

Science for Diplomats at EC-86

Innovation

and

the Chemical Weapons Convention:

The Scientific Advisory Board's Report on
Emerging Technologies



Tuesday, 10 October 2017

Ooms Room 13:30-14:45

LIGHT LUNCH AVAILABLE AT 13:00



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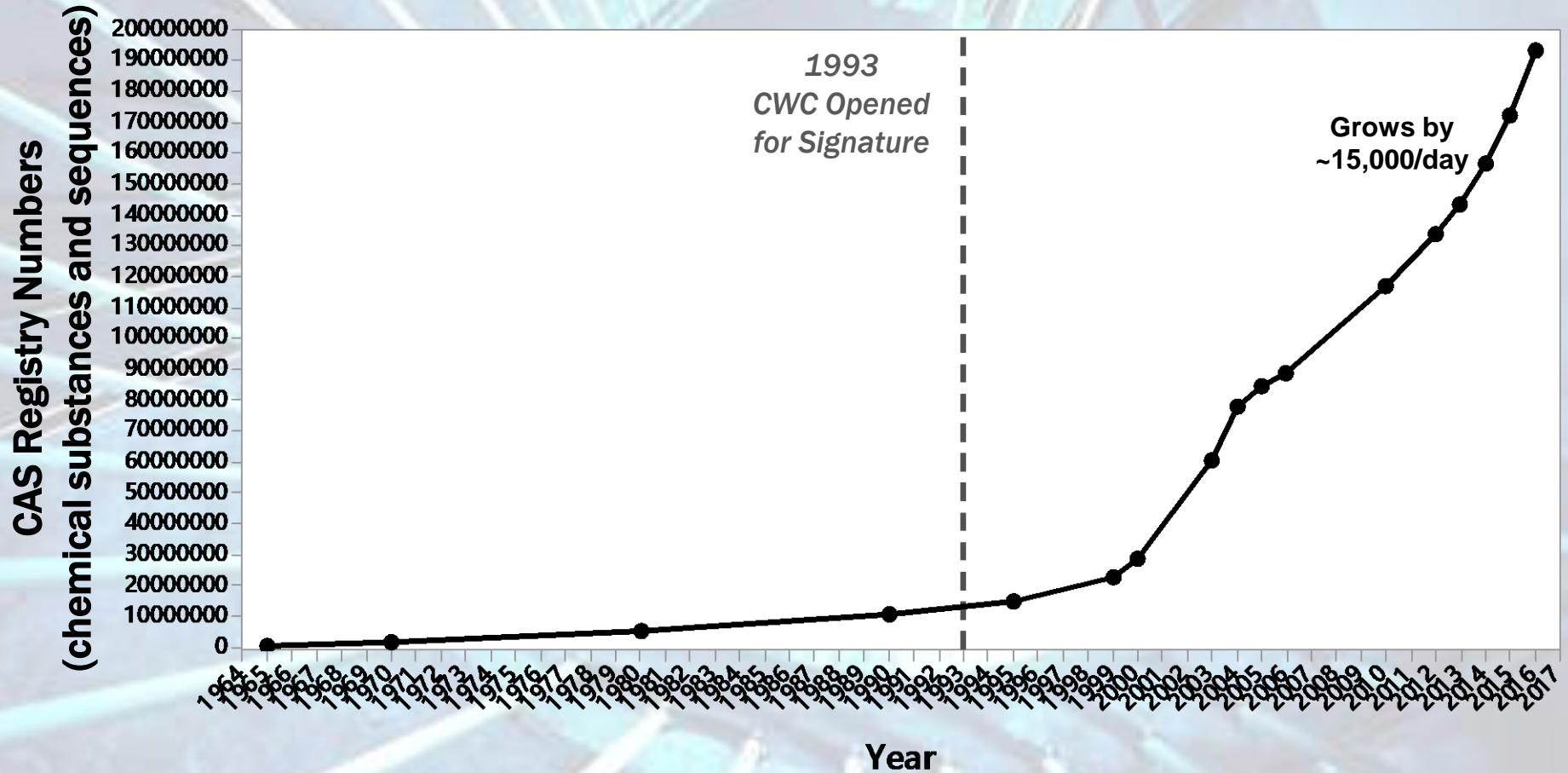
1997-**20**17
YEARS



