



Report of OPCW Temporary Working Group on Verification

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OPCW Scientific Advisory Board



Verification in context of the BWC

Expert panel (VEREX) established at 3rd Review Conference (1991) to identify and examine potential verification measures

Special Conference (1994) agreed to establish an Ad Hoc Group of States Parties to BWC to negotiate and develop legally-binding verification regime

Ad Hoc Group concluded its work for the 5th Review Conference (2001) :

- **Unable to conclude negotiations on the draft protocol**
- **Could not reach a consensus on the report of its work**

5th Review Conference change of direction of efforts to strengthen BWC:

- **Annual meetings of States Parties**
- **Experts meetings in years up to the 6th Review Conference (2006)**



100 years of chemical weapons

When were chemical weapons used for the first time?



The French army fired grenades filled with tear gas on the German army. The first use of chemicals in warfare was recorded. However, it was non-lethal only tear-inducing.



After the failure in Bolimow, Poland, the German army conducted the first large-scale lethal gas attack in Ieper, Belgium.



By the end of WWI, some 124,200 tonnes of chlorine, mustard, and other chemical agents had been released, and more than 90,000 soldiers suffered painful deaths due to exposure to them.



The first large-scale non-lethal use of chemical weapons in the history of World War I took place on the Rawka River during the Battle of Bolimow. The German army fired 18,000 shells. The attempt failed because the chemical froze due to low temperatures.



British soldiers picture, courtesy of Wikipedia

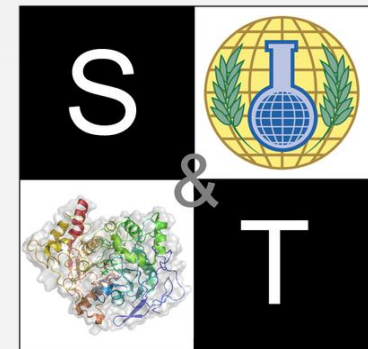
After toxic gases had proven to be an efficient weapon a month earlier in Ieper, the German army hit again with chlorine poison gas in Bolimow, Poland. This time the attack killed many enemy soldiers.



Exactly 100 years later excavations started in Bolimow to reveal the consequences of the horrible event that occurred during WWI. Find out more on Sunday, 31 May, when the OPCW releases its documentary "Buried Memories" TheFiresProject.com



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NOTE BY THE TECHNICAL SECRETARIAT

THE OPCW IN 2025: ENSURING A WORLD FREE OF CHEMICAL WEAPONS

OPCW in 2025

2. Verification to ensure continued confidence in compliance will remain at the heart of the Organisation's work. But its methods and practices will need to be adapted to changing realities. In addition to maintaining a viable industry verification regime and preparedness for non-routine inspections, greater emphasis will be placed on enhancing the Organisation's analytical capabilities.

10. The missions in the Syrian Arab Republic provide important lessons to learn for the future of the Organisation. These range from the conduct at short notice of an investigation of use in adverse conditions, to the collaboration with the United Nations and other international organisations, to the in-depth involvement with a chemical demilitarisation programme. Identifying and learning lessons from these missions will help further increase the resilience of the Organisation and help it to continue to fulfil its mission under the Convention.



14. In order to prevent the re-emergence of chemical weapons, an effective industry verification regime will have to be sustained. This needs to be supported by the augmented data monitoring and transfer controls provided for in the Convention. In addition, full and effective national implementation of the Convention is vitally important for preventing the re-emergence of chemical weapons, as is the continued problem resolution and deterrent value of the provisions for consultation, cooperation, and fact-finding, including the capability to conduct non-routine verification activities such as challenge inspections and investigations of potential use at any point in time.

