



Division of Nuclear Chemistry and Technology
American Chemical Society

NUCL WWW Home Page – <http://www.nucl-acs.org>

NEWSLETTER
October 2016

Newsletter Editor: Andrew Klose
Email: andrew.klose@augie.edu

Abstract Deadline for the Spring 2017 ACS National Meeting is Oct. 31st. There will be no extension for abstract submissions.

Topics

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- > UPCOMING PROGRAMMIG
- > NUCL ELECTIONS
- > AWARD NOMINATIONS COMMITTEE OF NUCL
- > CALL FOR PAPERS

FROM THE CHAIR

Paul Benny

Greetings NUCL Members,

The NUCL division was well represented in the “Chemistry: of the people, by the people, for the people” Fall 2016 ACS meeting (August 14-18) held in Philadelphia, PA. We had a number of exciting sessions with presentations in radiochemistry, nuclear forensics, nuclear modeling, nuclear medicine and separations. In particular, the division was able to celebrate Phil Horwitz’s many accomplishments throughout the years including the recent recipient of the Glenn T. Seaborg award 2016 during his special symposia. Graham Peaslee also represented the NUCL division by giving a presentation on the general science of the division in a high profile symposium at the meeting.

Chair, 2016

Program Chair, 2016

PAUL BENNY

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Chair Elect, 2016

Program Chair, 2017

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Vice Chair, 2016

Program Chair, 2018

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Secretary, 2014-2016

LUTHER McDONALD

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Treasurer, 2014-2016

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GRAHAM F. PEASLEE, 2015-2017

peaslee@hope.edu

SILVIA JURISSON, 2014-2016

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Alternate Councilor

DAWN A. SHAUGHNESSY, 2015-2017

Members-at-Large, Executive Committee

SUZANNE LAPI, 2015-2017

SUE CLARK, 2016-2018

As we look forward to another exciting national meeting in San Francisco in spring (April 2-6, 2017), there will be a number of symposia available to present your research at the meeting. The system is now open and abstracts can be submitted until October 31st, 2016. In particular, the young investigators symposium is an excellent platform for undergraduate, graduates, and post-docs to present their results in as an oral presentation. The ACS recently announced Dave Clark of Los Alamos National Laboratory as the newest recipient of the Glenn T. Seaborg award for 2017 for his many accomplishments in the nuclear chemistry and applications. We will be hosting Dave's symposium at the upcoming San Francisco meeting.

As a division, we need to continue to be diligent to implement strategies to help the division grow and develop. It is important for us as a division to continue to develop new strategies to reach younger generation scientists, bridge the gap between the general public and the nuclear society, and incorporate cross cutting science with the NUCL division. As part of our strategic goals, the executive committee looks to help integrate the science and programming to help shape our division to the forefront of ACS division. If you have suggestions or ideas to help mold our division, please speak to our leadership on how we can work to provide the best environment to engage scientists in the nuclear field.

Sincerely,
Paul Benny

SPRING 2017 – SAN FRANCISCO, CA
April 2 – 6, 2017 (*Amy Hixon*)

Abstract submission for the Spring 2017 National Meeting is open and close on October 31st. Please note there **WILL BE NO EXTENSION** on submissions, as NUCL needs to coordinate with INORG regarding

scheduling. Symposia are listed below. Please contact Amy Hixon (ahixon@nd.edu) for more information.

- **Advanced Actinide Materials: Nanostructure, Complexity, and Extreme Environments**
Organizers: Peter Burns (pburns@nd.edu) and *Ginger Sigmon* (gsigmon@nd.edu)
- **Nuclear and Radiochemistry Summer School: Past, Present, and Future**
Organizers: Dale Ensor (densor@tntech.edu) and *J. David Robertson* (robertsonjo@missouri.edu)
- **Frontiers in Heavy Element Electronic Structure: A Tribute to Bruce Bursten**
Organizers: David Clark (dlclark@lanl.gov), *David Shuh* (dkshuh@lbl.gov), and *Lynne Soderholm* (ls@anl.gov),
- **Archaeometry in Nuclear Chemistry**
Organizer: Rachel Popelka-Filcoff (Rachel.PopelkaFilcoff@flinders.edu.au)
- **Nuclear Fission**
Organizers: Todd Bredeweg (toddb@lanl.gov) and *Robert Rundberg* (rundberg@lanl.gov)
- **General Topics in Nuclear Chemistry and Technology**
Organizer: Laetitia Delmau (delmaulh@ornl.gov)
(*Note: both oral and poster*)
- **Young Investigators in Nuclear and Radiochemistry**
Organizers: Amy Hixon (ahixon@nd.edu) and *Erin May* (erin.may@inl.gov)