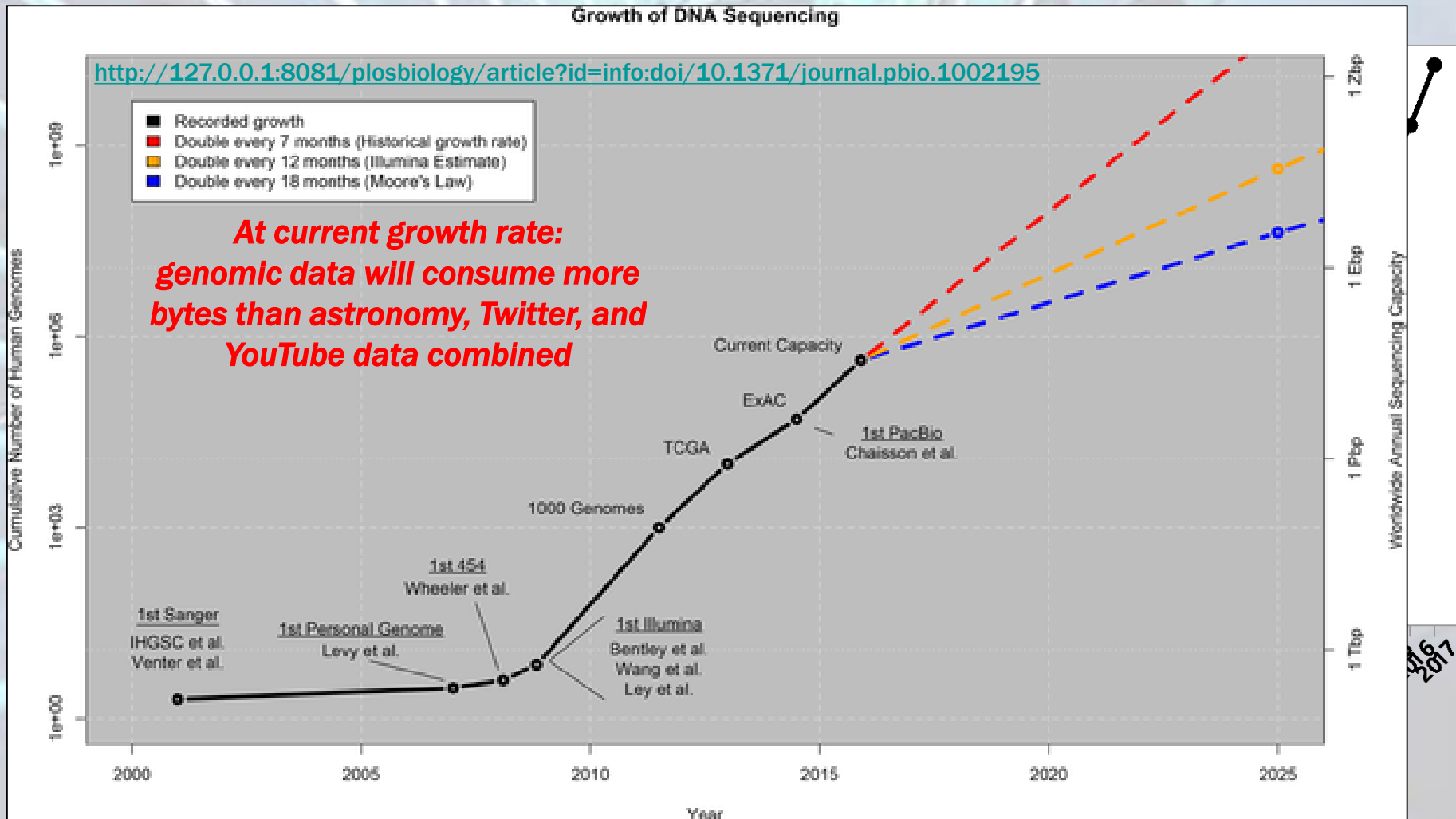


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Understanding the Impact of Science on Security is a Challenge



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Understanding the Impact of Science on Security is a Challenge

Growth of DNA Sequencing

<http://127.0.0.1:8081/plosbiology/article?id=info:doi/10.1371/journal.pbio.1002195>

- Recorded growth
- Double every 7 months (Historical growth rate)
- Double every 12 months
- Double every 18 months

**At current
genomic data
bytes than astr
YouTube c**

1st Sanger
IHGSC et al.
Venter et al.

1st Person
Levy

STORAGE LIMITS

Estimates based on bacterial genetics suggest that digital DNA could one day rival or exceed today's storage technology.

	Hard disk	Flash memory	Bacterial DNA
Read-write speed (μ s per bit)	~3,000–5,000	~100	<100
Data retention (years)	>10	>10	>100
Power usage (watts per gigabyte)	~0.04	~0.01–0.04	<10 ⁻¹⁰
Data density (bits per cm ³)	~10 ¹³	~10 ¹⁶	~10 ¹⁹

WEIGHT
OF DNA
NEEDED
TO STORE
WORLD'S
DATA



©nature

<http://www.nature.com/news/how-dna-could-store-all-the-world-s-data-1.20496>

Worldwide Annual Sequencing Capacity

2016
2017

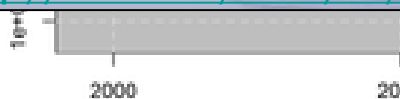


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Computed by Olivier H. Buissonnet and SCImago Lab, data by Elsevier Scopus



Data density
(bits per cm³)