21. However, the Organisation will devote fewer resources to chemical weapons inspection-related activities as the destruction of currently declared stockpiles of chemical weapons nears completion. Approaching this major milestone provides the opportunity to re-examine the routine verification system of the Convention in order to adapt the Organisation's permanent mandate to changing circumstances. Emphasis will be placed on the following areas:



- (a) While the evaluation of declaration data and the conduct of inspections will remain an essential part of the Organisation's verification work, the Organisation will need to enhance its analytical capabilities, putting in place processes that are more robustly geared towards a process of gathering, validating, and evaluating information befitting an independent and more holistic assessment of how the treaty is implemented. Developing and maintaining such an analytical capability within the Secretariat will contribute to the goal of maintaining confidence in compliance. An augmented capability to use reliable publicly available information will form part of this process, which will build upon efforts already under way in conjunction with States Parties.
- (b) The Organisation will also require enhanced capabilities to monitor the full spectrum of relevant toxic chemicals falling within its mandate, ranging from toxic industrial chemicals to chemicals used for example in medicine or law enforcement, including those acting on the central nervous system. In this regard, developments in science and technology and relevant advice from the Scientific Advisory Board (SAB), as well as in-house scientific resources, will inform the Organisation's course of action.



45. In order to continue achieving the goals of the Convention, the transition process will require that the Organisation's verification system be further developed to enhance its monitoring and analytical capabilities while retaining core expertise, and that its capacity development and engagement efforts be strengthened through enhanced capacities to analyse and respond to the implementation needs of States Parties. Combined with the improvements in organisational governance outlined above, this will enable the Organisation to remain fit for purpose, and to lead the way in preventing the re-emergence of chemical weapons.





The Scientific Advisory Board

The States that negotiated the Convention on Chemical Weapons (CWC) knew that in order for the Convention to remain relevant and avoid the problems of earlier chemical weapon treaties, the CWC would have to be adaptable. Both the Convention and its implementing body, the Organisation for the Prohibition of Chemical Weapons (OPCW), are intended to adapt not only to shifts in the international environment and the changing needs of States Parties, but also to respond to scientific and technological developments. To this end, the Convention foresees that the States Parties should 'review scientific and technological developments that could affect the operation of this Convention'. To provide States Parties with the expertise needed for such a review, Article VIII, paragraph 21 (h) of the CWC mandates the establishment of a Scientific Advisory Board (SAB) to monitor developments in science and technology and assess their impact on CWC implementation. The OPCW Conference of the States Parties (see Factsheet 3 on OPCW structure) addressed this issue at its second session in December 1997 when it instructed the Director-General to establish such a body.

Structure and Function of the Scientific Advisory Board

The SAB is a subsidiary body of the OPCW, enabling the Director-General to provide specialised advice in science and technology to OPCW policy-making bodies and Member States. The SAB reports to the Director-General, who then makes the Board's reports available, alongside his own response, to the Executive Council and the public. Every five years, the SAB prepares a comprehensive report for submission to the review conference. The SAB held its first meeting in 1998 and meets once or twice per year at the OPCW's headquarters in The Hague.

The SAB consists of 25 members, each of whom is an expert in one or more technical fields relevant to the Convention. SAB members serve in their individual capacity as independent experts. States Parties nominate candidates, and the Director-General makes the final selection, keeping in mind the need for geographical balance. Members are appointed for three years and can serve two consecutive terms. Members are drawn from universities, industry, defence organisations and other institutions. Only citizens of OPCW member states are eligible for SAB membership. Every year the SAB elects a Chair and Vice-Chair from its members.

Cooperation is important. The SAB coordinates with the OPCW Technical Secretariat, which provides support for SAB activities. The board invites experts from other international organisations, scientific institutes and industry associations to make presentations at meetings of the SAB and its temporary working groups (TWGs). Members of the SAB and its working groups also share their views with the scientific and industry communities by presenting at conferences.



Members of the Scientific Advisory Board in 2014

Funding for SAB activities comes from the OPCW's regular budget and voluntary contributions. A trust fund for the Board was set up in 2006. 14 States Parties and the European Union have contributed.