- **Evolving Nanoparticle Reactivity Throughout Nucleation, Growth, and Dissolution**

Organizers: GEOC (Jennifer Soltis (jennifer.soltis@pnnl.gov), Michele Contory, Frances Smith, and R Lee Penn (cosponsored by NUCL, COLL, and ENVR)

- **Glenn T. Seaborg Award for Nuclear Chemistry: Symposium in honor of David Clark**

Organizers: Bruce Bursten (bbursten@wpi.edu), Al Sattelberger (asattelberger@anl.gov), and Bill Evans (wevans@uci.edu), cosponsored by INOR

FALL 2017 – Washington, DC
August 20-24, 2017 (Jeff Terry)

Please contact Jeff Terry (terryj@iit.edu) if you are interested in organizing a symposium.

SPRING 2018 – New Orleans, LA
March 18-22, 2018 (Amy Hixon)

Please contact Amy Hixon (ahixon@nd.edu) if you are interested in organizing a symposium.

- **Radioisotope Production**
Organizers: Suzanne Lapi and Dennis Phillips
- **Radiopharmaceutical Chemistry** (FLUO primary sponsor, NUCL co-sponsored)
Organizers: Neil Vasdev, Alan Packard, and Suzanne Lapi.

NUCL DIVISION ELECTION CANDIDATES

Elections for the NUCL Executive Committee members will be held in November. A list of the candidates and their statements are below:

Candidates for NUCL Vice Chair 2017 (Chair Elect 2018, Chair and Program Chair 2019, Immediate Past Chair 2020):

- **John D. Auxier II** University of Tennessee - Knoxville
- **Jenifer Braley**, Colorado School of Mines

Candidates for Treasurer:

- **Dean Peterman**, Idaho National Laboratory
- **Brian Powell**, Clemson University

Candidates for Secretary:

- **Samantha Cary**, Los Alamos National Laboratory
- **Ralf Sudowe**, Colorado State University

Candidates for Councilor (one position):

- **Silvia Jurisson**, University of Missouri
- **David Clark**, Los Alamos National Laboratory

Candidate Biographies:

John D. Auxier II, University of Tennessee – Knoxville (jauxier@utk.edu), received his BS from Adams State College in 2010 and his Ph.D. in chemistry in 2013 from the University of Tennessee, Knoxville (UTK). From 2007 – 2013, Auxier worked on nuclear forensics projects as a student intern at Los Alamos National Laboratory (LANL) in the Actinide Analytical Chemistry group. While at LANL, he helped to organize the Plutonium Futures – the Science 2010 conference, served as a student representative to the worker

safety and security team, and also attended the 2009 ACS/DOE nuclear chemistry summer school San Jose State University. In 2013, Auxier accepted a joint post-doctoral position at Oak Ridge National Laboratory (ORNL) and UTK, where he was in charge of standing up the National Nuclear Security Administration Radiochemistry Center of Excellence (RCoE). While managing the RCoE, as a post-doc he mentored more than 15 graduate students and 20 undergraduate students, with some of them winning the Coryell Award for research excellence. He also helped to organize the 2014 Radiochemistry and Radiobioassay conference, and participated in organizing the nuclear forensics sessions at ACS National Meetings. In 2015, Auxier was converted to research associate professor and won the UTK Research Excellence Award in the UTK Nuclear Engineering and the Exemplary Service to Students Award from the UTK College of Engineering. Shortly after converting to faculty, he retained his joint appointment at ORNL, but also was granted a joint appointment at Y-12 National Security Complex to support a number of nuclear forensics efforts. In 2016, Auxier was granted a guest scientist position at LANL to support nuclear forensics research and develop student opportunities. He has been a member of the NUCL division of ACS since 2007, as well as having memberships in the American Physical Society, and American Nuclear Society. His research interests involve development of novel gas-phase separations for rare earth fission products, nuclear melt glass surrogates, and interrogations into the diffusion rates of impurities in alloys for surrogate special nuclear materials. As part of this research, he has published numerous scientific articles on nuclear forensics and radiation detection materials, along with a patent on rapid separations. He has published a total of 14 peer reviewed articles, received 2 U.S. patents, and has been awarded a number of grants from sponsors including DHS,

DTRA, and DOE NNSA in areas related to nuclear forensics and analysis.

