TEMPORARY WORKING GROUP (TWG) ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

Dr Veronica Borrett. Member, SAB
Chair, TWG on Investigative Science and Technology

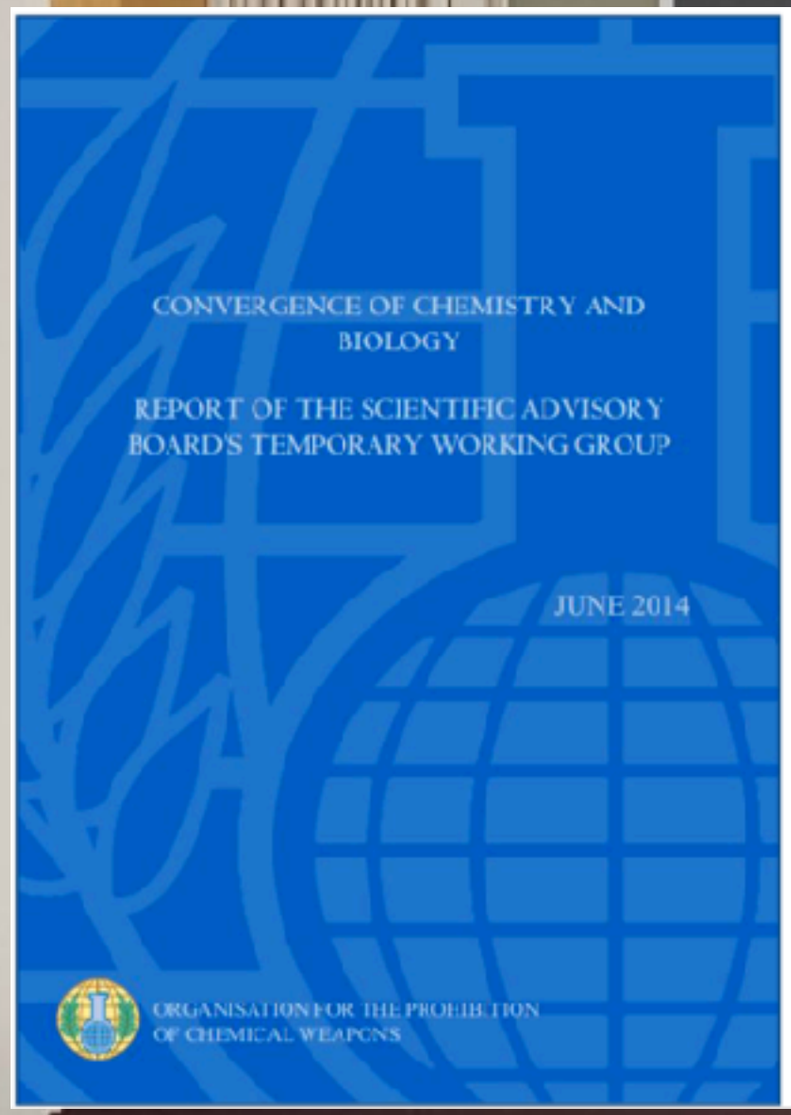
OPCW TWG on Investigative Science and Technology Second Meeting
14 to 16 November 2018