Past and Present Temporary Working Groups	
Chemical Weapons Destruction Technologies	1999 – 2000
Reviewed technologies for the destruction of chemical weapons.	
Equipment Issues	1999 – 2000
Examined issues related to equipment for inspections and on-site monitoring of chemical weapon destruction operations.	
Analytical Procedures	1999 – 2000
Addressed alternative inspection methods, the use of analytical equipment belonging to the Inspected State Party and possible inclusion of non-scheduled chemicals in the Central OPCW Analytical Database.	
Ricin Production	1999 – 1999
Examined how and at what stage production of ricin should be reported.	
Adamsite	1999 – 1999
Determine whether adamsite is an acceptable riot control agent and criteria to be taken into account when declaring holdings of adamsite.	
Low Concentration Limits for Schedule 2A and 2A* Chemicals	2000 – 2000
Examined the concentration level at which mixtures of chemicals containing Schedule 2A and 2A* chemicals should be regulated.	
Biomedical Samples	2004 – 2007
Examined whether the OPCW Laboratory and designated laboratory network can develop the capacity to analyze biomedical samples.	
Sampling and Analysis	2007 – 2012
Examined issues relating to the collection and analysis of samples for verification purposes.	
Convergence of Chemistry and Biology	2011 – 2013
Examined the risks and benefits that rapid advances in life sciences pose to the Convention.	
Education and Outreach	2012 – 2014
Examined how to raise awareness of the Convention and build relationships between the OPCW and the scientific community, the academic community, chemical industry, international organisations and other groups.	
Verification	2013 – 2015
Examined verification technologies, methodologies and equipment.	

Issues for the SAB

Science and technology underpin almost every aspect of the Convention, from complex verification procedures to the CWC's most fundamental definitions. Science, technology and world events can change rapidly, requiring new insights and understandings to ensure the OPCW and the Convention can respond. Therefore, the SAB is called upon to provide guidance on a wide range of issues. Some of the topics on which the Director-General has recently asked the SAB for advice include medical treatment for blister and nerve agents, riot control agents (RCAs), new approaches to verification, and education and outreach in science and technology. The SAB also provides expert advice on any proposed changes to the Schedules of Chemicals (see Factsheet 7).

In addition to its ongoing activities, the SAB has temporary working groups to provide recommendations on specific issues within specific timeframes. The Director-General establishes these working groups in consultation with the SAB. The SAB Chairperson appoints one member of the SAB to chair each TWG, and the Director-General appoints additional experts to serve as members of the group based on suggestions from OPCW member states and the SAB. Only citizens of member states are eligible to be members of a working group. At the end of the group's mandate, it submits a report of its findings to the SAB and Director-General.

Since its creation, the SAB has had eleven TWGs on the following topics: the convergence of chemistry and biology; verification; education and outreach; sampling and analysis; ricin production; analytical procedures; on-site monitoring equipment; chemical weapon destruction technologies; adamsite; low concentration limits for Schedule 2A chemicals; and biomedical samples. See the summary table on the left for details.

As of October 2014, the Board has one active temporary working group, on Verification. Two other temporary working groups, on the Convergence of Biology and Chemistry and on Education and Outreach, ended their mandate in 2013 and 2014, respectively. TWG and SAB reports are publicly available on the SAB website at www.opcw.org/about-opcw/subsidiary-bodies/scientific-advisory-board.

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Verification TWG



15 experts; chair Prof. Roberto Martinez-Alvarez



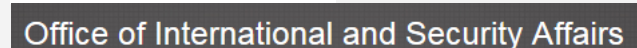
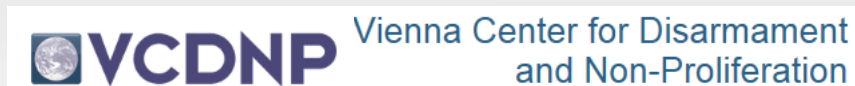
TWG structure

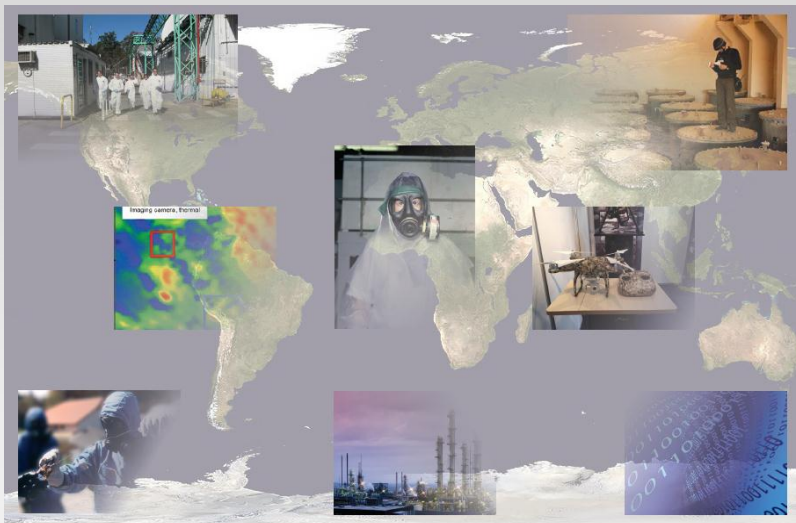
Six meetings held, started March 2013 and finished in May 2015

