ITWG Nuclear Forensics International Technical Working Group

ITWG NUCLEAR FORENSICS UPDATE

No. 24 September 2022

CHAIRPERSONS' ADDRESS

Welcome to a special edition of the Nuclear Forensics International Technical Working Group (ITWG) newsletter that commemorates the 25th anniversary of the ITWG. With so many changes to the international landscape over the past quarter of a century, it is in some ways remarkable that an informal, unaffiliated association of nuclear forensics practitioners from all over the world has made such progress in the field and still thrives. Moreover, the ability of the group to conduct unique activities—like the Collaborative Materials (CMX) and Galaxy Serpent exercises—which help identify, develop and socialize best practices, has been fundamental to our success. Similarly, the group's collaboration with the International Atomic Energy Agency (IAEA) and other international efforts has contributed to its relevance over the years. And enough cannot be said about past leaders of the group such as Lothar Koch, Sid Niemeyer, Klaus Mayer, David Smith and Ben Garrett. Still ITWG continues and evolves.

While initially formed by the Group of Seven plus one (G7+1) in response to the smuggling of nuclear materials into Europe during the collapse of the Soviet Union, the group continues to help prepare governments' experts to investigate and prosecute a range of nuclear crimes and other malicious acts. Over the years, participation in the group's activities has grown, as has its contribution to the nuclear security community. For example, only a handful of laboratories participated in early ITWG round robin exercises but the most recent CMX had more than 20 labs. Another example is the Model Action Plan developed by the ITWG in very early days and which later was adapted into an IAEA Nuclear Security Series guidance document. Recently, there has also been an evolution in the group's leadership team. At this year's annual meeting, Klaus Mayer (European Commission Joint Research Center) transitioned his co-chair responsibilities to Maria Wallenius (European Commission Joint Research Center). Liz Keegan (Australian Nuclear Science and Technology Organisation) and Ed van Zalen (Netherlands Forensics Institute) joined the Executive Committee. David Smith (Lawrence Livermore National Laboratory) transitioned his Outreach and Training Task Group co-chair responsibilities to Liz Dallas (Oak Ridge National Laboratory), and Ali el-Jaby (Canadian Nuclear Safety Commission) transitioned his Libraries Task Group co-chair responsibilities to Chris Cochran (Canadian Nuclear Safety Commission). (Please see pp. 1–6 for more changes to ITWG leadership.) Thank you to the new members of the leadership team for stepping up; we are excited for your contributions. Thanks also to all ITWG members for continuing to participate in ITWG activities. With your support we hope to celebrate many more anniversaries!

With best regards,

Michael Curry and Maria Wallenius

INTRODUCTION TO THE ITWG AND ITS LEADERSHIP: DECADES OF GLOBAL EXPERTISE IN NUCLEAR FORENSICS

Forensic science, or forensics, is the examination of the available evidence in a legal context with the aim of discovering linkages among people, places, things and events. Nuclear forensic science (nuclear forensics) is a subdiscipline of forensic science, defined as the examination of nuclear or other radioactive material, or of evidence that is contaminated with radionuclides, in the context of legal proceedings under international or national law related to nuclear security. Nuclear forensics increasingly assists many states to determine the origin and history of nuclear and other radioactive material out of regulatory control as part of a nuclear security infrastructure. This contributes to both the prevention of and response to nuclear security events.

Continued page 2

Introduction to the ITWG and its Leadership... *continued from page 1*

Figure 1. Map of Nuclear Forensics International Technical Working Group participants

It is recognized as an important tool to help national or international authorities meet their nuclear security obligations.

The Nuclear Forensics International Technical Working Group (ITWG) is an informal and unaffiliated association of nuclear forensics practitioners who are dedicated to advancing nuclear forensics in order to prevent and respond to incidents involving nuclear and other radioactive material out of regulatory control. The ITWG is open to all states, organizations and individuals that are recognized by competent national or international authorities as having an interest in technical nuclear forensics.

The ITWG provides a technical platform for nuclear scientists, forensics specialists, law enforcement officials and policymakers to voluntarily share requirements and exchange information on nuclear forensics in support of law enforcement and nuclear security investigations. Founded in 1995, the ITWG continues to grow through the provision of innovative solutions focused on improving nuclear forensics state of the art. The work of the ITWG has gained increasing relevance and wider reach as more states apply nuclear forensics examinations to high-visibility cases of illicit trafficking of nuclear and other radioactive material. Scientists, experts, law enforcement officials and policymakers from over 50 countries and 11 multilateral and international organizations have participated in annual meetings of the ITWG (see figure 1).[1]

The work of the ITWG is steered by its two co-chairs and its Executive Committee, with support from the co-chairs of five ITWG task groups and the co-chairs of the ITWG Nuclear Forensic Laboratories (INFL).[2]

[1] The participating states are Afghanistan, Algeria, Angola, Armenia, Australia, Austria, Azerbaijan, Belarus, Belgium, Brazil, Bulgaria, Canada, China, Czechia, the Democratic Republic of the Congo, Egypt, Finland, France, Georgia, Germany, Hungary, India, Iraq, Israel, Italy, Japan, Kazakhstan, Kyrgyzstan, Lithuania, Luxembourg, Moldova, the Netherlands, Pakistan, Poland, Republic of Korea, Romania, Russia, Saudi Arabia, Serbia, Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland, Tajikistan, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States and Uzbekistan. The participating multilateral and international organizations are the European Commission, the European Police Office (EUROPOL), the Global Initiative to Combat Nuclear Terrorism (GICNT), the International Atomic Energy Agency (IAEA), the International Criminal Police Organization (INTERPOL), the Organization for Security and Co-operation in Europe (OSCE), the Stockholm International Peace Research Institute (SIPRI), the United Nations Interregional Crime and Justice Research Institute (UNICRI), the United Nations Office on Drugs and Crime (UNODC), the Vienna Center for Disarmament and Non-Proliferation (VCDNP) and the World Institute for Nuclear Security (WINS).

[2] The most recent ITWG Annual Meeting took place in Pleasanton, California, on 20–24 June 2022. A report from the meeting will be published in the December 2022 issue of the newsletter. Descriptions of the task groups and their work can be found on pp. 11–17.

The informal nature of the group means that all the members of the ITWG leadership work on ITWG issues on a voluntary basis.

ITWG co-chairs

Michael Curry (United States) is a team leader at the US Department of State where he currently serves as the Senior Coordinator for Nuclear Forensics Cooperation. Curry has worked on a variety of arms control, non-proliferation and political–military affairs issues for almost 35 years. For the past 20 years he has focused on issues related to countering the smuggling of nuclear and radioactive material. Curry has participated in the ITWG since 2008 and served as its co-chair since 2014.

Dr Maria Wallenius (European Commission) is a research scientist who coordinates nuclear forensics casework and cooperative nuclear forensics projects at the Joint Research Centre (JRC) of the European Commission in Karlsruhe, Germany. Wallenius has worked at the JRC Karlsruhe for more than 25 years and has developed new methods of using various mass spectrometry techniques in the safeguards and nuclear forensics field. Wallenius has participated in the ITWG since 2000 and was the Guidelines Task Group co-chair in 2012–17 and the ITWG Nuclear Forensics Laboratories (INFL) co-chair in 2018–22.

Executive Committee members

Pascal Girard (France) works for the French Alternative Energies and Atomic Energy Commission (Commissariat à l'énergie atomique et aux énergies alternatives, CEA). As a nuclear forensics expert at the CEA, Girard supports the Collaborative Materials Exercises and, as the coordinator of the development and maintenance of the ITWG websites, is instrumental in the outreach efforts of the ITWG.

Liz Keegan (Australia) is a Senior Scientist at the Australian Nuclear Science and Technology Organisation (ANSTO). She has been the lead examiner on a number of nuclear forensic investigations and is the project lead on a variety of collaborative research and capability development projects in the area of nuclear forensics. Keegan has a background in analytical chemistry and mass spectrometry and has over 30 years of experience working in nuclear science. Keegan has participated in the ITWG since 2010 and became a member of the Executive Committee in 2022.

