



The Impact of Science and Technology on the Implementation of the Chemical Weapons Convention

15th Workshop for Diplomatic Personnel Involved in the Work of the OPCW

*OPCW Laboratory and Equipment Store
Rijswijk, The Netherlands
29 September 2015*

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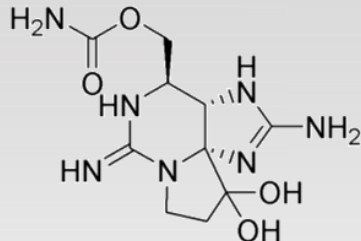


Science and Technology at OPCW
www.opcw.org/special-sections/science-technology/





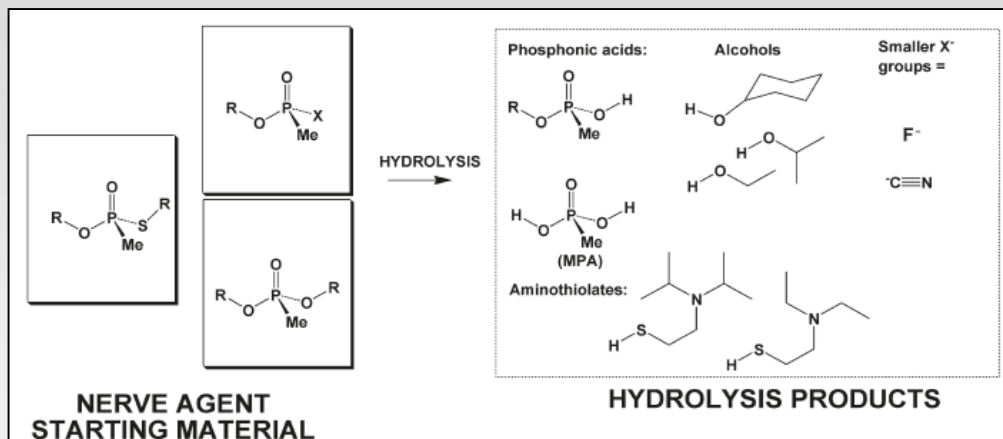
Science and Technology Underpin the CWC



Article II



Article III



Articles IV and V



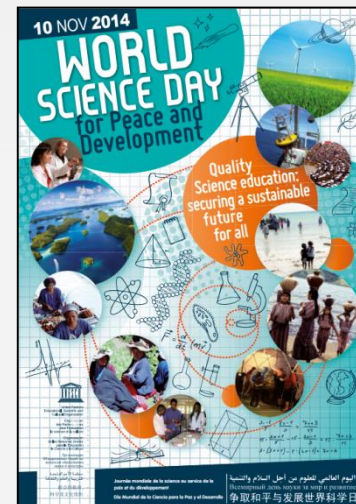
Article VI



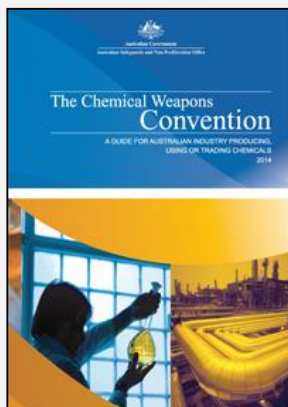
Article VIII



Articles IX and X



Article XI



Article VII



The Third Review Conference

- **“Conviction** that the provisions of the Convention are mutually reinforcing and that the full, effective, and non-discriminatory implementation of all of its provisions, taking into account relevant developments in science, technology and industry, is of critical importance;”

