

## CHAIRPERSONS' ADDRESS

Welcome to the 32nd edition of the Nuclear Forensics International Technical Working Group (ITWG) newsletter. The ITWG recently held its 27th annual meeting in Manchester, United Kingdom and the co-chairs would like sincerely to thank the host, the National Nuclear Laboratory in the UK, which did a great job in organizing the ITWG-27 meeting. The contribution of the sponsors, the United States Department of Energy's Nuclear Smuggling Detection and Deterrence (DOE NSDD) programme and the European Commission's Joint Research Center (JRC), was also essential. Last but not least, we would like to thank the participants. Without their active engagement in discussions on ongoing and upcoming ITWG activities, such as Galaxy Serpent v5 and CMX-8, ITWG-27 would not have been such a success. The meeting summary and further details can be found on page 3.

As always, this edition of ITWG Update contains other interesting news and stories. Those who missed ITWG-27 may not know that Michael Curry, the long-standing co-chair of the ITWG has ceased to be the ITWG co-chair as he retired from US government service soon after the meeting. He has been replaced by James Blankenship. Below you will find a tribute to Michael and his outstanding work as an ITWG co-chair. You can also read about Project 'Triglav', which is being implemented on the Slovak-Ukrainian border to fight against chemical, biological, radiological and nuclear (CBRN) threats (page 5).

As co-chairs, we have already started to plan the next ITWG annual meeting. Although not yet fully confirmed, we hope to meet you all together in the summer of 2025 in Bologna, Italy to celebrate the ITWG's 30 years of existence and to continue to strengthen our collective efforts in nuclear forensics for many years to come!

With best regards,

James Blankenship and Maria Wallenius

## MICHAEL CURRY: TEN YEARS OF ACCOMPLISHMENTS, COLLABORATION AND OUTREACH AS US ITWG CO-CHAIR

DAVID K. SMITH, MARIA WALLENIUS AND KLAUS MAYER

As the world's leading community of nuclear forensics practitioners, the countries contributing to the ITWG have developed scientific methods adopted globally by technical experts and law enforcement officials to counter the persistent threat of nuclear and other radioactive materials out of regulatory control. A diverse working group of technical and security professionals uses annual meetings, exercises and task groups to exchange best practices and lessons learned over the last 30 years. Michael has been a co-chair for the last 10 years, during which he has vigorously promoted the work of the group, enabled its collaborations and fostered numerous accomplishments. The key role of the ITWG's leadership is to effectively harness the strengths of this



**Figure 1.** 23rd ITWG Annual Meeting, 4–8 June 2018, Schwarzenburg/Spiez, Switzerland

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Michael Curry... *continued from page 1*

diverse working group, embrace common approaches and share experiences that support the conduct of a nuclear forensics examination.

Michael joined the US State Department almost 40 years ago and has been at the forefront of international security initiatives throughout this time, leading from his efforts in arms control and non-proliferation of nuclear weapons to a more recent focus on countering the smuggling of materials used in weapons of mass destruction. Michael first participated in the ITWG in 2008 and has served as co-chair since 2014. On his retirement from the ITWG leadership, as well as from US Government service, the ITWG acknowledges Michael's enormous contribution to positioning the ITWG as the pre-eminent global provider of technical solutions to support nuclear forensics investigations. The ITWG is better for Michael's vision and direction.

In the past decade under Michael's leadership, the ITWG has transitioned from its formative years to an established working group recognized internationally as the premier provider of technical guidance, collaborative exercises and regular outreach to its global membership on nuclear forensics. During Michael's tenure as co-chair, the ITWG task groups published 14 guidelines covering technical aspects of an examination, organized four Collaborative Material Exercises (CMXs) involving analyses of real nuclear material at participating ITWG laboratories, conducted five Galaxy Serpent exercises to increase confidence in populating and using national nuclear

forensics libraries, forged strong links with law enforcement through forensic examination of evidence and delivered regular and effective technical outreach, which was particularly important during the Covid-19 pandemic for maintaining the cohesion of the ITWG membership. Michael capably organized the ITWG annual meetings to the benefit of its growing membership and ensured the timely exchange of achievements in professional development seminars. Under Michael the ITWG executive committee embarked on a forward-looking strategy, working with its task groups to position the ITWG to best prepare states to develop and sustain nuclear forensics capabilities nationally, regionally and internationally. Michael prioritized the role of participating ITWG Nuclear Forensics Laboratories, the self-declared analytical laboratories that have adopted the ITWG's model action plan, to implement ITWG guidance in support of nuclear forensics examinations, as innovators and implementers of nuclear forensics best practice.