Jenifer Braley, *Colorado School of Mines* (mjbraley@mines.edu), has served as the Program Chair of the ACS NUCL Division from 2011- 2014 and was a member of the ACS Younger Chemists Committee from 2014-2015. As Chair of the NUCL division, her priorities would focus on increasing divisional networking/communication and facilitating/enhancing the visibility of nuclear and radiochemistry research. She joined the faculty at Colorado School of Mines in the fall of 2012 after a two-year employment at Pacific Northwest National Laboratory. During her undergraduate research, she studied the solid-state synthesis of *f*-block elements at Colorado State University with Professor Peter Dorhout. In 2006 she joined the group of Professor Ken Nash at Washington State University (WSU). Here she examined the fundamental solution chemistry of the *f*-elements relevant to solid-liquid and liquid-liquid separations chemistry. While in graduate school, she was able to complete an internship at Eichrom Technologies with Dr. Phil Horwitz (2016 ACS NUCL Division Seaborg Awardee) and bolstered her understanding of extraction chromatographic (solid-liquid) separations. She has joined the faculty at Colorado School of Mines to educate students on the fundamental and applied concerns of nuclear chemistry and radiochemistry (including the nuclear fuel cycle, nuclear forensics, and radioisotope production). As a member of the Nuclear Engineering Program at Mines, she actively engages the U.S. Geological Survey 1 MW TRIGA Nuclear Reactor on the Denver Federal Center to accomplish research and educational goals.

Dean R. Peterman, *Idaho National Laboratory* (dean.peterman@inl.gov), received a B.S. in Chemistry from Denison University in 1988 and a M.S. and Ph.D. in Physical

Chemistry from the University of Cincinnati in 1993 and 1995, respectively. While a post-doctoral research associate in the laboratories of Dr. Gregory R. Choppin at Florida State University, he studied the complexation of tetravalent actinides by aminopolycarboxylate ligands. He joined the Idaho National Laboratory as a member of the Aqueous Separations & Radiochemistry Department in 1999. He has over 25 years of experience in field of physical inorganic chemistry with an emphasis on the aqueous chemistry of lanthanide and actinide elements. His main research areas are the use of soft donor ligand systems for the selective separation for trivalent actinides from lanthanides and the effects of gamma radiolysis on solvent extraction processes. He is a co-inventor of the Fission Product Extraction (FPEX) solvent extraction process which simultaneously removes cesium and strontium from dissolved used nuclear fuel. He is a member of the team which received a 2011 R&D Award for the development of the Rad-Release chemical decontamination technology and a 2014 Secretary of Energy's Honor Award recipient as a member of the Salt Waste Disposal Technologies Team. Dr. Peterman has served in numerous leadership positions within the ACS including Chair of the Idaho Section of the ACS, Chair of the SS&T subdivision of the I&EC division of the ACS, and Treasurer of I&EC division of the ACS.

Brian A. Powell, *Clemson University* (bpowell@clemson.edu), has expertise in the understanding and prediction of the physical, chemical, and biological processes which govern the mobility of radionuclides in natural and engineered systems through his research in the Department of Environmental Engineering and Earth Sciences at Clemson University as well as previous work at the Lawrence Livermore National Laboratory and the Lawrence Berkeley National Laboratory. He has a B.S. in Chemistry from the

University of Montevallo, and M.S. and Ph.D. in Environmental Engineering and Science from Clemson University. He holds memberships in the American Chemical Society, American Geophysical Union, Geological Society of America, Association of Environmental Engineering and Science Professors, and Sigma Xi. At Clemson University, Dr. Powell teaches courses in Actinide Environmental Chemistry, Environmental Radiation Protection (Lecture and Laboratory courses), Introductory Health Physics, Geochemistry, and Geochemical Reaction Modeling.

