Idaho National Laboratory's 2015

Research & Development Awards Ceremony

February 2016

Idaho National Laboratory

20th Annual Research and Development Awards Ceremony

2015 Highlight Video

Patent Video

Lifetime Achievement Awards

20-patent level: William Apel

15-patent level: Bob Fox, Dale Kotter

5-patent level: David Crandall, Doug Few, Scott Herbst, Steve Herrmann and David Swank

Outstanding Paper Published by an Early Career Scientist/Engineer

Travis Grimes, Peter Zalupski, Leigh Martin

Outstanding Scientific Paper

Aaron Wilson and Christopher Orme

Lifetime Achievement Award for INL Publisher

David Petti

Outstanding Innovation Award

David Hurley and Robert Schley

Outstanding Impact Award

Nikki Rasmussen, William Fuger, James Schondel, Margy Blackburn and Ryan Buxton

Laboratory Award for Early Career Exceptional Achievement

Assel Aitkaliyeva

Laboratory Award for Exceptional Engineering Achievement

Steve Hayes

Laboratory Award for Exceptional Scientific Achievement

Jian Gan

Laboratory Award for Individual Lifetime Achievement in Science and Technology

Jack Law

Inventor of the Year

Kevin Gering

Technician of the Year Video

Technician of the Year

William Fuger, Thomas L. Morgan and Chris Stayman

Research and Development Awards Ceremony

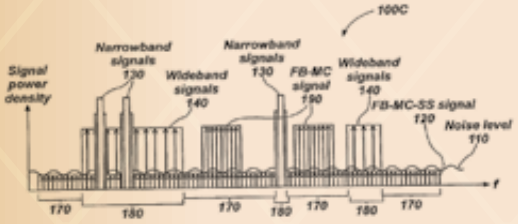
Welcome to the 2015 R&D Ceremony. Fiscal Year 2015 featured a number of notable accomplishments for technology transfer. Twenty-seven U.S. patent applications were issued to INL or DOE based on the inventions of INL scientists and researchers. INL also received permission to assert copyright on seven software programs developed by INL authors.

In addition to the Technology Transfer milestones, INL experienced other exceptional accomplishments. Areas that INL excelled in this year include:

- Nuclear fuels and materials research and experiments.
- Research on plug-in vehicles and charging infrastructure, integrated energy systems and critical materials.
- Control systems cybersecurity incident response and analysis.
- Developing a new scientific approach and methodology for studying nuclear fuel system thermal properties.

We hope you enjoy learning more about INL's accomplishments, patents and copyright assertions from 2015.

Methods and Apparatuses Using Filter Banks for Multi-carrier Spread Spectrum Signals



A spread-spectrum (SS) technique is often employed by wireless carriers and military to distribute wireless signal over a wider bandwidth, but the most common types of SS are often susceptible to interference. Hussein Moradi, Behrouz Farhang and Carl A. Kutsche were issued this patent for their transceiver invention, which uses Filter Bank Multi-Carrier Spread-Spectrum (FB-MC-SS), to send and receive a signal over a range of frequencies with multiplicity of subcarriers, improving bandwidth and decreasing interference with spectrum-sensing capability.

Docket No. BA-585D1. U.S. Patent No. 8,861,571 – Issued October 14, 2014. Inventors: Hussein Moradi, Behrouz Farhang, Carl A. Kutsche

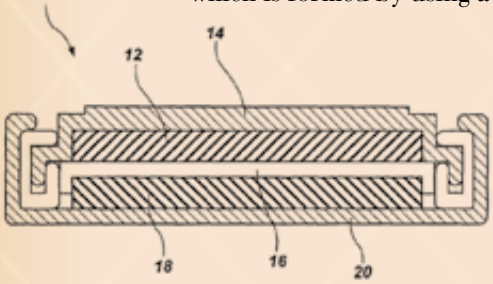
Method of Estimating Pulse Response Using an Impedance Spectrum

With the increase of energy storage devices, such as batteries, fuel cells, ultracapacitors, etc., the need for systems that can monitor the life span of each device has also increased. Inventors John Morrison, William Morrison, Jon P. Christophersen and Chester G. Motloch were awarded this patent for developing an in-situ method to measure impedance, which can then be used to estimate voltage. These measurements will help optimize performance and extend the life of the device.

Docket No. BA-421. U.S. Patent No. 8,868,363 - Issued October 21, 2014. Inventors: John L. Morrison, William H. Morrison, Jon P. Christophersen, Chester G. Motloch

Electrodes Including a Polyphosphazene Cyclomatrix, Methods of Forming the Electrodes, and Related Electrochemical Cells

Though lithium-ion batteries are growing in popularity, safety concerns, storage limitations and other issues have prevented auto manufacturers from fully embracing these batteries for many new electric vehicle designs. Kevin L. Gering, Frederick F. Stewart, Aaron D. Wilson and Mark L. Stone were awarded this patent for designing a new class of negative electrode (anode) for lithium-ion batteries, which is formed by using a foundation of a polyphosphazene cyclomatrix. This technology holds promise for being more cost-effective, more efficient at high voltage, highly tunable and safer than current designs.



Docket No. BA-670. U.S. Patent No. 8,871,385 - Issued October 28, 2014. Inventors: Kevin L. Gering, Frederick F. Stewart, Aaron D. Wilson, Mark L. Stone

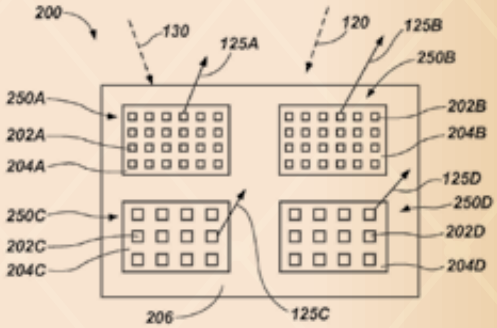
Methods for Radiation Detection and Characterization Using a Multiple Detector Probe

During environmental remediation, field operators are often unaware of the radiological contents in subsurface closed waste containers until the containers are exposed. This patent describes the hardware and software for a multidetector probe, which safely detects radiation by utilizing neutron detectors for high and low neutron radiation fields as well as gross radiation and low (LaBr) and high activity (CZT) gamma spectrometers within a subsurface closed container. It sends measurements and information about the type of radiation to a nearby computer, limiting potential exposure to radioactive waste. This patent was issued to Douglas W. Akers and Lyle G. Roybal.

Docket No. BA-398. U.S. Patent No. 8,878,140 – Issued November 4, 2014. Inventors: Douglas W. Akers, Lyle G. Roybal

Apparatus, System, and Method for Laser-Induced Breakdown Spectroscopy

Mass-spectrometer and optical technologies often require extensive sample preparation and are often too large and expensive for portable needs. Laser-induced breakdown spectroscopy (LIBS) is an optical method that allows for easier sample preparation, but it can still be cost- and size-prohibitive. This patent was awarded to Andrew J. Effenberger, Jill R. Scott and Timothy R. McJunkin for their invention of a new LIBS system that is portable, low-cost and high-resolution.



Docket No. BA-560. U.S. Patent No. 8,891,073 - Issued November 18, 2014. Inventors: Andrew J. Effenberger, Jill R. Scott, Timothy R. McJunkin

Radiation Sensitive Devices and Systems for Detection of Radioactive Materials and Related Methods

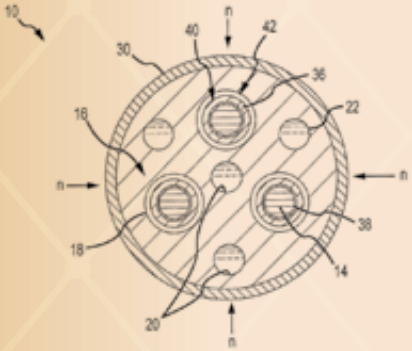
If unwanted nuclear materials are shipped into the country, the technical limitations of most detectors — and the ease with which these materials can be shielded -- can make them difficult to detect. This patent, awarded to Dale K. Kotter, describes the invention of a low-cost detector made of a radiation-sensitive substrate that at least partially ionizes when it is exposed to the ionizing radiation of these nuclear materials.

Docket No. BA-454. U.S. Patent No. 8,901,507 - Issued December 2, 2014. Inventor: Dale K. Kotter

Methods of Natural Gas Liquefaction and Natural Gas Liquefaction Plants Utilizing Multiple and Varying Gas Streams

Current methods for processing conventional natural gas (CNG) to form liquid natural gas (LNG) require large facilities with extensive upfront costs: treatment costs, storage costs and transport costs. This patent, issued to Bruce M. Wilding and Terry D. Turner, describes a new design for natural gas liquefaction plants that use multiple and varying gas streams to more efficiently process CNG into LNG on smaller scales and at decreased costs.

