radiochemical techniques in medicine, environment, and industrial applications.

The Chancellor's Honors Program

Our first undergraduate-only class was offered in Fall 2012 through the Chancellor's Honors Program. The class, focused on challenges in disarmament, was very well received and culminated with a class tour of ORNL.

UNHO 101 Global Zero: Challenges, Obstacles, and Hard Problems

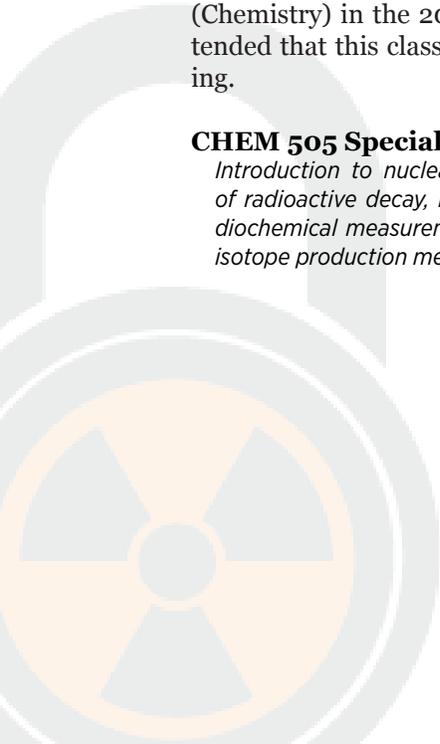
The course is about nuclear weapons in the modern world and about efforts to eliminate the deadly threat they present. Students are exposed to critical issues in nuclear security and the ongoing international efforts for complete nuclear disarmament, including U.S. and global efforts to control nuclear weapons and technology and the international regimes intended to arrest proliferation. This course does not only discuss whether going to zero is a good and feasible idea, but will also focus on the practical implications, challenges and problems of nuclear disarmament for U.S. and the international community.

Collaborations with other universities

2012 also saw the Institute's first collaboration on curriculum development with another university. North Carolina State University (NCSU), working with INS and ORNL, upgraded and expanded their **Principles of Nuclear Security and Non-proliferation** class to include a broader treatment of nuclear security topics.

Because the NCSU class coincided with UT's Physical Security class, we sponsored the development of a head-to-head physical security table-top exercise between the NCSU class and the UT class as a capstone event. This event, dubbed the "Uranium Bowl," was played out between UT and NCSU during NCSU's spring break at the UT campus.

The graduate student who led the development of the Uranium Bowl gave a paper on it at the 2012 INMM Meeting, and a number of other universities are now interested in participating.



Teaching, scholarship, and programs

UT Professor Dyrk Greenhalgh explaining the rules for the Uranium Bowl to the UT and NCSU teams



Professor Hall presenting the inaugural Uranium Bowl trophy to NCSU Professor Steve Skutnik's class

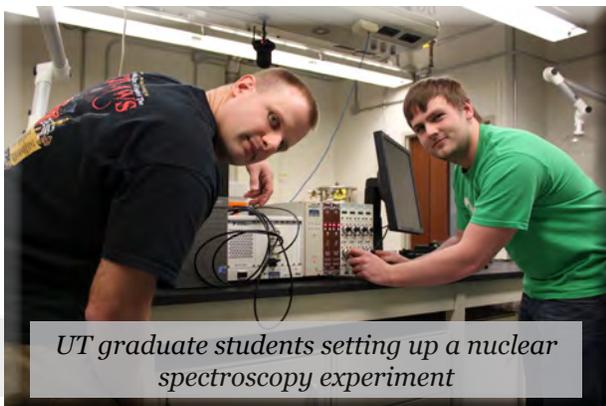


Research

Research is one of the fundamental elements of sustaining and promoting national and global nuclear security. The INS conducts collaborative research across Charter Members, with governmental agencies, universities and research centers nationally and on international level. We are engaged in collaboration with various federal and state agencies, international organizations such as International Atomic Energy Agency and World Institute for Nuclear Security, U.S. and foreign universities.

