

Trends in Chemical Production

Science for Diplomats at CSP-22

The Report of the Scientific Advisory Board's Workshop

Join us for an afternoon of hands-on chemical synthesis.



Wednesday, 29 November 2017

Antarctica Room, World Forum

13:15-14:45

Light lunch served at 13:00

November 2018: A Time to Review



November 2018: A Time to Review

Third Special Session of the
Conference of the States
Parties to Review the
Operation of the Chemical
Weapons Convention

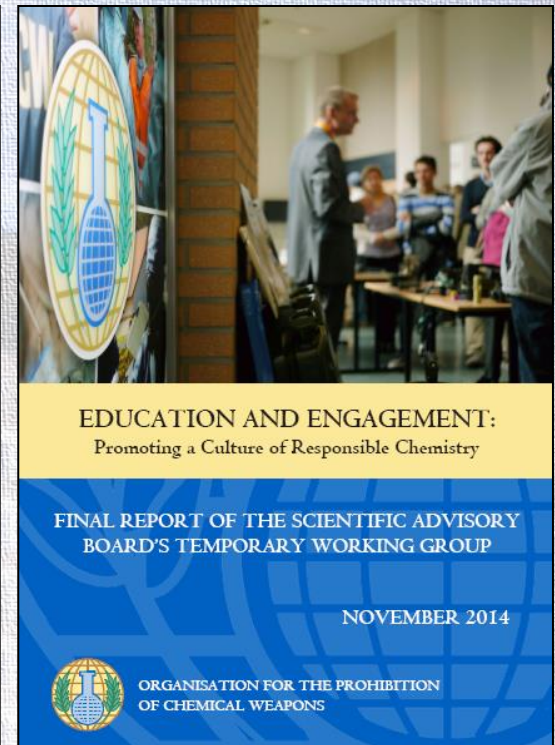
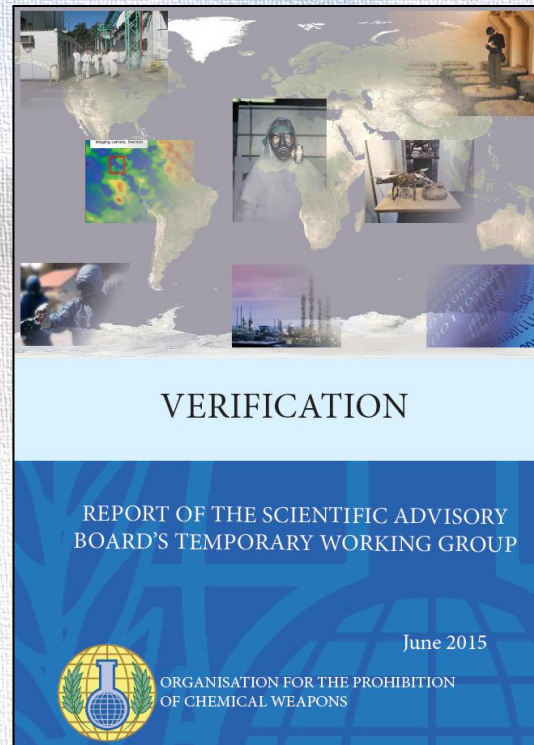
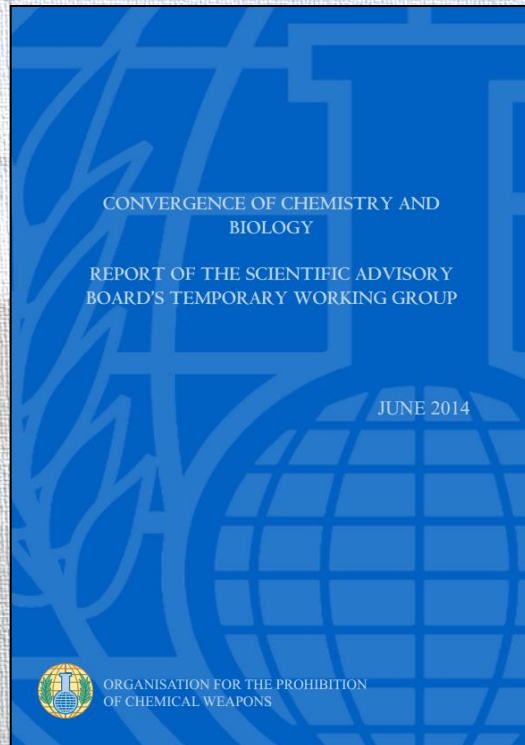
8-19 April 2013