Docket No. BA-350. U.S. Patent No. 8,899,074 - Issued December 2, 2014. Inventors: Bruce M. Wilding, Terry D. Turner



Neutron Absorbers and Methods of Forming at Least a Portion of a Neutron Absorber

A thermal neutron absorbing material was developed to provide a domestic capability for fast flux materials and fuels testing in a pressurized water reactor. The patent describes a method for fabricating this new material. Donna Post Guillen, Douglas L. Porter, W. David Swank and Arnold W. Erickson were awarded this patent for their invention, which uses aluminum and hafnium to form a conduction-cooled, neutron absorber block material.

Docket No. BA-537. U.S. Patent No. 8,903,035 – Issued December 2, 2014. Inventors: Donna Post Guillen, Douglas L. Porter, W. David Swank, Arnold W. Erickson

Actinide-ion Sensor

A primary concern regarding the future of nuclear power is the management of radioactive waste. This invention describes an apparatus that can provide real-time monitoring of radioactive concentrations within waste. It pairs a working electrode and electrolyte inside the container with a reference electrode and electrolyte outside, and it then measures the difference with a voltmeter. The patent was issued to Shelly X. Li, Jan-Fong Jue, R. Scott Herbst and Steven D. Hermann.

Docket No. BA-427. U.S. Patent No. 8,932,446 – Issued January 13, 2015. Inventors: Shelly X. Li, Jan-Fong Jue, R. Scott Herbst, Steven D. Herrmann

Methods, Apparatus and Systems for Monitoring Transmission Systems

Pipe lines, cell towers, power lines and other transmission systems are all susceptible to damage via weather, accidents or sabotage. Repairs are often costly and complicated, and large segments of the population are negatively impacted when the systems unexpectedly go down. Robert E. Polk, John M. Svoboda, Phillip B. West, Gail L. Heath and Clark L. Scott were awarded this patent for their invention that monitors transmission systems, providing advanced notice of problems to operators.

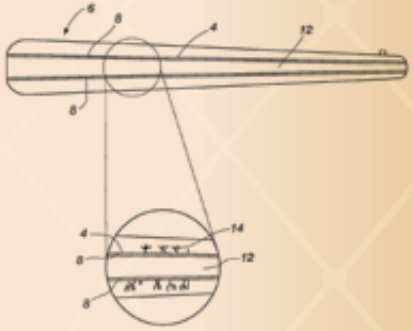
Docket No. B-566D1. U.S. Patent No. 8,941,491 – Issued January 27, 2015. Inventors: Robert E. Polk, John M. Svoboda, Phillip B. West, Gail L. Heath, Clark L. Scott

Hybrid Particles and Associated Methods

Semiconductor materials are found in LEDs, photovoltaic cells, microprocessors and various other technological devices. Conventional semiconductor devices use lanthanide-based materials, and as the need for these lanthanides increases, so does the cost. Robert V. Fox, Rene G. Rodriguez, Joshua J. Pak and Chivin Sun were awarded this patent for their invention of hybrid particles that can be used to create new semiconductor materials at lower costs.

Docket No. BA-388. U.S. Patent No. 8,951,446 - Issued February 10, 2015. Inventors: Robert V. Fox, Rene G. Rodriguez, Joshua J. Pak, Chivin Sun

Real Time Explosive Hazard Information Sensing, Processing, and Communication for Autonomous Operation



Remotely operated robots can be used for mine detection, but this requires skilled operators who may have to expose themselves in hostile environments. Roelof J. Versteeg, Douglas A. Few, Robert A. Kinoshita, Doug Johnson and Ondrej Linda received this patent for developing software that allows robots to autonomously detect, characterize and map explosive hazards in a battlefield or other hostile environment.

Docket No. BA-476. U.S. Patent No. 8,965,578 - Issued February 24, 2015. Inventors: Roelof J. Versteeg, Douglas A. Few, Robert A. Kinoshita, Doug Johnson, Ondrej Linda

Methods of Forming Boron Nitride

New designs for ballistic weapons have resulted in projectiles that can travel faster, farther and with greater accuracy, but these changes also increase temperature and friction within the barrel, causing greater damage. A boron nitride coating can condition and heal the weapon. Tammy L. Trowbridge, Alan K. Wertsching, Patrick J. Pinhero and David L. Crandall were awarded this patent for their invention, which establishes a new method for forming boron nitride.

Docket No. BA-195. U.S. Patent No. 8,968,827 - Issued March 3, 2015. Inventors: Tammy L. Trowbridge, Alan K. Wertsching, Patrick J. Pinhero, David L. Crandall

Identification of Discriminant Proteins through Antibody Profiling, Methods and Apparatus for Identifying an Individual

Each person has their own unique antibody profile, which can be recovered from any biological sample more quickly and effectively than DNA tests. This patent describes a statistical analysis method to identify protein arrays that can be used to positively identify a specific individual. It was awarded to Vicki S. Thompson, Jeffrey A. Lacey, Cynthia D. Gentillon and William A. Apel.

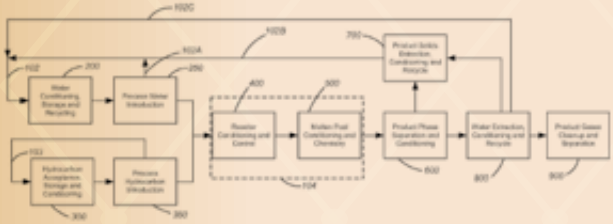
Docket No. BA-386. U.S. Patent No. 8,969,009 - Issued March 3, 2015. Inventors: Vicki S. Thompson, Jeffrey A. Lacey, Cynthia D. Gentillon, William A. Apel

Alteration and Modulation of Protein Activity by Varying Post-translational Modification

This patent was issued to David N. Thompson, David W. Reed, Vicki S. Thompson, Jeffrey A. Lacey and William A. Apel for their approach for altering the enzymatic activity of a microorganism that thrives in extreme environments by post-translationally modifying proteins of interest. The invention will aid various techniques in the biotech field, including improved methods for converting biomass sugars into fuels and chemicals.

Docket No. BA-351. U.S. Patent No. 8,969,033 - Issued March 3, 2015. Inventors: David N. Thompson, David William Reed, Vicki S. Thompson, Jeffrey A. Lacey, William A. Apel

User Interface for a Tele-operated Robotic Hand System



When working with dangerous materials and objects in settings such as hot cells, glove boxes and explosives disarmament, operators need an interface that allows them the greatest levels of dexterity, range of motion and accuracy. Awarded to Anthony Louis Crawford, this patent describes an interface for a robotic hand that has a unique structure and associated algorithm to measure the size of the user hand based on random fingertip movement. This allows the actual user's hand posture to be communicated to a robotic hand rather than just fingertip position, lending itself to more intuitive movement despite the differences between user hand sizes.

Docket No. BA-630. U.S. Patent No. 8,989,902 - Issued March 24, 2015. Inventor: Anthony Louis Crawford

System and Process for the Production of Syngas and Fuel Gases

As the push for cleaner, renewable fuels grows stronger, researchers are looking at new ways to extract energy from alternative energy resources, as well as from energy reserves that have previously been overlooked. Dennis N. Bingham, Kerry M. Klingler, Terry D. Turner, Bruce M. Wilding and Bradley C. Benefiel have developed a new method for producing synthesis gas and hydrogen by separating the gases from a carbon feedstock. They were awarded this patent for their invention.

Docket No. BA-558D1. U.S. Patent No. 9,011,725 - Issued April 21, 2015. Inventors: Dennis N. Bingham, Kerry M. Klingler, Terry D. Turner, Bruce M. Wilding, Bradley C. Benefiel

Apparatuses for Large Area Radiation Detection and Related Method

This patent was awarded to Douglas W. Akers and Mark W. Drigert for development of a radiation detector that uses scintillators to detect beta-emitting radioactive materials, such as Technetium-99 (Tc-99) and Carbon-14, which are difficult to measure in the environment with standard detectors. Tc-99 detection is of particular importance because the element has a long half-life and it moves easily through the environment, especially in water.

Docket No. BA-659. U.S. Patent No. 9,018,586 – Issued April 28, 2015. Inventors: Douglas W. Akers, Mark W. Drigert

Method and Device for Fabricating Dispersion Fuel Comprising Fission Product Collection Spaces

In traditional nuclear reactors, when neutrons interact with fissile material they create fission products that can build up and negatively impact the longevity and efficiency of the fuel. This invention describes a method for creating spaces within the reactor that will collect these fission products, improving the lifespan of the fuel. The patent was issued to Eric L. Shaber and Randall S. Fielding.