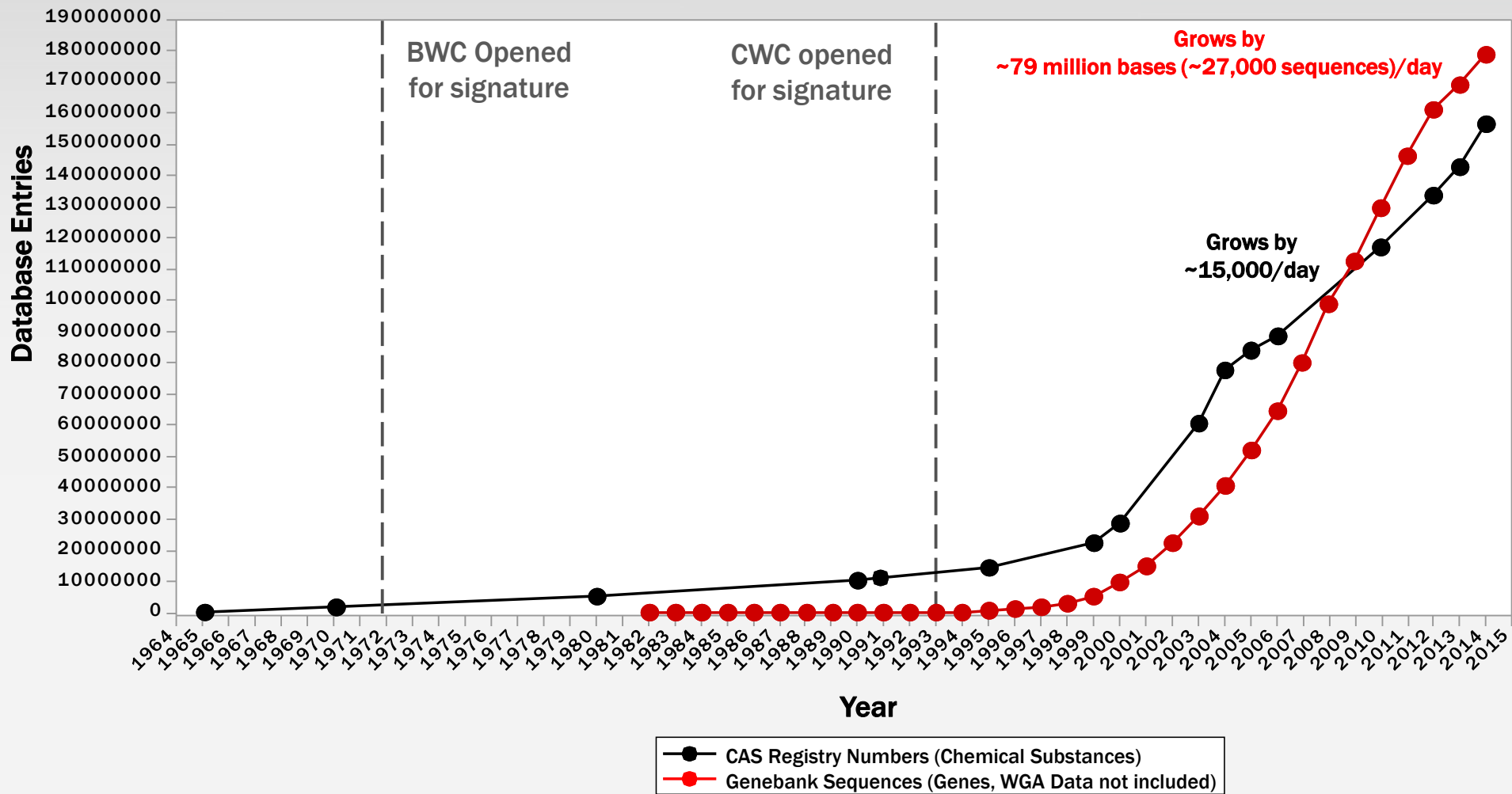
RC-3/3 paragraph 9.4*

- **“Recognition** that new challenges related to the Convention continue to arise and that its implementation may need to be improved to continue to achieve the object and purpose of the Convention and to stay abreast of developments in science and technology;”

RC-3/3, paragraph 9.9*



Scientific Developments 1965 - 2014





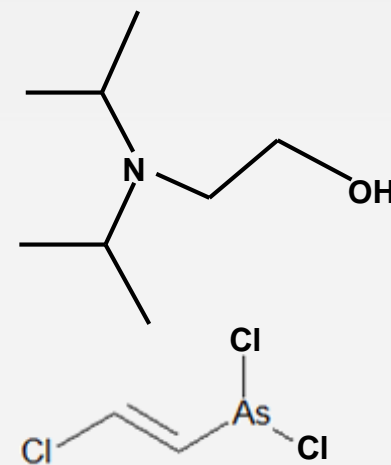
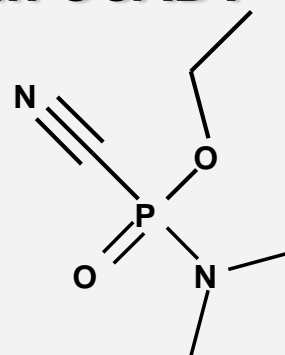
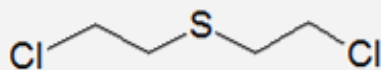
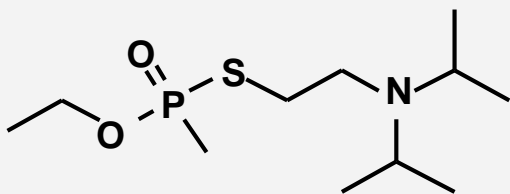
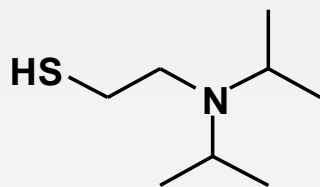
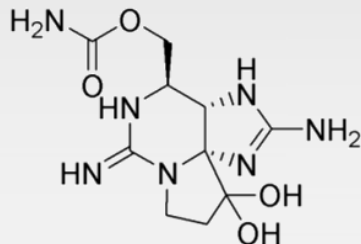
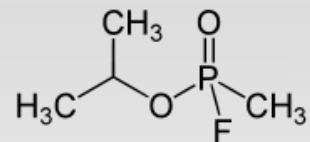
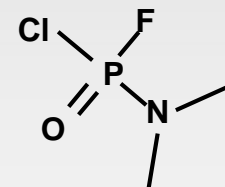
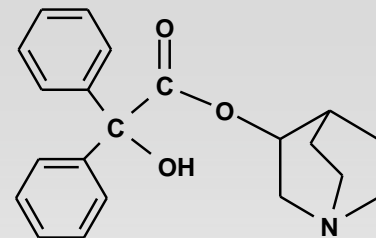
Understanding Chemicals

- > 156 Million CAS Numbers!
- How Many Possible Scheduled Chemicals?

Infinite number of possibilities!
(generic structures in Schedule 1 and Schedule 2)

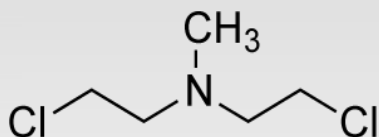
- How Many Actual Scheduled Chemicals
- ~35,000 CAS Numbers Reported*

- How Many Mass Spectra in OCAD?
- ~5,000*

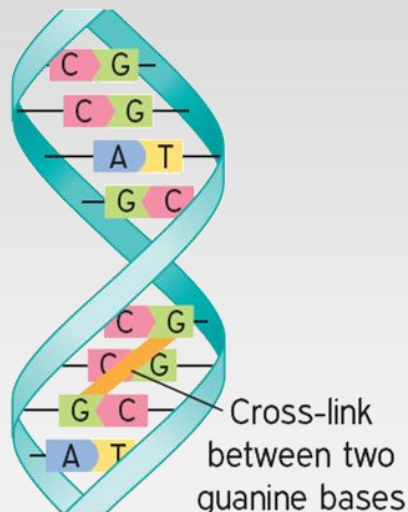




Chemicals Have Multiple Uses



Nitrogen Mustard
Schedule 1A



Placement of RSS bar code to read as UPC number

67386 911 51

DANGER: Contact Poison. Avoid contact with skin, mucous membranes, or eyes. Do not inhale the dust or vapor. In case of skin contact, wash with copious amounts of water for at least 15 minutes, followed by 2% sodium thiosulfate solution. See PRECAUTIONS and DOSAGE AND ADMINISTRATION in accompanying package insert. Store at controlled room temperature, 15-30°C (59-86°F). Protect from light and humidity.