Briefings received from experts from international organisations

And from members of OPCW Technical Secretariat on current practices and future plans

TWG conducted a gap analysis by interviewing Secretariat members





VERIFICATION

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June 2015



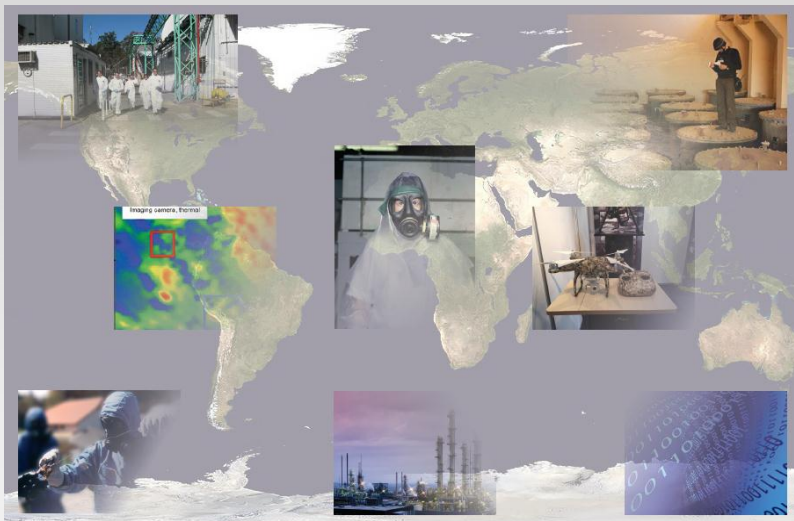
ORGANISATION FOR THE PROHIBITION
OF CHEMICAL WEAPONS

What are the technologies/methodologies used for verification purposes in other international treaties that could benefit the verification regime of the CWC?

Systematic use of information collected from multiple sources by the Secretariat could, e.g. assist States Parties identify declarable activities and the Secretariat to follow global trends relevant to verification

Recommendation

Secretariat should consider adopting a comprehensive more analytical approach to verification utilising all available and verifiable information



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Which methodologies (whether existing or new) could assist States Parties to ensure that all declarable plant sites are identified for declaration?

Effective use of open-source information could help the Secretariat identify and understand the wider development and trends of the chemical industry

This could help OPCW to be able to address future developments/evolving challenges

Recommendation

Secretariat should acquire the capability to use open-source information routinely



Which new or emerging technologies may add value to existing capabilities for verification purposes (such as data analysis/data mining, statistical analysis, attribution analysis)?

A more analytical approach to verification using all available information would require improved information management support within OPCW

Recommendations

Secretariat should put in place an information management structure that can provide the support required for the verification process

Remote/automated monitoring technologies should be added to the list of approved inspection equipment

Secretariat should look into the option of using satellite imagery for the planning of non-routine missions, in particular for investigations of alleged use (IAU) and challenge inspections



Which new or emerging technologies may add value to existing capabilities for verification purposes (such as data analysis/data mining, statistical analysis, attribution analysis)?

Recommendations

Secretariat should visit the National Authorities to obtain assurance on the accuracy and completeness of declarations; outcome of such visits may impact on the inspection frequency

Secretariat must commission an independent review of all activities pertaining to the missions carried out in the Syrian Arab Republic



ORGANISATION FOR THE
PROHIBITION OF CHEMICAL WEAPONS

Working together for a world free of chemical weapons







How can sampling and analysis be utilised most effectively for verification purposes?