The proof of Michael's effectiveness as ITWG co-chair, working first with Klaus Mayer and subsequently with Maria Wallenius of the European Commission, is reflected in the current global stature enjoyed by the ITWG. The ITWG featured prominently throughout the 2016 Nuclear Security Summit. Global leadership recognized the ITWG in the 2016 Summit communiqué, where the ITWG



**Figure 2.** Michael Curry and Klaus Mayer at the 22nd ITWG Annual Meeting, 30 June 2017, Karlsruhe, Germany



**Figure 3.** 24th ITWG Annual Meeting, June 2019, Măgurele, Romania

was said to: ‘Advocate for the International Atomic Energy Agency (IAEA) to advance and sustain States’ nuclear forensics capabilities, including building upon the expertise of the Nuclear Forensics International Technical Working Group, by developing guidance documents promoting international nuclear forensics cooperation, sharing experience and knowledge, and supporting the development of national nuclear material databases or national nuclear forensics libraries’. Michael was a keen advocate for the ITWG at the IAEA. The ITWG was a cooperating partner in the IAEA international conference on nuclear forensics convened in 2014. The ITWG has partnered extensively with subsequent IAEA consultancies and related international conferences, including the recent IAEA International Conference on Nuclear Security in May 2024. Michael ensured these successes in Vienna and both the ITWG and the IAEA benefited.

Michael’s inclusive leadership was his hallmark. Since its founding, the ITWG has remained an informal association of practitioners representing a range of expertise in nuclear science, regulators, forensic science and law enforcement. This diversity requires an inclusive style that ensures the ITWG membership is heard and a consensus forged.

Michael focused on encouraging meaningful contributions from the executive, tasks groups and membership. Michael consistently prioritized the

ITWG’s interest in promoting nuclear forensics best practice. His commitment is reflected in the fact that nuclear forensics is recognized internationally as an instrument of nuclear security prevention and response. To achieve this outreach is vital and Michael remained an advocate of regular communication with the membership. The launch of the quarterly ITWG Update newsletter in 2016, revisions to the ITWG open and closed websites and the effective use of digital platforms to convene the all-virtual ITWG annual meeting in 2021 are just some examples of Michael’s legacy

On behalf of the membership and as former and current ITWG co-chairs, we thank Michael for his exemplary service in the working group over the past ten years. Collectively, we have each benefited from having served with him. The ITWG is a leading example of the ability of experts in nuclear science and security to effectively partner. This requires a balance between charting the future direction of the group while ensuring the delivery of practical and consensus technical guidance. He has realized this masterfully. We wish Michael all the very best in his next endeavours.

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## REVIEW OF THE 27TH ANNUAL MEETING OF THE ITWG

JAMES BLANKENSHIP AND MARIA WALLENIS

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The 27th annual meeting of the Nuclear Forensics International Technical Working Group (ITWG-27), held in Manchester, United Kingdom, on 25–27 June 2024 gathered over 80 nuclear forensics practitioners from around 30 countries and international organizations, and marked the most recent milestone in the working group’s series of annual meetings. This was the third time that the UK had organized the annual meeting, following ITWG-4 in London in 1998 and ITWG-15 in Oxford in 2010. The welcoming remarks from the host country were made by Jeremy Edwards from National Nuclear Laboratory (NNL) and Olivia Marsden from Atomic Weapons Establishment (AWE).

During the plenary session, participants heard about ongoing activities at the International Atomic Energy Agency (IAEA) and the International Criminal Police Organization (INTERPOL), including upcoming training, workshops and conferences.