Dr Éva Kovács-Széles (Hungary) is Unit Head, Crime Scene Management and Nuclear Forensic Science, in the Division of Nuclear Security at the International Atomic Energy Agency (IAEA), Vienna. Before joining the IAEA, she was head of the Nuclear

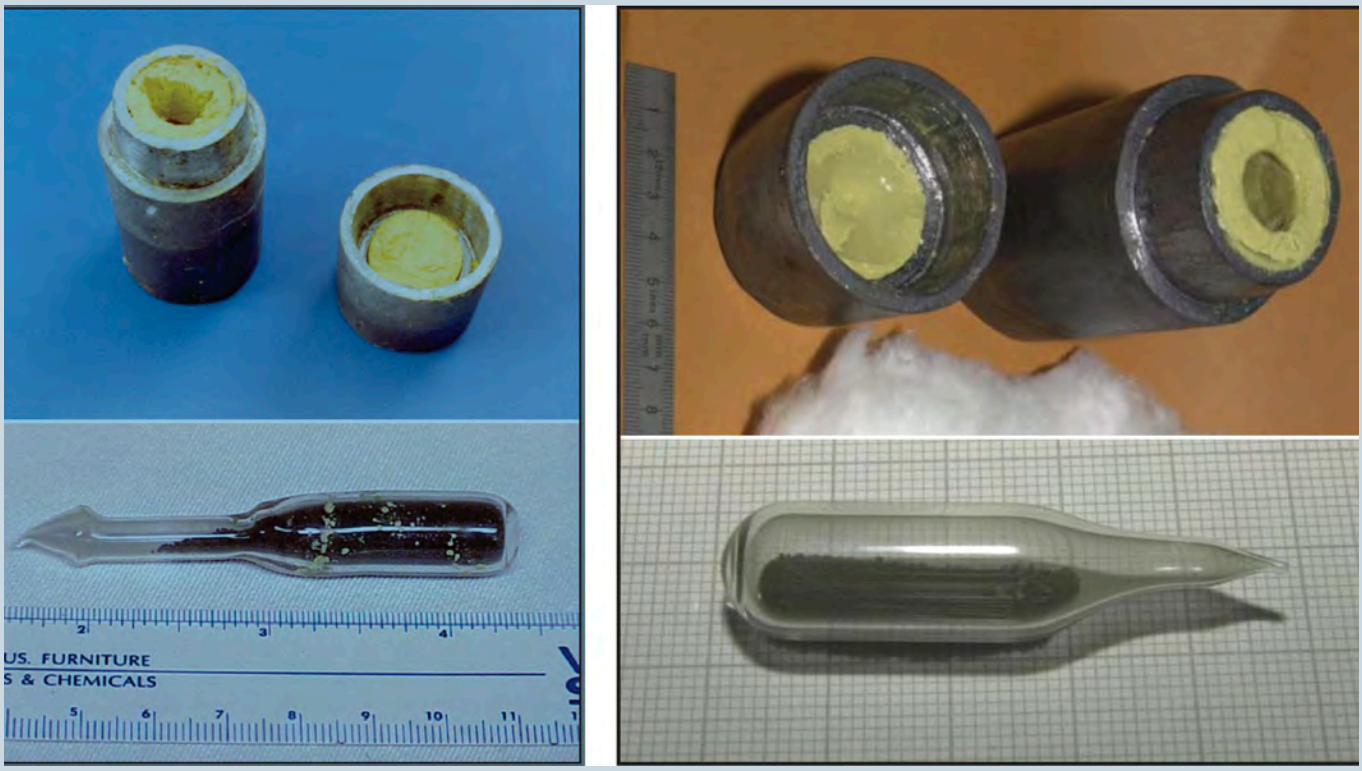

Figure 2. Images of uranium oxide seizures from Rousse, Bulgaria (1999), and Paris, France (2001). The nuclear material and associated packaging are remarkably similar. Credit: Kristo, M. J. et al. 'Nuclear forensic science: Analysis of nuclear material out of regulatory control', *Annual Review of Earth and Planetary Sciences*, 11 May 2016.

Continued page 4

Introduction to the ITWG and its Leadership... *continued from page 3*

Security Department and the National Nuclear Forensics Laboratory at the Centre for Energy Research (CER) in Budapest. Kovacs-Szeles began her work at the CER in 2008 as the scientist responsible for nuclear safeguards, security and nuclear forensics R&D activities. Her background is in analytical chemistry and mass spectrometry. Kovacs-Szeles has participated in the ITWG since 2011 and served as the Evidence Collection Task Group co-chair in 2013–17.

Paul Thompson (United Kingdom) is a Distinguished Scientist at the UK Atomic Weapons Establishment (AWE) and an expert in radiochemistry. Thompson started work at the AWE in 1978. In addition to his work on nuclear forensics, he has been associated with the Comprehensive Nuclear-Test-Ban Treaty (CTBT), supporting IAEA Safeguards, environmental radioactivity, and chairing sessions and presenting papers at nuclear-related conferences. He has participated in ITWG meetings since the pre-meeting in 1995 and has been a member of the Executive Committee since it formed. Paul has previously been the chair of the Royal Society of Chemistry's Radiochemical Methods Group.

Ed van Zalen (the Netherlands) is a chemical, biological, radiological and nuclear (CBRN) Programme Manager at the Netherlands Forensics Institute in The Hague. He is co-chair of the Nuclear Forensics Working Group of the Global Initiative to Combat Nuclear Terrorism (GICNT). His current focus area is the development of innovative forensics methods applicable for use at a CBRN crime scene and in the laboratory. In this role, he is responsible for developing the response to a CBRN incident and the development of analytical forensics methods. Van Zalen has participated in the ITWG since 2011. He was the Outreach and Training Task Group co-chair in 2014–22 and joined the ITWG Executive Committee in 2022.

Evidence and Testimony Task Group

Dr James Blankenship (USA) is a Forensic Examiner with the US Federal Bureau of Investigation (FBI), where he leads the analysis of weapons of mass destruction, specifically the threat of nuclear and radioactive dispersal devices. Prior to his work with the FBI, he worked on the US Department of Defense nuclear, chemical and biological defence programmes and served as a programme manager in the Radiation Hardened Microelectronics Advanced Technology programme. Blankenship has participated in the ITWG since 2007 and has served as the Evidence and Testimony Task Group co-chair since 2013.

Dr Jens-Tarek Eisheh (Germany) is a scientific advisor in the Emergency Preparedness and Response division of the Response to Nuclear Security Events section at the German Federal Office for Radiation