Recommendations

OPCW should increase staff of OPCW Laboratory to cope with:

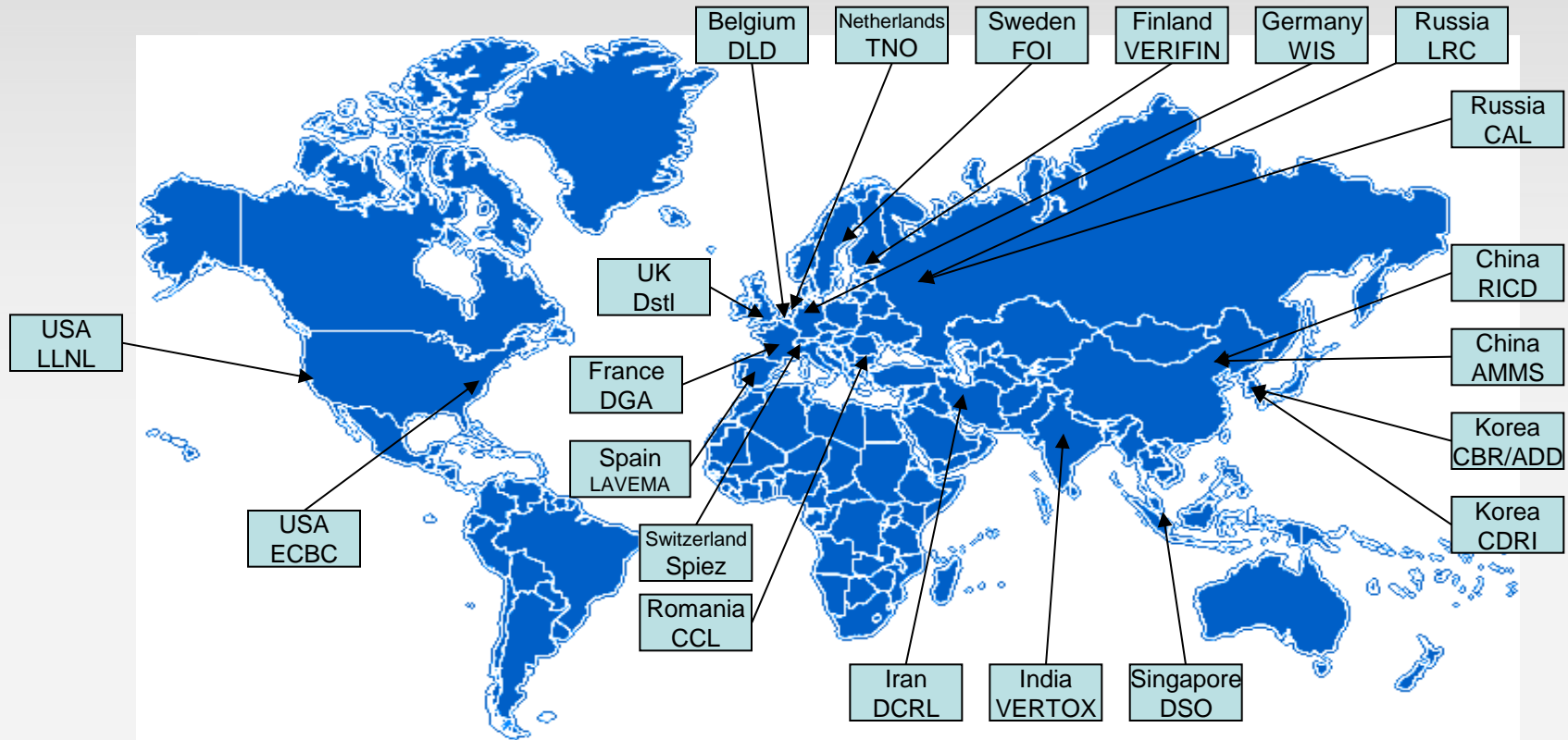
- various aspects of IAU**
- biomedical samples**
- trace environmental analysis**
- toxins**
- on-site analysis**

Establishing a network of Designated Labs for biomedical sample analysis should be a high priority





OPCW Designated Laboratories (environmental)



21 Designated Laboratories (7 suspended) in 17 countries

as of March 2015



How can sampling and analysis be utilised most effectively for verification purposes?