NDC 67386-911-51

1 Vial

Trituration of Mustargen® Rx only
(mechlorethamine HCl for injection)

10 mg

A Nitrogen Mustard – POISON
This vial contains 10 mg of mechlorethamine hydrochloride with sodium chloride q.s. 100 mg

Lundbeck Inc.
Deerfield, IL 60015, U.S.A.

Lot: Exp.: ▶

780-03008-1

and Anti-Cancer Drug
(as a salt)

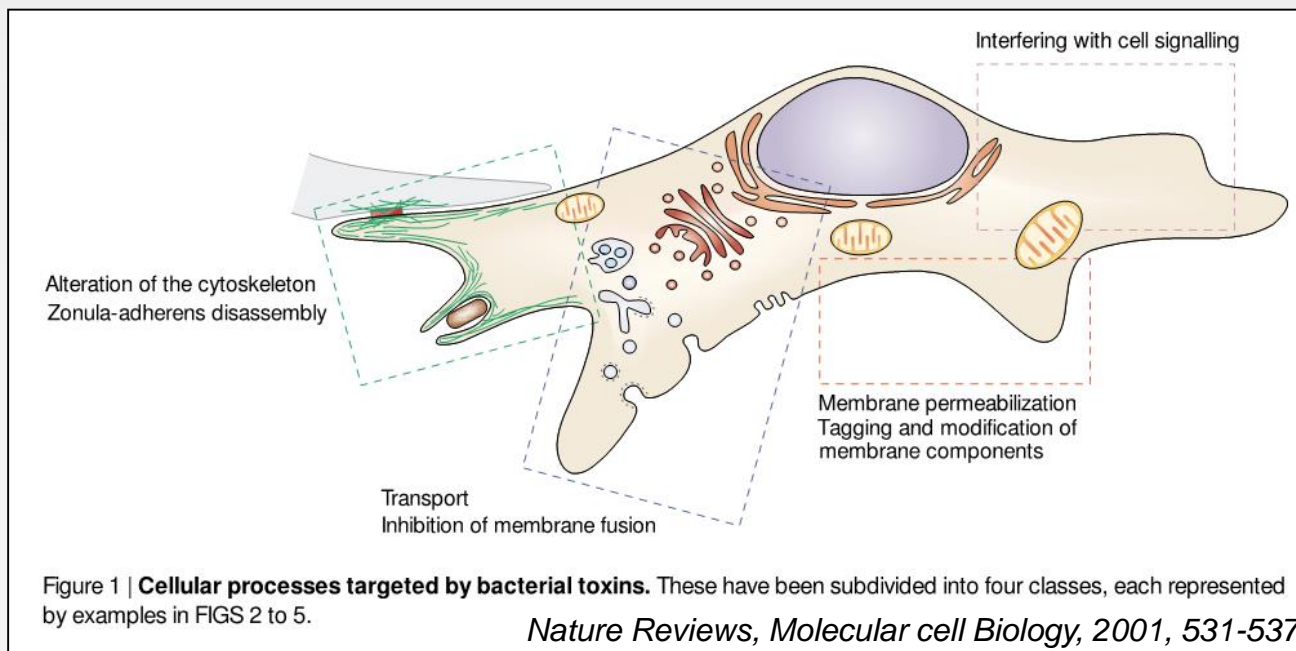


Research On Toxic Substances

THE BACTERIAL TOXIN TOOLKIT

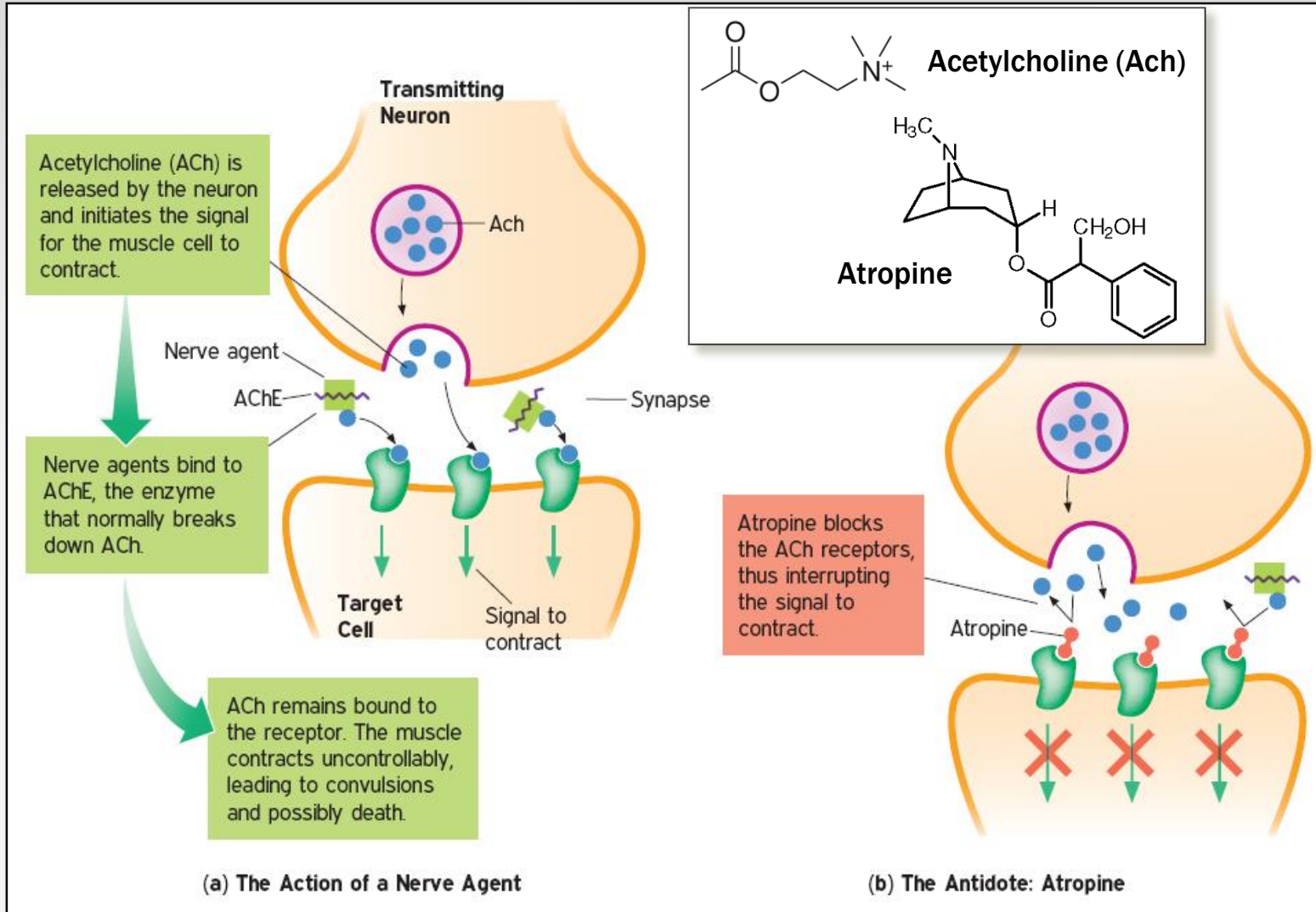
Giampietro Schiavo and F. Gisou van der Goot‡*

