



ORGANISATION FOR THE  
PROHIBITION OF CHEMICAL WEAPONS

*Working together for a world free of chemical weapons*

## Science for Diplomats (2)

# Biomedical Sample Analysis

**10 October 2014**  
**OPCW Headquarters**  
**The Hague, The Netherlands**

**Jonathan E. Forman, Ph.D.**  
**Science Policy Adviser**  
**Office of Strategy and Policy**

**Marc-Michael Blum, Ph.D.**  
**Senior Analytical Chemist**  
**Organisation for the Prohibition of Chemical Weapons**



ORGANISATION FOR THE  
PROHIBITION OF CHEMICAL WEAPONS

*Working together for a world free of chemical weapons*

**SAB Report of the Developments  
in S&T to The Third review Conference  
(RC-3/DG.1, Dated 29 October 2012)**

**Director General's Recommendations  
(RC-3/DG.2, Dated 31 January 2013)**

**Status of the Follow-Up to the Recommendations  
on S&T to the Third Review Conference  
(EC-77/DG.11, Dated 5 September 2014)**



### Laboratory Capabilities and Analysis

“The Secretariat will continue to monitor developments relating to **unscheduled and novel toxic chemicals** and will explore ways in which to augment its **technical capabilities** in this area.”

“...notes the SAB's views on the **OPCW Central Analytical Database** and...the Secretariat needs to have analytical data on relevant unscheduled chemicals.”

(paragraphs 9 and 32 of RC-3/DG.2)

- The OPCW Laboratory (LAB) is monitoring developments, has noted the SAB's advice on RCA's, and is working with the Validation Group to obtain analytical data on relevant unscheduled chemicals
- LAB is establishing a training laboratory
- LAB participates in various activities and programmes (e.g. EQuATox).
- OCAD continues to be regularly updated, it currently contains validated data for > 5000 scheduled chemicals

“...note the importance of continuing to **improve on-site and off-site analysis**”

“...future such exercises will progress towards the more difficult analysis of longer-lived biomarkers of exposure, such as protein adducts”

(paragraphs 24 and 25 of RC-3/DG.2)

- Effective capability was demonstrated in the investigation of alleged use in 2013.
- LAB and OPCW Designated Laboratories are continually working on refining methodologies.
- Workshops are routinely held with the Designated Laboratories and for review of proficiency testing
- LAB is continuing to improve its capabilities for conducting biomedical sampling and analysis.
- Chemical analysis was the topic for the first workshop (on 9 July) of the “Science for diplomats” series

“...a **review of the proficiency-testing programme** be undertaken”

“...resources be made available to enable **regular exercises of the entire off-site analysis process** to be conducted in conjunction with OPCW field exercises.”

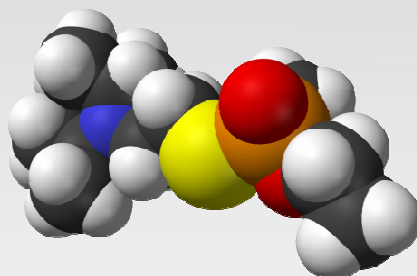
(paragraphs 26 and 30 of RC-3/DG.2)

- In July 2014, LAB held discussions with Designated Laboratories.
- Dr. Robin Black, former SAB member, is chairing a group to review the proficiency testing programme
- TS intends to seek funding through the annual programme and budget; not yet done due to the financial situation.