Docket No. BA-467. U.S. Patent No. 9,025,722 – Issued May 5, 2015. Inventors: Eric L. Shaber, Randall S. Fielding

Type ii Restriction Modification System Methylation Subunit of Alicyclobacillus Acidocaldarius

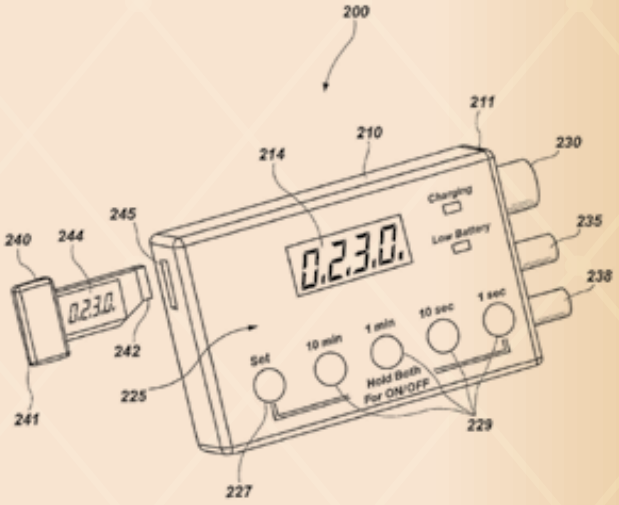
Certain strains of bacteria that thrive in hot or acidic environments (thermophiles and acidophiles), if genetically modified, show great potential for the production of chemicals critical to industrial processes. However, most standard genetic recombination processes are not well suited for these extremophiles. Brady D. Lee, Deborah T. Newby, Jeffrey A Lacey, David N. Thompson, Vicki S. Thompson, William A. Apel, Francisco F. Roberto and David W. Reed received this patent for developing "tools" that more successfully allow for the genetic engineering of certain extremophiles.

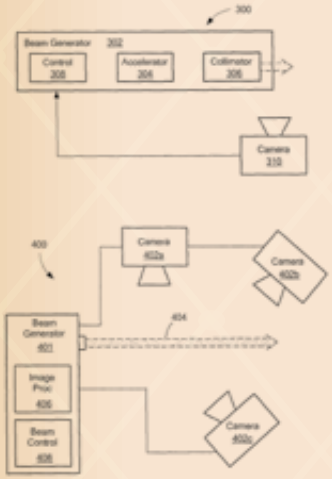
Docket No. BA-322D2. U.S. Patent No. 9,029,114 - Issued May 5, 2015. Inventors: Brady D. Lee, Deborah T. Newby, Jeffrey A Lacey, David N. Thompson, Vicki S. Thompson, William A. Apel, Francisco F. Roberto, David William Reed

Methods for Synchronizing a Countdown Routine of a Timer Key and Electronic Device

Military, police and some commercial situations call for explosives triggered by energetic initiation devices. This patent was awarded to Reston A. Condit, Michael Alan Daniels, Gregory P. Clemens, Eric S. Tomberlin and Joel A. Johnson for their invention, which synchronizes the countdown routines of a timer key and electronic device. The invention allows personnel to set a timer on the initiation device, giving them enough time to move to a safe location.

Docket No. BA-440D1. U.S. Patent No. 9,046,268 – Issued June 2, 2015. Inventors: Reston A. Condit, Michael Alan Daniels, Gregory P. Clemens, Eric S. Tomberlin, Joel A. Johnson





Method and Apparatus to Monitor a Beam of Ionizing Radiation

Radiation beams are useful in a variety of systems, including medicine and active interrogation systems. Inherent risks associated with the beams make it important to track their exact locations, but current methods are costly and labor-intensive. This patent was awarded to Brandon Blackburn, David L. Chichester, Scott Marshall Watson, James T. Johnson and Mathew T. Kinlaw for their methods and apparatus to capture fluorescence images to track the ionizing radiation beam.

Docket No. BA-465X. U.S. Patent No. 9,046,619 – Issued June 2, 2015. Inventors: Brandon Blackburn, David L. Chichester, Scott Marshall Watson, James T. Johnson, Mathew T. Kinlaw

Thermophilic and Thermoacidophilic Biopolymer-degrading Genes and Enzymes from Alicyclobacillus Acidocaldarius and Related Organisms, Methods

David N. Thompson, William A. Apel, Vicki S. Thompson, David W. Reed, Jeffrey A. Lacey and Emily D. Henriksen were awarded this patent for their work identifying, isolating and purifying enzymes and nucleic acid sequences from alicyclobacillus acidocaldarius, a heat- and acid-loving bacterium. This work will help optimize processes involved in removing and degrading the tough cell walls of plant material, which is an important step in the pretreatment of biomass for production of biofuels.

Docket No. BA-283ACIP1C1. U.S. Patent No. 9,045,741 – Issued June 2, 2015. Inventors: David N. Thompson, William A. Apel, Vicki S. Thompson, David William Reed, Jeffrey A. Lacey, Emily D. Henriksen

Precursor Polymer Compositions Comprising Polybenzimidazole (as Amended)

This patent — awarded to John R. Klaehn, Eric S. Peterson and Christopher J. Orme — describes stable, high-performance polymer compositions that include polybenzimidazole (PBI). PBI is a resilient polymer used to form materials such as membranes, conductive materials, fire-resistant materials and ultrafilters. However, it can craze and crack when the hydrogen bonding has been disrupted. This invention improves the durability of PBI by combining it with another polymer.

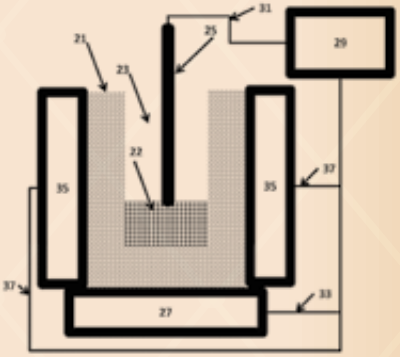
Docket No. BA-500D1. U.S. Patent No. 9,080,052 – Issued July 14, 2015. Inventors: John R. Klaehn, Eric S. Peterson, Christopher J. Orme

System and Process for Upgrading Hydrocarbons

Though hydrocarbon-based fuels are still a major source of energy production, growing energy needs also require the development of alternative fuel systems. One option is to improve current hydrocarbon sources. Dennis N. Bingham, Kerry M. Klingler, Joseph D. Smith, Terry D. Turner and Bruce M. Wilding were awarded this patent for their invention, which upgrades hydrocarbon material using a black-wax upgrade subsystem and a molten-salt gasification system.

Docket No. BA-661. U.S. Patent No. 9,114,984 – Issued Aug. 25, 2015. Inventors: Dennis N. Bingham, Kerry M. Klingler, Joseph D. Smith, Terry D. Turner, Bruce M. Wilding

Real-time Monitoring of Plutonium Content in Uranium-plutonium Alloys



As processing and preprocessing techniques for nuclear and spent nuclear fuel evolve, so must methods of monitoring and measuring the remaining plutonium contents within that fuel. Shelly X. Li, Brian R. Westphal and Steven D. Herrmann were awarded this patent for their method and device that allow for real-time, in-situ monitoring of plutonium content within uranium-plutonium alloys. This will help meet International Atomic Energy Agency safety standards, while decreasing proliferation risks.

Docket No. BA-702. U.S. Patent No. 9,121,807 – Issued Sept. 1, 2015. Inventors: Shelly X. Li, Brian R. Westphal, Steven D. Herrmann

Fogging Formulations for Fixation of Particulate Contamination in Ductwork and Enclosures

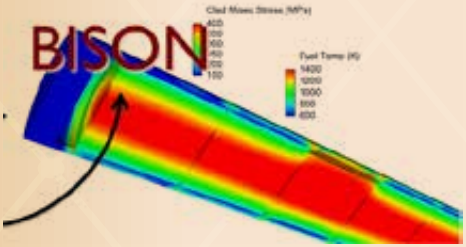
Radionuclides may contaminate dust, lint and particulates throughout radiological buildings and ventilation systems. During decommissioning it is difficult to safely dismantle these buildings without resuspending the contamination. Joseph W. Maresca, Lori M. Kostelnik, James R. Kriskovich, Rick L. Demmer and Julia Lynn Tripp received this patent for their invention of fogging formulations, which can easily penetrate particles, trapping and keeping them safely contained both during and after the decommissioning process.

Docket No. BA-387. U.S. Patent No. 9,126,230 – Issued Sept. 8, 2015. Inventors: Joseph W. Maresca, Lori M. Kostelnik, James R. Kriskovich, Rick L. Demmer, Julia Lynn Tripp

Copyright Assertions

Bison

BISON is a nuclear fuel modeling application that utilizes the Multiphysics Object Oriented Simulation Environment (MOOSE) framework. BISON is able to process several things happening at once (changing temperature and deformation, for example), what scientists refer to as multiphysics.



The application solves fully coupled equations, meaning the temperature and deformation of the model are computed simultaneously. BISON contains sophisticated models that describe fuel behavior in a reactor, including models for complicated physical phenomena such as thermal expansion, solid and gaseous fission product swelling, densification and creep. By refining designs based on simulation results, scientists can maximize the efficiency of testing in research reactors.