His research focuses on biogeochemical processes controlling radionuclide behavior in the environment such as sorption by minerals, interactions with nano-colloids, complexation by organic ligands, and interactions with microorganisms. He has published over 30 refereed journal publications, 16 research reports, and made over 50 technical presentations on these topical areas. He has conducted sponsored research in a wide range of projects dealing with topics of nuclear forensics, evaluation of nanoparticle behavior, sorption and environmental transport of plutonium, development of radiation detection and radiation detection laboratory courses, iodine, radium, strontium geochemistry in wetland and subsurface sediments, radionuclide geochemistry of saltstone and solid waste performance assessments at the Savannah River Site, measurement of thermodynamic parameters supporting advanced fuel cycle chemistry, and related topics. These research projects have received over \$6M in funding from the National Science Foundation, the Department of Energy, the Nuclear Regulatory Commission, the Department of Homeland Security, the National Nuclear Security Agency, and Savannah River Nuclear Services (through the South Carolina Universities Education and Research Foundation). The knowledge gained from this work can be used to evaluate risk posed by subsurface contamination, to

design remediation strategies for contaminated sites, and to facilitate the use of safe disposal practices.

Professor Brian Powell is the Principal Investigator on the Department of Energy, Experimental Program to Stimulate Competitive Research Implementation Project "Radionuclide Waste Disposal: Development of Multi-scale Experimental and Modeling Capabilities" (2014-Present)

Samantha Cary, *Los Alamos National Laboratory* (scary109@gmail.com), received her BS in chemistry from Ithaca College in 2012 and her PhD in chemistry from Florida State University in 2015 under the guidance of Professor Thomas Albrecht-Schmitt. Her thesis focused on studying the structure and bonding of late actinide systems. During this time Cary developed proficiency in handling large (mg scale) quantities of Np, Pu, Am, Cm, Bk, and Cf in support of the coordination chemistry studies associated with her thesis. In 2015 she received the Innovations in Fuel Cycle Research Awards sponsored by the U.S. Department of Energy for her work with californium. Currently she is an Agnew Postdoctoral Research Fellow at Los Alamos National Laboratory where she is working in areas of National Security and application inspired actinide science. Specifically, these efforts can be broadly described in terms of actinide separations, coordination chemistry, solid-state synthesis, and superconductivity.

Ralf Sudowe, *Colorado State University* (ralf.sudowe@colostate.edu), received a M.S. in Chemistry (1995) and a Ph.D. in Nuclear Chemistry (1999) from the Philipps-University Marburg in Germany. He spent two years as Visiting Postdoctoral Fellow in the Nuclear Science Division at Lawrence Berkeley National Laboratory (1999 – 2001) and then became a Staff Scientist in the Nuclear Science and Chemical Sciences Division at LBNL (2001 – 2006). From 2006 to 2016, Dr. Sudowe was a faculty member in

the Department of Health Physics & Diagnostic Sciences at University of Nevada Las Vegas, where he held the titles of Assistant Professor (2006 – 2012) and Associate Professor (2012 – 2016). He joined the faculty of the Department of Environmental & Radiological Health Sciences at Colorado State University in the summer of 2016. Dr. Sudowe is a member of the American Chemical Society, the American Nuclear Society and the Health Physics Society.

Silvia S. Jurisson, *University of Missouri* (jurissons@missouri.edu), earned her B.S. in Chemistry from the University of Delaware in 1978 and her Ph.D. in inorganic and radiopharmaceutical chemistry at the University of Cincinnati with Professor Ed Deutsch in 1982. She had postdoctoral training at the University of New South Wales (1983-1984) with Professor W. Greg Jackson, the Australian National University (1984) with Professor Alan M. Sargeson, and the University of Missouri (1984-1986) with Professor David E. Troutner. She spent 5 years in the pharmaceutical industry at Squibb/Bristol-Myers-Squibb before beginning her academic career at the University of Missouri in 1991 and where she is now a Professor of Chemistry, Radiology, and Nuclear Engineering, and Senior Research Scientist at the University of Missouri Research Reactor. She has been involved in inorganic and radiochemistry with applications to radiopharmaceutical chemistry, radioenvironmental chemistry, and biological systems. She is actively involved in training students at all levels in inorganic and radiochemistry research and currently has 5 graduate students and 1 undergraduate student working in her laboratories. She has over 135 publications and especially enjoys her students' successes. She serves on the editorial boards of Nuclear Medicine and Biology and the Journal of Nuclear and Radioanalytical Chemistry, and

is an Associate Editor of *Radiochimica Acta*. She is the Chair of the Campus Radiation Safety Committee, and serves on the Reactor Advisory Committee at the University of Missouri. She was awarded the Glenn T. Seaborg Award for Nuclear Chemistry from the American Chemical Society in 2012, the College of Arts & Science Purple Chalk Teaching Award in 2013, the Fuldner Chemistry Fellow Award in 2013 and 2014, was elected as a Fellow of the American Association for the Advancement of Science in 2014 and a Fellow of the American Chemical Society in 2016. She has served as Vice-Chair, Chair-Elect and Chair of the Nuclear Division of the American Chemical Society (2008-2010), and is just completing her term as Councilor for the Nuclear Division (2014-2016), where she serves on the Meetings and Exposition committee and its Technical Programming sub-committee.