Key research areas for the INS include:

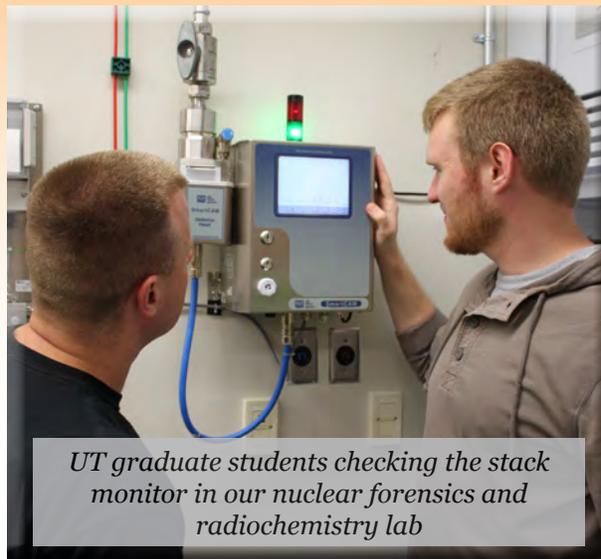
- Signatures of nuclear materials and processes;
- Prevention, detection, interdiction, and response for illicit nuclear/radioactive threats;
- Applications of nuclear probes for detection of security-relevant materials;
- Application of nuclear security in real-world settings; and
- Policy, law and diplomacy relating to global nuclear security.



UT graduate students setting up a nuclear spectroscopy experiment

INS fosters the development of collaborative research proposals in nuclear security applications as opportunities arise. The philosophy of the INS is to focus on areas where we can augment our research mission without interference to ongoing relationships and projects -- therefore, not every project that is within the nuclear security thrust area is managed through the INS. In general, the INS targets those large-scale, complex proposals wherein interdisciplinary and multi-organizational teams are best suited for the work.

As an example, the INS was recently led the



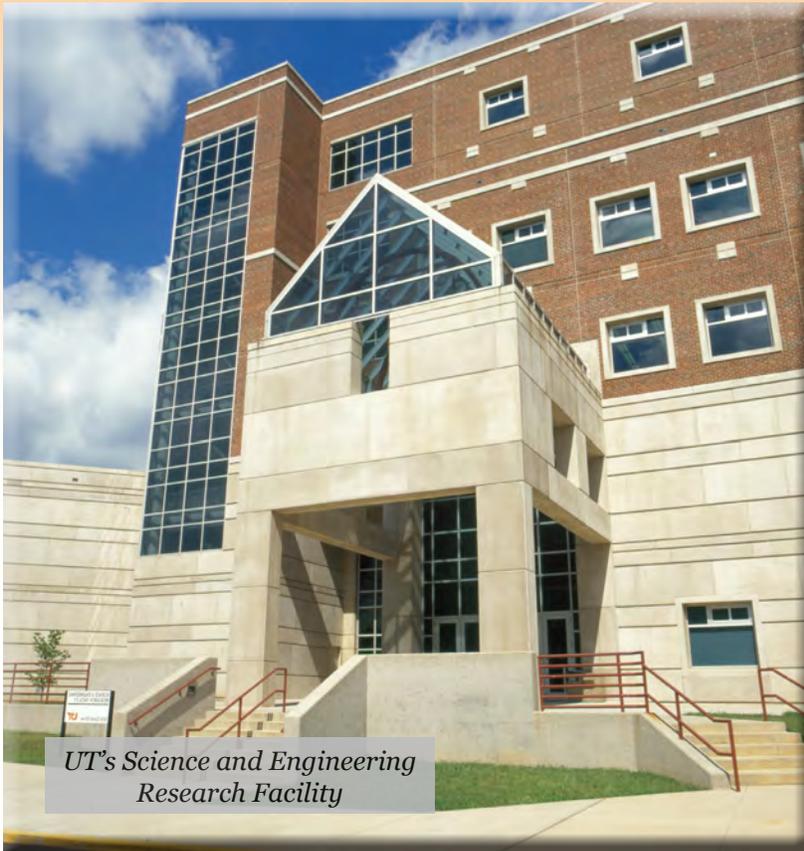
UT graduate students checking the stack monitor in our nuclear forensics and radiochemistry lab

development of a major grant proposal to the National Nuclear Security Administration (NNSA) to establish a Radiochemistry Center of Excellence at UT. This proposal, which involved three separate academic departments, will establish an academic pipeline and center of excellence for NNSA's nuclear stockpile stewardship mission area.