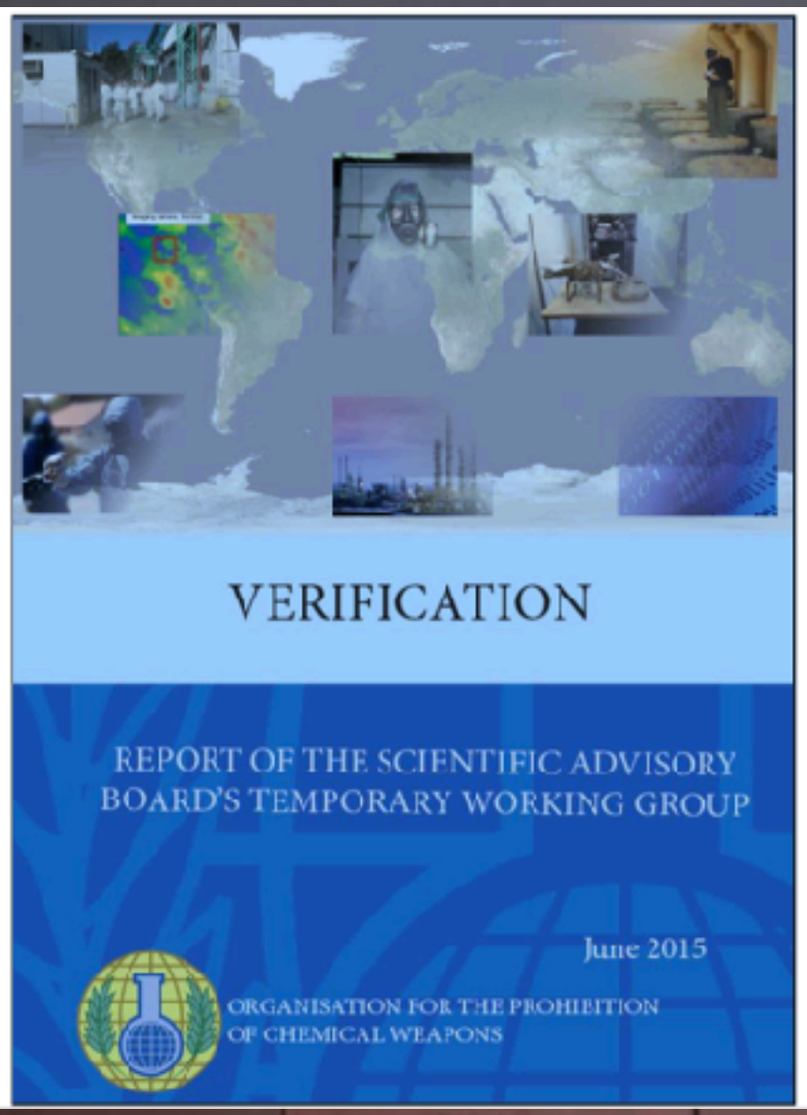
REPORTING

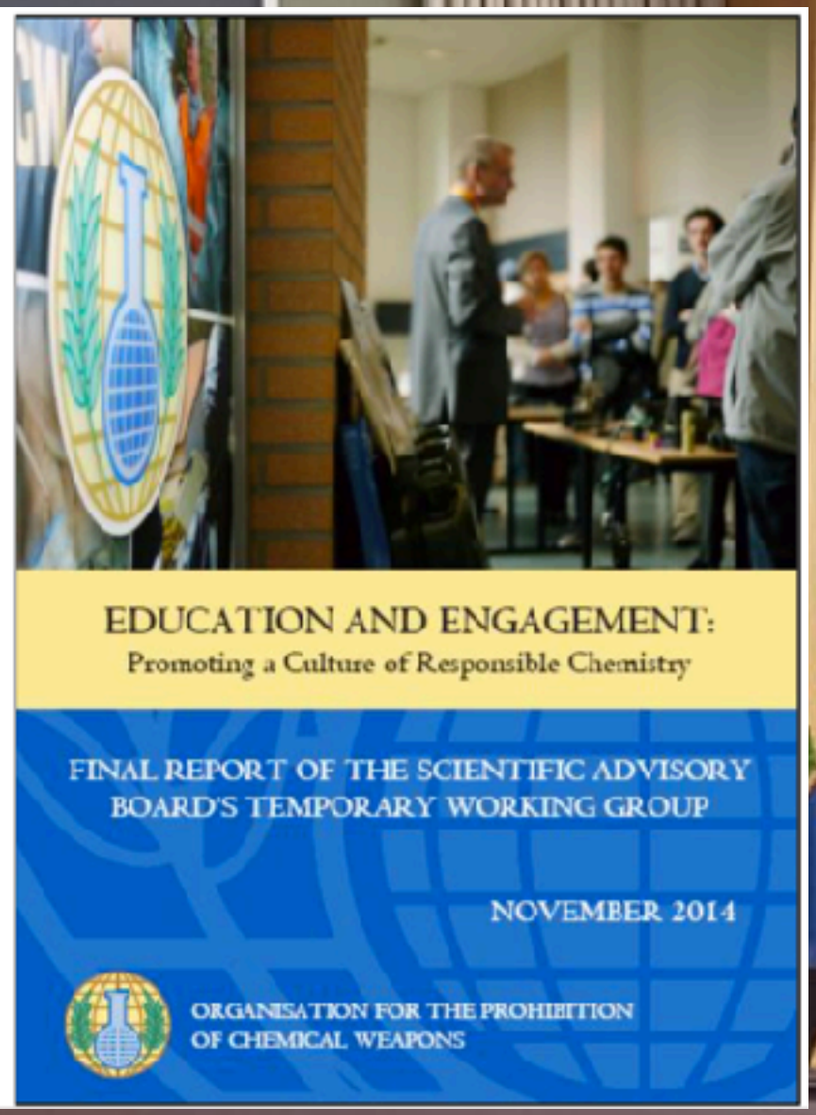

TWG established by the OPCW Director General
TWG report and recommendations reviewed and approved by SAB (Scientific Advisory Board)
SAB provides TWG report to the Director General for consideration

TWG ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

REPORTING







SAB provides TWG report to the Director General for consideration

TWG ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

BACKGROUND

- The lessons learned from contingency operations, such as the OPCW Fact-Finding Mission in the Syrian Arab Republic, have highlighted the need for continued broad engagement and evaluation of technologies and methods (both current and emerging) relevant to the verification regime.
- In response, the OPCW/VERIFIN convened a Workshop on "Chemical Forensics: Capabilities across the Field and the Potential Applications in CWC Implementation" in Helsinki 2016.
- In its report from the workshop, the SAB recommended (SAB-24/WP.1) that additional workshops or a temporary working group (TWG) could be considered to strengthen the understanding of technologies, procedures and capabilities that forensics can bring to investigations.
- The SAB also highlighted the importance of engagement with forensic experts, forensic practitioners and OPCW inspectors and laboratories, to explore methods and capabilities relevant to the verification of the Chemical Weapons Convention.

TWG ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

BACKGROUND