$\sim 10^{13}$

$\sim 10^{16}$

$\sim 10^{19}$

©nature

<http://www.nature.com/news/how-dna-could-store-all-the-world-s-data-1.20496>

Year

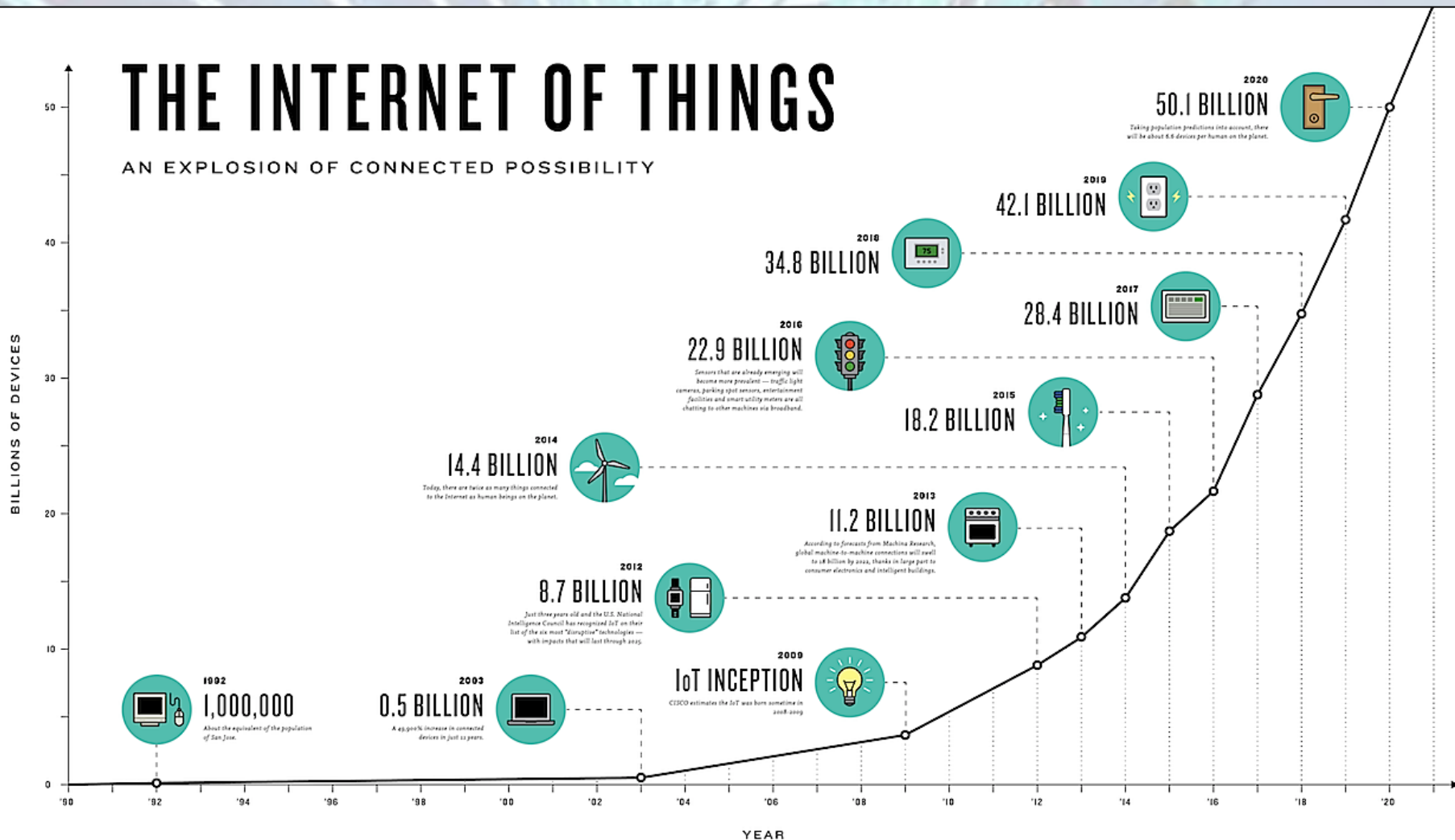


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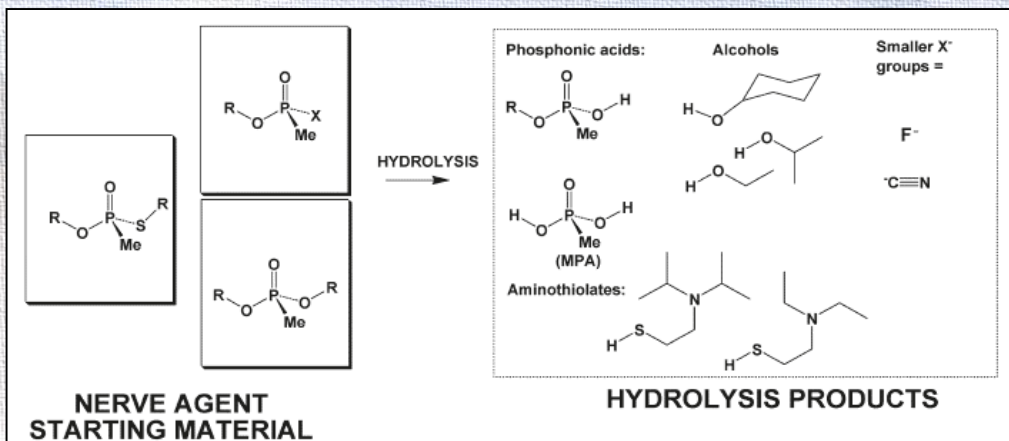
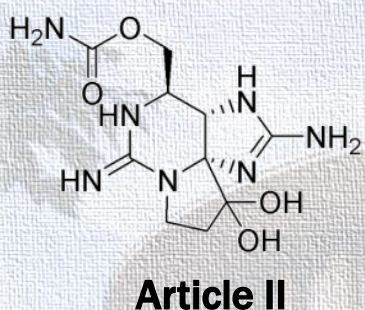
Understanding the Impact of Science on Security is a Challenge

THE INTERNET OF THINGS

AN EXPLOSION OF CONNECTED POSSIBILITY



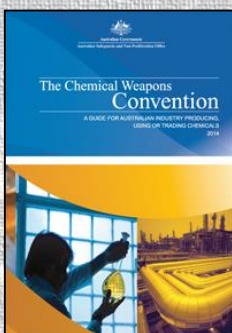
Without Sound Scientific and Technological Capacity There is No Treaty Implementation