Pathogenic bacteria and higher eukaryotes have spent a long time together, leading to a precise understanding of one another's way of functioning. Through rapid evolution, bacteria have engineered increasingly sophisticated weapons to hit exactly where it hurts, interfering with fundamental host functions. However, toxins are not only useful to the bacteria — they have also become an essential asset for life scientists, who can now use them as toolkits to explore cellular processes.





Research On Toxic Substances





Can This be Easily Discussed?





We Must Maintain our Skills and Knowledge!

■ Critical Knowledge

- Analytical capabilities
- Chemicals (CW)
- Chemical production

■ **Science and Technology**

- Look for opportunities
- Understand challenges





OPCW Scientific Advisory Board



■ 25 Members, nominated by States Parties and appointed by Director-General

<https://www.opcw.org/special-sections/science-technology/scientific-advisory-board/>



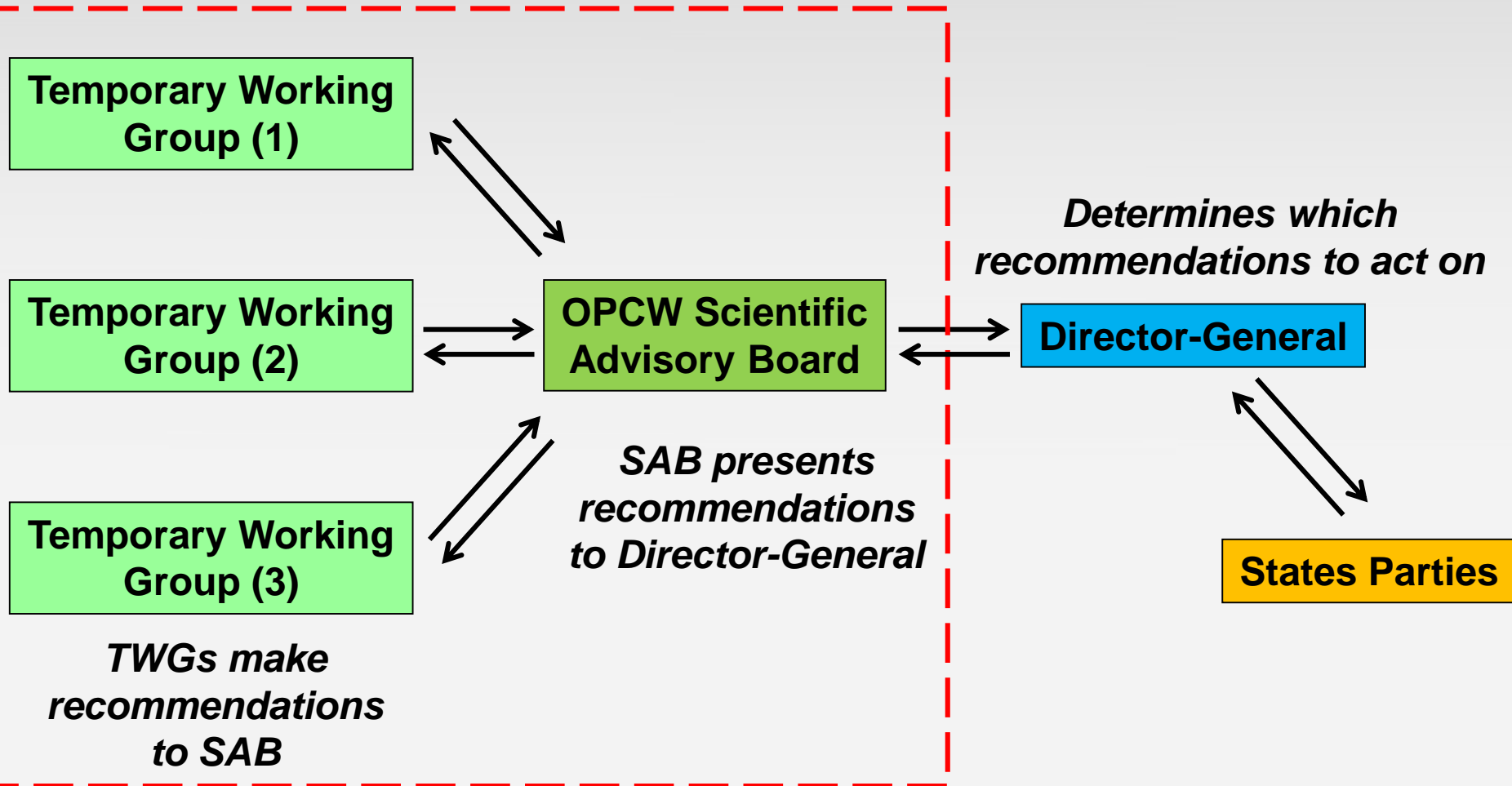
Scientific Advisory Board

- **Independent Experts**
- **Assess developments** in science and technology
 - Emerging technologies
 - Methodologies for verification
- **Provide advice** on proposed changes to the Annex on **Chemicals**
- **Provide scientific and technological advice** relevant to the Convention, including in relation to co-operation and assistance
- **Temporary Working Groups (TWGs)** to address substantive issues