Funded proposals submitted through the Institute in 2012 include:

- Proposal "Radiochemistry Center of Excellence": funding approved, start date is pending. Funding agency: National Nuclear Security Administration. Lead Principal Investigator: Dr. Howard Hall. Total budget: \$6,000,000.
- Proposal "Technical Support for reliability studies": funded. Funding agency: DOE - UT-Battelle - Oak Ridge National Laboratory. Lead Principal Investigator: Dr. Howard Hall. Total budget: \$30,910.
- Proposal "Assessment of Commercial Nickel Supplies": funded. Funding agency: Oak Ridge Associated Universities. Lead Principal Investigator: Dr. Howard Hall. Total budget: \$30,000.
- Proposal "UT Institute for Nuclear Security Collaboration FY13": funded. Funding agency: Y-12 National Security Complex. Lead Principal Investigator: Dr. Howard Hall. Total budget: \$60,000.

Research



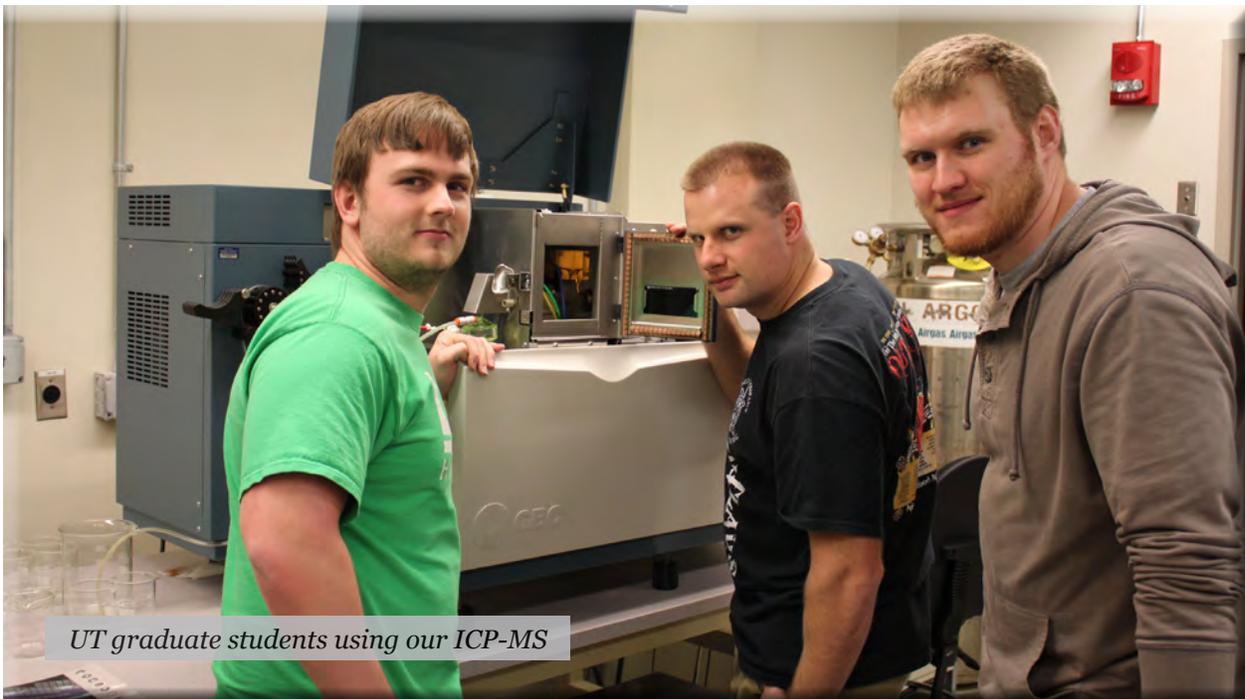
*UT's Science and Engineering
Research Facility*