Organisation for the Prohibition of Chemical Weapons

SAB Report:

Overview of scientific and technological changes during review period
Advice on relevant and emerging areas of science and technology
Recommendations for moving forward

The Scientific Review



The Scientific Review



The Scientific Review



The Scientific Review

25 Events

676 Attendees

- 256 individuals

- 56 Nationalities

405 Speakers

- 191 individuals

- 56 Nationalities

30 Reports



The Lead Up To Previous Review Conferences

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IMPACT OF SCIENTIFIC DEVELOPMENTS ON THE CHEMICAL WEAPONS CONVENTION (IUPAC Technical Report)

Prepared for publication by
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IMPACT OF SCIENTIFIC DEVELOPMENTS ON THE CHEMICAL WEAPONS CONVENTION (IUPAC Technical Report)

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Impact of scientific developments on the Chemical Weapons Convention (IUPAC Technical Report)[#]

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Abstract: This document represents the final report of discussions and conclusions arising
from the workshop on Developments in Science and Technology Relevant to the Chemical
Weapons Convention, held in Spiez, Switzerland in February 2012.

Keywords: Chemical Weapons Convention; CWC; implementation; science and technology;
Third Review Conference.

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 - 3.7 Chemical safety and security: Engaging the chemical sciences community
 - 3.8 Defense against CW agents
 - 3.9 Chemical safety and security: Engaging the chemical sciences community

[#]Generating body: IUPAC Executive Committee; see more details on p. 876.
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International Workshops of the OPCW Scientific Advisory Board

A European Union Funded Project

In Support of Scientific Review for the Fourth Review Conference of the Chemical Weapon Convention

4 Workshops with a total attendance of **187**

159 Individuals from **40** States Parties

111 Presentations from **91** Individual Presenters



OPCW
Organisation for
the Prohibition of
Chemical Weapons

1997-2017





Chemical Forensics: Capabilities across the Field and the Potential Applications in Chemical Weapons Convention Implementation

Helsinki, Finland. 20 to 22 June 2016

SAB-24/WP.1, dated 14 July 2016, URL: <http://q-r.to/bap1gy>

Coorganizer: VERIFIN



Chemical Warfare Agents: Toxicity, Emergency Response and Medical Countermeasures

Paris, France. 26 to 27 September 2016

SAB-24/WP.2, dated 14 October 2016, URL: <http://q-r.to/bap1h4>

Coorganizer:



Innovative Technologies for Chemical Security

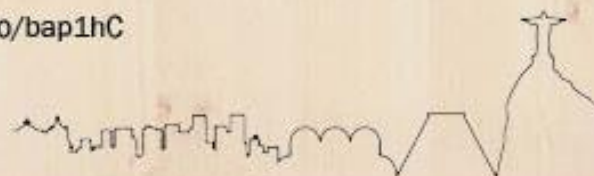
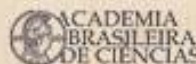
Rio de Janeiro, Brazil. 3 to 5 July 2017

SAB-26/WP.1, dated 21 July 2017, URL: <http://q-r.to/bap1hC>

Coorganizers:



The National
Academies of
SCIENCES
ENGINEERING
MEDICINE

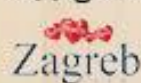


International Workshop on Trends in Chemical Production

Zagreb, the Republic of Croatia. 3 to 5 October 2017

SAB-26/WP.2, dated 19 October 2017, URL: <http://q-r.to/bap1hD>

Coorganizers:



REPUBLIC OF CROATIA
MINISTRY OF ECONOMY





Spiez Laboratory & OPCW Present Science for Diplomats at CSP-21

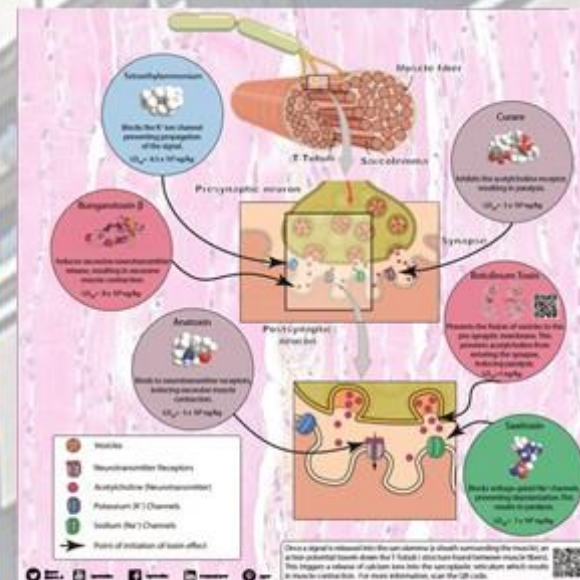


Wednesday 30 November 2016
Europe Room, World Forum
13:00 – 15:00

A Review of three workshops: Spiez CONVERGENCE 2, and the OPCW SAB's Chemical Forensics and Toxicity of Chemical Agents; with lunch



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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



OPCW

1997-**20**17
YEARS





Institute
for Medical
Research and
Occupational
Health



1923 Chemical & Engineering News begins as the **News Edition of Industrial & Engineering Chemistry**.

▲ **1923** Acids and bases get refined definitions—one from Johannes N. Brønsted and Thomas M. Lowry, another from Gilbert N. Lewis.

▲ **1923** Tetraethyllead, an antiknock additive to gasoline, earns its discoverer, Thomas Midgley Jr., an ACS award. **1925** Six German firms merge to form the IG Farben conglomerate. It soon becomes the world's biggest chemical company.

1925–27 Work from Werner Heisenberg, Wolfgang E. Pauli, and Erwin Schrödinger ushers in the era of quantum mechanics. **1926** Four U.K. chemical companies merge to form Imperial Chemical Industries (ICI). In its heyday it will become the British Empire's largest manufacturing firm.

1930s Sulfonamides (sulfa drugs) are introduced. They are the first antibiotics commercialized. **1931** Harold C. Urey discovers deuterium. **1932** James Chadwick discovers the neutron. **1932** Albert Szent-Györgyi and Charles G. King independently isolate vitamin C.



▲ **1935** DuPont chemists Wallace H. Carothers (pictured) and Gerard Berchert invent nylon. **1935** ICI patents the process for making polyethylene, one of today's most common plastics. **1937** Eugene J. Houdry develops industrial-scale catalytic petroleum cracking, setting the stage for the modern oil refinery.

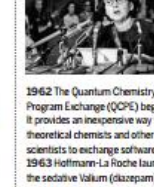
► **1941** To show that his chlorofluorocarbon (CFC) coolant, Freon, is nontoxic and nonflammable, Thomas Midgley Jr. takes the stage at an ACS national meeting, inhales a lungful of Freon, and blows out a candle. **1941** Archer J. P. Martin and Richard L. M. Synge begin publishing work that would lead to partition chromatography, revolutionizing analytical chemistry. **1942** ACS renames its flagship magazine **Chemical & Engineering News**. **1942** Mustard gas, 1,1'-thiobis (2-chloroethane), a chemical weapon in World War I, becomes the first compound used in chemotherapy for treating cancer. **1943** Experimenting on himself, Albert Hofmann experiences the world's first lysergic acid diethylamide (LSD) trip. **1944** Selman Waksman isolates the antibiotic streptomycin, the first effective treatment for tuberculosis. **1945** The U.S. explodes first atomic weapon in Alamogordo, N.M., and drops two bombs over Japan to end World War II.



early Earth's atmosphere. **1955** Frederick Sanger determines the complete amino acid sequence of a protein, insulin. **1955** Melvin E. Calvin traces the complete path that carbon takes in a plant during photosynthesis. ▲ **1955** Procter & Gamble scientists develop the first fluoride-containing toothpaste shown to prevent cavities. **1957** Bisphenol A is first used commercially to make plastics and epoxy resins. ▼ **1958** Mass spectrometry is used to analyze amino acids and peptides for the first time.