EC-84/DG.9 Response to the Report of the Twenty-Fourth Session of the Scientific Advisory Board (Recommendations to the Director-General (paragraph 1.2 of SAB-24/1))

- 8. The Director-General thanks the SAB for its recommendations from the 2016 workshop on chemical forensics endorsed by the Board at its Twenty-Fourth Session (paragraphs 8.12 to 8.17 of SAB-24/1, and paragraph 18 below). He notes the relevance of this advice to the verification regime, especially for sampling and analysis, and collection and validation of information in support of contingency operations such as deployments of the OPCW Fact-Finding Mission in Syria. The recommendations supporting adoption of fit-for purpose tools and methods would also be relevant to initiatives such as the Rapid Response and Assistance Mission.
- 9. In accordance with paragraph 9 of the SAB's terms of reference (C-II/DEC.10/Rev.1, dated 2 December 2004), the Director-General requests that the SAB establish a new temporary working group (TWG) and appoint a Chairperson for it. **This TWG will address questions relating to science and technology relevant in investigative work, and will undertake further consideration of topics described in paragraph 8 above, other recommendations from the chemical forensics workshop, and in particular questions falling under subparagraphs 2(e) and (g) of the SAB's terms of reference relevant to investigative methods in contingency operations.** The Director-General will in the near future prepare a mandate for theTWG, which should hold its first meeting before the end of the first quarter of 2018.