Article III

Articles IV and V

Article VI



Article VII



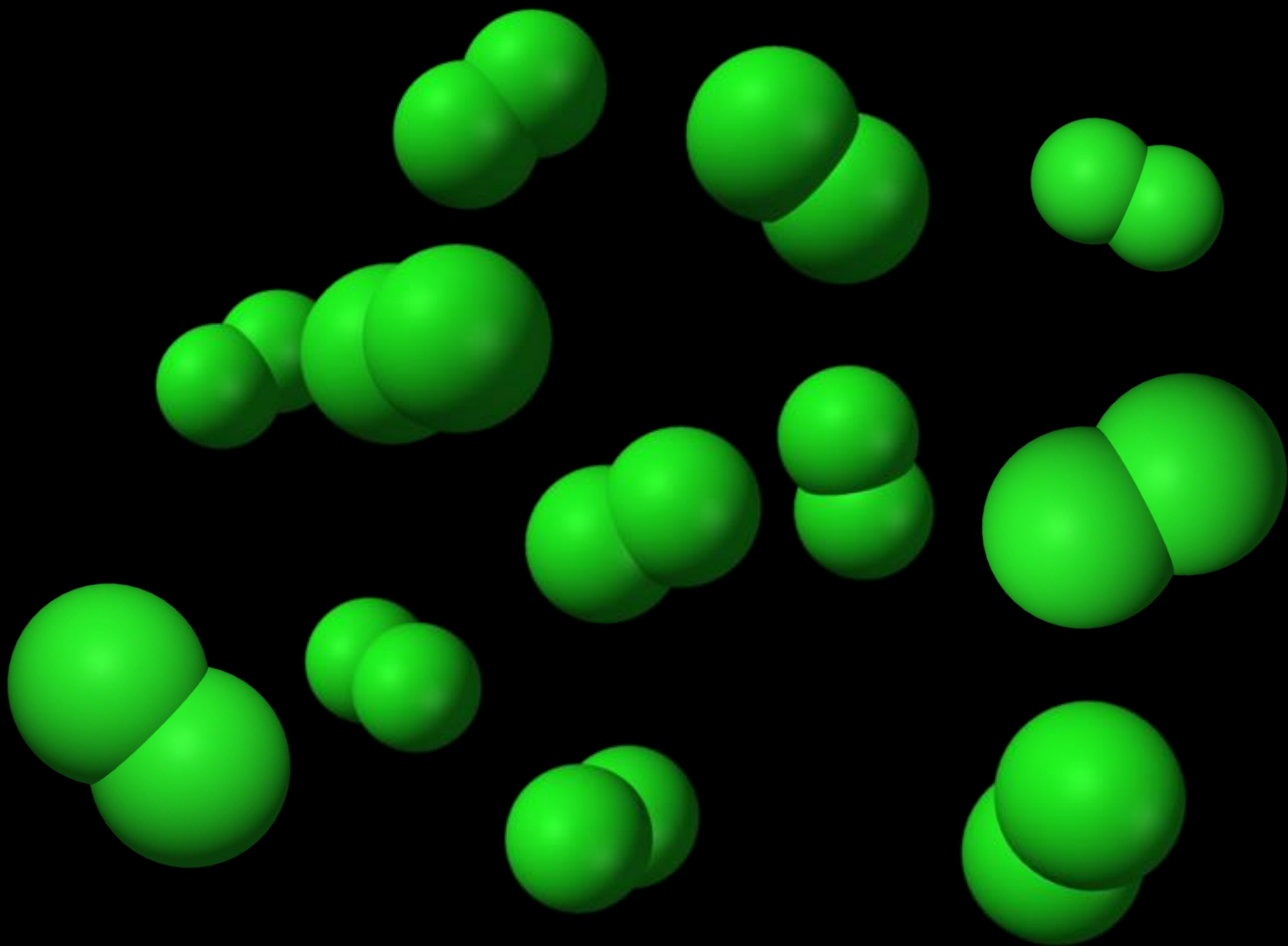
Article VIII



Articles IX and X



Article XI





**Chemical analysis to verify
chlorine gas exposure?**

December 2018: A Time to Review





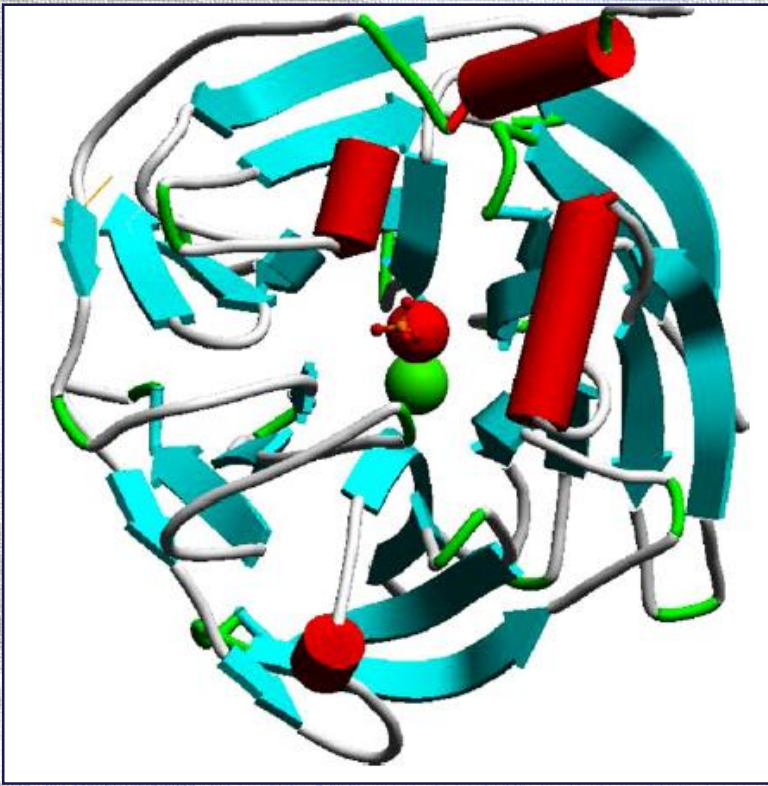
Workshops to Inform SAB Report



Image courtesy of TNS Sofres
www.flickr.com/photos/124561666@N02/

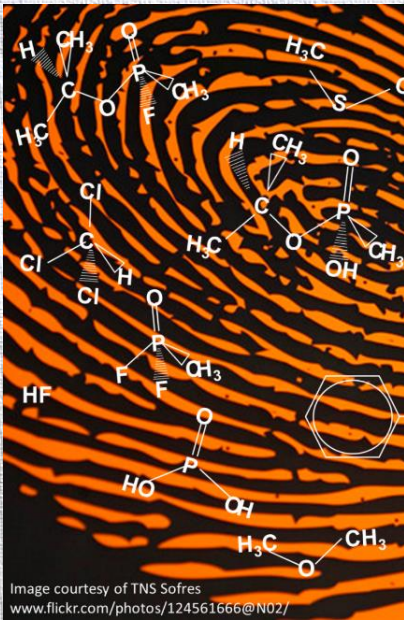
Chemical Forensics
Helsinki, Finland
June 2016

**Medical Countermeasures and
Emergency Response**
Paris, France, September 2016








Workshops to Inform SAB Report




Chemical
Helsinki,
June 2

 OPCW | 1997-2017

 INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

 The National Academies of SCIENCES ENGINEERING MEDICINE

 ACADEMIA BRASILEIRA DE CIÊNCIAS

03-05 | JULY - 2017
RIO DE JANEIRO - BRAZIL

INTERNATIONAL WORKSHOP ON INNOVATIVE TECHNOLOGIES FOR CHEMICAL SECURITY

Science for Peace

#ScienceforPeace

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Innovation is Both New Technologies and Repurposing of Existing Technologies