Docket No. CW-11-02. Inventors: Jason Hales, Richard L Williamson, Stephen R. Novascone, Benjamin Spencer, Giovanni Pastore, Cody Permann, David Andrs, J. C. Newman, Jr., Michael Tonks, Richard C. Martineau, Danielle Perez, Shane Stafford, Frederick Gleicher, JW Peterson, Andrew E. Slaughter, Pavel G. Medvedev, Thomas K. Larson, Derek Gaston

Grizzly

Grizzly is a simulation tool for assessing the effects of age-related degradation on systems, structures and components of nuclear power plants. Grizzly is built on the MOOSE framework and uses a Jacobian-free Newton Krylov method to obtain solutions to coupled simulations of a variety of physics including heat conduction, species diffusion, chemical reactions and solid mechanics. Grizzly runs on a wide range of hardware, from a single processor to massively parallel machines.

Docket No. CW-13-05. Inventors: Benjamin Spencer, Daniel Schwen, Pritam Chakraborty, Hai Huang, Xianming Bai, John Peterson, Cody Permann, Andrew Slaughter, Derek Gaston, David Andrs, Jason Miller

MorphoHawk

MorphoHawk is a computational method that solves many types of image and signal analysis challenges. It can monitor known objects or terrain to automatically identify the appearance of new objects of interest. MorphoHawk uses two core algorithms to extract object information from digital images by filtering with simple geometrical figures such as rectangles or simple curves. This approach makes it possible to get useful information from images obtained under changing conditions, such as varied weather or lighting.

Docket No. CW-13-13. Inventors: Michael V. Glazoff, Kevin L Gering, Yuri Petrovich Pytyev

Reactor Application For Coaching Newbies (RACCOON)

RACCOON is a MOOSE-based reactor physics application designed to engage undergraduate and first-year graduate students. The code contains capabilities to solve the multigroup neutron diffusion equation, a group of partial differential equations that engineers often use to model nuclear physics. The application also will soon have a provision to provide simple thermal feedback. These capabilities are sufficient to solve example problems found in the typical textbook of senior-level reactor physics classes.

Docket No. CW-14-04. Inventors: Sebastian Schunert, Javier Ortensi, Yaqi Wang, Frederick Gleicher

An Integrated Tool For Functional Requirements Analysis, Function Allocation And Task Analysis: HFE-Trace Formerly Functional Requirements Analysis, Function Allocation And Task Analysis Assistant: Fra/fa/ta Assistant

HFE-Trace is an integrated method for analyzing Human Factors Engineering requirements for nuclear power plants. The method, which includes physical and cognitive ergonomic considerations, supports the coherent and consistent application of the nuclear industry's best practices. After collecting data on the design of a new nuclear power plant, HFE-Trace identifies potential system and functional breakdowns of the intended power plant design. It also can assess factors that may shape operator performance, such as system and process complexity, workload, environmental conditions, procedures and regulations. A final step includes assessment of methods to prevent potential operator errors.

Docket No. CW-15-01. Inventors: Jacques Victor Hugo

Reservoir Temperature Estimator: RTEst

The Reservoir Temperature Estimator (RTEst) is a program that can estimate deep geothermal reservoir temperature and chemical parameters such as $C0_2$ fugacity (the activity of the gas) based on the water chemistry of shallower, cooler reservoir fluids. This code uses the plug-in features provided in The Geochemist's Workbench, the standard for geochemical modeling in aqueous systems. The code also interfaces with a standard model-independent parameter estimation code (Pest) to optimize the estimated parameters.

Docket No. CW-15-02. Inventor: Carl D. Palmer

Autonomic Intelligent Cyber Sensor Version 1.0.1: AICS

The Autonomic Intelligent Cyber Sensor (AICS) provides cybersecurity and industrial network state awareness for Ethernet-based control network implementations. It can identify anomalous network traffic, discover network entity information, deploy deceptive virtual hosts and implement self-configuring modules. AICS accomplishes all this using collaborative mechanisms based on Autonomic Research and a Service Oriented Architecture (SOA) and dynamically reacting to the industrial human-digital ecosystem in which it resides. Information is transported internally and externally on a standards-based, flexible two-level communication structure.

Docket No. CW-15-04. Inventors: Denis Todd Vollmer, Milos Manic, Ondrej Linda

Hall of Fame

Established in 2002, the “INL Hall of Fame” recognizes achievement over the entire span of a career. Inventors are inducted into INL’s Hall of Fame after reaching the five-patent milestone. They are again recognized when they reach 10, 15 and 20 patented inventions.

Efforts to advance and license technologies created at INL continue to pay dividends for both the inventors and the laboratory.

5 Patents

Douglas A. Few

Patent Number

8,271,132

7,974,738

7,801,644

7,587,260

7,584,020

David L. Crandall

Patent Number

8,968,827

8,000,010

7,661,220 B2

7,337,574

7,225,574

R. Scott Herbst

Patent Number

8,932,446

7,807,606

7,494,630

7,368,412

6,270,737

Steven D. Herrmann

Patent Number

9,121,807

8,932,446

8,734,738

6,365,019

5,678,240

W.D. Swank

Patent Number

8,903,035

8,007,607

7,286,626

6,967,304

6,919,576

15 Patents

Robert V. Fox

Patent Number	Description
8,951,446	Hybrid Particles And Associated Methods
8,324,414	Methods Of Forming Single Source Precursors, Methods Of Forming Polymeric Single Source Precursors, And Single Source Precursors And Intermediate Products Formed By Such Methods
8,003,070	Methods For Forming Particles From Single Source Precursors, Methods Of Forming Semiconductor Devices, And Devices Formed Using Such Methods
7,723,463	Decontamination Materials, Methods For Removing Contaminant Matter From A Porous Material, And Systems And Strippable Coatings For Decontaminating Structures That Include Porous Material
7,713,401	Methods For Performing Electrochemical Nitration Reactions
7,691,270	Method For Removing Impurities From An Impurity-containing Fluid Stream
7,514,575	Production Of Biodiesel Using Expanded Gas Solvents
7,345,208	Method For Making An Energetic Material
6,984,768	Method For Destroying Halocarbon Compositions Using A Critical Solvent
6,887,283	Process For Producing Biodiesel, Lubricants And Fuel And Lubricant Additives In A Critical Fluid Medium
6,652,654	System Configured For Applying Multiple Modifying Agents To A Substrate
6,623,686	System Configured For Applying A Modifying Agent To A Non-equidimensional Substrate
6,579,821	Method And Reactivating Solid Catalysts Used In Alkylation Reactions
6,495,204	Method For Modifying Monofilaments, Bundles Of Monofilaments And High Strength Fibrous Material
6,103,948	Solid Catalyzed Isoparaffin Alkylation At Supercritical Fluid And Near-supercritical Fluid Conditions

Dale K. Kotter

Patent Number	Description
8,901,507	Radiation Sensitive Devices And Systems For Detection Of Radioactive Materials And Related Methods
8,847,824	Apparatuses And Method For Converting Electromagnetic Radiation To Direct Current
8,338,772	Devices, Systems And Methods For Harvesting Energy And Methods For Forming Such Devices
8,102,260	Methods, Systems And Devices For Detecting Threatening Objects And For Classifying Magnetic Data
8,071,931	Structures, Systems And Methods For Harvesting Energy From Electromagnetic Radiation
7,796,028	Circuitry, Systems And Methods For Detecting Magnetic Fields
7,792,644	Methods, Computer Readable Media And Graphical User Interfaces For Analysis Of Frequency Selective Surfaces
7,652,572 B2	Methods, Systems And Devices For Detecting And Locating Ferromagnetic Objects
7,436,373	Portable Receiver For Radar Detection
7,013,245	Method And Apparatus For Detecting Concealed Weapons
5,629,824	Hall-effect Arc Protector
5,501,080	Self-contained Cryogenic Gas Sampling Apparatus And Method
5,317,259	DC-based Magnetic Field Controller
5,307,006	Optical Voltage Reference
4,996,531	Digital Optical Conversion Module