TWG on Investigative Science and Technology

Terms Of Reference for the TWG

1. The ongoing contingency operations of the Technical Secretariat have increasingly involved investigations, analysis, and fact-finding, with collection and evaluation of oral, material, and digital evidence of the use of chemical agents. Such activities are not part of routine inspection and verification activities under the Chemical Weapons Convention. **The Director-General has decided that it would be useful to have an in-depth review of the methods and technologies used in investigative work, and that these would be relevant to and augment the capacity of the Technical Secretariat.** Further to his response to the report of the Twenty-Fourth Session of the SAB (SAB-24/1, dated 28 October 2016) and in accordance with paragraph 9 of the terms of reference of the SAB (Annex to C-II/DEC.10/Rev.1, dated 2 December 2004), the Director-General has therefore established a Temporary Working Group (TWG) on Investigative Science and Technology and has appointed Dr Veronica Borrett as the Chairperson of the Group.

2. **The objective of the TWG is to review the science and technology relevant to investigations such as those mandated under Articles IX and X of the Chemical Weapons Convention. This would include science and technology for the validation and provenancing (i.e. determining the chronology of ownership, custody and/or location) of evidence, and the integration of multiple and diverse inputs to reconstruct a past event,** as well as further considerations of topics in the recommendations from the SAB's 2016 chemical forensics workshop (SAB-24/WP.1, dated 14 July 2016), and topics falling under subparagraphs 2(e)108 and 2(g)109 of the SAB's terms of reference. **The work of this TWG is intended to identify capabilities, skill sets, and equipment that would augment and strengthen the Technical Secretariat's capabilities.** The findings will be considered by the SAB and recommendations will be provided to the Director-General.

3. The TWG will consist of individuals who collectively have **expertise in the theory and practice of investigative work, including but not limited to investigational chemical analysis, evidence collection, forensic sciences, informatics, crime scene reconstruction, toxicology, inspection, or experience of implementation of the Chemical Weapons Convention.** Qualified members of the SAB may join the TWG. Members of relevant scientific and international organisations may also be invited to join the TWG. Guest speakers may be invited from time to time. The TWG may also, when necessary, draw upon the expertise of the Technical Secretariat, in particular the OPCW Laboratory, Inspectorate, and the Assistance and Protection Branch.

108 "... assess the scientific and technological merit of a present, or proposed, methodology for use by the Technical Secretariat in verification under the Convention".
109 "assess and report on emerging technologies and new equipment which could be used on verification activities".