*UT graduate student
working in our labs*



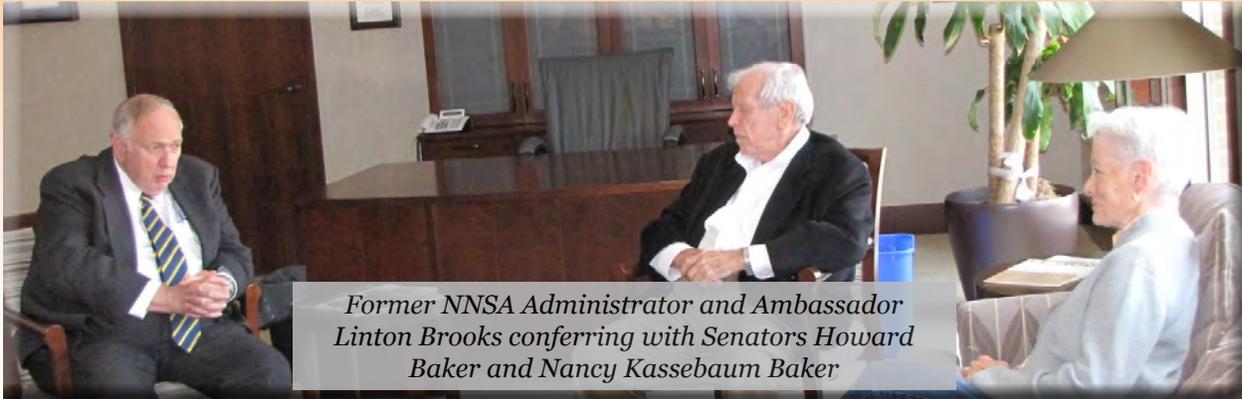
*UT graduate student
preparing a sample*



UT graduate students using our ICP-MS



Events, outreach, and service



Former NNSA Administrator and Ambassador Linton Brooks conferring with Senators Howard Baker and Nancy Kassebaum Baker

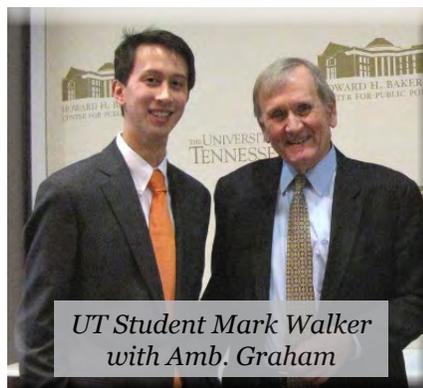
INS's early work in this area is largely centered in the Baker Center, and has been centered on serving as a non-partisan resource to the public on issues on nuclear security policy. Additionally, INS has supported engagement of the nuclear security culture concept with emerging nuclear power producing states through direct visits and interactions with the appropriate governmental leadership, with a particular emphasis on nuclear newcomer states and engagements coordinated by the US Department of State's Partnership for Nuclear Security program.

Distinguished speakers

The Institute has brought a number of leading figures to campus to speak on timely issues relevant to nuclear security. Ambassador Thomas Graham spoke at the Baker Center on nuclear non-proliferations issues (April 2012), Dr. Siegfried Hecker, former director of Los Alamos National Laboratory, on challenges with North Korea and Iran nuclear programs (November 2011), Ambassador Linton Brooks on the New START treaty (September 2011). INS also co-sponsored a student-organized discussion panel "Nukes & Faith: Discussing religion's role in nuclear security and energy," hosted by the Baker Center (October 2011).



Siegfried Hecker



UT Student Mark Walker with Amb. Graham



Amb. Brooks chatting with UT students



Events, outreach, and service

Supporting the National Academies report "Assuring a Future U.S.-based Nuclear and Radiochemistry Expertise"

In 2011, the National Academies of Science undertook a study on the supply and demand of nuclear and radiochemical expertise in the U.S. The INS supported this effort as a service to the nation through the participation of INS Director Hall.

The critical U.S. need for nuclear and radiochemistry expertise in areas such as nuclear medicine, nuclear power, nuclear security, and radioactive waste clean-up and disposal, combined with a past decline in the number of students graduating in this field drove the request for this comprehensive examination of the current and anticipated supply and demand for expertise, including types and levels of skills, in the United States for medicine, energy, defense, and environment.

The *Committee on Assuring a Future U.S.-Based Nuclear and Radiochemistry Expertise* was charged with examining the demand for nuclear chemistry expertise in the United States compared with the production of experts with these skills, and to discuss possible approaches for ensuring adequate availability of these skills, including necessary science and technology

training platforms.

The committee of 13 members, including INS Director Professor Howard Hall, was convened from approximately January 2011 through December 2011. Expertise included those with experience in nuclear and radiochemistry, including backgrounds in nuclear medicine, nuclear power, nuclear security, and environmental management and in research management, university administration, scientific workforce and training indicators, and development of advanced educational programs.