William A. Apel

Patent Number	Description
9,045,741	Thermophilic And Thermoacidophilic Biopolymer-degrading Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
8,969,033	Alteration And Modulation Of Protein Activity By Varying Post-translational Modification
8,969,009	Identification Of Discriminant Proteins Through Antibody Profiling, Methods And Apparatus For Identifying An Individual
8,728,803	Thermophilic And Thermoacidophilic Metabolism Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
8,716,011	Transcriptional Control In Alicyclobacillus Acidocaldarius And Associated Genes, Proteins And Methods
8,569,030	Genetic Elements, Proteins And Associated Methods Including Application Of Additional Genetic Information To Gram (+) Thermoacidophiles
8,557,557	Thermophilic And Thermoacidophilic Biopolymer-degrading Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
8,497,110 B2	Thermophilic And Thermoacidophilic Biopolymer-degrading Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
8,492,114 B2	Methods Of Combined Bioprocessing And Related Microorganisms, Thermophilic And/or Acidophilic Enzymes And Nucleic Acids Encoding Said Enzymes
8,431,379	Thermal And Acid Tolerant Beta Xylosidases, Arabinofuranosidases, Genes Encoding, Related Organisms And Methods
8,426,185	Thermophilic And Thermoacidophilic Biopolymer-degrading Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
8,351,674	Image Portion Identification Methods, Image Parsing Methods, Image Parsing Systems And Articles Of Manufacture
7,960,534	Thermophilic And Thermoacidophilic Sugar Transporter Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
7,923,234	Thermal And Acid Tolerant Beta-xylosidases, Genes Encoding, Related Organisms And Methods
7,858,353	Thermophilic And Thermoacidophilic Biopolymer-degrading Genes And Enzymes From Alicyclobacillus Acidocaldarius And Related Organisms, Methods
7,727,755	Enzyme And Methodology For The Treatment Of A Biomass
7,695,919	Improved Antibody Profiling Sensitivity Through Increased Reporter Antibody Layering
6,811,997	Method For Chromium Analysis And Speciation
5,795,751	Biofilter For Removal Of Nitrogen Oxides From Contaminated Gases
5,681,739	Method For In Situ And Ex Situ Bioremediation Of Hexavalent Chromium Contaminated Soils And/or Groundwater

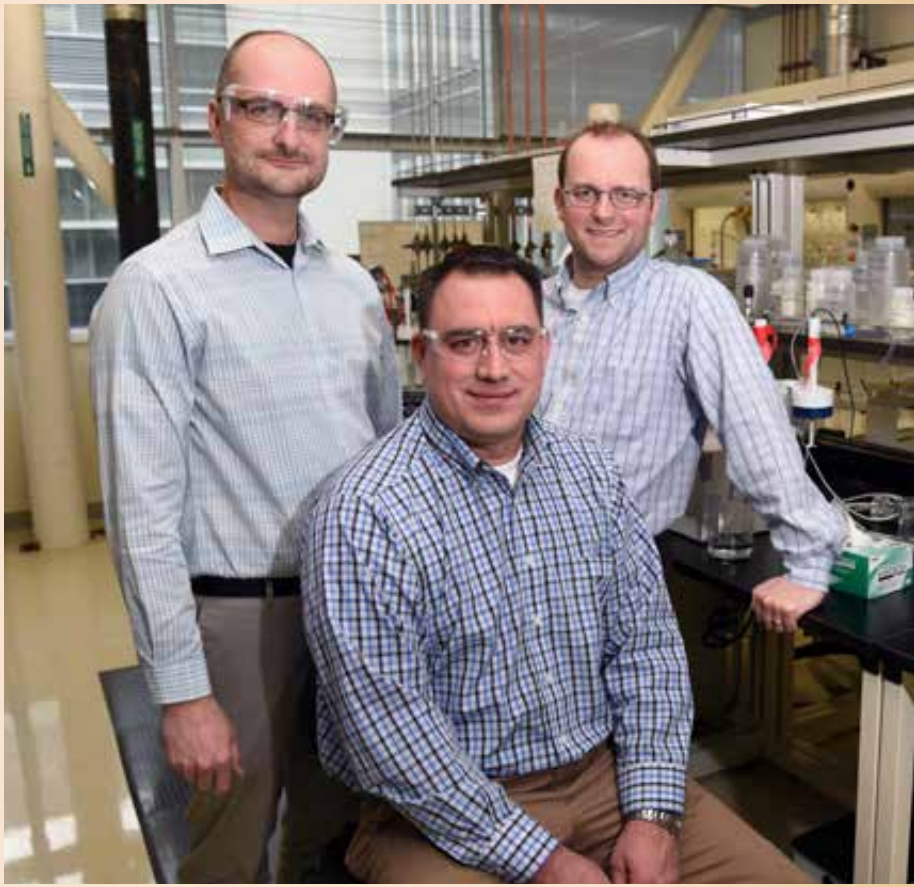
Outstanding Paper Awards

The outstanding paper awards in early career, science and engineering recognize researchers for research acumen and skill in communicating with the research community through published peer-reviewed journal articles. The recipients were selected based on technical merit, contribution and presentation quality.

Outstanding Paper by Early Career Scientist or Engineer

Travis Grimes, Peter Zalupski and Leigh Martin were selected for "Features of the Thermodynamics of Trivalent Lanthanide/Actinide Distribution Reactions by Tri-n-octylphosphine Oxide (TOPO) and Bis(2-ethylhexyl) Phosphoric Acid," a paper published in the Journal of Physical Chemistry B.

The novel research presents the first direct measurement of heats of extraction of transplutonium elements (Am and Cm) using two-phase calorimetric techniques.



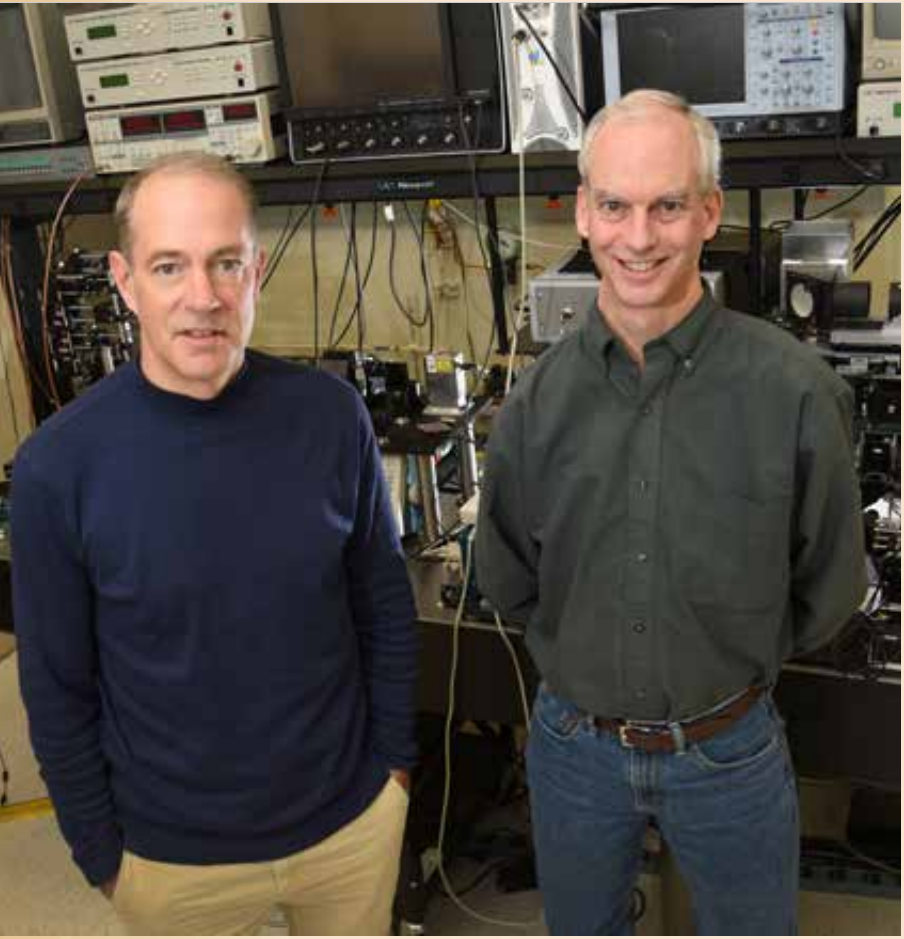
Outstanding Scientific Paper

Aaron Wilson and Christopher Orme won this award for "Concentration dependent speciation and mass transport properties of switchable polarity solvents," a paper published in the Royal Society of Chemistry. Their work to investigate the physical properties of switchable polarity solvents (SPSs) resulted in new insights about the nature of a basic chemical building block: the hydrogen bond. Specifically, their work suggested the presence of a specific nanostructure that would be the first example of a type of hydrogen bond never before observed in solution.

Lifetime Achievement Award for an INL Author – David Petti

This award recognizes an INL author for research and communicating with the research community by publishing 75 or more peer-reviewed journal articles. Dave Petti will receive this award for publishing research in the fields of nuclear fuels, advanced nuclear reactor technologies, fusion nuclear technologies and light water reactor safety.

Outstanding Achievement Awards



Outstanding Innovation Award – David Hurley and Robert Schley

This award is presented to an individual or team for being innovative and thinking outside the box in deploying INL technologies. The Thermal Conductivity Microscope (TCM) is an instrument that measures local thermal conductivity and diffusivity of irradiated nuclear fuel.

The TCM is a first-of-a kind instrument and is uniquely capable of measuring thermal properties on length scales commensurate with microstructure heterogeneity. Current efforts are focused on placing the TCM into the thermal properties suite of the Irradiated Materials Characterization Laboratory. Once operational, the TCM will provide key information for validating new computational materials science models under development at INL.