Figure 3. ITWG Nuclear Forensics meeting, June 2022 Credit: LLNL/Flickr

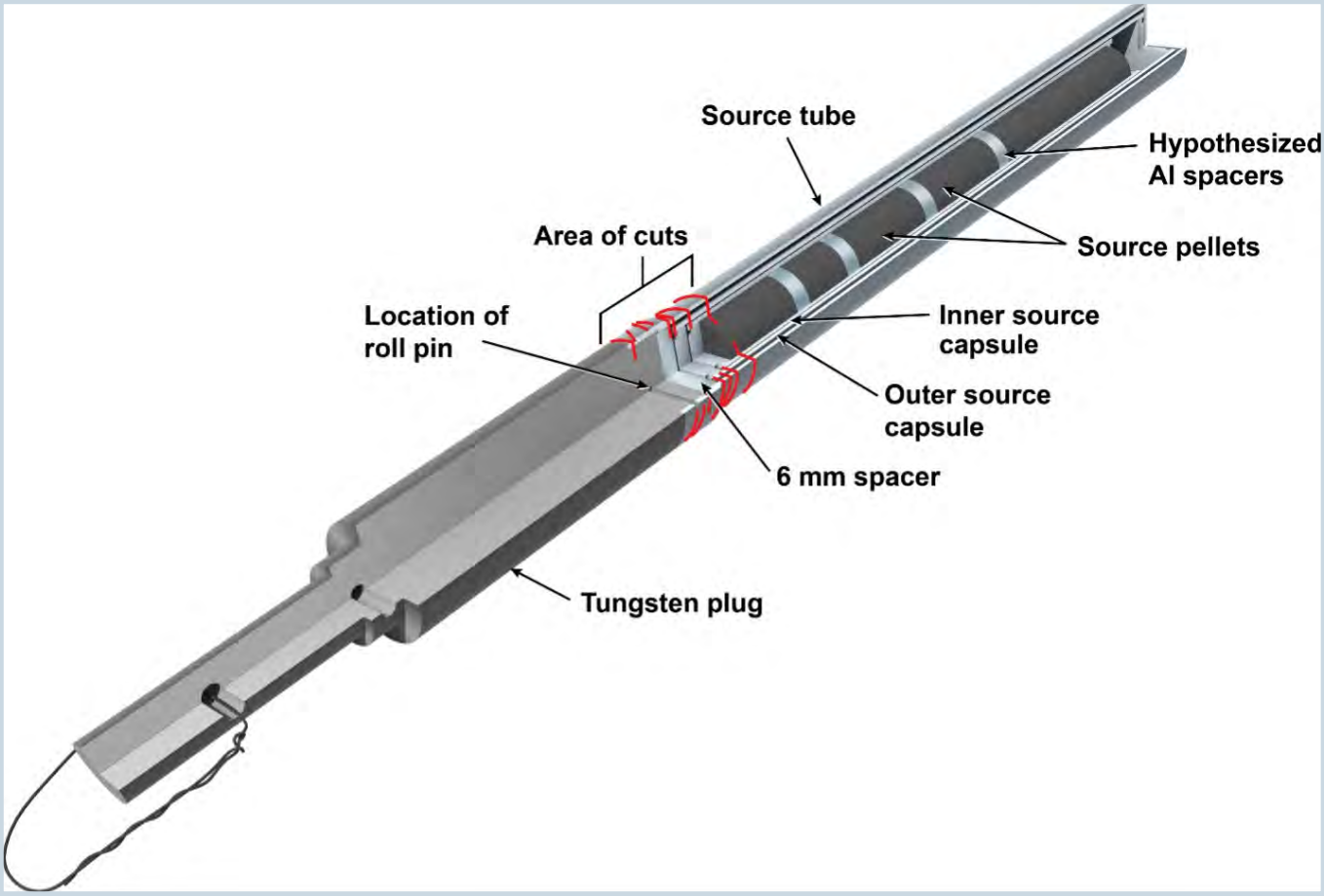

Figure 4. Artist's rendition documenting the damage to the breached source assembly recovered from the Harborview Medical Facility

Protection (BfS) in Berlin. He works as a gamma spectrometry specialist, a radiation safety officer and a dangerous goods expert. He has supported various nuclear forensics examinations and is an expert on the transportation of radioactive materials, including evidence. Eisheh has participated in the ITWG since 2008 and served as the Evidence and Testimony Task Group co-chair since 2018.

Exercise Task Group

Dr Olivia Marsden (UK) is Group Leader for Radiochemistry in the Materials and Analytical Science section of the AWE. The group comprises approximately 80 people working in a variety of fields, including nuclear forensics. Marsden began work at the AWE in 2004, in the analytical laboratories, and was the focal point for its participation in the third ITWG Collaborative Materials Exercise (CMX-3) in 2009. Marsden has been participating in the ITWG since 2010 and has served as the Exercise Task Group co-chair since 2012.

Dr Jon Schwantes (USA) leads the Nuclear and Radiochemistry Team and is a senior scientist at Pacific Northwest National Laboratory (PNNL). He is a member of the Washington State Academy of Science and currently a co-chair of the ITWG Exercise Task Group. He has authored or co-authored 117 publications (74 peer reviewed), was part of the confirmatory team for the discovery of element 111 (subsequently named roentgenium) and led a team of researchers in 2009 that identified the oldest known reactor-produced plutonium in the world. Schwantes served on two separate US Department of Energy (DOE) response teams to the 2011 accident at the Fukushima Daiichi nuclear power station. In 2014, he was appointed by the Secretary of Energy to serve as a member of the Technical Assessment Team (TAT), a five-person team charged with investigating a major contamination event at the Waste Isolation Pilot Plant (WIPP) that occurred on 14 February of that year. He was subsequently awarded the Secretary's Achievement Award for his role in that investigation. Most recently, Schwantes led the forensics examination following radioactive contamination resulting from a breach of a 3000 Ci sealed source during recovery operations on 2 May 2019 at the University of Washington Harborview Medical Facility in downtown Seattle (see figure 4).

Continued page 6

Introduction to the ITWG and its leadership... *continued from page 5*

Guidelines Task Group

Dr Michael Kristo (USA) is an Associate Program Leader for Nuclear Smuggling Detection and Deterrence in the Global Security Directorate at Lawrence Livermore National Laboratory (LLNL), USA, as well as Group Leader of the Chemical & Isotopic Signatures Group. He is a Principal Investigator on a wide variety of projects in the areas of nuclear forensics, non-proliferation and international collaboration. Kristo has participated in the ITWG since 2006 and has served as the Guidelines Task Group co-chair since 2006.

Dr Jovana Nikolov (Serbia) is an Associate Professor in the Nuclear Physics Group at the University of Novi Sad Faculty of Sciences. She has a background in nuclear structure measurements and is now mostly involved in applied nuclear physics. She is a pioneer in developing nuclear forensics capabilities in Serbia and the Western Balkans, mostly involved in training and education. Nikolov has participated in the ITWG since 2017 and became a co-chair of the Guidelines Task Group in 2022.

Libraries Task Group

Dr Chris Cochrane (Canada) is the Technical Advisor to the Director General of the Directorate of Security and Safeguards at the Canadian Nuclear Safety Commission (CNSC). He is responsible for coordination of the Canadian technical nuclear forensics capability and the Canadian National Nuclear Forensics Library. Since joining the CNSC in 2018, Cochrane has contributed to several whole-of-government nuclear forensics initiatives. He currently leads the Atmospheric Nuclear Forensics Capability Advancement Project. Cochrane has participated in the ITWG since 2018 and served as the National Nuclear Forensics Library Task Group co-chair since 2022.

Dr Stephen LaMont (USA) is a Program Manager at the US Los Alamos National Laboratory for nuclear forensics and treaty monitoring projects. A radiochemist by training, LaMont has over 25 years of experience applying radiochemistry and mass spectrometry to non-proliferation, environmental safeguards and nuclear forensics. He spent five years as the Chief Scientist for the US Nuclear Materials Information Program, helping to establish the US National Nuclear Forensics Library. LaMont has participated in the ITWG since 2011 and served as Libraries Task Group co-chair since 2014.

Outreach and Training Task Group

Liz Dallas (USA) is the Group Lead of the Facility and Systems Security Group at Oak Ridge National Laboratory (ORNL) and the Sustainability Program Lead for the ORNL's support to the US DOE/National Nuclear Security Administration's (NNSA) Office of Nuclear Smuggling Detection and Deterrence (NSDD). She has worked on nuclear material detection, analysis and security for over 20 years in various roles focused on science education and training, international treaties and verification, and counter nuclear smuggling. She has supported the NSDD since 2016, working with partner countries on capacity building initiatives in nuclear forensics, and on sustainable approaches to the management and assessment of systems designed to encounter, detect and interdict radioactive materials outside of regulatory control. Dallas assumed the responsibilities of Outreach Task Group co-chair in 2022 .

ITWG Nuclear Forensics Laboratories (INFL)

Dr Naomi Marks (USA) is an Associate Program Leader for Nuclear Counterterrorism and Counterproliferation in the Global Security Directorate at the LLNL, as well as Deputy Director of the Glenn T. Seaborg Institute. She is Principal Investigator on a wide variety of projects in the areas of nuclear forensics, non-proliferation and international collaboration. Marks has been involved with the development of the Galaxy Serpent series of exercises GSv3, GSv4 and the forthcoming GSv5. Marks has participated in the ITWG since 2017 and served as the INFL co-chair since 2018.