The Committee's report was released in early 2012.



International engagements

One of important goals of the INS is to strengthen and promote the nuclear security culture around the globe. To achieve that, INS is engaging and cooperating with leading international organizations, universities and a number of foreign countries, including Kuwait, Saudi Arabia, Malaysia and South Korea. We are also engaging “nuclear newcomer states” — those nations developing nuclear power programs for the first time — to encourage them to participate in student and faculty exchanges with UT, along with other enrichment and curriculum enhancement activities.

International Atomic Energy Agency (IAEA)

INS became a member of the International Nuclear Security Education Network (INSEN), a group of experts from academia, international organizations and professional nuclear material management associations established, under the auspices of the IAEA Nuclear Security Programme.

The institute nominated one of its faculty members, Dr. Steve Skutnik, to participate in the King's College (London, UK) IAEA-sponsored professional development short course in nuclear security. Professor Skutnik was accepted, and will participate in this program in 2012 and 2013. We anticipate that this faculty exchange will strengthen both our program at UT as well as convey some of our experiences to our colleagues in King' College.

World Institute for Nuclear Security (WINS)

INS is actively engaged in the WINS accreditation initiative, the Nuclear Security Academy. This work will ultimately lead to higher quality professional development and training in nuclear security around the world through the development and

promulgation of best practices and educational quality management systems.

INS participated in a WINS workshop defining how WINS will develop, operate, and manage the accreditation process. The workshop, held in Vienna Austria, drew participants from the US, Europe, the Middle East, Asia, and several non-governmental organizations as well as the IAEA. INS is also working with WINS to be one of the first adopters of the WINS accreditation process for our academic and professional development offerings.

WINS Best Practices in Nuclear Security Workshop

More than 20 countries were represented at the first-ever workshop on best security practices for nuclear power plants and other major nuclear facilities, conducted in the United States at the Y-12 National Security Complex for the World Institute for Nuclear Security (WINS). The workshop was jointly sponsored by the NNSA, the Department of Defense (DoD), UT, and INS.

Global Human Capital Outreach

His Excellency Dr. Ahmad E. Y. Bishara, Secretary General of the Kuwait National Nuclear Energy Committee, visited UT campus and discussed the possibilities for educational cooperation between UT and Kuwait, as well as potential future nuclear programs in Kuwait. As a result of this visit, UT in 2012 has a number of students in nuclear engineering from Kuwait.

The Institute is engaged in collaboration with South Korea on the joint human capital development project in Asia, sponsored by the US and South Korean governments. This included participation in a curriculum development workshop supporting the



NNSA- and Korea Institute for Nuclear Nonproliferation and Control-sponsored curriculum development workshop with the National University of Malaysia (Universiti Kebangsaan Malaysia) in Selangor, Malaysia. December 2011. Photo courtesy UKM.

International engagements



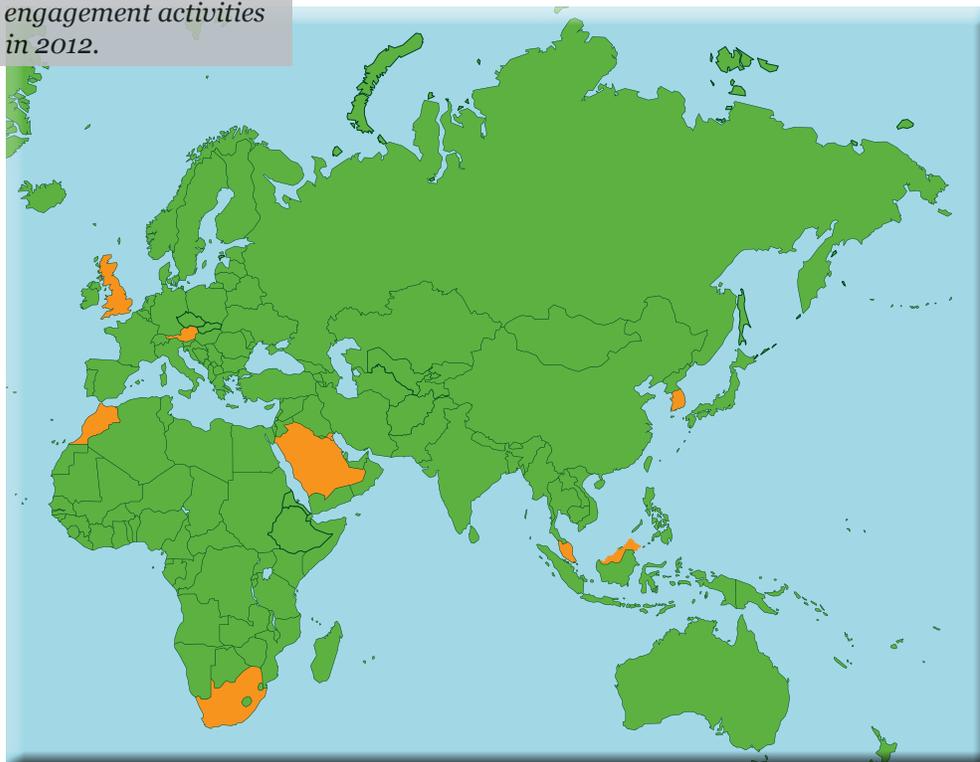
Malaysian effort to build an indigenous educational capability in nuclear security.