TWG ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

MEMBERS

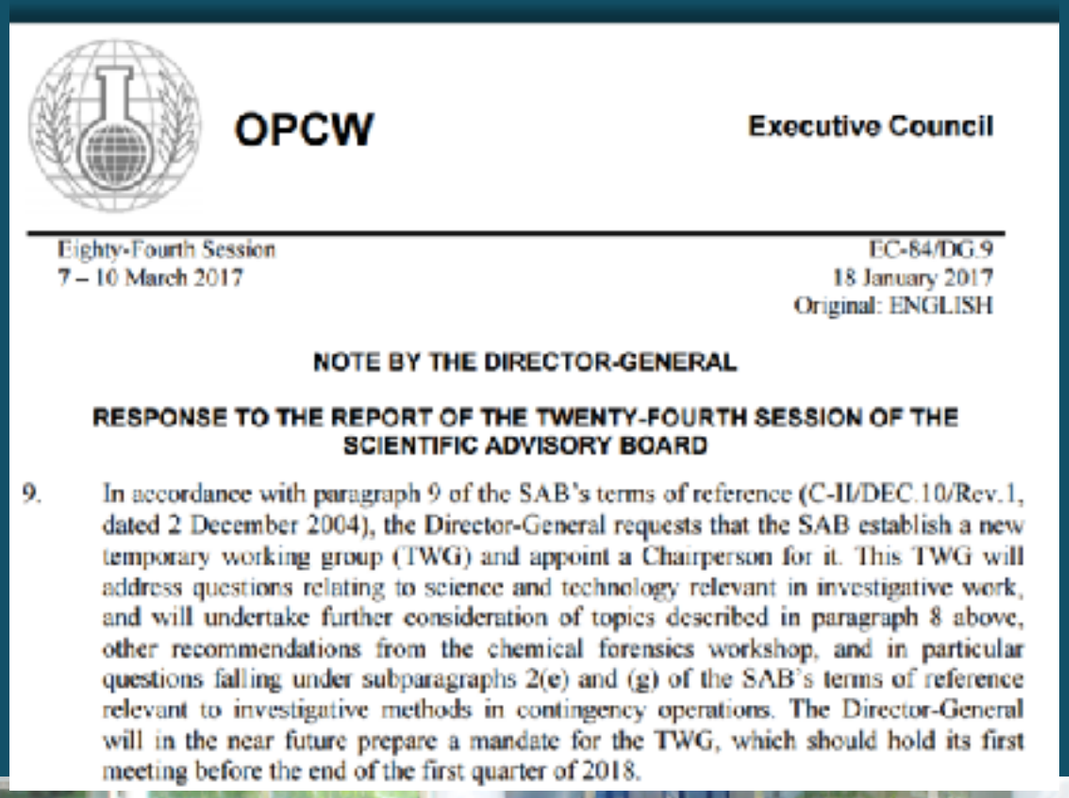
- Veronica Borrett (Australia); TWG Chair *
- Augustin Baulig (France) *
- Christophe Curty (Switzerland) *
- David Gonzalez (Uruguay) *
- Robert Mikulak (USA) *
- Syed Raza (India) *
- Valentin Rubaylo (Russian Federation) *
- Cheng Tang (China); SAB Vice-chair *
- Christopher Timperley (United Kingdom); SAB-Chair *
- Francois van Straten (South Africa) *
- Farhat Waqar (Pakistan) *
- Daan Noort (TNO, The Netherlands)*

- Ed van Zalen (Netherlands Forensic Institute (NFI); TWG Vice Chair
- Crister Åstot (FOI, Sweden)
- Brigette Dorner (RKI, Germany)
- Carlos Fraga (Pacific Northwest National Laboratory, USA)
- Paula Vanninen (VERIFN, Finland)

*** SAB Members**

TWG ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

SAB REPORTS REVIEWED PRIOR TO FIRST TWG MEETING INCLUDE:



OPCW

Executive Council

Eighty-Fourth Session
7 – 10 March 2017

EC-84/DG.9
18 January 2017
Original: ENGLISH

NOTE BY THE DIRECTOR-GENERAL

RESPONSE TO THE REPORT OF THE TWENTY-FOURTH SESSION OF THE SCIENTIFIC ADVISORY BOARD

9. In accordance with paragraph 9 of the SAB's terms of reference (C-II/DEC.10/Rev.1, dated 2 December 2004), the Director-General requests that the SAB establish a new temporary working group (TWG) and appoint a Chairperson for it. This TWG will address questions relating to science and technology relevant in investigative work, and will undertake further consideration of topics described in paragraph 8 above, other recommendations from the chemical forensics workshop, and in particular questions falling under subparagraphs 2(e) and (g) of the SAB's terms of reference relevant to investigative methods in contingency operations. The Director-General will in the near future prepare a mandate for the TWG, which should hold its first meeting before the end of the first quarter of 2018.

OPCW/VERIFIN Workshop "Chemical Forensics: Capabilities across the Field and the Potential Applications in CWC Implementation" Helsinki 2016

SAB Session Reports, SAB-22

TWG on Verification Final Report

OPCW/IUPAC/ABC/AAS "International Workshop on Innovative Technologies for Chemical Security" Brazil 2017

ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

Working Together For a World Free of Chemical Weapons

Temporary Working Group on Investigative Science and Technology

Reporting to the Scientific Advisory Board (SAB), the Temporary Working Group (TWG) will in particular consider the following questions:

Question 1:

Which methods and capabilities used in the forensic sciences could usefully be developed and/or adopted for Chemical Weapons Convention-based investigations?