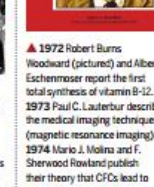
1962 Neil Bartlett proves that noble gases can form chemical compounds by preparing XePtF₆. ▼ **1962** Rachel Carson's book "Silent Spring" alerts the public to environmental damage from industrial chemicals, including DDT. **1962** The Quantum Chemistry Program Exchange (QCPE) begins. It provides an inexpensive way for theoretical chemists and other scientists to exchange software. **1963** Hoffmann-La Roche launches the sedative Valium (diazepam). **1964** First commercial quadrupole mass spectrometer debuts. **1964** Chemical Abstracts Service introduces the CAS Registry, the first computer-based system for storing chemical representations.



1965 DuPont chemist Stephanie L. Kwolek invents the strong but light polymer Kevlar. **1966** Weston A. Anderson and Richard R. Ernst develop Fourier transform NMR, laying the groundwork for modern NMR spectroscopy. **1967** Monroe E. Wall and Martin C. Warr isolate the future cancer drug Taxol (paclitaxel) from the bark of the Pacific yew tree. **1968** George C. Cotzias shows that the psychoactive drug levodopa is effective against symptoms of Parkinson's disease.



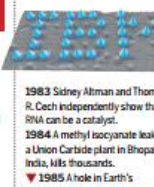
▲ **1972** Robert Burns Woodward (pictured) and Albert Eschenmayer report the first total synthesis of vitamin B-8. **1973** Paul C. Lauterbur describes the medical imaging technique MRI (magnetic resonance imaging). **1974** Mario J. Molina and F. Sherwood Rowland publish their theory that CFCs lead to atmospheric ozone depletion. **1975** Cesare Milstein and Georges Köhler develop a strategy for producing monoclonal antibodies. **1976** Herbert W. Boyer and Robert A. Swanson set up Genentech, the first biotechnology company. **1976** Congress passes the Toxic Substances Control Act to regulate the chemicals in everyday products.



1980 In large part because of Love Canal, Congress passes the Comprehensive Environmental Response, Compensation & Liability Act (Superfund). ▼ **1981** IBM Zurich's Gerd Binnig and Heinrich Rohrer develop scanning tunneling microscopy, which Donald M. Eigler later uses to manipulate individual atoms. **1983** Sidney Altman and Thomas R. Cech independently show that RNA can be a catalyst. **1984** A methyl isocyanate leak at a Union Carbide plant in Bhopal, India, kills thousands. ▼ **1985** A hole in Earth's atmosphere ozone layer is first observed over Antarctica.



1986 The Chernobyl nuclear power plant in the Soviet Union has a reactor core meltdown, releasing massive amounts of radiation. **1986** Congress creates the Toxics Release Inventory of hundreds of chemicals released into air, water, or land. **1986** Cambridge Scientific Co. debuts the ChemDraw structure-drawing program for computers. ▼ **1986** Johannes G. Bednorz and Karl A. Müller discover the first high-temperature superconductor. **1987** Eli Lilly & Co. receives approval to market Prozac (fluoxetine) to treat depression. **1987** Nations begin signing the Montreal protocol, an international treaty designed to protect the ozone layer. **1987** FDA approves azidothymidine (AZT) to treat HIV/AIDS. **1988** Intergovernmental Panel on Climate Change is established.



1989 The U.S. launches the Human Genome Project. **1990** Congress amends the Clean Air Act, making air pollution standards significantly tougher. ▼ **1991** Sumo Iijima discovers the carbon nanobelt. Act, making air pollution standards significantly tougher. ▼ **1991** Sumo Iijima discovers the carbon nanobelt.



▲ **1992** Robert A. Holton patents a route to Taxol that begins with a compound in yew tree needles, sparing the trees. **1993** Dow Chemical wins Supreme Court decision in the Daubert case, requiring judges to use peer-reviewed science in court. **1994** Calgene's Flavr Savr tomato becomes the first genetically modified food to hit the market. **1995** Eric A. Cornell and Carl E. Wieman make the first Bose-Einstein condensate, which displays quantum mechanical properties on the macroscopic scale. **1996** The Food Quality Protection Act and amendments to the Safe Drinking Water Act require EPA to develop a program to screen chemicals for their potential to interact with the human endocrine system.