INS also hosted a representative from Saudi Arabia's King Abdullah City for Atomic and Renewable Energy, seeking to foster cooperation between Saudi Arabia and UT in the field of nuclear security and energy. This exchange, which began in 2012, is expected to continue with greater engagement with the Kingdom's emerging nuclear power program.

US Department of State - Partnership for Nuclear Security Program

INS is collaborating on an ongoing basis with the Partnership for Nuclear Security (PNS) program. Under this activity, INS has hosted foreign academics at UT and ORNL, collaborated with PNS to devise faculty and curricular enrichment activities suitable for PNS's priority countries, and participates with visiting faculty and students in a variety of settings.

Global locations where INS has had international engagement activities in 2012.



Nuclear security professional development and training

In 2012, the INS partners began the process of establishing a joint professional development program in nuclear security. This program will provide training and continuing education for personnel entering and working in the nuclear security field. This will provide a means of training incoming nuclear security personnel in a timely and cost efficient manner, as well as providing a means for existing mid-career and senior-level nuclear security personnel to remain up-to-date on the latest trends and technologies, and expand their professional capabilities.

The program is based on a large collection of specialized short courses in nuclear security topics (typically 1-5 days in length). These courses will be taught by subject matter experts from the INS

partner organizations. Students will be able to get hands-on experience in some of the one-of-a-kind nuclear facilities that are in the Oak Ridge complex. INS will offer these courses to participants on a fee-for-service basis, and in addition to receiving world-class training, the students will be able to receive continuing education units.

As the program grows, these courses and new courses will be organized and assembled into a number of certificate programs in various areas of nuclear security. The first offerings in this program are expected to be available in 2013. INS Board Member Andy Page, CEO of ORAU, delivered the initial public presentation on this program in December at the 2012 European Nuclear Conference in Manchester, UK.



Training nuclear security professionals. Photos courtesy of Y-12.

Nuclear security professional development and training



Conducting a mock security exercise for observers. Photo courtesy of Y-12.



Ongoing strategic objectives for the INS

Strengthen our network of partnership and collaboration, increasing east Tennessee's unique value to the global nuclear security enterprise

Execute a dynamic approach for building our indigenous capabilities while fostering strong partnerships across the nuclear security community of interest

Continually align INS goals with sponsor needs to develop new and/or expanded funding streams

Develop INS academic programs and research opportunities with a strategic focus on those areas most aligned with global needs in the field of nuclear security

Expand our academic efforts to address the needs of post-graduate entrants into the nuclear security field as well as continuing education needs for current professionals

Increase awareness of the capabilities and resources offered by INS to potential external partners and influential decision makers, sponsors, and donors

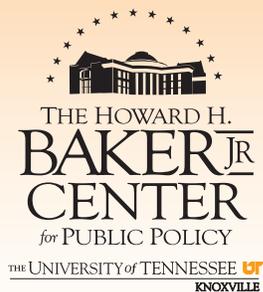
Develop strong relationships with policy makers who can both utilize and champion INS as the premiere global resource in sustaining nuclear security

Increase the INS international portfolio and faculty/student opportunities, developing greater influence through collaborative leadership

Develop new and impactful projects both nationally and internationally that support the INS, the Baker Center, our partners, and the University.



Partners in the INS



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