Dr Zsolt Varga (European Commission) is a Project Officer in the Nuclear Safeguards and Forensics unit at the JRC, Karlsruhe. He works on method development for nuclear forensics signatures (elemental impurities, isotopic composition and age dating). Varga has been participating in the ITWG since 2009. He was the co-chair of the Guidelines Task Group until 2022, when he moved to co-chair the INFL Task Group. •

Figure 5. The genesis of the ITWG: Participants of the International Conference on Nuclear Smuggling Forensic Analysis, Lawrence Livermore National Laboratory, CA, United States, November 1995

THE METRICS OF SUCCESS: 25 YEARS OF THE NUCLEAR FORENSICS INTERNATIONAL TECHNICAL WORKING GROUP

KLAUS MAYER AND DAVID K. SMITH[3]

The achievements of the Nuclear Forensics International Technical Working Group on its 25th anniversary include the roster of guidelines, the seven collaborative materials exercises, and outreach and annual meetings delivered over three decades as an informal scientific association of practitioners. At the time of this important anniversary, however, it is equally important to measure the impact and effectiveness of the ITWG in meeting the ever-present challenge of nuclear security. Looking at the body of the group's contributions since its inception 27 years ago, the ITWG anticipated and delivered the essential science required for nuclear forensics to serve as a capability for states to meet their nuclear security responsibilities to prosecute unauthorized acts involving nuclear or other radioactive material. In doing so, the ITWG continues to supply the scientific rigour that provides confidence in nuclear forensics conclusions.

Evolving and complex international nuclear security requirements

At the time of the ITWG's founding in 1995, the world's political alignments and accompanying security threats were substantively different to those we see today. At that time, kilogram quantities of enriched uranium and amounts of several hundred grams of plutonium were intercepted in Eastern and Western Europe arising from security lapses mostly linked to the break-up of the Soviet Union. As

Figure 6. Participants of the 12th Annual meeting of the ITWG, Umeå, Sweden, 2007.

[3] Klaus Mayer served as the European Commission's Co-Chair of the Nuclear Forensics International Technical Working Group (ITWG) from 2005 until 2022. David Smith served in various ITWG leadership roles from 2003 to 2022, including as the US Co-Chair in 2008–2010.

Continued page 8

The Metrics of Success... *continued from page 7*

Figure 7. ITWG Nuclear Forensics meeting, June 2022. Credit: LLNL/Flickr

economic conditions deteriorated, individuals took advantage of vulnerabilities in physical protection measures and regulatory control by attempting to sell these inventories for profit on the illegal market. The potential for such materials to be used in an improvised nuclear device constituted a significant threat. In 2022, we face a different challenge with an emphasis on nuclear terrorism that has accelerated in the aftermath of the terrorist attacks of 11 September 2001. As nuclear and radioactive materials are used increasingly in energy supply, industry, construction, research and medicine around the world, the need to secure these materials has been given new urgency. Radioactive materials (e.g. ^{60}Co, ^{137}Cs) now complement nuclear materials as a danger. Illicit trafficking has diversified and there are reports of organized subnational networks of sellers and buyers working together to acquire these materials for malicious use.

Figure 8. ITWG Nuclear Forensics meeting, June 2022. Credit: LLNL/Flickr

Figure 9. Map identifying (in orange) countries that have participated in one of the past three annual meetings of the ITWG and (indicated with their flag) countries with ITWG Nuclear Forensics Laboratories

For these reasons, the ITWG has had to adapt. First and foremost, the work of the ITWG, as part of early international commitments to nuclear security following the break-up of the Soviet Union, maintained its focus on the smuggling of nuclear and other radioactive materials as part of national preparedness that included physical protection measures, global radiation detection architectures and consensus guidance on the response to nuclear and other radioactive material out of regulatory control. There have been no documented criminal or terrorist acts using nuclear or radioactive material incorporated in an improvised nuclear device or radiological dispersal device. Through the efforts of the ITWG, its affiliates, as well as unwavering national efforts, nuclear and radioactive material has become increasingly secure.

The value of being informal and unaffiliated

In terms of its effectiveness and impact, the ITWG has flourished as an informal and unaffiliated forum for nuclear forensics practitioners. Participating experts benefit from developing, sharing and promoting best practices and ultimately helping to advance a state's nuclear security response plan. The priority of the ITWG focuses on the promotion of best practice with allowance for international consensus on analytical methods, interpretative tools and collaborative exercises where results can be easily shared without the need to aspire to a predefined performance metric. This approach has worked particularly well with the increasing number of ITWG participants, each with unique requirements for nuclear forensics and accompanying analytical competencies. The emphasis on the work of technical practitioners makes ITWG deliberations inherently scientific. With no political agenda, the ITWG can focus on tools, technologies and scientific approaches that can be honed over the long haul and are not subject to short-term political considerations. For this reason, the ITWG provides an available forum that allows regular access to nuclear forensics where the incremental advances gleaned from analytical and interpretative exercises can be shared. The structure of the ITWG also works to its advantage. The presence of long-standing task groups allows the work of each to reinforce mutual requirements in each of these critical areas; for example, the results of exercises can derive information on improved analytical practice that in turn can inform enhancements to published nuclear forensics guidelines.

Sustained ITWG nuclear forensics guidance

Central to its effectiveness over the years has been the ITWG's focus on nuclear security response, which emphasizes the strength of a nuclear forensics examination. The applicability of the ITWG's Model

Continued page 10

The Metrics of Success... *continued from page 9*

Action Plan is as relevant in 2022 as it was when first formulated by the ITWG in its earliest years. The Model Action Plan continues to prepare states for the initial response to a nuclear security event, to collect and register evidence, develop a forensics examination plan for processing nuclear and traditional evidence, categorize and characterize that evidence in the forensics examination laboratory and derive interpretations of material origin and history that link it to unauthorized acts. Through 25 years of adoption by states and their investigating authorities, the responses to individual incidents of nuclear and other radioactive material out of regulatory control, each unique in their circumstances and forensics profile, have been central to improvements in the plan. In the decades since its founding, the ITWG has moved beyond developing analytical profiles of nuclear material diverted out of regulatory control to diversified and sustained outreach encompassing guidelines, best practices and exercises in support of investigations that promote confidence in examinations. This, in turn, has enabled successful criminal prosecutions of those responsible for cases of illicit trafficking. As law enforcement and prosecutors place higher confidence in nuclear forensics outcomes due to effective ITWG outreach, courtrooms around the world have returned more criminal convictions.

International technical contributions over 25 years

The work of the ITWG has built the scientific and forensics foundations that have allowed nuclear forensics as a discipline to flourish and be positioned in the next 25 years to serve as an effective response to nuclear and other radioactive material found out of regulatory control. The development of the Model Action Plan to guide the conduct of a nuclear forensics examination, crafting the role of a national nuclear forensics library to aid in the determination of the origin and history of radioactive materials, emphasizing that the response to a radiological crime scene should include a forensics examination plan that supports the lead investigator, and a schedule of analytical and table-top exercises to maintain capabilities can all be traced to the ITWG. More recently, the ITWG exhibited its versatility by its pivot to all-virtual outreach during the pandemic. A series of technical webinars also proved highly successful. Of particular significance was the successful implementation of the first all-virtual ITWG Annual Meeting in 2021, which gathered the largest number of participants for any ITWG event. Details of these accomplishments have been published in prior editions of the *ITWG Update* as well as other forums.

Figure 10. Mock items of evidence used in Collaborative Materials Exercise

The ITWG annual meeting serves as the centrepiece of the international nuclear forensics calendar. The meetings also fulfil another of the ITWG objectives over the years: to foster outreach. Growing interest and participation in the meetings serve as a catalyst for practitioners to exchange the most recent advances in nuclear forensics through a focus on the work of the task groups. Sharing information from successful implementation and including case studies have proved highly effective.