UPmove™



UP2

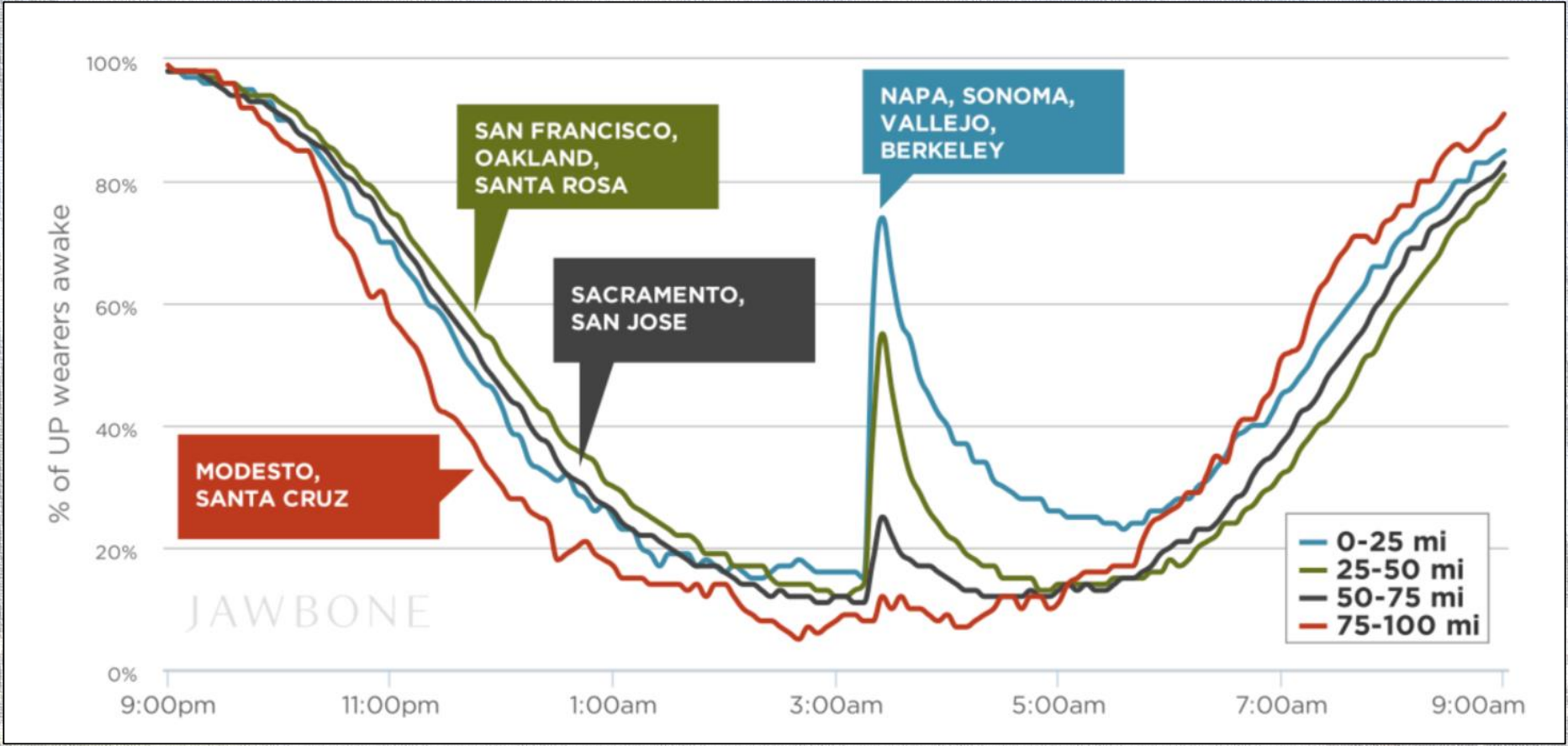


UP3



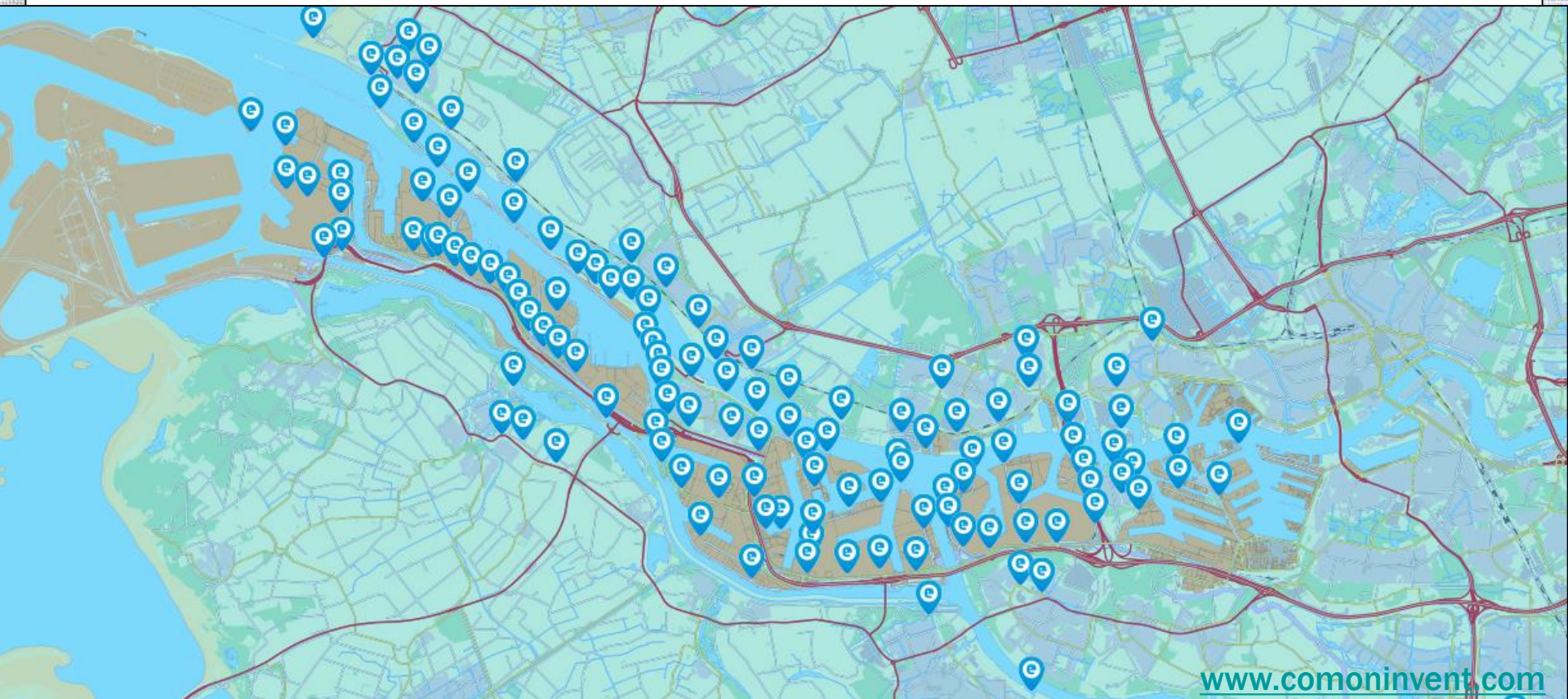


Innovation is Both New Technologies and Repurposing of Existing Technologies

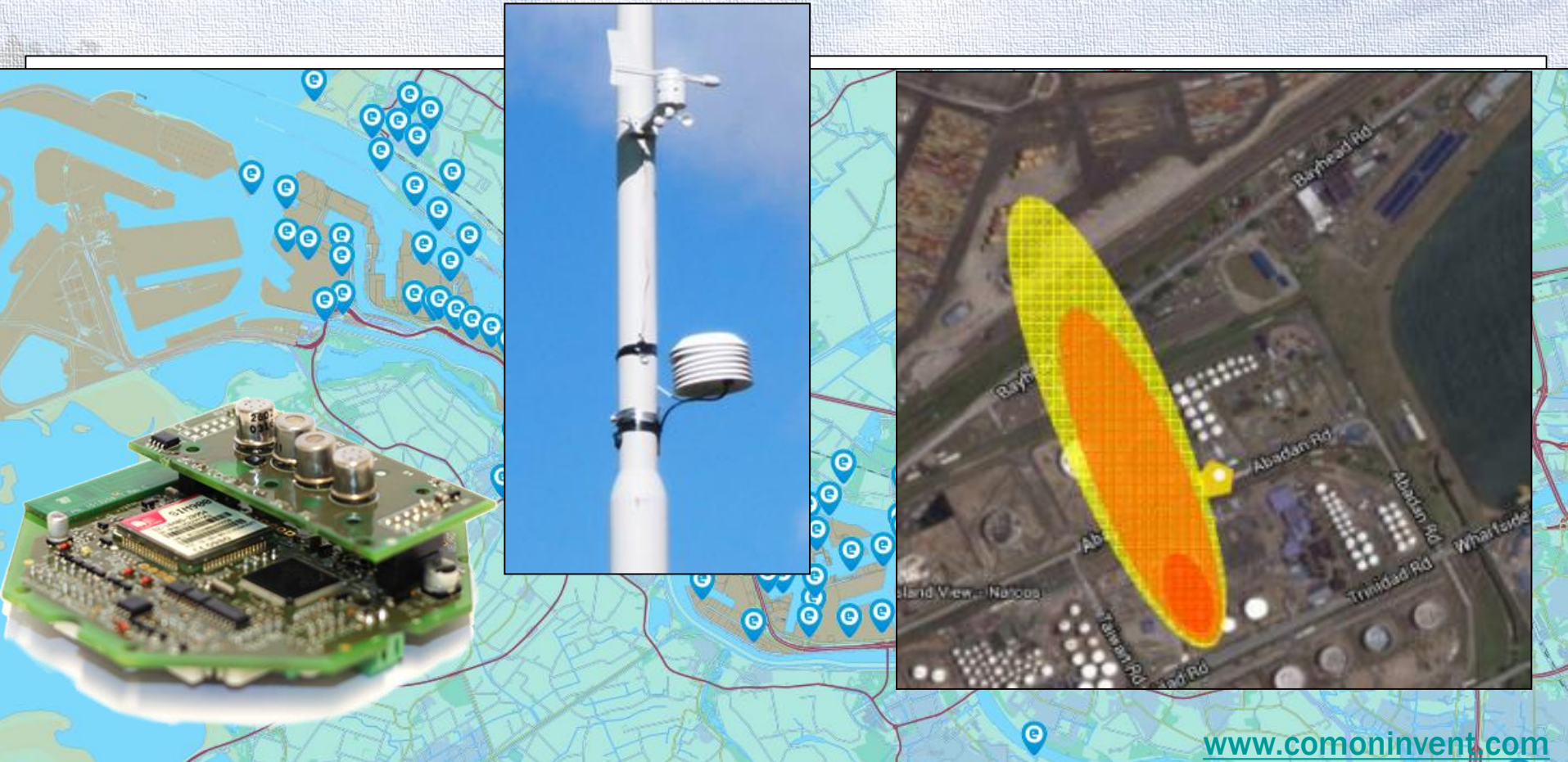




Innovation is Both New Technologies and Repurposing of Existing Technologies



Innovation is Both New Technologies and Repurposing of Existing Technologies





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The Value is the Data



Data Collection and Integration: The Case of Agriculture





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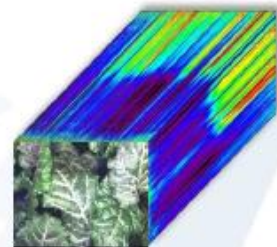
Data Collection and Integration: The Case of Agriculture

Effects of plant diseases

- Changes in the **pigment content**
- Changes in the **water content**
- Accumulation/degradation of **metabolites**
- Changes in the **cell/leaf structure**
- Accumulation of **fungal biomass**
- Changes in the **source-sink relation**



**Visible and Indicative
Indicators (On-Site Analysis)**



Physiological and metabolic parameters
influence the spectral signature of plants

Molecular Indicators (Off-Site Analysis)

Wolke (University of Bonn)

If Plants Could Talk...