Mechanism for Bringing SAB Recommendations Forward

***Recommendations are made independent of
the OPCW Technical Secretariat***





ORGANISATION FOR THE
PROHIBITION OF CHEMICAL WEAPONS

Working together for a world free of chemical weapons

Industry, Chemistry and Biology



Global Diffusion of Technology and Materials





Chemistry is a Science of Change





Chemistry is a Science of Change





Chemistry is a Science of Change





Benefits of Convergence

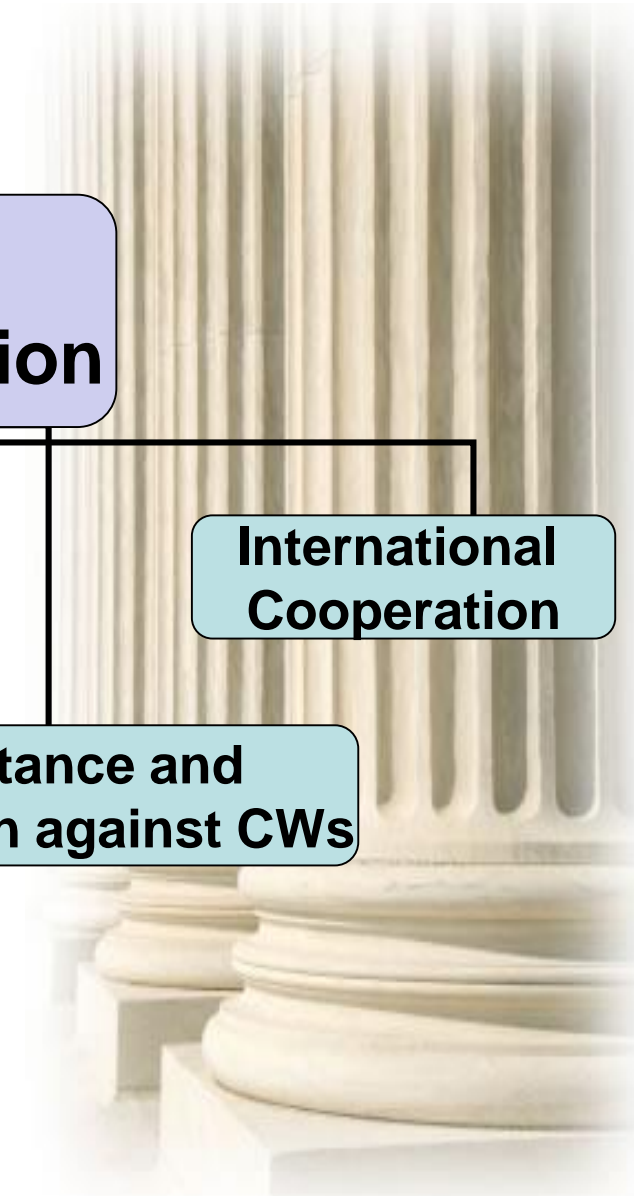
The Chemical Weapons Convention

**Disarmament
(Destruction and
Verification)**

**Non-proliferation
(Verification)**

**Assistance and
Protection against CWs**

**International
Cooperation**





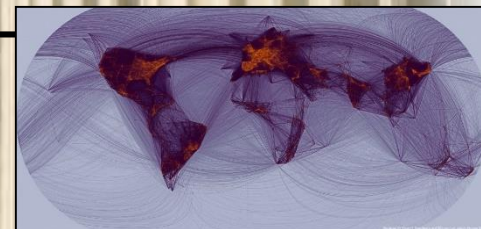
Benefits of Convergence

**Microbial breakdown
of chemicals**

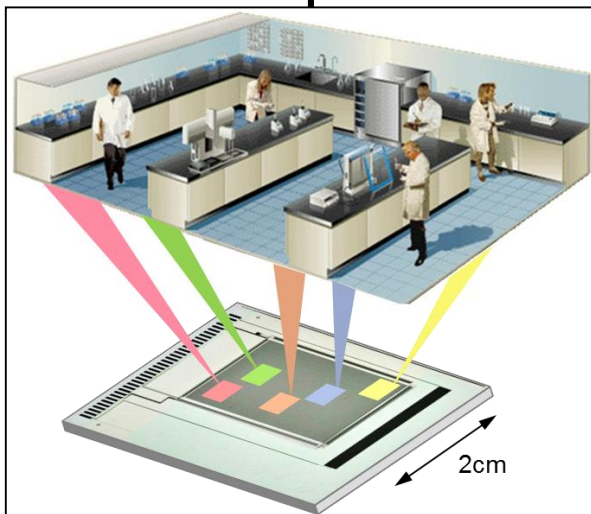


**The Chemical
Weapons Convention**

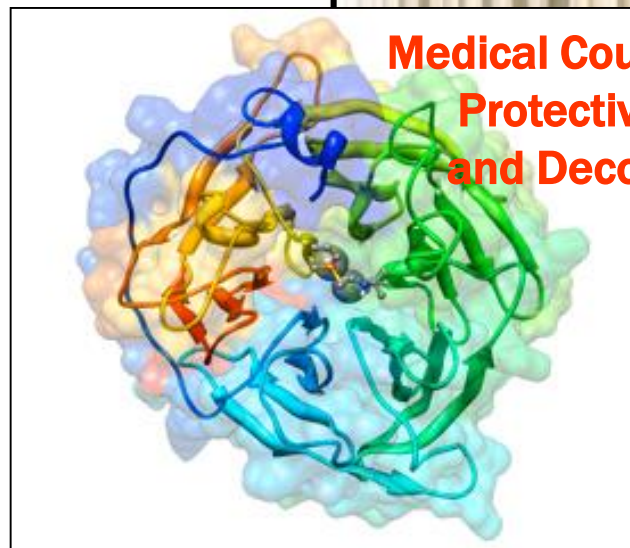
**Opportunities for
International Scientific
Collaboration**