The success of seven collaborative materials exercises involving nuclear as well as conventional forensics evidence has been due to the strength of the examinations conducted by more than 20 analytical laboratories globally. As an informal working group that is self-funded, these exercises serve as a model for continuing international cooperation beyond just sharing the effectiveness of analytical practices in the nuclear forensics laboratory. The exercises foster trust and confidence building in applied nuclear security practice. More recently, the ITWG has extended this work to include a series of virtual exercises using statistical data analysis to infer material origin and history as a component of a national nuclear forensics library. The Galaxy Serpent exercises focus on the creation and maintenance of a national nuclear forensics library and awareness raising, using the internet as the enabling technology for participating teams from around the world. Data from spent nuclear fuel, radioactive sources and uranium ore concentrate have been interrogated in the various exercises. They

have emphasized the technical cohesion required for the conduct of a nuclear forensics examination that involves subject matter experts from many disciplines to derive a high confidence interpretation.

The publication of guidelines on analytical and interpretative best practice has been a priority of the ITWG since its inception. These guidelines are prepared by experts in their respective disciplines and disseminated for review by ITWG participants. Once approved by the ITWG leadership, they are posted on the unrestricted open ITWG website. Thus far, 14 sets of guidelines have been published.

A measure of impact and effectiveness has been the steady growth in ITWG outreach to its membership and the wider international community of nuclear forensics practitioners. Open, unrestricted (http://www.nf-itwg.org) and closed, restricted websites provide portals for disseminating the work of the task groups and the outcomes from the annual meetings. The open website is being redesigned to improve interactivity and access. The *ITWG Update* has published more than 20 regular and special editions in English and Russian since its inaugural edition in December 2016. Its goal is the timely publication of nuclear forensics advances globally. The update highlights the contributions of ITWG nuclear forensics laboratories, technical and case studies, insights into the future of the discipline, a calendar of events and recent peer-reviewed publications.

The successful move to virtual outreach since the Covid-19 pandemic has been significant in reaching an expanded international audience. Regular technical webinars have featured the work of the membership. ITWG annual meetings have also featured a virtual component since 2021, which has widened their audience and impact.

Enduring ITWG contributions ensure future success

As an informal working group of nuclear forensics practitioners, the ITWG leads international efforts to promote scientific collaboration, expert partnerships, a relevant technical agenda and pertinent outreach to further nuclear security practice globally. Other international security-driven efforts to counter weapons of mass destruction such as chemical and cyber-threats now emulate the ITWG in prioritizing technical assistance and the provision of expertise. Through its informal structure, the ITWG has evolved to meet the diversified nuclear security threat. On the occasion of its 25th anniversary, experts involved in the creation of the ITWG are moving to emeritus status. Crucially, however, the ITWG enjoys the enthusiasm of a new cadre of members, and women are moving into leadership positions. Taken together, we are convinced these developments will ensure that the ITWG will continue to flourish over its next 25 years. •

THE TASK GROUPS: THE WORK OF THE ITWG

The ITWG has five task groups: the Evidence and Testimony Task Group (ETTG), the Exercise Task Group (ETG), the Guidelines Task Group (GTG), the Libraries Task Group (LTG), the Outreach and Training Task Group (OTTG); and the ITWG Nuclear Forensics Laboratories (INFL).

Evidence and Testimony Task Group

The Evidence and Testimony Task Group is one of the oldest task groups. Initially, the focus was on crime scene management and the effects the presence of radioactive materials might have on the identification, preservation, collection and processing of evidence. The ETTG later broadened its perspectives to include the use of conventional forensic science, such as fingerprint and trace evidence or DNA analysis, on radioactive items or items contaminated with radioactive materials, as well as the challenges of providing testimony in a manner that is concise, clear and that fully represents the findings.

To accomplish these challenging tasks, the ETTG depends on the generosity of the international nuclear forensics community to provide skilled volunteers with a wide variety of backgrounds. Opportunities still exist to co-author or provide content for several guidelines:

- Guideline on Evidence Collection in a Radiological or Nuclear Contaminated Crime Scene (last revised 2018)
- Guideline on the establishment and maintenance of the Chain of Custody / Continuity of evidence from the collection of items at the scene through to the final disposition of the item (NEW!)

Continued page 12

The Task Groups... *continued from page 11*

- Guideline on documents to be retained as evidence is collected and analysed in support of law enforcement/prosecutorial actions (NEW!)

Pocket Cards are among the most exciting products to result from the work of the ETTG. These are a series of short (less than one page with graphics) descriptions of radioanalytical techniques/concepts written specifically for non-technical personnel who find themselves involved in or leading an investigation involving radioactive or nuclear materials. The ETTG envisages that these cards will be used as basic learning materials that can be given as a fast read to law enforcement officers, prosecutors or judges, to highlight the capabilities and limitations of a given technique or concept. These Pocket Cards, written and reviewed by technical experts in their field, should provide the reader with an unbiased and simple appreciation of a given topic.

Since the seventh Collaborative Materials Exercise (CMX-7), the ETTG has been totally dedicated to supporting the Exercise Task Group's CMX series by creating, and evaluating the results from, the Crime-Scene-In-A-Box (CSIAB) kit. This widely distributed and immensely popular add-on to CMX-7 brought even more in-depth conventional forensics into play than the previous exercises. In CMX-8, the ETTG will again be supporting conventional forensics by providing even more challenging mock items of evidence which can be used before, during or after the CMX materials are analysed to best suit the needs of the exercise participants.

The ETTG continues to look for volunteers willing to help create, write and review our guidelines or Pocket Cards, or work with the ETG on the next CSIAB. The work is plentiful and the rewards are boundless. If you have questions or would like to volunteer, please contact either of the co-chairs: Jens-Tarek Eisheh jeisheh@bfs.de or Jim Blankenship jfblankenship@fbi.gov.

Exercise Task Group

The Exercise Task Group is primarily responsible for organizing and facilitating the CMXs for the community, which have been a prominent feature of ITWG activities since 1998. Since that time, seven CMXs have been designed and executed with the participation of laboratories representing 29 countries and the European Commission. The purpose of the CMXs is to advance the nuclear forensics capabilities of the ITWG Nuclear Forensics Laboratories by tracking the state of the art and best practice of nuclear forensic science, and identifying analytical techniques ready for operational use and new laboratory methods worthy of additional development. Unlike performance tests, CMXs are designed to provide technical learning experiences for the INFLs. CMXs are unique in that they target both questions of legal importance and questions of