Outstanding Impact Award – Nikki Rasmussen, William Fuger, James Schondel, Margy Blackburn and Ryan Buxton

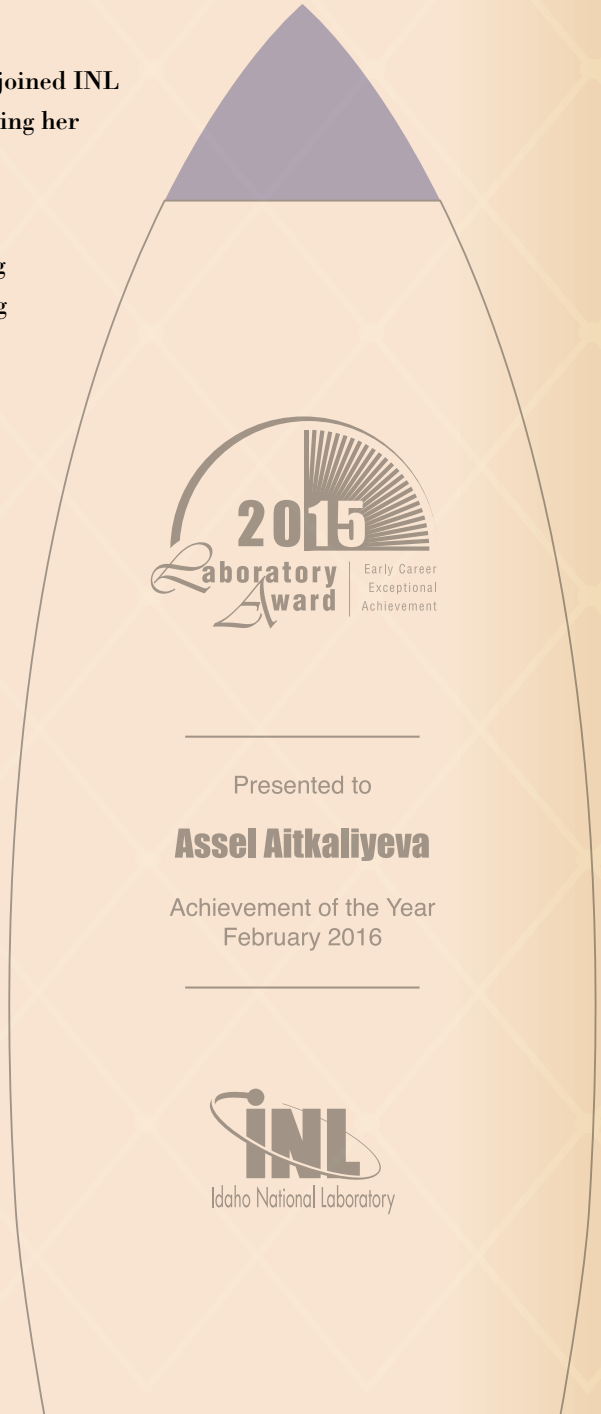
This award is presented to an individual or team that exceeds expectations and delivers significant impact within the external science and technology community. Nikki Rasmussen, William Fuger, James Schondel, Margy Blackburn and Ryan Buxton earned this award for a technically challenging project that saves the lives of U.S. and allied frontline military personnel. This project demonstrates the technical complexity of the research and development (R&D) accomplished at INL; the extensive testing, demonstration and validation processes; and significant improvements to production processes to increase efficiencies and protect employees' personal safety.

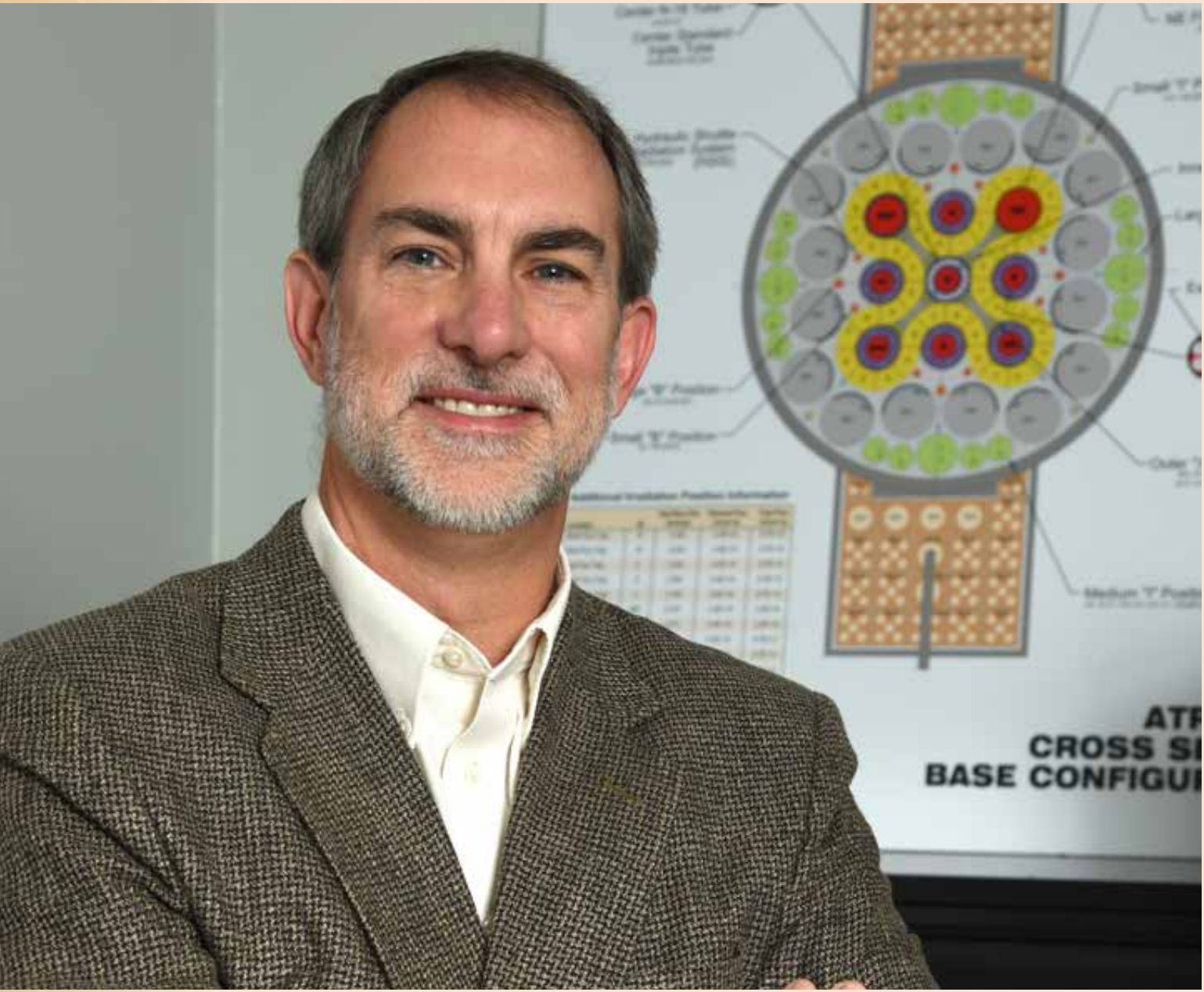
Assel Aitkaliyeva

Dr. Assel Aitkaliyeva started a yearlong internship at INL in 2011, and joined INL full time as Nuclear Science User Facilities (NSUF) technical lead following her graduation in December 2012.

Dr. Aitkaliyeva's scientific work at INL is focused on understanding the equilibria and kinetics of plutonium-based fuels in contact with cladding materials. Her studies are designed to close the gap in the understanding of the progression of the fuel-cladding chemical interaction (FCCI). Her work in pioneering focused ion-beam sample preparation methods has made her widely sought after as an adviser by domestic and international laboratories.

Dr. Aitkaliyeva has as Bachelor of Science in physics from Kazakh National University, a Master of Science in nuclear engineering and a Ph.D. in materials science from Texas A&M University. She has authored more than 20 peer-reviewed journal publications and 30 presentations at professional meetings. She has published six peer-reviewed journal papers based on her INL research. As a principal investigator, Dr. Aitkaliyeva has secured more than $3.2 million in research funding for her work, including a $593,000 grant for research equipment that benefits many others within the lab.

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Steven Hayes

Dr. Steven Hayes is a researcher in the Nuclear Fuels & Materials Division and a Fellow of the Nuclear Science & Technology Directorate. He serves as the focus area lead for Advanced Reactors Fuel Development in the Fuel Cycle Research & Development (FCRD) Program's Advanced Fuel Campaign and as technical lead for the Fuels Product Line in the Nuclear Energy Advanced Modeling & Simulation (NEAMS) Program. He works to demonstrate acceptable performance of metallic fuels fabricated using recycled actinide materials under a CRADA between INL and the Korean Atomic Energy Research Institute.