David L. Clark, *Los Alamos National Laboratory (LANL)* (dlclark@lanl.gov), is a Laboratory Fellow and Director of the Laboratory's National Security Education Center. He received a B.S. in chemistry in 1982 from the University of Washington, and a Ph.D. in 1986 from Indiana University. Clark was a postdoctoral fellow at the University of Oxford before joining Los Alamos National Laboratory as a J. Robert Oppenheimer Fellow in 1988. He became a Technical Staff Member in the Isotope and Nuclear Chemistry Division in 1989. Since then he has held various leadership positions at Los Alamos, including PI for the Laboratory's Heavy Element Chemistry program (1993 – 2014), Solubility Task for the Yucca Mountain Project (1993-1997), Source Term Test Program for the WIPP license application (1996-1997), program manager for plutonium aging and pit lifetime assessments, (1998-2003), and leader of the Plutonium Science and Research Strategy (2009 – present). Clark has been highly involved in service to the actinide chemistry community

through organization of ACS symposia (1993-present), service on organizing and steering committees of 3 international actinide conferences including Actinides (1993-present), Migration (2003 – present), and Plutonium Futures – the Science (1997-present); the establishment and stewardship of the Seaborg Institute at Los Alamos (1997-2009); the development of the Plutonium Science and Research Strategy (2009-present); co-leadership of the chemistry investigations into the WIPP radiological release (2014-2015); and the establishment of the Los Alamos Judicial Science School (2013-present). Clark served as Director of the Glenn T. Seaborg Institute for Transactinium Science between 1997-2009. He has served the DOE as a technical advisor for environmental stewardship including the Rocky Flats cleanup and closure (1995-2005), closure of High Level Waste tanks at the Savannah River Site (2011), and as a technical advisor to the DOE High Level Waste Corporate Board (2009-2011). He is a Fellow of the American Association for the Advancement of Science, and a Los Alamos Laboratory Fellow. He is the recipient of two ACS national awards - the Nobel Laureate Signature Award (1998) and the Glenn Seaborg Award in Nuclear Chemistry (2017). His research interests are in the molecular and electronic structure of actinide materials, applications of synchrotron radiation to nuclear security, behavior of actinide and fission products in the environment, the aging effects of nuclear weapons materials, and the education of judges on the methods of science. He is an international authority on the chemistry and physics of the actinides, and has published over 160 peer-reviewed publications, encyclopedia and book chapters.

**AWARDS NOMINATIONS COMMITTEE
OF NUCL**

Steve Yates

The Awards Nominations Committee of the Division was formed to encourage and facilitate nominations for national ACS awards. Please nominate a colleague for one of the awards given below or another ACS award

(<http://www.acs.org/content/acs/en/funding-and-awards/awards/national.html>).

*Glenn T. Seaborg Award for Nuclear
Chemistry*

(<http://www.acs.org/content/acs/en/funding-and-awards/awards/national/bytopic/glenn-t-seaborg-award-for-nuclear-chemistry.html>) -- Nominations are initiated by individuals and the procedures are given on the ACS website. The next deadline is November 1, 2016.

ACS Fellows

(<http://www.acs.org/content/acs/en/funding-and-awards/fellows.html>) -- Nominations can be initiated by individuals; however, the Division can nominate up to four individuals as ACS Fellows annually. Nominations for the 2017 class of Fellows are scheduled to open February 1, 2017 and close April 1, 2017.

*W. Frank Kinard Distinguished Service
Award*

This award, established in 2014, recognizes NUCL members for outstanding service to the Division and the field of nuclear science -- Nomination procedures are given on the NUCL website (http://www.nucl.acs.org/?page_id=611) and the next deadline is July 1, 2017.