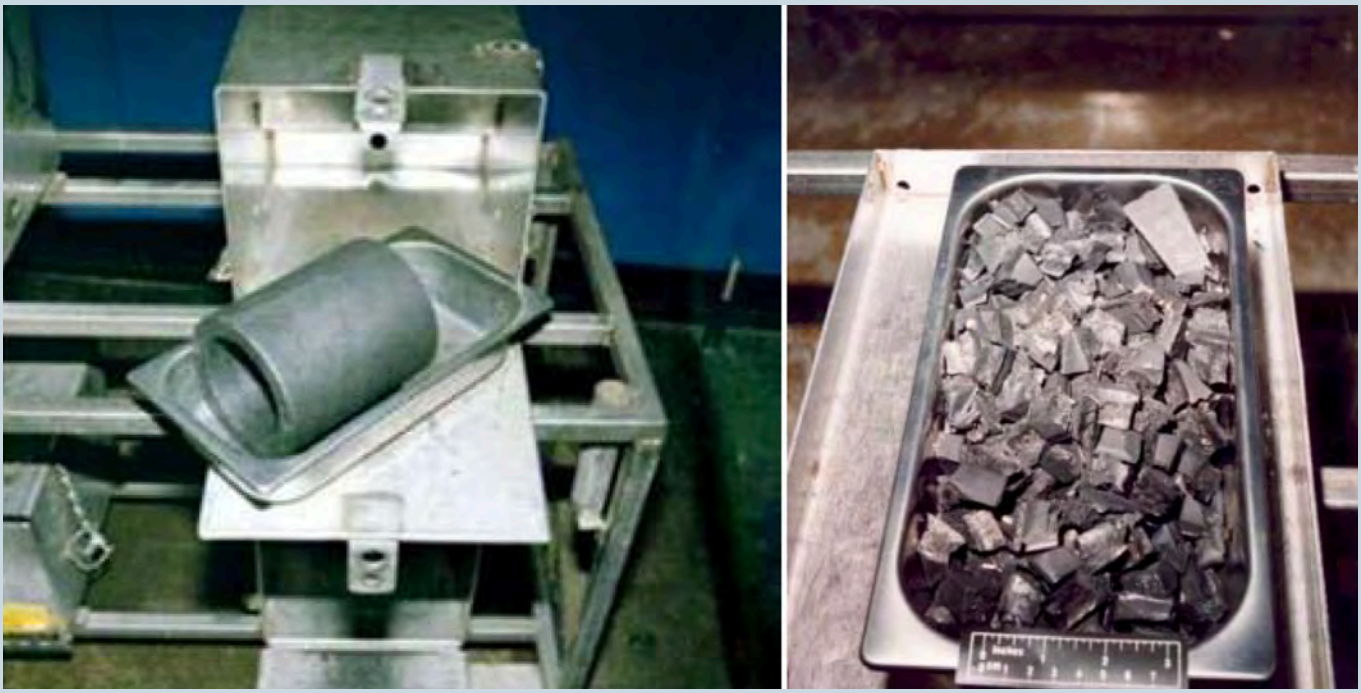

Figure 11. An exemplar of a uranium metal sample log and uranium metal pieces from the Y-12 National Security Center used in a CMX exercise.

national security importance. The exercises facilitate analyses that support basic law enforcement and first responder functions, such as whether the material in question is radioactive or dangerous, or whether the event warrants a criminal investigation. With regard to national security interests, exercises facilitate enquiries of a more advanced nature, such as whether the material in question is related in any way (e.g. similar form or production history) to past seizures. In an effort to inject a high degree of realism into the exercises, internationally recognized reporting requirements are adopted and actual materials from the nuclear fuel cycle are used. These materials have included depleted, natural, low-enriched and high-enriched uranium oxides and metals, and reactor- and weapons-grade plutonium oxide and fluorides (see figure 11). Classical forensics evidence (e.g. fingerprints, DNA, toolmarks, and so on) contaminated with radioactivity have been a regular feature of exercises since 2019 and an optional radiological crime scene module was recently introduced in collaboration with the ETTG to encourage participation by law enforcement counterparts. A primary driver of the success of the CMX series is the dedication by its organizers to maintain this activity as a learning experience, keeping results from individual laboratories confidential, but publishing summaries of community performance and the major outcomes in the open literature.

As a testament to the advancement of the state of practice and the art of nuclear forensics analysis through participation in CMXs, participants in CMX-3 applied 13 different analytical techniques to characterize special nuclear exercise materials. Roughly 10 years later, participants in the most recent exercise used nearly 40 different analytical techniques to characterize exercise materials, one-third of which were employed in a CMX for the first time. The CMXs have grown in complexity and popularity, with recent participation by over 20 laboratories and 15 law enforcement agencies. CMX-7 will officially close out the exercise at a Data Review Meeting in Prague in October 2022 but planning is already under way for CMX-8, which is scheduled to commence in 2024.

Guidelines Task Group

At the first ITWG Meeting in 1996, part of the terms of reference advanced was to: 'Identify and prioritize techniques and methods for forensics analyses of nuclear materials in order to answer questions regarding source attribution and the intended use of seized nuclear materials.' In 2004, the ITWG Executive Committee recognized the need to create 'general guidelines' (as opposed to standards) that would strengthen confidence in the findings derived from INFLs engaged in ITWG sample analysis exercises, as well as actual case work. In 2006, at the 11th annual meeting of the ITWG in Speyer, Germany, the ITWG Guidelines Task Group was created to 'develop consensus guidelines, consistent with the IAEA/ITWG Model Action Plan, to be utilized by all ITWG nuclear forensics laboratories'. The use of such guidelines would enable comparison of results among all the INFL laboratories and provide additional credibility for our analytical results with legal authorities.

Consequently, the ITWG Guidelines Task Group was established to provide practitioners with documented guidelines on fulfilling the requirements of the nuclear forensics Model Action Plan, as a generalized approach to an examination involving materials outside of regulatory control. Since each nuclear forensics examination is different, these guidelines are not prescriptive, but reflect best practices as identified in a collaborative effort by the community of nuclear forensics experts from around the world represented in the ITWG. The guidelines also serve to complement the ITWG CMXs, where a common sample is shared among participating nuclear forensics laboratories (see above). The sharing of results from these CMXs identified the need for consensus guidelines that reflect best practices in the nuclear forensics laboratory. In addition, the guidelines now encompass evidence collection, non-destructive analysis associated with categorization at a nuclear security event, and determinations of confidence in findings. Consistent with international practice, written procedures are essential for high levels of confidence in findings associated with a nuclear forensics examination. The ITWG guidelines do not in themselves constitute a nuclear forensics quality assurance programme but can provide the basis for one as required. (For a full list of currently approved guidelines, see the open ITWG website, http://www.nf-itwg.org/.)

Two new guidelines have been recently approved by the ITWG Executive Committee: one on laser ablation-inductively coupled plasma mass spectrometry (LA-ICP-MS), developed by Slobodan Jovanovic at the Canadian Nuclear Safety Commission; and one on isotope dilution mass spectrometry, developed by Amy Gaffney of Lawrence Livermore National Laboratory. One set of guidelines currently under

Continued page 14

The Task Groups... *continued from page 13*

development is the Graded Decision Framework (GDF). The GDF is a draft guidelines document that provides a statistically grounded framework for communicating confidence in findings to investigative authorities and other audiences. It is intended to be accessible to nuclear forensics practitioners who are not themselves statistical specialists and do not have ready access to such expertise. It aims to inform expert judgment, but not to replace it, and is offered as one potential tool in the nuclear forensics practitioner's toolbox.

Libraries Task Group

If nuclear or other radioactive material is found outside of regulatory control anywhere in the world, then a country may find itself asking the question: 'is it ours?'; or, more specifically, whether this material is consistent with material used, produced or stored within its borders. A national nuclear forensics library (NNFL) is an extremely valuable resource for answering this question with confidence in a timely fashion. It can also help investigators identify materials and answer questions regarding a material's intended use, production history and provenance.

The Libraries Task Group focuses on demonstrating the utility of an NNFL in supporting an investigation involving material found out of regulatory control. An NNFL consists of information and subject matter expertise on the radiological or nuclear materials produced, used or stored within a state. Just like a research library is composed of much more than books, an NNFL is more than just data. An NNFL is a national system for the identification of nuclear and other radioactive materials found out of regulatory control. It comprises reference information and subject matter expertise on nuclear and other radioactive materials produced, used or stored within a state that can be used to identify the materials out of regulatory control.

The ITWG Libraries Task Group provides guidance on implementing such libraries and adopting best practices. This includes how to advocate for national policies that support an NNFL capability and socializing best practices when it comes to the technical approach to answering investigative questions. The group has organized an ongoing series of virtual tabletop exercises, which is known as Galaxy Serpent. These exercises challenge participants to construct a comparative database and subsequently determine the consistency of exercise data with the content of the database using comparisons of samples of interest with known materials used, produced or stored as part of the nuclear fuel cycle. Four editions of Galaxy Serpent have been completed, each of which used a different material of interest. The versions of the exercise have focused on spent nuclear fuel, sealed sources, uranium ore concentrate and uranium fuel pellets. Over 200 participants from 40 countries and international organizations participated in the most recent exercise. Future exercises will partner with the ETG's CMXs to incorporate analytical measurements and facilitate dialogue between nuclear forensics practitioners and legal authorities.

In recent years, the Libraries Task Group has been successful at raising awareness and understanding of NNFLs and their role in investigations. In 2018, the IAEA published a non-serial publication, *Development of a National Nuclear Forensics Library: A System for the Identification of Nuclear or Other Radioactive Material out of Regulatory Control*, with considerable input from Libraries Task Group members. The value of NNFLs was also highlighted during an ITWG Libraries Task Group-led mini-exercise that took place during the IAEA's 2022 Technical Meeting on Nuclear Forensics.