Recommendations

Lessons on chemical sampling and analysis form the OPCW's support to the UN Mission to investigate the use of CW in the Syrian Arab Republic, and all subsequent OPCW activities in relation to the Syrian Arab Republic must be identified and implemented



Proficiency Tests should incorporate a broader range of chemicals and at a wider range of concentrations to prepare laboratories for IAU scenarios





How can sampling and analysis be utilised most effectively for verification purposes?

Recommendations

Secretariat should expedite toxin identification exercises

Continuous additions to OCAD are recommended to allow the OPCW to meet all its mandated inspection aims, including IAU

Developments in analytical instrument portability, miniaturisation and disposable biosensors should be reviewed periodically by the Secretariat and SAB for potential applicability for on-site analysis

Secretariat should monitor developments in chemical forensics



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The OPCW Science & Technology Monitor

A sampling of Science & Technology
Relevant to the Chemical Weapons Convention

1 June 2015

In This Issue

Medical Countermeasures

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OPCW Research Projects Support Programme

Featured content

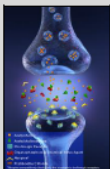
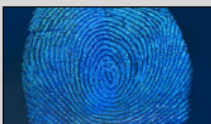


Image from [DuoDate](#)[®]
Medical countermeasures at
work in a synapse.



Fingerprinting chemicals.

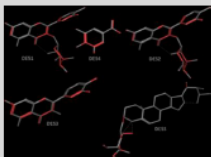


Image from [PloS One, 2013 Nov, 8\(11\)](#)

Drug discovery research in
OPCW Supported Research
Projects

Welcome

Welcome to the *OPCW Science and Technology Monitor*, an occasional bulletin to provide updates on developments in science and technology across a broad spectrum of topics relevant to the CWC. Past issues are available from the [Science and Technology section of the OPCW website](#).

Thanks to all of you who have taken our survey. For those who have not yet responded, the survey is still open ([click here](#)). There are only six questions, all easier than the puzzle (we promise) and all responses are anonymous. Your feedback is highly appreciated!

Today marks the 25th anniversary of the [signing of the 1990 Chemical Weapons Accord by the United States of America and the Soviet Union](#). This agreement, which pre-dated the CWC, marks one of many steps taken in the journey toward a world free of chemical weapons. Steps taken in chemical disarmament have been supported by the science of chemistry itself; a scientific field that provides opportunities for international collaborations and brings forth new developments with peaceful economic and technological benefits. [As we move into the future, we look forward to a wealth of new discoveries from this evolving scientific field.](#)

The S&T Puzzle

We once again congratulate our colleagues at the [CTBTO](#), whose entry correctly recognized four of the top five spoken words of the Director-General in the eight statements delivered [from 22 January to 29 April 2015](#) (in case you were wondering, they missed "States"). The prize for best visualisation of the words of the Director-General, however, goes unclaimed as no submissions (except our own, below) were received. Puzzle statistics now stand at: VER 4, OSP 2, OCS 1, INS 1 and CTBTO 3.



For this edition of the puzzle, we look at the multiple uses of a cup of coffee. Can you tell us the identity and LD₅₀ (that's right, the median lethal dose) of the most abundant chemical in the cup; the [molarity \(M\)](#) of caffeine (molecule above); and the LD₅₀ of coffee itself? To keep this simple, assume this coffee is made with [Arabica beans](#) and brewed by a certified procedure (for



Monitoring latest S&T

Monthly newsletter in popular science format on topics relevant to the CWC

Chemical Forensics

We thank our colleagues from the OPCW Laboratory for their major contribution and input to this feature

The ability to obtain unique signatures such as [fingerprints](#) and [DNA](#) to identify individuals or the [marks left on a fired bullet to identify the firearm that shot it](#), to compare with reference materials (such as a fingerprint obtained from a suspect) are among the most powerful forensic tools available to law enforcement. Chemical signatures that indicate [drug use](#) or [gender](#) can even be collected from fingerprints.

Chemical samples can also have unique signatures that might reflect how and where they originated. For the Chemical Weapons Convention, one might ask, questions such as: What kind of molecular signatures exists for chemical warfare agents and toxic chemicals that may have been used in an incident under investigation, what kind of reference samples are required for comparison and [what kind of forensic information can be obtained with such information?](#)



OPCW Scientific Advisory Board