The IAEA Technical Meeting on Nuclear Forensics proposed for 2025 was also highlighted. As a newcomer at the ITWG meetings, the United Nations Office on Drugs and Crime (UNODC) briefed the community about its CBRN Terrorism Prevention Programme. The plenary session continued by reviewing the ITWG’s recent achievements, such as the intensive work done by the Outreach and Training Task Group funded by the French Alternative Energies and Atomic Energy Commission (CEA) on developing the new ITWG restricted website. The comprehensive After Action Report (AAR) on CMX-7 was presented by the Exercise Task Group (ETG). The plenary also provided opportunities to share information on the multitude of national activities that various laboratories are pursuing.

There were a variety of scientific talks on cutting-edge research during the ITWG’s Nuclear Forensics Laboratories (INFL) session. R&D

Review of the 27th Annual Meeting of the ITWG *continued from page 3*

work on radiochronometry continues in many laboratories, not only on refining the methods and understanding the signature, but also on researching innovative approaches. In addition, there were talks on conventional forensics evidence recovery, non-destructive analytical methods and lanthanides' signature in uranium products. There were also multiple presentations on case studies where nuclear forensics techniques have been applied. Case studies are always much appreciated for sharing lessons learned.

Another aspect of the INFL session was the Professional Development Seminars. This time there were two of them: one on morphology led by Canadian Nuclear Laboratories (CNL) and the AWE, and the second on evidential photography led by the Federal Bureau of Investigation and the AWE. Several laboratories usefully incorporated morphological interpretations during CMX-7 and many are expected to apply record photography techniques during the next collaborative material exercise (CMX-8), which is expected to begin in October 2024. Both seminars provided useful insights and fostered rich technical discussions.

The ITWG's five task groups (Evidence and Testimony, Exercises, Guidelines, Libraries and Assessment, and Outreach and Training) made significant progress in their work and fostered intense discussions. New thinking was raised and each task group began implementing its strategic plan, which will be available on the new restricted website soon. The new website will also contain separate tabs for

each task group, where summaries of the discussions held in annual meetings will be shared, together with other task group-specific activities.

A test run of a flexible table-top exercise (TTX) discussion tool on radiological crime scene management took place during the Evidence and Testimony Task Group (ETTG) session. The discussion tool can be used to exercise prioritization of evidence collection, review of national regulations and the route from crime scene to laboratory, among other things. There are currently three different scenarios, which can be tailored as desired to the specifics of each country to ease play. The ETTG is collecting comments from task group members about the usability of the TTX in order to get the first version out in the near future.

The Exercise Task Group session reviewed progress on preparations for CMX-8. The exercise will have three components: nuclear material, Crime-Scene-In-A-Box (CSIAB), which will include traditional forensics evidence, and a new component – a query to a national nuclear forensics library (NNFL). Sample shipment is currently under way. The ETG session also led a panel discussion on radiochronometry.

The Guidelines Task Group session discussed a small number of guidelines. The guideline on 'Characterization of particle morphology via microscopy' has gone through several iterations of comments and will soon be ready to be approved. A new guideline on 'National nuclear forensics libraries' was presented and a new guideline on 'Fission track analysis: from sampling to measurement' is under discussion.



**Figure 4.** Participants of the ITWG 27th Annual Meeting, June 2024, Manchester, United Kingdom

The Libraries and Assessment Task Group (LATG) session reviewed version 5 of the Galaxy Serpent exercise (GSv5). There was spirited discussion among participants about the investigative questions asked as part of the exercise and the different approaches taken by participants to answering those questions. The new LATG Strategy was also reviewed by attendees, and there was a request for ideas for the next Galaxy Serpent.

The Outreach and Training Task Group (OTTG) presented proposals for the look of the new ITWG restricted website. The updated website is more user-friendly and should allow ITWG members to interact,

for instance in task groups, between annual meetings, when finalized. Members are encouraged to complete their profiles and upload a picture to the new website. Alongside the well-established newsletter, ITWG Update, the OTTG is launching a new publications series, 'ITWG Series on Nuclear Forensics Cases'. The first issue will be out soon. The OTTG session also included a panel on the NSDD's approach to regional support.