“The signs are that the bombs were made with the windows open but the net curtains taped to the walls to avoid being seen. The fumes had killed off the tops of plants just outside the windows”

- Report of the Official Account of the Bombings in London on 7th July 2005



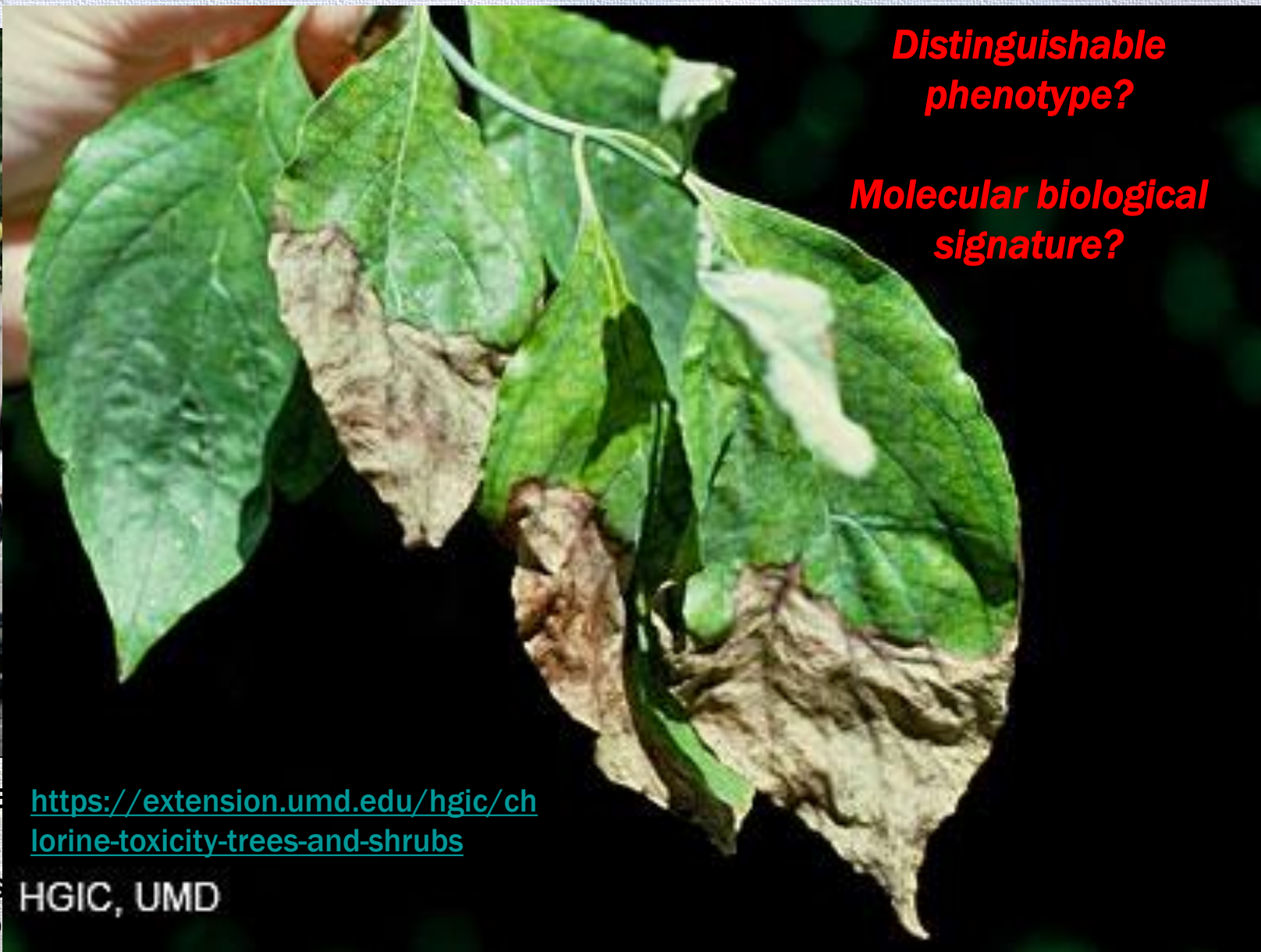
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If Plants Could Talk...



**Distinguishable
phenotype?**

**Molecular biological
signature?**



“The
curt
tops
- Rep

<https://extension.umd.edu/hgic/chlorine-toxicity-trees-and-shrubs>

HGIC, UMD



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Presentation by Dr Christopher Timperley