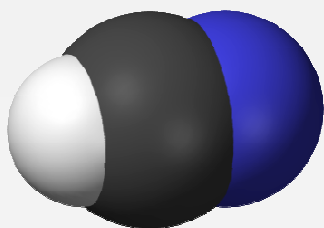


# Scheduled Chemicals Span a Broad Range of Properties

## VX (O-ethyl-S-[2(diisopropylamino)ethyl] methylphosphonothiolate)



## Hydrogen Cyanide (HCN)

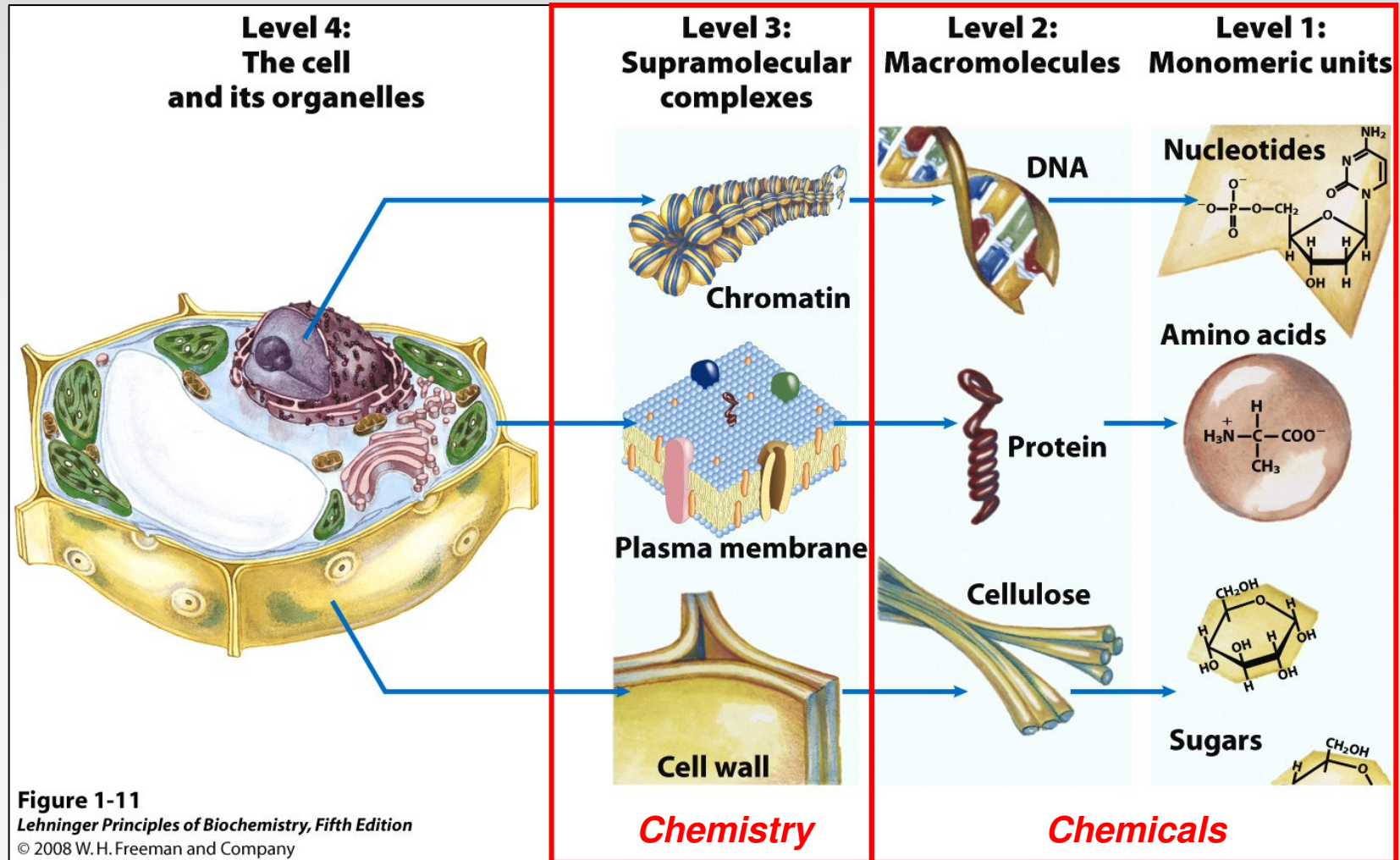


## Ricin





# Chemistry Underpins Biology



**Figure 1-11**  
*Lehninger Principles of Biochemistry, Fifth Edition*  
© 2008 W. H. Freeman and Company



# Biomedical Sample Analysis



**Table 4.2 Summary table of laboratory results for biomedical samples taken from one deceased individual**

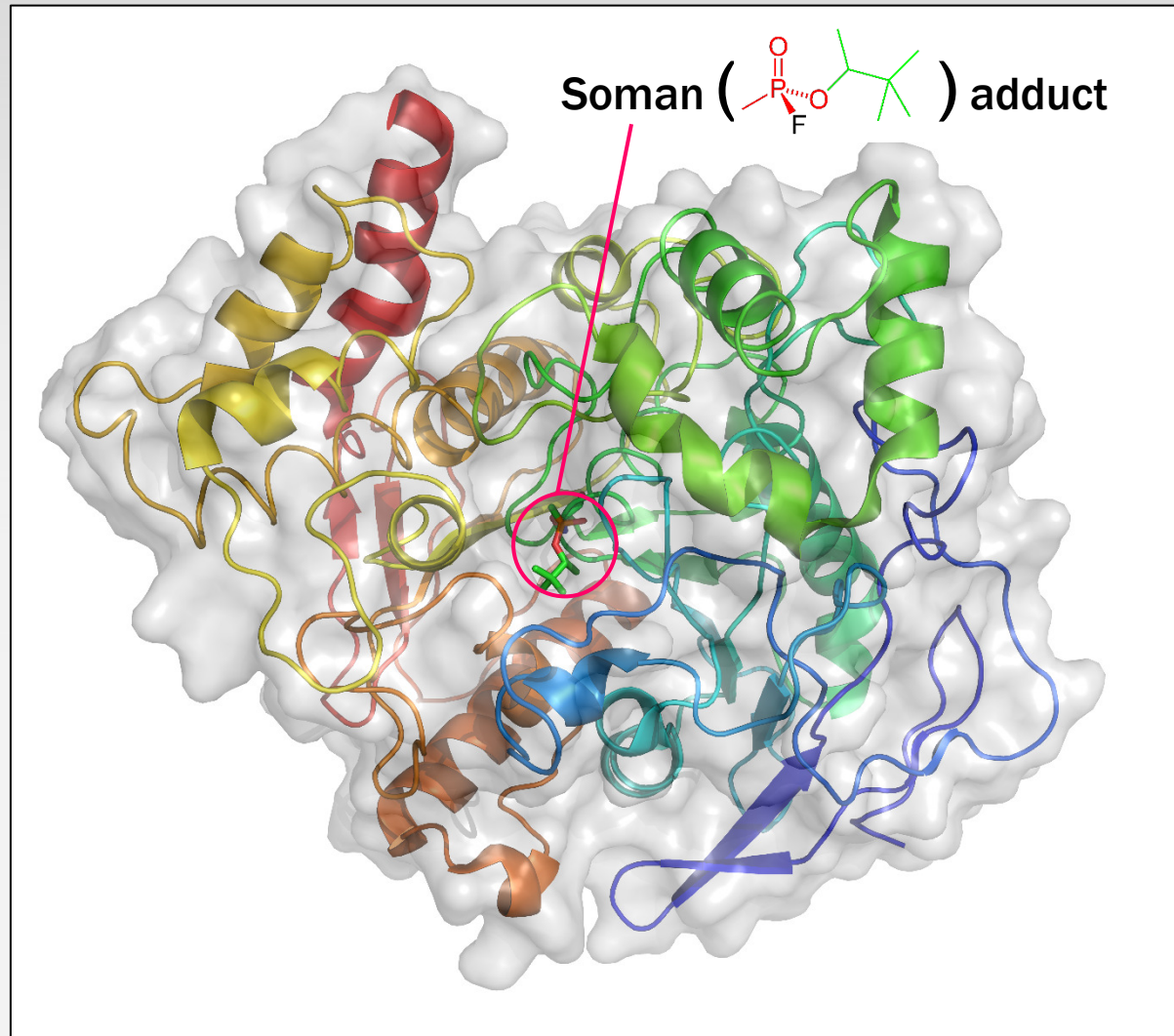
SN	Sample	Laboratory 1 Sarin and its metabolites	Laboratory 2 Sarin and its metabolites
1	Hair	Positive	Positive
2	Kidney	Positive	Positive
3	Skin	Positive	Positive
4	Blood	Positive	Positive
5	Liver	Positive	Positive
6	Breast fat	Positive	
7	Muscle	Positive	
8	Bronchus	Positive	Positive
9	Lung	Positive	Positive
10	Eye	Positive	
11	Brain	Positive	Positive
12	Heart	Positive	

*Note: Identification is positive when either the Sarin metabolite isopropyl methylphosphonic acid (IMPA) or the fluoride reactivation product of IMPA (Sarin) is detected.*

**From: Final Report of United Nations Mission to Investigate Allegations of the Use of Chemical Weapons in the Syrian Arab Republic (13 December 2013)**