Presentations from ITWG-27 will be made available to ITWG members soon on the restricted website. Stay tuned! •

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## PROTECTING THE SLOVAKIAN–UKRAINIAN BORDER AGAINST CBRN THREATS: OUTCOMES OF PROJECT 'TRIGLAV'

EVA STRUHÁROVÁ AND DUŠAN MACÁK

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The Slovak–Ukrainian border is just under 100 kilometres long but its importance to the European Union (EU) is exceptionally high. It serves as a gateway to the Schengen area, so anything that crosses this border could end up in any EU member state. This also applies to chemical, biological, radioactive and nuclear (CBRN) materials. The task of the Slovak and Ukrainian security forces is to prevent illegal trade in hazardous materials and thus protect the lives and health of the entire EU population. The full name of the project, 'Triglav: Strengthening the fight against chemical, biological, radioactive and nuclear threats at the Slovakian–Ukrainian border', was carefully chosen to wrap-up all the joint efforts, which at the beginning seemed an impossible task. It was decided to add the symbolic name, Triglav, to the self-explanatory project title to represent three heads of a living organism—three countries working together in one common initiative. Norway, as the donor country, was represented by the Norwegian Radiation and Nuclear Safety Authority (DSA); the Slovakian Ministry of the Interior (MoI) was represented by the Department for Detection of Hazardous Substances and Environmental Crime (the CBRN Unit), as a project promoter and the main recipient of the grant; and three Ukrainian organizations, the International CBRN Risk Mitigation Research Center (CBRN Center), the State Border Guard Service of Ukraine (SBGS) and the Security Service of Ukraine (SSU), were our project partners.

The main goals of the Triglav project were to:

- (a) improve institutional cooperation in the CBRN

- field; (b) increase the level of CBRN knowledge and the skills of personnel by introducing a system of education and training; (c) improve the quality and availability of technical equipment; and (d) raise awareness about CBRN-related criminal activities. The project designed a series of tailor-made activities in order to achieve these goals. Networking events, bilateral field exercises and a number of education and training, and awareness rising activities were carefully planned, developed and carried out by project partners.

One of the most impactful and sustainable project outcomes was a bilateral agreement between the MoI and the SBGS, drafted by the project partners and submitted to the governmental authorities in Slovakia and Ukraine. The document was signed by the statutory representatives of both institutions as an agreement between the MoI and the SBGS on interaction and cooperation in the field of CBRN security at the border. It is a bilateral intergovernmental agreement that sets a common standard and baseline for the MoI and the SBGS to collaborate in the field of CBRN security in the long term. The project partners tested the particular procedures developed in the agreement during a three-day field exercise on the management of a CBRN incident, which contained a cross-border element and tested the newly established direct cross-border information flow. In recognition of the problems posed by language barriers for international cooperation, the CBRN Center organized five intensive English

**Protecting the Slovakian–Ukrainian border...** *continued from page 5*

language courses within the project, specifically designed for 100 Ukrainian CBRN specialists.

Networking constituted a significant component of the project's efforts. The CBRN Unit organized three networking courses with the primary aims of strengthening interagency and international ties between Slovakia and Ukraine, sharing best practices, providing an overview of current trends and challenges, and promoting global cooperation. The courses included practical demonstrations of Slovak national capacities in the field of CBRN security. They were attended by 89 representatives from institutions to which CBRN security has been entrusted.

Our aim was to build a formalized CBRN education and training system within the Triglav project and to maintain it long term. Following a study visit to the USA and the subsequent work of the project partners, a curriculum was developed for the specialist CBRN course. The project partners adapted the curriculum to national conditions, and the CBRN Unit submitted the course to the Accreditation Committee of the MoI of the Slovak Republic, which accredited it in June 2024. Successful completion of this course is now mandatory for all new police officers enlisted in the service of the CBRN Unit. The subject matter experts in the CBRN Unit delivered eight specialized CBRN courses to 160 CBRN Unit police officers as a test run of the new curriculum. The Ukrainian project partners carried out five similar training events for 100 Ukrainian specialists. The main objectives of these activities were to deepen the theoretical knowledge and enhance the practical experience of

personnel in the use of detection devices and personal protective equipment (PPE) during simulated CBRN incidents, keeping in mind the specificities of CBRN crime investigations.