**Biosensors
And
diagnostic
devices**



**Medical Countermeasures,
Protective Materials
and Decontaminants**





Benefits of Con

Microbial breakdown of chemicals



Biosensors And diagnostic devices



CONVERGENCE OF CHEMISTRY AND
BIOLOGY

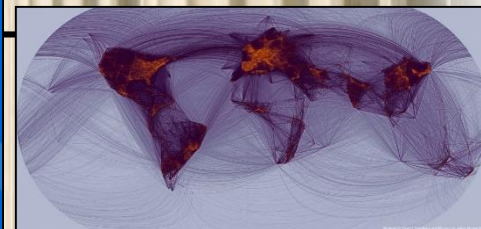
REPORT OF THE SCIENTIFIC ADVISORY
BOARD'S TEMPORARY WORKING GROUP

JUNE 2014

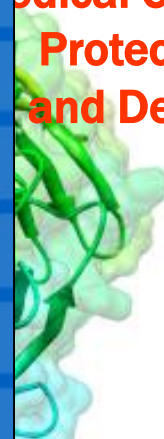


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OF CHEMICAL WEAPONS

Opportunities for International Scientific Collaboration



Medical Countermeasures, Protective Materials and Decontaminants





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PROHIBITION OF CHEMICAL WEAPONS

Working together for a world free of chemical weapons

A Twenty-First Century World



Converging Science is the Norm, Not the Exception!



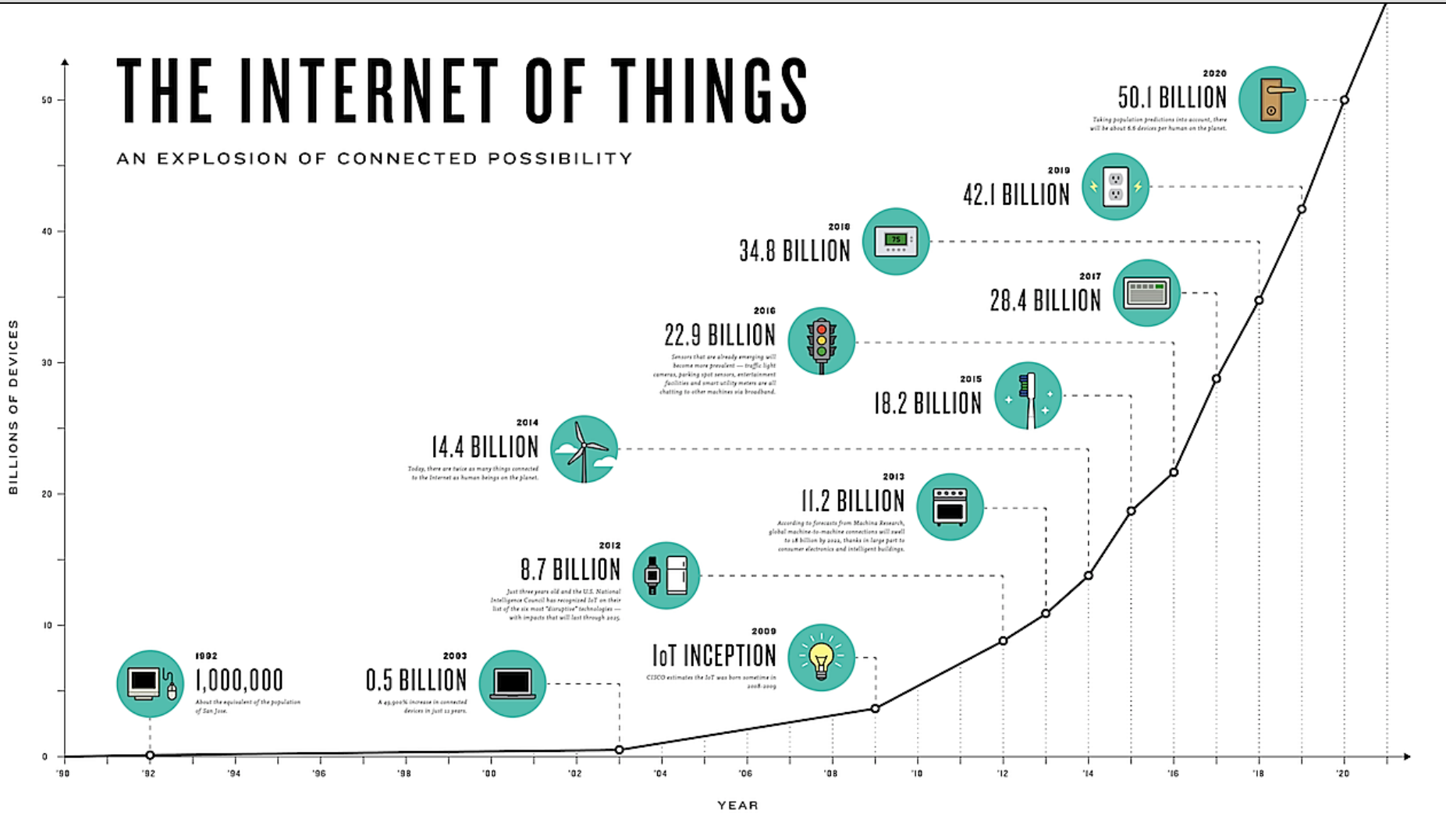
Chemistry – Biology – Physics – Engineering – Informatics and More...