Question 2:

What are the best practices and analysis tools used in the forensic sciences for effectively cross-referencing, validating, and linking together information related to investigation sites, materials collected/analysed, and individuals interviewed?

Question 3:

What are the best practices for management of data collected in investigations, including compilation, curation, and analytics?

Question 4:

What are the best practices for the collection, handling, curation and storage, and annotation of evidence?

Question 5:

Which technologies and methodologies (whether established or new) allow point-of-care and non-destructive measurements at an investigation site to help guide evidence collection?

Question 6:

Which technologies and methodologies (whether established or new) can be used in the provenancing of chemical and/or material samples collected in an investigation?

Question 7:

Which methods are available (or are being developed) for the sampling and analysis of environmental and biomedical materials and can be used in the detection of toxic industrial chemicals relevant to the Chemical Weapons Convention?

Question 8:

Which technologies and methodologies (whether established or new) can be used in ensuring chain of custody and verifying authenticity (especially in regard to digital images and video recordings)?

Question 9:

Which technologies and methodologies (whether established or new) can be used to ensure the integrity of an investigation site?

Question 10:

Do collections of physical objects, samples, and other information for chemical weapons-related analysis exist and can they be made available to investigators for retrospective review? How might these collections be used to support investigations?

Question 11:

Are there stakeholders that the Technical Secretariat could usefully engage with to leverage their capabilities on investigative matters?

In addition, the TWG will provide advice on Technical Secretariat proposals for methodologies, procedures, technologies, and equipment for investigative purposes.

ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

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Forensic Methods and Capabilities

Subgroup A

Question 1:

Which methods and capabilities used in the forensic sciences could usefully be developed and/or adopted for Chemical Weapons Convention-based investigations?

Question 11:

Are there stakeholders that the Technical Secretariat could usefully engage with to leverage their capabilities on investigative matters?

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Data Collection and Management

Subgroup B

Question 2:

What are the best practices and analysis tools used in the forensic sciences for effectively cross-referencing, validating, and linking together information related to investigation sites, materials collected/analysed, and individuals interviewed?

Question 3:

What are the best practices for management of data collected in investigations, including compilation, curation, and analytics?

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Sampling, Detection and Analysis

Subgroup C

Question 5:

Which technologies and methodologies (whether established or new) allow point-of-care and non-destructive measurements at an investigation site to help guide evidence collection?

Question 7:

Which methods are available (or are being developed) for the sampling and analysis of environmental and biomedical materials and can be used in the detection of toxic industrial chemicals relevant to the Chemical Weapons Convention?

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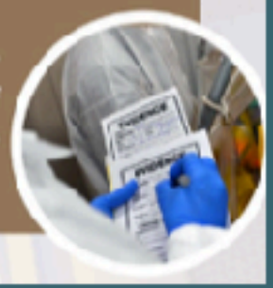
Integrity of Scene and Evidence Collection

Question 4:

What are the best practices for the collection, handling, curation and storage, and annotation of evidence?

Subgroup D

Which technologies and methodologies (whether established or new) can be used in ensuring chain of custody and verifying authenticity (especially in regard to digital images and video recordings)?



Question 9:

Which technologies and methodologies (whether established or new) can be used to ensure the integrity of an investigation site?

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Provenance

Subgroup E

Question 6:

Which technologies and methodologies (whether established or new) can be used in the provenancing of chemical and/or material samples collected in an investigation?

Question 10:

Do collections of physical objects, samples, and other information for chemical weapons-related analysis exist and can they be made available to investigators for retrospective review? How might these collections be used to support investigations?

ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

Working Together For a World Free of Chemical Weapons

Temporary Working Group on Investigative Science and Technology

Subgroup F - Other Considerations

Reporting to the Scientific Advisory Board, consider the following questions:

Question 1:

Which methods and capabilities used in the forensic sciences could usefully be developed and/or adopted for Chemical Weapons Convention-based investigations?

Question 2:

What are the best practices and analysis tools used in the forensic sciences for effectively cross-referencing, validating, and linking together information related to investigation sites, materials collected/analysed, and individuals interviewed?