Dr. Hayes began his career in Idaho in 1992, first with Argonne National Laboratory-West, and then joining Idaho National Laboratory at its inception. During his career, Dr. Hayes has been engaged in the development, testing and modeling of a variety of nuclear fuels, including metallic, oxide and nitride fuels for liquid metal reactors, high-density dispersion fuels for research reactors, and enhanced accident-tolerant fuels for LWRs. He led fuels and materials irradiation experiments in Experimental Breeder Reactor II prior to its shutdown and today he maintains an active fuel testing program in the Advanced Test Reactor. He earned Bachelor of Science, Master of Science and Ph.D. in nuclear engineering from Texas A&M University. He is the author of numerous publications related to nuclear fuel performance and has been awarded a U.S. patent for an innovative nuclear fuel design enabling the enhanced destruction of plutonium.

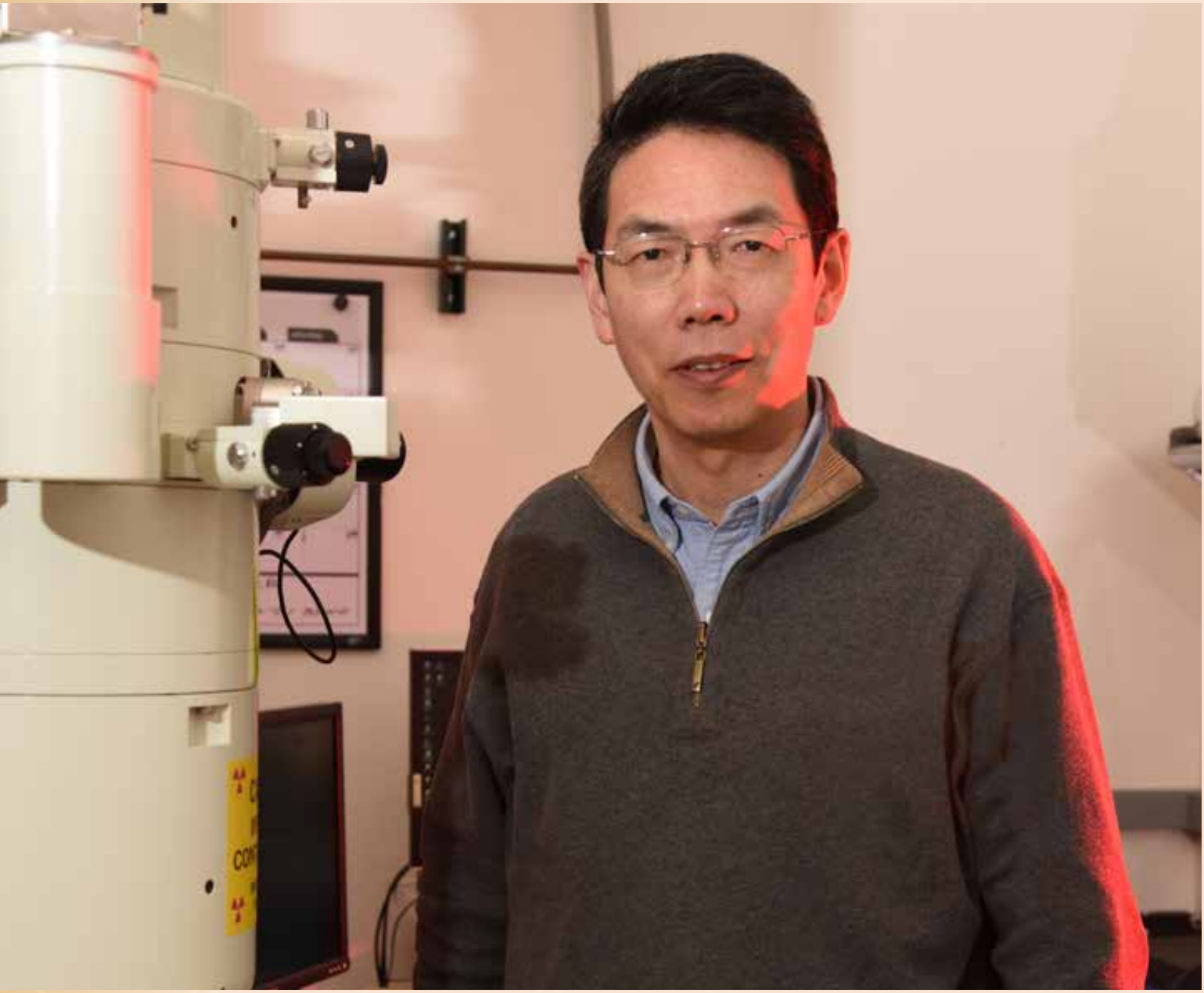
2015 Laboratory Award
Exceptional Engineering Achievement

Presented to

Steven Hayes

Achievement of the Year
February 2016

INL
Idaho National Laboratory



Jian Gan

Dr. Gan's work involves microstructural investigation of nuclear fuels and reactor core structural materials. He uses transmission electron microscopy (TEM) to advance development of ceramic coatings that can mitigate the chemical interactions between fuel and cladding.

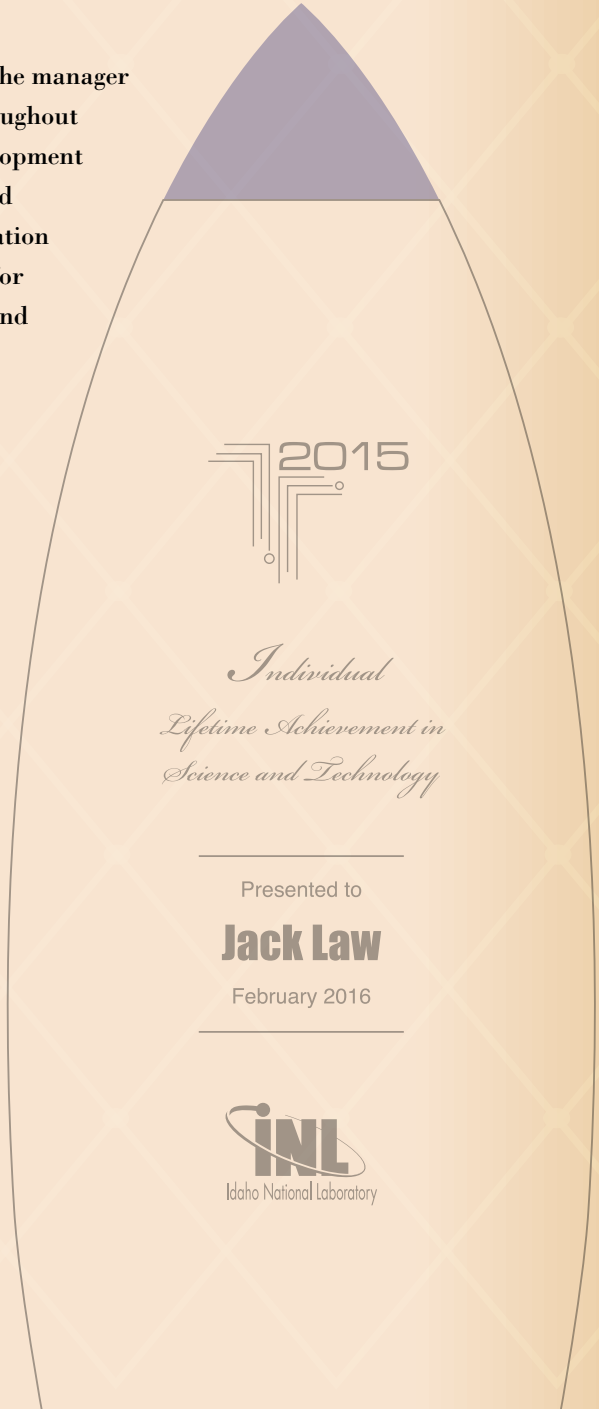
While his major research interest is in how radiation affects materials and fuels, his work also includes the development of a fiber-optic sensor for reactor in-pile temperature measurement, failure analysis of 6H-SiC monolithic cladding for gas-cooled fast reactors, and weld development of FeCrAl thin-walled cladding for light water reactor accident-tolerant fuels.