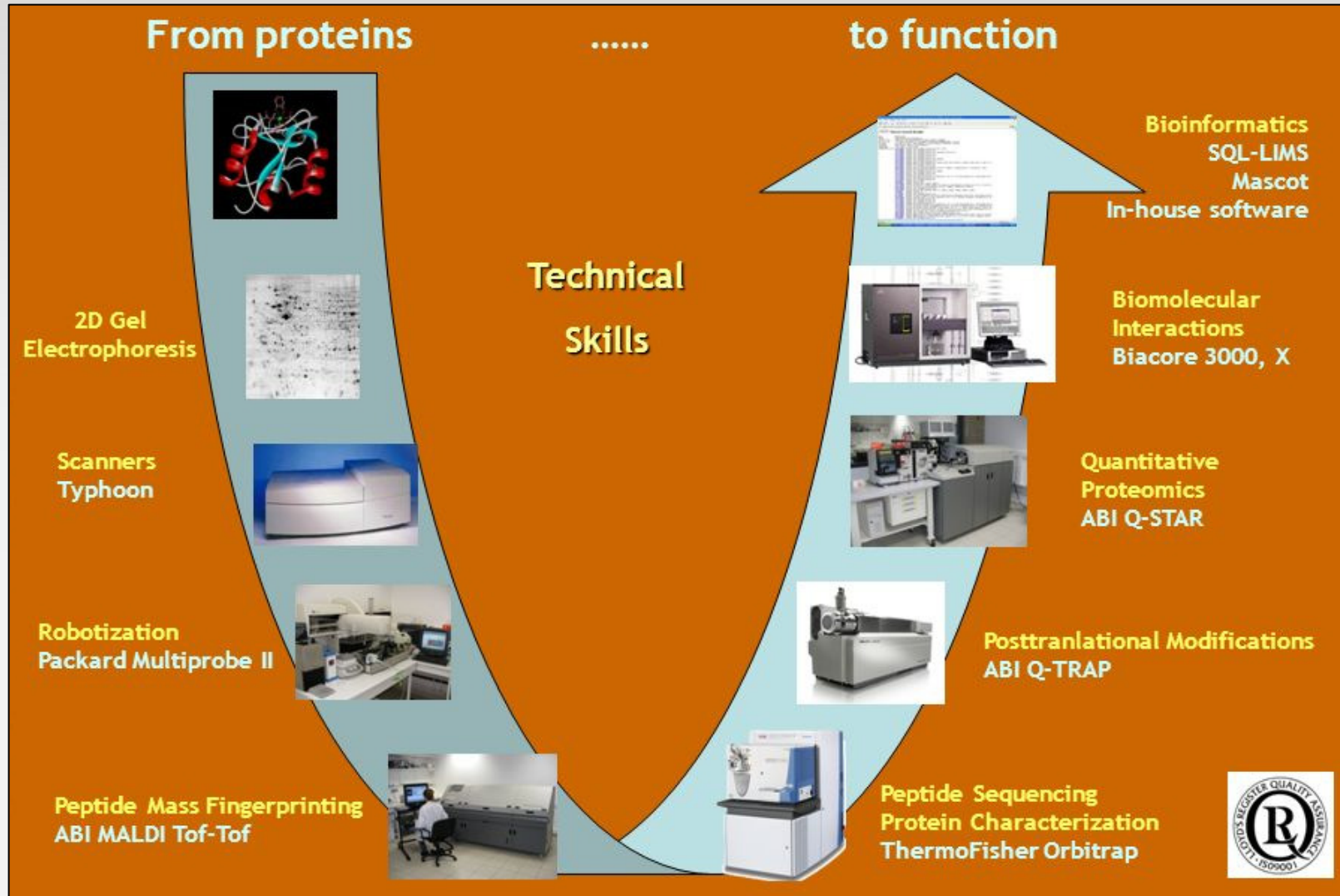


# Chemical Signatures in a Biological System





# Tools for Protein Analysis







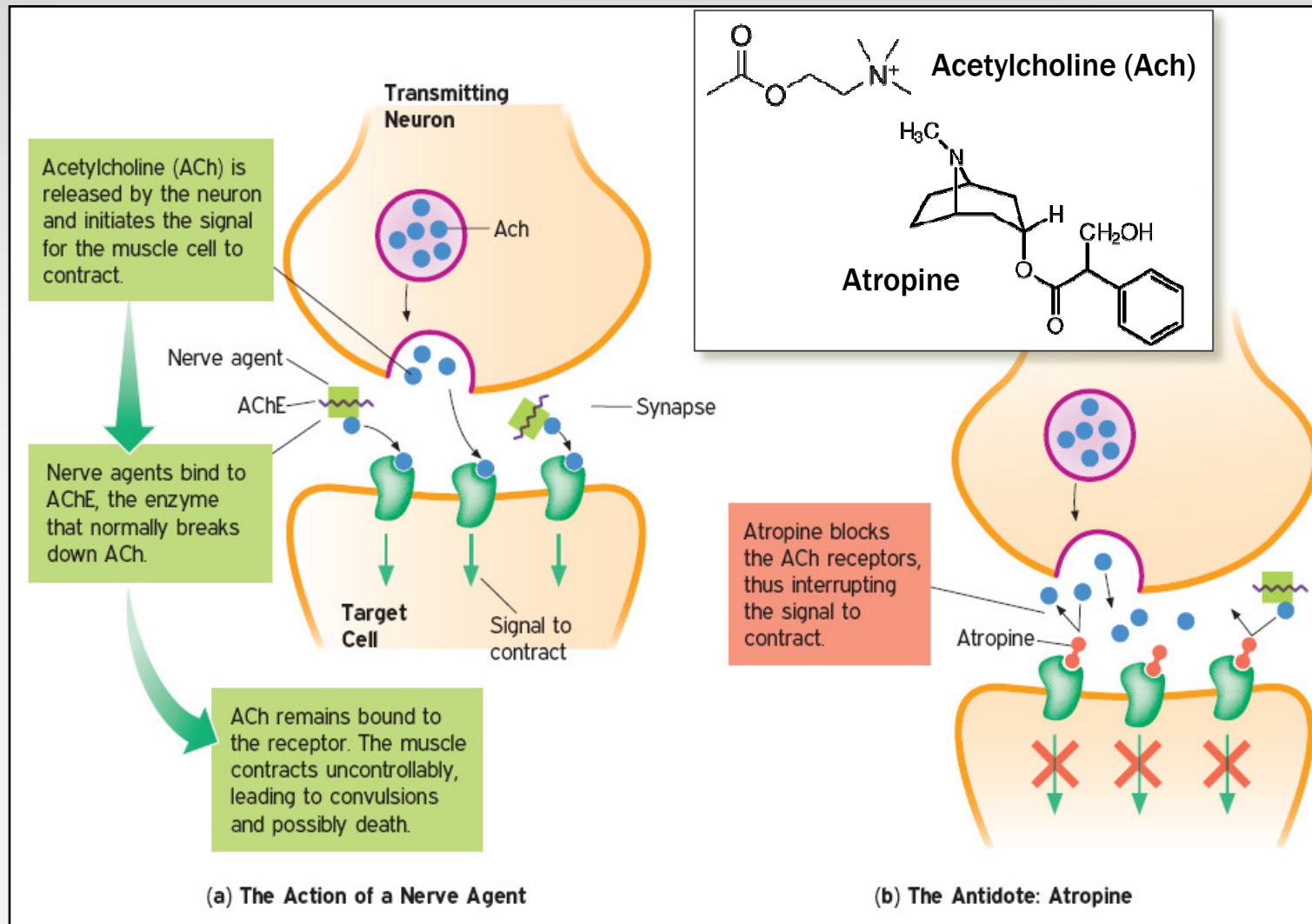
ORGANISATION FOR THE  
PROHIBITION OF CHEMICAL WEAPONS

*Working together for a world free of chemical weapons*

# Presentation by Marc-Michael Blum



# The Chemistry of Countermeasures





## S & T For Diplomats: A Series of Discussions

- December 2014 (On the margins of CSP-19, to be confirmed)
  - **S&T for Diplomats (3): The meaning of production by synthesis and biomediated chemical production**
    - SAB Convergence Related Recommendations
    - Production by Synthesis
- March 2015 (On the margins of EC-78, To be confirmed)
  - **S&T for Diplomats (4): The Chemistry of Countermeasures**
    - Assistance and Protection Related Recommendations
    - Immediate response and longer term considerations
- **Other topics to be scheduled**