In the coming year, the Libraries Task Group will continue its work to advance best practices in NNFL use. The results of the fourth Galaxy Serpent are being analysed and will be submitted for publication in early 2023. The fifth edition of Galaxy Serpent is scheduled to begin in January 2023. It will focus on connecting data analysis to meaningful statements that address investigative questions. We look forward to working with you all to promote the use of NNFLs and ensure that nuclear forensics continues to provide defensible answers to investigative questions.

Outreach and Training Task Group

Outreach has always been the highest priority for the Nuclear Forensics ITWG. Through the sharing of consensus technical guidance on the conduct of a nuclear forensics examination, and the results of analytical and virtual exercises on nuclear forensics categorization, characterization and interpretation, as well as serving as a bridge between law enforcement and nuclear forensics at the radiological crime scene, outreach informs practitioners of recent developments in nuclear forensics as a prevention of and response to incidents involving nuclear and other radioactive material out of regulatory control.

Figure 12. The Nuclear Forensics International Technical Working Group website: http://www.nf-itwg.org/

For this reason, the Outreach and Training Task Group (formerly the Outreach and Communications Task Group) was established at the founding of the ITWG to share technical developments and scientific findings, lessons learned from collaborative exercises and the newest research results. The task group focuses on the best platforms for disseminating these accomplishments to the ITWG internal membership, the ITWG's technical partners, including the IAEA, and the broader international nuclear security audience. More recently, during the Covid-19 pandemic, the ITWG embraced virtual outreach to augment its more traditional in-person forums and exchanges.

The purpose of the ITWG Outreach and Training Task Group is to foster an active association of nuclear forensics practitioners that promotes international efforts, fosters coordination with others working in nuclear forensics, enhances technical communication and informs relevant training in nuclear forensics human resource development. An initial contribution of the task group was the creation of an open website (http://www.nf-itwg.org/) to provide a front-facing portal that introduces the work of the ITWG more broadly (see figure 12). A restricted, non-public website was also created to allow work, preliminary plans and the proceedings of the ITWG to be shared among its membership. The open website also enables downloads of technical guidelines on consensus approaches to the analysis and reporting of the INFL and a quarterly newsletter on recent international activities in nuclear forensics, the *ITWG Update*.

The *ITWG Update* newsletter was launched six years ago to provide regular messages from the ITWG leadership, the Executive Committee and membership. Each newsletter includes a calendar of upcoming events, technical reports from the task groups, highlights from nuclear forensics laboratories and sponsors, and a review of the current state of practice and foreseeable requirements for nuclear forensics. The update also lists recent peer-reviewed publications in nuclear forensics and commemorates events, such as in this 25th anniversary issue. The update is published quarterly in English and Russian.

The Outreach and Training Task Group also represents the ITWG at international meetings and conferences such as those at the IAEA, the Institute of Nuclear Material Management (INMM), where the ITWG's 25th anniversary has just featured as part of the INMM's 2022 meeting, the American Association for the Advancement of Science, the American Chemical Society and the UK's NuFor meeting, among others.

The challenges presented by Covid-19 and a survey of the membership led the ITWG Outreach and Training Task Group to pivot to virtual events in order to continue to provide sustained contact with nuclear forensics practitioners. This transition went remarkably well, as is demonstrated by the resulting ongoing ITWG webinar series. These webinars feature presentations from leading experts on a range of topics from nuclear forensics signatures of uranium matrices and radioactive sources to the results of the collaborative exercises, law enforcement perspectives

Continued page 16

The Task Groups... *continued from page 15*

on nuclear forensics evidence collection and optimized laboratory protocols. Although the ITWG annual meeting returned to a hybrid (in-person and virtual) format in 2022, in 2021 the task group helped organize the first all-virtual ITWG meeting, which included a retrospective by its founding members. Notably, the all-virtual meeting was the largest annual meeting convened to date. Virtual strategies will undoubtedly remain important in future ITWG outreach.

The task group now finds itself at an important crossroads. The task group founding chairs from the LLNL, and later the IAEA, as well as the Netherlands Forensics Institute have recently transitioned to ITWG emeritus status. The succeeding task group chairs, one from Oak Ridge National Laboratory and the NNSA Nuclear Smuggling Detection and Deterrence Program (Liz Dallas) and another yet to be appointed, will exploit the unique capabilities, mandates and programmatic priorities of their respective institutions, as well as their own wealth of professional experience, to improve ITWG messaging and its ability to support and sustain nuclear forensics technical practice globally.

The ITWG Nuclear Forensics Laboratory

The concept of the ITWG Nuclear Forensics Laboratory was first discussed at ITWG-8 in Budapest in 2003. The stated objective was to 'advance the science of nuclear forensics and to serve the need of states and law enforcement agencies' for such a capability. At ITWG-9 in Cadarache, France, the US co-chair at the time, Sid Niemeyer, presented an organizational chart for the INFL, comprising its own Executive Committee and task groups to perform specific INFL functions. Among the functions of the INFL are establishing guidelines for best practices, conducting international exercises, promoting research and development activities, communicating with external organizations, providing a point-of-contact for nuclear forensics assistance and assisting in nuclear forensics investigations. The members of the INFL are scientists from laboratories who have

Figure 13. Sources used in mobile caesium irradiators in the former Soviet Union containing 3500 Curies of caesium-137. (Soviet Union). Credit: IAEA/Flickr

participated in an ITWG Round Robin (or later a CMX) or those invited by the Executive Committee. The INFL meets just prior to plenary ITWG meetings.

Some of the INFL's activities are covered by other ITWG task groups. However, other key aspects, such as promoting R&D activities and assisting in nuclear forensics investigations, remain a core competence of the INFL. Like the task groups, the INFL is supervised by two co-chairs. Naomi Marks (LLNL) and Maria Wallenius (JRC-Karlsruhe) were the inaugural co-chairs in 2018. In 2022, Maria Wallenius became the ITWG co-chair, and Zsolt Varga (JRC-Karlsruhe) became the new co-chair along with Naomi.

At the ITWG-25 meeting held on 20–24 June 2022 in Livermore, California, the INFL helped to create a scientific programme of talks ranging from advances in actinide measurements by mass spectrometry to new approaches to light stable isotope measurements, NNFLs and tagging nuclear fuels.

At the ITWG-25 meeting, the INFL also coordinated two professional development seminars: one on contamination control and the use of glove bags, presented by the Pacific Northwest National Laboratory (USA), Soreq (Israel) and the CEA in France; and the other on Accelerator Mass Spectrometry, presented by the LLNL. These gave participants an opportunity to learn more about these techniques and methods, and to become familiar with their application and their limitations.

In addition to the annual meeting activities, the INFL has also helped to coordinate the ITWG monthly webinars that began during the Covid-19 pandemic and continue every other month. These webinars provide opportunities for colleagues to share research developments and good practices in all aspects of nuclear forensics.

In sum, the INFL remains a key component of the annual ITWG meetings and the increased emphasis on scientific developments and case studies will be an important component of future ITWG meetings. •

THE JRC AND THE ITWG: A LONGSTANDING AND SUCCESSFUL PARTNERSHIP

KLAUS MAYER AND MARIA WALLENIUS

The JRC was involved in investigating the first incidents of 'nuclear smuggling' when the German authorities asked JRC Karlsruhe to analyse seized materials back in 1992. Hence, the JRC was among the first laboratories—possibly the very first—to do what is now known as 'pre-detonation nuclear forensics'. The JRC's proven experience in nuclear material analysis and its thorough fuel cycle knowledge formed a solid basis for this nuclear forensics work. As illicit trafficking persisted, the international community reacted and the Nuclear Smuggling International Technical Working Group was founded following a G7+1 initiative at its Ottawa Summit in 1995. By the time of the ITWG's creation at an experts' meeting (usually referred to as ITWG-0) at the Lawrence Livermore National Laboratory, the JRC had already analysed samples from 21 nuclear smuggling incidents. Thus, the JRC already had a substantial knowledge base in the area of nuclear forensics, so it was only logical that it should join this newly formed group and take a leading role by making its experience available to the wider community. At the same time,

Figures 14 and 15. Pellets from the first nuclear forensics analysis at the JRC in 1992. Photo credit: European Commission.