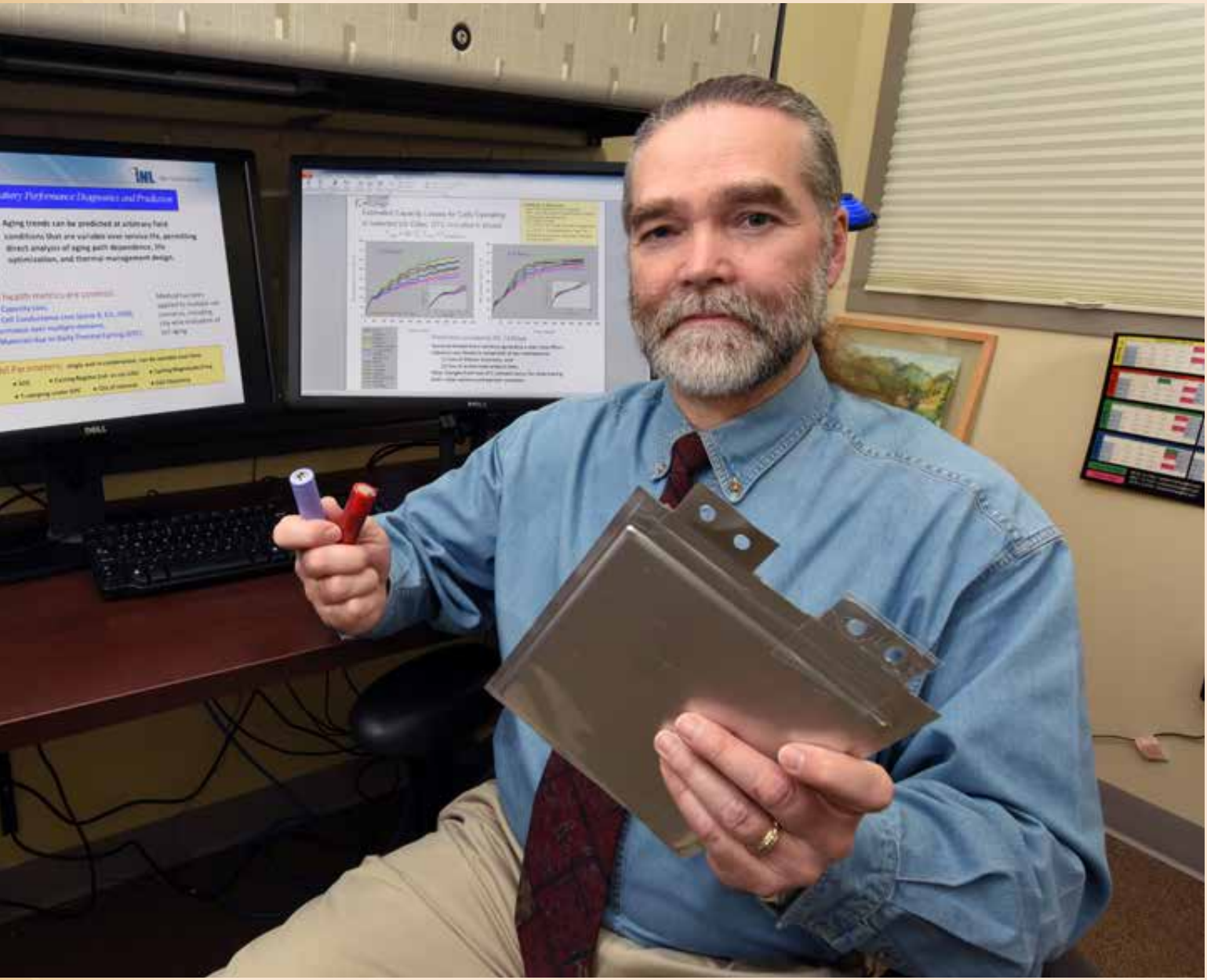
Dr. Gan earned a Bachelor of Science in physics from Fudan University, a Master of Science and Ph.D. in nuclear engineering from the University of Michigan and a Master of Science in physics from Central Michigan University. He has authored or co-authored 90 publications in journals or conference proceedings and has more than 22 years of research work experience.

Jack Law

Jack D. Law is a Nuclear Science and Technology Directorate Fellow and the manager of the Aqueous Separations and Radiochemistry Department at INL. Throughout his 31-year career at INL, Jack has focused much of his effort on the development of advanced separation processes for the treatment of used nuclear fuel and highly radioactive tank wastes. Jack has developed and tested novel separation equipment, and has demonstrated numerous solvent extraction processes for the separation of actinides, lanthanides and fission products using actual and simulated waste solutions. He spent several years as lead test engineer for startup of the Liquid Effluent Treatment and Disposal Facility at INTEC.

Jack is currently the assistant technical program chair for the 2016 ANS Annual Meeting and the ex-officio chair of the Fuel Cycle and Waste Management Division. He is an advisory board member for the Actinide Separations Conference, the U.S. representative on the NEA/ OECD Expert Group on Fuel Recycling Chemistry, and the conference chair for the upcoming 14th Annual International Information Exchange Meeting for Actinide and Fission Product Partitioning and Transmutation. He earned a Bachelor of Science in chemical engineering from Montana State University. He has been awarded 10 U.S. patents, three Russian patents, the 2013 Department of Energy's Secretary's Achievement Award, and has published over 40 peer-reviewed journal articles and eight book chapters.




INL
Battery Performance Diagnostics and Prediction
DELL

Dr. Kevin Gering

Dr. Kevin Gering is principal investigator of Applied Battery Research and Diagnostic Testing, as well an experienced inventor with more than 25 years of experience at INL.

His inventions include photoreactor design, cyanide detection, thermal management and a range of advanced modeling tools and chemical materials related to battery energy storage.

Dr. Gering has tackled daunting challenges in battery technology, such as mechanism-wise diagnostics and prognostics of battery aging, accurate prediction of battery performance over multiple regimes and the creation of a molecular-based electrolyte model.

He is prominently known across the battery research industry and has been recognized for his work on the Advanced Electrolyte Model and CellSage.

Dr. Gering earned a Bachelor of Science in chemistry from Southern Nazarene University, a Master of Science in chemical engineering from the University of Oklahoma and a Ph.D. in chemical engineering from the University of Oklahoma.

He has contributed to various patents and been lead inventor on a growing list of chemistry-related patents. During his career at INL, he has been awarded four copyrights, nine U.S. patents and has six U.S. patents pending.

Technician of the Year Finalists

Thomas Morgan

Thomas Morgan came to INL in 2007 as a technician in the MFC Machine Shop. After eight months, he was given a job opportunity in the Mock-up Shop, where he currently works.

Tom has provided support for several programs, including development and testing of tools and components for the Measurement of Actinide Neutronic Transmutation Rates (MANTRA) experiment, validation and remote modification of tools for disassembly and testing of experiments for the Advanced Reactor Technology program, and modifications to the Fuel Accident Condition Simulator (FACS) furnace. His work supported various parts of the Joint Fuel Cycle Studies (JFCS) program, which is a cooperative agreement with the South Korean Atomic Energy Agency to develop and test electrometallurgical separation techniques for light water reactor fuels. He also worked on equipment for testing plate-type fuels used to verify the cladding performance of aluminum clad plate fuels and determination of fuel density.

Tom supported sizing and sectioning of material at INL, testing the chemical and thermal reactivity of TRIGA fuel. He constructed several components for the lab-scale testing of the pyrometallurgy processing furnace and for handling corrosive gases and chemistry control. During retrofit of the Gas Assay and Sample Recharge (GASR) system, Tom helped by constructing special tools and fittings for this system used by multiple programs to sample the headspace gas in fuel rods to determine the pressure, volume and gaseous fission products that are indications of the effects of irradiation. He earned associate degrees in machine technology and electronics technology from Idaho State University.

Chris Stayman

Chris Stayman came to INL in September 2011, and was hired to work at the ATR Complex as a subcontracted radiological control technician (RCT) for seismic upgrades in order to minimize the risk of a loss of primary coolant water in the event of an earthquake.

His career in radiation safety began in 2005 at the Energy Solutions Clive Waste Disposal Facility and led to work as a lead radiological control technician for retrieval and treatment of transuranic waste at AMWTP. He had a supporting role in Hanford's environmental restoration project

and lead RCT over retrieval re-startup activities at AMWTP. Now an INL employee, he was recently promoted to radiological control supervisor for the ATR.

Chris is currently pursuing a Bachelor of Science in radiation protection from Thomas Edison State College.

This past year, Chris played a key role in resolving ATR maintenance issues prior to operation. The bottom line is that an effective radiological control technician covering a high-risk job can lead to the lab's continued success. Throughout 2015, Chris' experience and knowledge proved vital for successful process outcomes at ATR.

William Fuger

William "Bill" Fuger came to INL in 2005 following six years of work in the private sector, where he manufactured and designed a multitude of components for various industries. In 2007, Bill accepted a position as a deployed technician from North Holmes Laboratory to the Yucca Mountain Waste Closure System project. Currently, he works in the Reactive Materials Group focusing on National and Homeland Security projects.

In 1999, he earned an associate degree in machine tool technology from Idaho State University. Bill was honored as a finalist for the 2006 Technician of the Year award for his contributions to the Idaho Explosives Detection System, and as a finalist for 2015 Technician of the Year award for his work on the Ki-Jang Research Reactor (KJRR) project and the Improved Gavin Can (IGC) project. He was recognized with the 2010 Technician of the Year award for significant contributions to multiple National and Homeland Security projects and programs, and received the 2015 Laboratory Director's Award of Impact for work directed at leading INL research in saving lives.