Global Communication and Data Collection

THE INTERNET OF THINGS

AN EXPLOSION OF CONNECTED POSSIBILITY





Global Communication and Data Collection



Image:
<https://airqualityegg.wikispaces.com/AirQualityEgg>

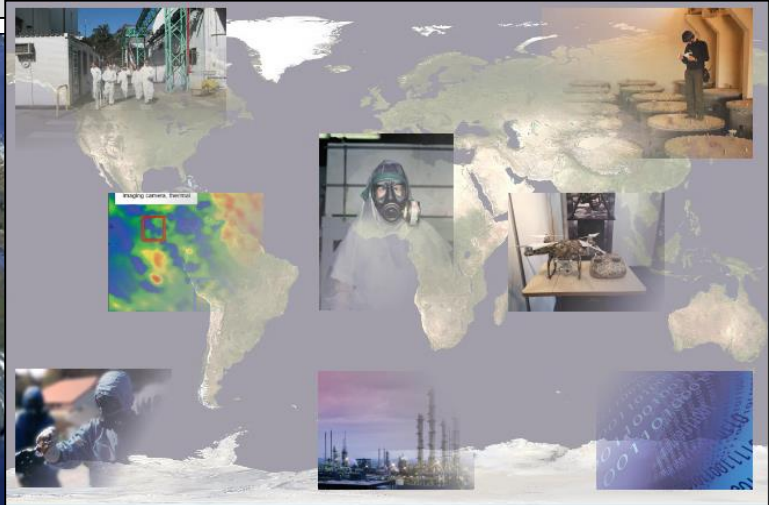
YEAR



Global Communication and Data Collection



BILLIONS OF DEVICES



VERIFICATION

REPORT OF THE SCIENTIFIC ADVISORY BOARD'S TEMPORARY WORKING GROUP
June 2015
ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS



Image: <https://airqualityegg.wikispaces.com/AirQualityEgg>



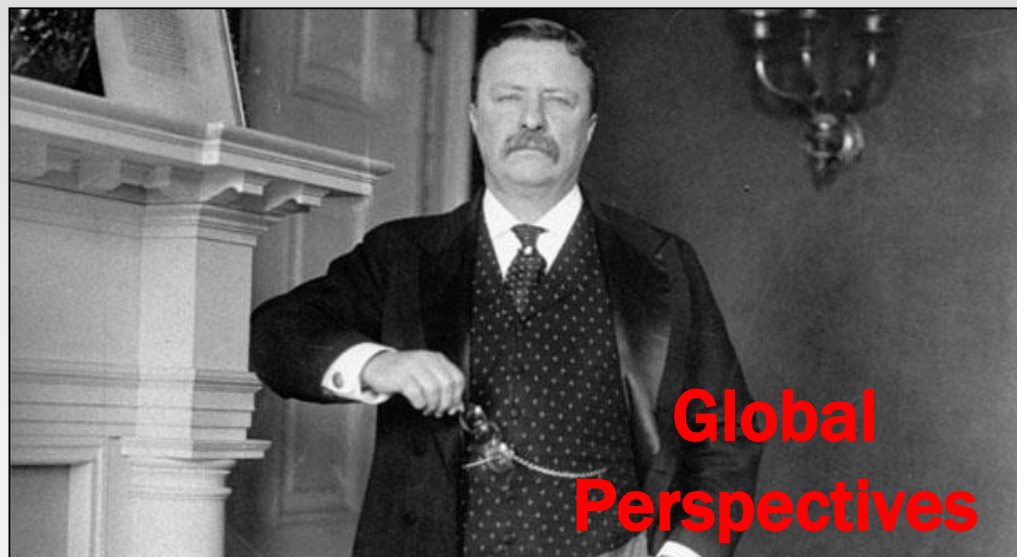
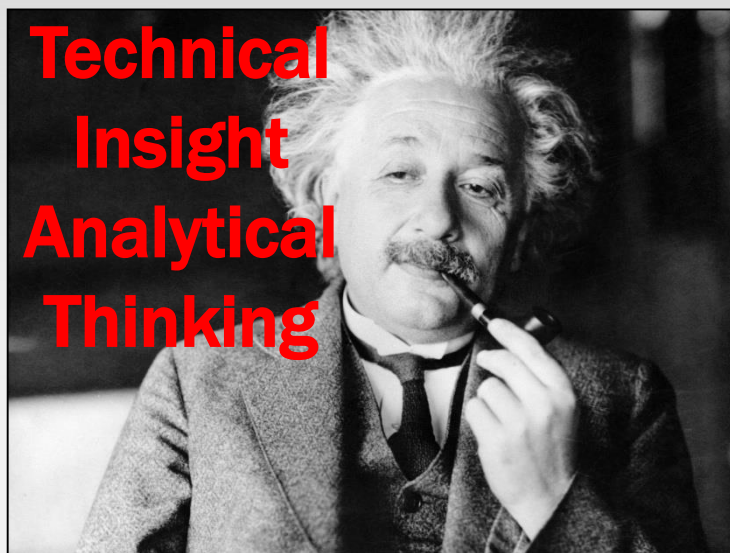
ORGANISATION FOR THE
PROHIBITION OF CHEMICAL WEAPONS

Working together for a world free of chemical weapons

Effective Science Advice



Science and Policy: Learning to Communicate



Scientists

Ask Questions

Analyze Data

Uncertainty

Create Solutions

Policy Makers

Seek Answers

Present Conclusions

Certainty

Find Solutions



Science Communication


SCIENCE FOR DIPLOMATS

DATA ANALYTICS AND THE CWC: AN INTRODUCTION TO OCPF SITE SELECTION METHODOLOGY


Tuesday 6 October 2015
13:30 - 15:00
Ooms Room

Light lunch available at 13:00

$A15 \text{ Value} = N^{1.5} \times M \times G \times P \times A$

 ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

VOLUME 2 NUMBER 7

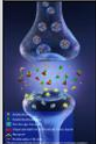

The OPCW Science & Technology Monitor
A sampling of Science & Technology Relevant to the Chemical Weapons Convention