Suggestions and questions should be addressed to Steve Yates (yates@uky.edu; 859-257-4005).

Call for Papers:

Nuclear and Radiochemistry Summer School: Past, Present, and Future

253nd National Meeting of the
American Chemical Society
San Francisco, CA April 2 – 6, 2017

Sponsored by the Division of Nuclear Chemistry and Technology (NUCL)
of the American Chemical Society

Abstracts are invited from graduates of the nuclear science summer school. Talks should focus on how your experience at the summer school provided focus for your career in nuclear and radiochemistry. The purpose of the symposium is to highlight the importance of the summer school in recruiting current and future generations of scientists. Speakers are encouraged to present past and current research.

Organized by:

Dale D. Ensor
Department of Chemistry
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Cookeville, TN 38505
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J. David Robertson
Department of Chemistry
University of Missouri
Columbia, MO 65211
robertsonjo@missouri.edu

Abstracts are due October 31, 2016. You should submit your abstract using Online Abstract Submittal Form System at <https://callforpapers.acs.org/sanfran2017>. Feel free to contact the organizers to indicate your interest or to answer any questions.

Call for Papers:

Advanced Actinide Materials: Nanostructure, Complexity, and Extreme Environments

253rd National Meeting of the
American Chemical Society
San Francisco, CA April 2 – 6, 2017

Sponsored by the Division of Nuclear Chemistry and Technology (NUCL)
of the American Chemical Society

Organizers:

Dr. Peter C. Burns, University of Notre Dame, pburns@nd.edu
Dr. Ginger E. Sigmon, University of Notre Dame, gsigmon@nd.edu

The Division of Nuclear Chemistry and Technology (NUCL) will convene a symposium entitled *Advanced Actinide Materials: Nanostructure, Complexity, and Extreme Environments* at the 253rd American Chemical Society National Meeting in San Francisco, CA.

The development of advanced actinide materials has grown over the past few years to yield a wide range of novel compounds with fascinating properties, both physical and chemical. This symposium will highlight complex actinide materials and showcase advanced experimental and computational investigations. Appropriate topics include, but are not limited to:

- Characterization of nanoscale actinide materials
- Design of novel actinide nanomaterials
- Spectroscopic or calorimetric investigations of novel materials
- Impact of extreme environments (temperature, pressure, radiation field)
- Atomistic modeling and molecular dynamic simulations of actinide materials.

All interested in the latest advancements in actinide materials are encouraged to attend.

Abstracts should be submitted on-line on the PACS abstract submission site:
<http://abstracts.acs.org>

Select NUCL and then this symposium. Follow instructions to input a 150 word abstract.

Deadline for online abstract submission is end of October 2016.

If you have difficulty submitting an abstract, please contact the organizers.



The 62nd Radiobioassay and Radiochemical Measurements Conference

will be at the Ala Moana Hotel 6-10 February 2017, Honolulu, Hawaii. The call for papers and conference information are available at:

www.rrmc.co

Please consider sharing and presenting your work in the following topical areas. Historically, RRMCM will also accept abstracts for on-going projects that are not yet complete. Topics include:

- Sample Pre-treatment and Dissolution Methods
- Radionuclide Chemistry
- Radioanalytical Methods
- Low-level and Non-nuclear Techniques (MS, KPA, Calorimetry, Optical...)
- Rapid Analytical Methods in Response to Radiological Emergencies
- Instrumentation, Software, and Automation Tools
- Naturally Occurring Radionuclides in Terrestrial and Marine Environments
- Radon and epidemiological studies
- Nuclear fuel cycles and nuclear power
- Nuclear Waste Characterization/D&D/Restoration/Management
- Radionuclide Speciation
- Environmental Studies
- Radioisotopes in nuclear medicine
- Nuclear Forensics
- Reference Materials and Certified Reference Materials
- Metrology Applications
- Quality Assurance and Quality Control
- Method Validation and Verification
- Intercomparisons
- Performance Evaluation
- Traceability Evaluation
- Radiological incidents / emergency preparedness exercise
- Computational Methods/Statistical Tools/Uncertainty Evaluation
- Radiation safety
- Professional or career development activities or guidance
- Regulations, Standards, and Compliance Issues
- In-vivo/In-vitro Radiobioassay, Dosimetry, and Radiation Protection
- Risk Assessment and Management
- Environmental and Biokinetic Model Validation
- Applications and Research Needs