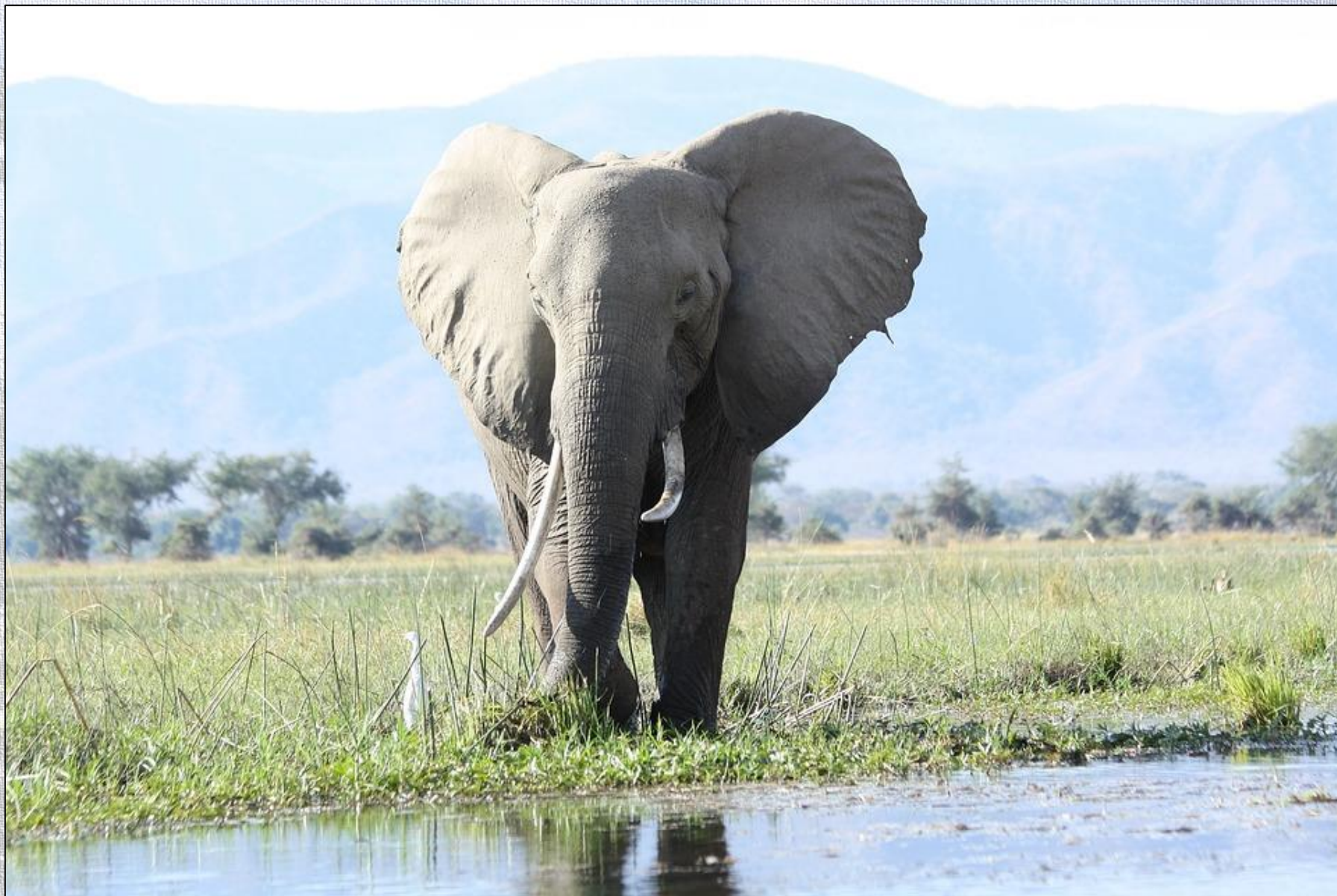
Chairperson OPCW SAB



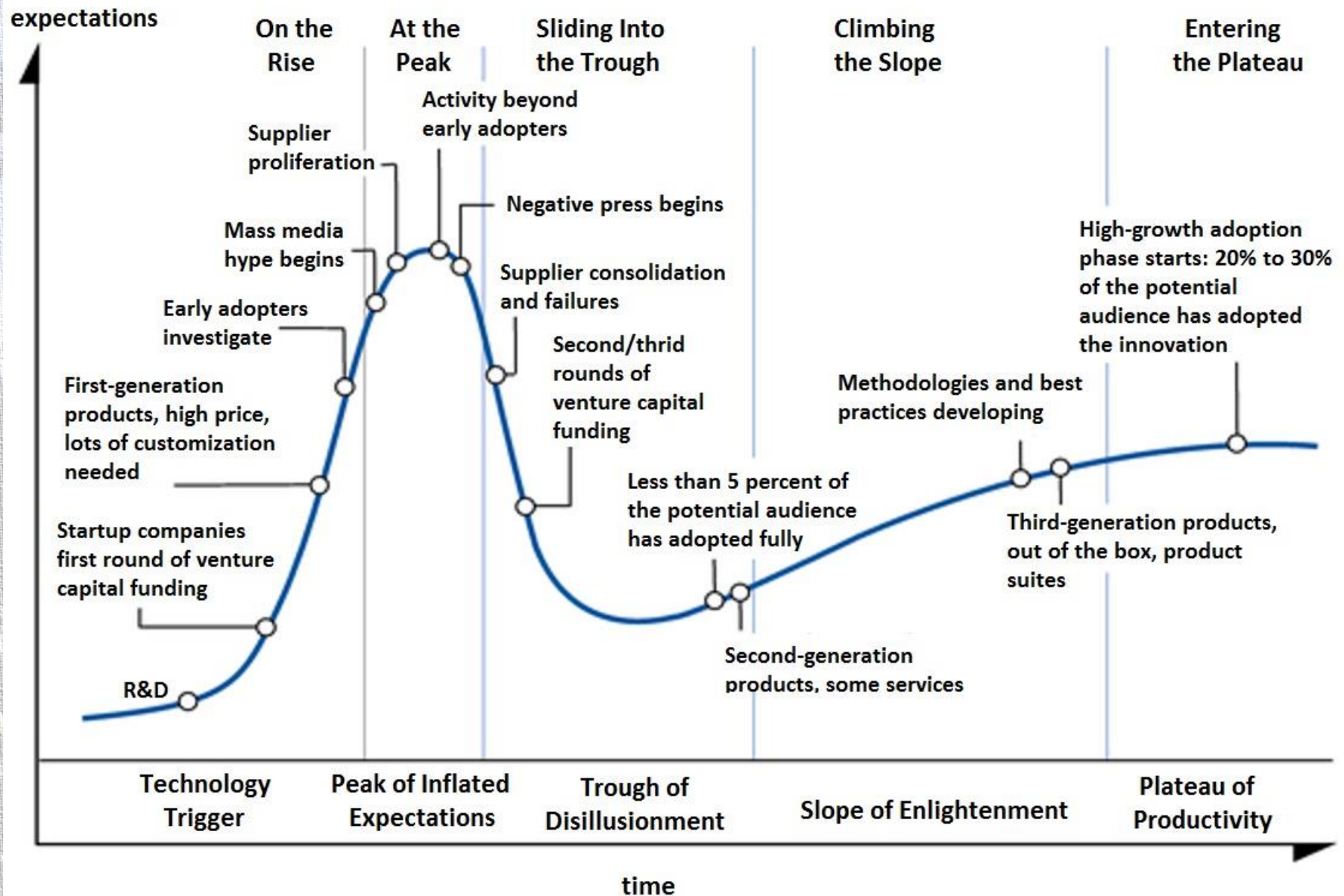


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At the End of the Day: Science Advice Must be Practical