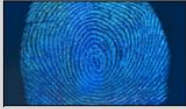
1 June 2015

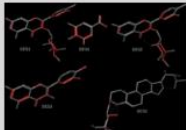
In This Issue

- Medical Countermeasures**
- Chemical Forensics**
- 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 marks one of many steps taken in the field of chemical weapons. Steps that have been supported by the scientific field that provides collaborations and brings forth new economic and technological benefits. [In the future, we look forward to a well-evolving scientific field.](#)

The S&T Puzzle

We once again congratulate our entry correctly recognized four of the Director-General in the eight [January to 29 April 2015](#) (in common "States"). The prize for being the Director-General, however, goes to (except our own, below) were announced at: VER 4, OSP 2, OCS 1, INS 1.



For this edition of the puzzle, we look for the molarity (M) of caffeine (mol/L) in coffee. Can you tell us the median lethal dose) of the most common molarity (M) of caffeine (mol/L) in coffee itself? To keep this simple, we look for the [Arabica beans](#) and brewed tea.

Title	Date	
 S&T Monitor, February 2015 - 2	26/02/2015	<input type="checkbox"/>
 S&T Monitor, February 2015 - 1	06/02/2015	<input type="checkbox"/>
 S&T Monitor, January 2015	23/01/2015	<input type="checkbox"/>
 S&T Monitor, December 2014 - 2	31/12/2014	<input type="checkbox"/>
 S&T Monitor, December 2014 - 1	09/12/2014	<input type="checkbox"/>
 S&T Monitor, November 2014	14/11/2014	<input type="checkbox"/>
 S&T Monitor, October 2014 - 2	28/10/2014	<input type="checkbox"/>
 S&T Monitor, October 2014 - 1	10/10/2014	<input type="checkbox"/>
 S&T Monitor, September 2014 - 2	12/09/2014	<input type="checkbox"/>
 S&T Monitor, September 2014 - 1	01/09/2014	<input type="checkbox"/>

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* First name:

* Last name:

* E-mail address: (OPCW will not use this for any other purpose)

* Indicates Response Required

<https://www.opcw.org/special-sections/science-technology/science-for-diplomats/>
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Science Communication



SCIENCE FOR DIPLOMATS

DATA ANALYTICS AND INTRODUCTION TO SELECTION METHODS

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$A_{15} \text{ Value} = N^{1.5} \times M$


ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS



EDUCATION AND ENGAGEMENT:
Promoting a Culture of Responsible Chemistry

FINAL REPORT OF THE SCIENTIFIC ADVISORY BOARD'S TEMPORARY WORKING GROUP

NOVEMBER 2014



ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS

VOLUME 2 NUMBER 7

OPCW Science & Technology Monitor

Journal of Science & Technology of the Chemical Weapons Convention

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On the 25th anniversary of the signing of the 1990 Convention on the Prohibition of Chemical Weapons Accord by the United States of America and the United Kingdom. This agreement was a landmark step in the history of chemical weapons. Steps taken in support of the Convention are supported by the Science and Technology section that provides a platform for the latest technological developments and brings forth new ideas forward to a wider audience.

Title	Date	
S&T Monitor, February 2015 - 2	26/02/2015	<input type="checkbox"/>
S&T Monitor, February 2015 - 1	06/02/2015	<input type="checkbox"/>
S&T Monitor, January 2015	23/01/2015	<input type="checkbox"/>
S&T Monitor, December 2014 - 2	31/12/2014	<input type="checkbox"/>
S&T Monitor, December 2014 - 1	09/12/2014	<input type="checkbox"/>
S&T Monitor, November 2014	14/11/2014	<input type="checkbox"/>
S&T Monitor, October 2014 - 2	28/10/2014	<input type="checkbox"/>
S&T Monitor, October 2014 - 1	10/10/2014	<input type="checkbox"/>
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S&T Monitor, September 2014 - 1	01/09/2014	<input type="checkbox"/>

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www.opcw.org/special-sections/science-technology/



Science, Technology and Treaty Implementation

- **Science is dynamic, convergent, and collaborative**
 - Identifying threats or benefits requires understanding driving forces in scientific development
- **Understand adoption and application of new technologies**
 - Economics, Technology “life cycles” and Practicality
 - Look across scientific disciplines/applications to understand use
- **Maintaining an on-going dialogue with those driving new technology development is critical**
 - Recognize S&T Opportunities



ORGANISATION FOR THE PROHIBITION OF CHEMICAL WEAPONS
Working together for a world free of chemical weapons

The Scientific Advisory Board

“To enable the Director-General, in the performance of his functions, to render specialized advice in areas of science and technology relevant to this Convention, to the Conference, the Executive Council or States Parties.” - CWC Article VIII, Paragraph 21(h)

Recent advice includes:

- The Convergence of Chemistry and Biology
- Medical Treatment for Blister and Nerve Agents
- Riot Control Agents (RCAs)
- New Approaches to Verification
- Education and Outreach in Science & Technology



The SAB with the Deputy Director-General at their 22nd session. 8 June 2015



Nationalities of the Scientific Advisory Board in 2015



Links to SAB Reports and S&T Relevant Information

- Reports of the SAB and TWGs

<https://www.opcw.org/about-opcw/subsidiary-bodies/scientific-advisory-board/documents/reports/>

- SAB Related Documents

www.opcw.org/about-opcw/subsidiary-bodies/scientific-advisory-board/documents/related-documents/

- Science and Technology at OPCW

<https://www.opcw.org/special-sections/science-technology/>