Continued page 18

The JRC and the ITWG... *continued from page 17*

experts from other laboratories and communities, with their specific competencies, also provided valuable input into the group. Sharing experience, developing and promoting best practices, initiating research activities, and fostering interpretational techniques and collaboration with law enforcement became key elements of the ITWG's work and areas where the JRC was able to provide noteworthy contributions. The ITWG quickly became a platform where the input of its members catalysed ideas for new developments for the benefit of individual laboratories and the community as a whole. In consequence, the new discipline of nuclear forensic science got off to a flying start and matured rapidly to become a highly specialized and sophisticated interdisciplinary field.

The analytical techniques used at the JRC for nuclear safeguards and materials research were adapted to the specifics of nuclear forensics investigations; and instruments, such as the multi-collector ICP-MS, Raman and infrared spectroscopy or scanning electron microscopes, were repurposed. Nuclear forensics signatures were identified and methods were developed to determine these, such as for age dating, geolocation (stable isotopes) or origin assessment (rare-earth element pattern). The presentation of results and the peer discussions at annual meetings boosted the development of the JRC and of other ITWG laboratories. Moreover, development of the nuclear materials database, which began in 1996 in a cooperation between the JRC and the Bochvar Institute in Moscow (VNIINM), inspired the concept of a National Nuclear Forensics Library, contributing to the birth of the ITWG Libraries Task Group.

The ITWG collaborative materials exercises (initially known as Round Robins) were designed as 'learning experiences that provide opportunities for participants to test and demonstrate state-of-the-practice to the global scientific and law enforcement communities' (see *ITWG Update* no. 14, Feb. 2020). The JRC helped to kick-off these Round Robins and

Figure 16. Klaus Mayer conducts a tour of laboratories at the JRC Karlsruhe for those participating in the event 'Keeping Europeans safe: 30 years combating illicit trafficking of nuclear materials'.

provided plutonium oxide powder for the very first exercise. Moreover, the JRC has participated in all seven exercises and benefited from the variety of materials that were analysed, from the traditional forensics evidence associated with the material and—most importantly—from the discussions in the data review meetings.

For the JRC as a research organization, it has been straightforward to advocate the importance of nuclear materials analysis, the development of analytical methods and the identification of signatures. Within the ITWG, this can best be achieved through the ITWG Nuclear Forensics Laboratories (INFL) group. The concept of the INFL had been outlined by Sid Niemeyer in 2003 and INFL sessions were subsequently included on the agenda of the annual meetings. Maria Wallenius (JRC-Karlsruhe) and Naomi Marks (LLNL) took over responsibility for the INFL in 2018 and started to provide strong guidance. This renewed scientific focus boosted the productivity of the group.

The JRC hosted annual meetings in 1996 (ITWG-1), 2006 (ITWG-11) and 2017 (ITWG-22) and provided support to a number of other hosts by organizing annual meetings in their respective countries. ITWG meetings also sparked bilateral and multilateral cooperation where the JRC could establish partnerships in R&D and capacity building. In addition, cooperative projects related to nuclear forensics implemented by the JRC in several regions helped to advertise the ITWG, led experts to attend ITWG annual meetings and integrated them into the nuclear forensics community. The informal and unaffiliated character of the ITWG has proved to be of great value in this context, offering flexibility and allowing the group to steadily grow and expand its membership.

Lothar Koch (JRC) and Sidney Niemeyer (LLNL) were the first co-chairs of the ITWG. JRC scientists continued to serve in the leadership team through Klaus Mayer (co-chair 2005–2022), Maria Wallenius (co-lead of the guidelines TG 2012–17, co-lead of the INFL 2018–22, ITWG co-chair as of 2022) and Zsolt Varga (co-lead of the guidelines Task Group 2018–22, co-lead of the INFL as of 2022).

Since the inception of ITWG in 1995, the JRC has made a significant contribution to its work at different levels and in different roles. Moreover, the JRC has provided guidance to help keep the ITWG ahead of the game and at the forefront of nuclear forensic science. At the same time, the ITWG has been a great forum, inspiring research and development activities at the JRC, and a learning platform for JRC scientists. Overall, the ITWG and the JRC have been a highly successful partnership; even more than that, it has been a symbiosis of mutual benefit. •

UPCOMING TRAINING COURSES AND MEETINGS*

- IAEA International Training Course, Practical Introduction to Nuclear Forensics, Sydney, Australia, 14–18 November 2022
- IAEA International Training Course, Introduction to Nuclear Forensics, Bangkok, 21–25 November 2022
- IAEA International Training Course, Nuclear Forensics Methodologies, Pacific Northwest National Laboratory, 27 February–10 March 2023
- IAEA Regional Training Course, Introduction to Nuclear Forensics, Mauritius, 13–17 March 2023
- Third International Conference on Radioanalytical and Nuclear Chemistry (RANC), Budapest, 7–12 May 2023.

*Please check directly with the event organizer on the status and dates for implementation of the individual events listed above.

Dates and locations of IAEA training courses and meetings will be officially confirmed with host member states; participation in IAEA training courses and meetings is by nomination and in accordance with established IAEA procedures.

CONTENTS

NUCLEAR FORENSICS

Nuclear forensics is an essential component of national and international nuclear security response plans to events involving radioactive materials diverted outside of regulatory control. The ability to collect and preserve radiological and associated evidence as material is interdicted and to conduct nuclear forensics analysis provides insights to the history and origin of nuclear material, the point of diversion, and the identity of the perpetrators.

THE NUCLEAR FORENSICS INTERNATIONAL TECHNICAL WORKING GROUP

Since its inception in 1995, the Nuclear Forensics International Technical Working Group (ITWG) has been focused on nuclear forensic best practice through the development of techniques and methods for forensic analysis of nuclear, other radioactive, and radiologically contaminated materials. The objective of the ITWG is to advance the scientific discipline of nuclear forensics and to provide a common approach and effective technical solutions to competent national or international authorities that request assistance.

ITWG PRIORITIES AND ACTIVITIES

As a technical working group, the priorities for the ITWG include identifying requirements for nuclear forensic applications, evaluating present nuclear forensic capabilities, and recommending cooperative measures that ensure all states can respond to acts involving illicit trafficking and unauthorized possession of nuclear or other radioactive materials. An objective of the working group is to encourage technical peer-review of the nuclear forensic discipline. These goals are met through annual meetings, exercises, and informal and formal publications.

Outreach is a primary goal of the ITWG. The working group disseminates recent progress in nuclear forensic analysis and interpretation with the broader community of technical and security professionals who can benefit from these advancements. Affiliated international partner organizations include the International Atomic Energy Agency (IAEA), the European Commission, the European Police Office (EUROPOL), the International Criminal Police Organization (INTERPOL), the Global Initiative to Combat Nuclear Terrorism (GICNT) and the United Nations Interregional Crime and Justice Research Institute (UNICRI).

ITWG MEMBERSHIP

Nuclear forensics is both a technical capability as well as an investigatory process. For this reason the ITWG is a working group of experts including scientists, law enforcement officers, first responders, and nuclear regulators assigned by competent national authorities, affiliated contractors, and international organizations. The ITWG is open to all states interested in nuclear forensics.

ITWG participating states and organizations recognize that radiological crimes deserve thorough investigation and, when warranted, criminal prosecution. The ITWG encourages all states to possess the basic capability to categorize nuclear or other radioactive materials to assess their threat. As an international group, the ITWG shares its expertise through its membership to advance the science of nuclear forensics as well as its application to nuclear security objectives.

http://www.nf-itwg.org/

The 'ITWG Nuclear Forensics Update' is produced by the Stockholm International Peace Research Institute (SIPRI) on behalf of the Nuclear Forensics International Technical Working Group and with the financial support provided by the United States Department of Energy, National Nuclear Security Administration. The content and the views expressed here belong to the authors.