Question 3:

What are the best practices for management of data collected in investigations, including compilation, curation, and analytics?

Question 4:

What are the best practices for the collection, handling, curation and storage, and annotation of evidence?

Question 5:

Which technologies and methodologies (whether established or new) allow point-of-care and non-destructive measurements at an investigation site to help guide evidence collection?

Question 6:

Which technologies and methodologies (whether established or new) can be used in the provenancing of chemical and/or material samples collected in an investigation?

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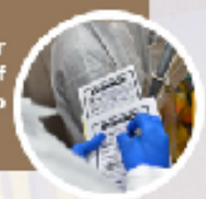
Which technologies and methodologies (whether established or new) can be used in ensuring chain of custody and verifying authenticity (especially in regard to digital images and video recordings)?



Question 9:

Which technologies and methodologies (whether established or new) can be used to ensure the integrity of an investigation site?

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Do collections of physical objects, samples, and other information for chemical weapons-related analysis exist and can they be made available to investigators for retrospective review? How might these collections be used to support investigations?

Question 11:

Are there stakeholders that the Technical Secretariat could usefully engage with to leverage their capabilities on investigative matters?

In addition, the TWG will provide advice on Technical Secretariat proposals for methodologies, procedures, technologies, and equipment for investigative purposes.

CONSIDERATIONS

- Operational context - challenges and requirements
- Laboratory capabilities
- Sample collection, dangerous goods shipment, analysis
- Chain of Custody
- Current best-practice and SOPs
- What new capabilities and connections are required?
- Connections with forensic community
- Forward thinking and emerging technologies from broader scientific community
- Approaches to combine multiple information streams

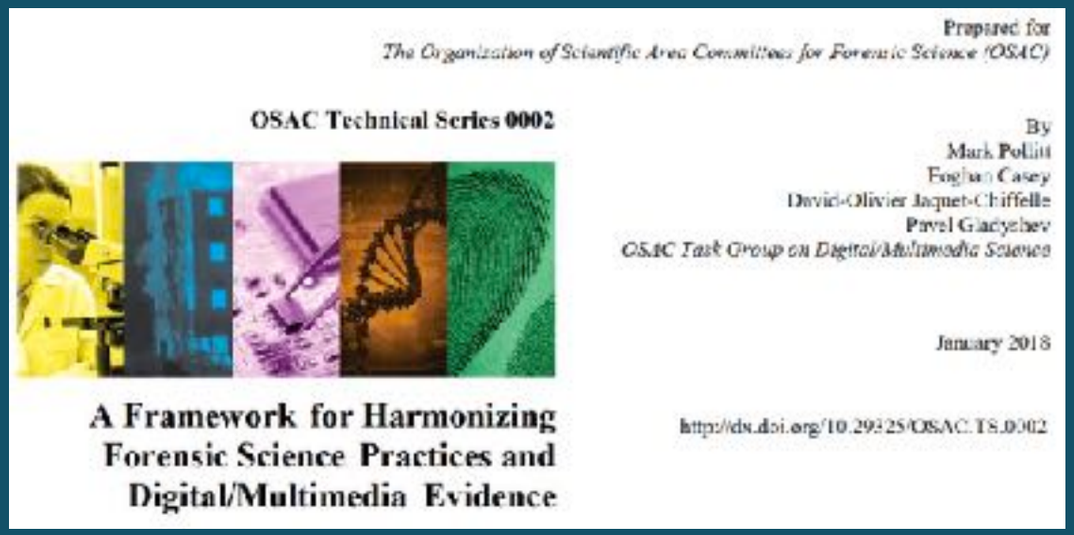
TECHNOLOGY SOLUTIONS

- The ability to access and apply new technology solutions for evaluating and documenting a scene or equipment, and detection and sampling.
  - help highlight sampling hotspots (the best place to take a sample)
    - can reduce the number of samples and increase their utility, reduce logistic burden and workload for OPCW lab and DL
    - increase effectiveness of time spent at the scene
  - support risk assessment for inspectors
  - support planning to reduce the time required at a scene - e.g. to reduce hazards that may be associated with working in personal protective equipment
- Robust forensic methods to ensure the integrity of information and sampled materials
  - Best practice for chain of custody, scene documentation, detection and analysis