Understanding the need for successful criminal proceedings, the CBRN Unit also organized a seminar for 40 Slovak and Ukrainian prosecutors. The seminar aimed to establish judicial cooperation on cross-border CBRN incidents. It comprised expert discussions, lectures and practical demonstrations of Slovak police procedures. A key activity was a mock trial involving the illicit cross-border trafficking of CBRN materials.

Recognizing the possibility of the occurrence of a CBRN-related incident involving dangerous perpetrators, two courses were conducted for 40 members of Slovak police intervention units and one for 20 Ukrainian participants. The courses provided practical training in handling CBRN offenders, managing contaminated crime scenes and fostering cooperation among units, emphasizing responders' safety.

In order to develop and establish the proper reaction capabilities, specialized detection equipment and PPE were procured within the Triglav project. This will allow Slovak and Ukrainian specialists to detect, identify and intercept CBRN materials, and subsequently to mitigate any possible negative impacts of CBRN incidents.

Our project was made possible through the generous support of European Economic Area grants (<https://eagrants.org>). This was a testament to the power

#### **NOTABLE PUBLICATIONS ON THE WORK OF THE ITWG, NUCLEAR FORENSICS AND RELATED DISCIPLINES**

- Quemet, A. et al., 'An isotope dilution mass spectrometry overview: Tips and applications for the measurement of radionuclides', *Journal of Analytical Atomic Spectrometry*, vol. 39, no. 7 (July 2024), pp. 1665–99.
- Elgad, N. et al., 'Image segmentation and classification for fission track analysis for nuclear forensics using U-net model', *Journal of Radioanalytical Nuclear Chemistry*, vol. 333, no. 5 (May 2024), pp. 2321–37.
- Kong, L. et al., 'Advancements in remote alpha radiation detection: Alpha-induced radio-luminescence imaging with enhanced ambient light suppression', *Sensors*, vol. 24, no. 12 (June 2024).
- Huang, S. et al., 'Development and application of elemental imaging technology in nuclear forensics', *Chinese Journal of Inorganic Analytical Chemistry / Zhongguo Wuji Fenxi Huaxue*, vol. 14, no. 6 (June 2024), pp. 732–38.
- Pietrykowski, M. and Scott, M. R., 'Age dating of repurified and mixed plutonium using machine learning', *Nuclear Science & Engineering* (May 2024), pp. 1–11.



**Figure 5.** Simulating radiological incident during the Ukrainian specialized trainings

of collective action, representing the possibility of finding synergies between diverse nations, institutions, policies, mindsets and talents that come together to address one of the pressing security



**Figure 6.** Firearms training in PPE for Slovak SWAT units simulating intervention in contaminated area by R/N materials

challenges of our time. The financial backing received was not just an investment in the above-mentioned activities, but a vote of confidence in our ability to make a tangible difference in the future. •

#### UPCOMING TRAINING COURSES AND MEETINGS\*

- IAEA: Peer-to-Peer Workshop on Nuclear Forensics, Yogyakarta, Indonesia, 26–30 August 2024
- ITWG: CMX-8, starting between September 2024 and January 2025, lasting approximately 2 months upon receipt of materials
- IAEA: Regional Training Course on Practical Introduction to Nuclear Forensics, Saclay, France, 30 September–4 October 2024
- IAEA: Regional Training Course on Practical Introduction to Nuclear Forensics, Hungary, 30 September–4 October 2024
- IAEA: International Training Course on Nuclear Forensic Methodologies, Karlsruhe, Germany, 14–25 October 2024
- IAEA: Regional Workshop on Radiological Crime Scene Management, Tbilisi, Georgia, 4–8 November 2024
- US Department of State: Global Forum to Prevent Radiological/Nuclear Terrorism (Global FTPRNT, “footprint”), Bucharest, Romania, 13–15 November 2024
- IAEA: Regional Training Course on Basic Introduction to Nuclear Forensics, Egypt, 17–21 November 2024
- IAEA: Regional Workshop on Radiological Crime Scene Management, Gaborone, Botswana, 9–13 December 2024

\*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.

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### 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/>

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