At the End of the Day: Science Advice Must be Practical





Institute
for Medical
Research and
Occupational
Health



**Trends in Chemical Production
Held from 3-5 October in Zagreb**

OPCW Scientific Advisory Board Briefing to States Parties



OPCW

1997-^{OPCW}
2017
YEARS

Thursday, 19 October 2017

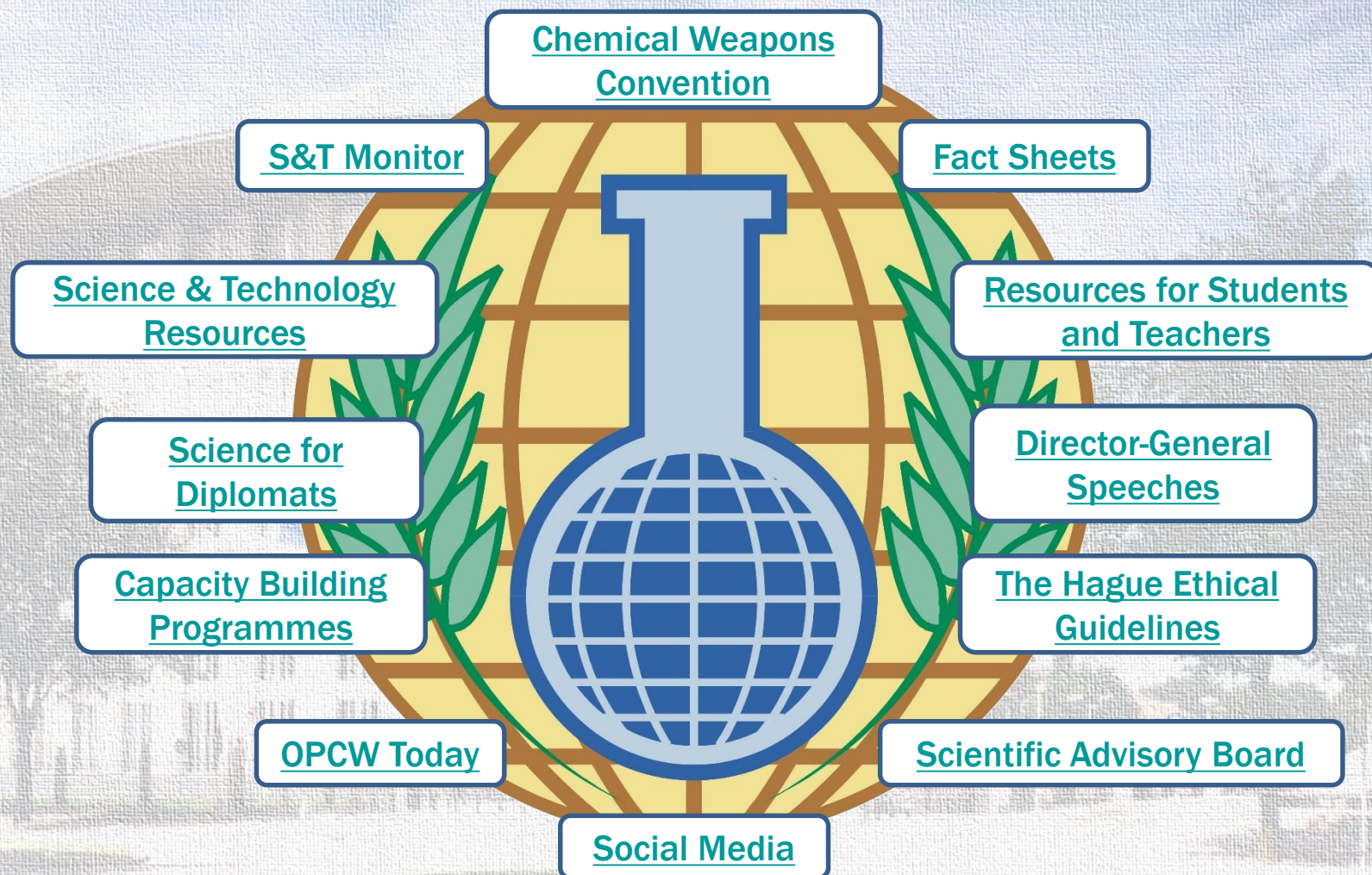
leper Room | 13:30-15:00

Light lunch served at 13:00



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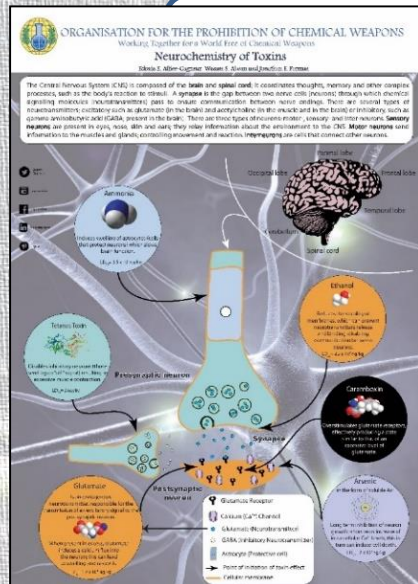
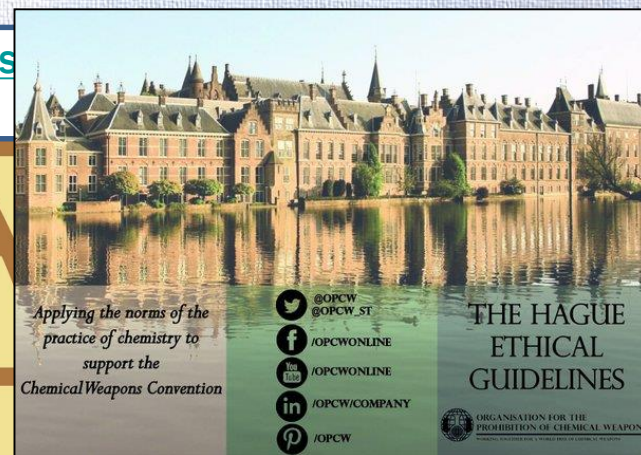
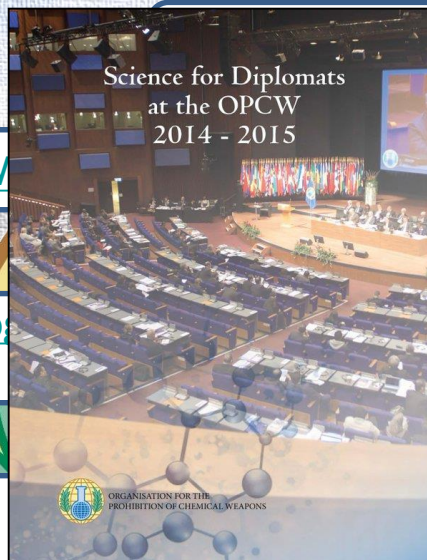
OPCW Science and Technology Resources





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OPCW Science and Technology Resources

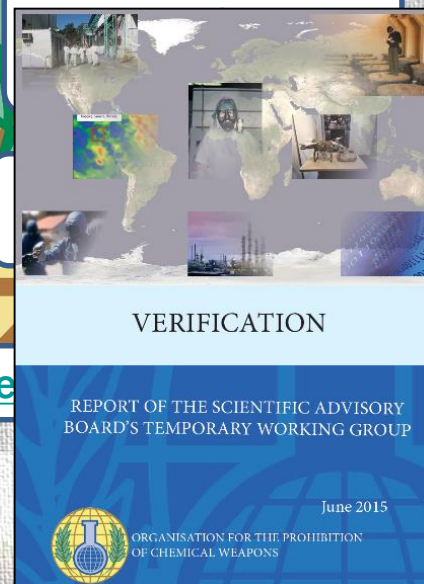


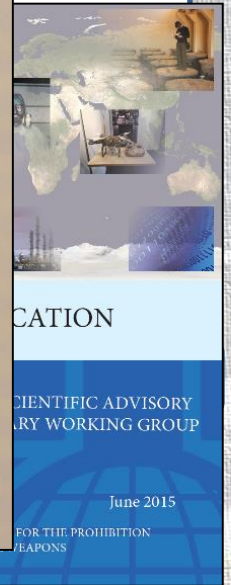
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