- Site assessment, documentation, sampling and analysis, and Chain of Custody may benefit from the application of technology solutions, such as:
  - UGV/UAVs,
  - imaging (particularly satellite imaging),
  - 3D and 2D scanning, and
  - inclusion of RFIDs (i.e. electronic tags) for monitoring, tracking and Chain of Custody.

TWG ON INVESTIGATIVE SCIENCE AND TECHNOLOGY

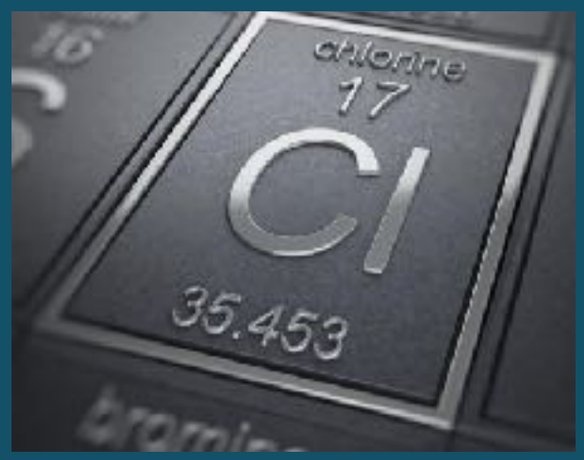
TECHNOLOGY



Authentication and validation of data

UAV/UGV and robotics for sampling

Chlorine markers and biomarkers



Profiling of CW to determine provenance

Imagery: Value and need for expert interpretation

UNOSAT

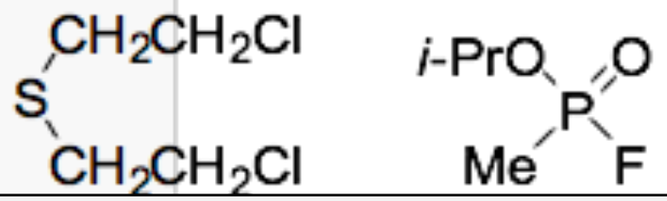
unitar
United Nations Institute for Training and Research

Builds on SAB work

Advice on chemical weapons sample stability and storage provided by the Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons to increase investigative capabilities worldwide

Christopher M. Timperley,[1a*] Jonathan E. Forman,[§*] Mohammad Abdollahi,[2] Abdullah Saeed Al-Amri,[3] Isel Pascual Alonso,[4] Augustin Baulig,[5] Veronica Borrett,[6] Florida A. Cariño,[7] Christophe Curty,[8] David González Bermúdez,[9] Zrinka Kovarik,[10] Roberto Martínez-Álvarez,[11] Robert Mikulak,[12] Nicia Maria Fusaro Mourão,[13] Ramasami Ponnadurai,[14] Slawomir Neffe,[15] Syed K. Raza,[16] Valentin Rubaylo,[17] Koji Takeuchi,[18] Cheng Tang,[19b] Ferruccio Trifirò,[20] Francois Mauritz van Straten,[21] Paula S. Vanninen,[22] Volodymyr Zaitsev,[23] Farhat Waqar,[24] Mongia Saïd Zina,[25] Marc-Michael Blum,[26c] Hugh Gregg[26d], Elena Fischer,[27e] Siqing Sun,[27e] Pei Yang[27e]

Review of, and advice given on, chemical weapons sample storage and stability, to assist chemical weapons-related forensic studies worldwide



TIMELINE

- First meeting was held 12 to 14 February 2018
- Second meeting was held 14 to 16 November 2018
- Third meeting proposed for April 2019

REPORTING

- Report to the SAB
- Potential for Interim Report
- Potential for DG request to SAB for Advice