2000 Masashi Miyano, Krzysztof Palczewski, and Ronald E. Striamp get first glimpse of a G protein-coupled receptor: a class of membrane proteins that are the targets of as many as 30% of marketed drugs. ▲ **2000s** Hydraulic fracturing (fracking) leads to a boom in U.S. natural gas production. **2001** Human Genome Project and Celera Genomics independently publish papers reporting the complete sequencing of the human genome. Pictured are J. Craig Venter (left) and Francis S. Collins. **2009** FDA approves first human clinical trial of an embryonic stem-cell-based therapy. The trial is halted two years later. **2009** NASA scientists definitively detect water on the moon. **2009** IBM researchers improve the resolution of atomic force microscopy so much that they are able to visualize all of the atom positions and bonds of a single molecule for the first time. **2011** Brian K. Kobilka and Roger Tsien determine the first structure of a G protein-coupled receptor with its G protein partner. **2012** An international team discovers a new particle that they think is the Higgs boson—a long-sought particle that imbues matter with mass. **2013** The U.S. Supreme Court rules that human genes cannot be patented. **2013** C&EN turns 90.



▲ **2001** Human Genome Project and Celera Genomics independently publish papers reporting the complete sequencing of the human genome. Pictured are J. Craig Venter (left) and Francis S. Collins. **2009** FDA approves first human clinical trial of an embryonic stem-cell-based therapy. The trial is halted two years later. **2009** NASA scientists definitively detect water on the moon. **2009** IBM researchers improve the resolution of atomic force microscopy so much that they are able to visualize all of the atom positions and bonds of a single molecule for the first time. **2011** Brian K. Kobilka and Roger Tsien determine the first structure of a G protein-coupled receptor with its G protein partner. **2012** An international team discovers a new particle that they think is the Higgs boson—a long-sought particle that imbues matter with mass. **2013** The U.S. Supreme Court rules that human genes cannot be patented. **2013** C&EN turns 90.



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How Chemistry Changed The World

Official sponsor of C&EN's 90th anniversary
SHIMADZU
 Excellence in Science

▼ **1928–29** Examining mold, Alexander Fleming discovers penicillin.



1928 C. V. Raman reports a light-scattering effect, which is observed after musing on the Mediterranean Sea's deep blue color. Adolf Smekal predicted this phenomenon in 1923.

1930 U.S. Congress formally establishes the National Institute of Health, precursor to the National Institutes of Health. **1930** Franz Fischer and Hans Tropsch patent their process for producing synthetic fuels from hydrogen and carbon monoxide. **1930s** Arnold O. Beckman commercializes the pH meter.

1937 Technetium is discovered. It's the first element to be artificially produced. **1938** Mass poisonings from an improperly prepared sulfa drug prompt passage of the Food, Drug & Cosmetic Act, which requires companies to perform safety tests. ▼ **1938** DuPont's Roy J. Plunkett accidentally discovers Teflon after having trouble with a gas cylinder. **1939** Linus C. Pauling publishes "The Nature of the Chemical Bond." The text becomes an instant classic. ▼ **1939** Paul Hermann Muller discovers that dichlorodiphenyltrichloroethane (DDT) is an effective insecticide. ▲ **1953** James D. Watson and Francis H. C. Crick determine DNA's double-helix structure.



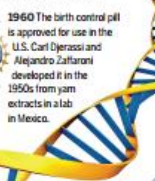
1945 Felix Bloch and Edward M. Purcell independently discover nuclear magnetic resonance (NMR). **1947** Enika Cremer and Fritz Prior devise the first gas chromatograph (GC). **1949** Dow Chemical introduces Saran Wrap, a thin, clingy plastic film for preserving foods. ▼ **1950** Congress establishes the U.S. National Science Foundation. **1951** Post World War II, the Allies break up IG Farben. Bayer, Hoechst, and BASF emerge. **1951** Linus C. Pauling correctly proposes the alpha-helix structure for proteins.



1960 The birth control pill is approved for use in the U.S. Carl Djerassi and Alejandro Zaffaroni developed it in the 1950s from yam extracts in a lab in Mexico. **1960** Theodore H. Maiman demonstrates the first working laser. **1961** M. Patricia Jevons finds strains of *Staphylococcus aureus* resistant to the antibiotic methicillin. **1961** Countries begin to pull the morning-sickness aid thalidomide from the market because it causes severe birth defects.



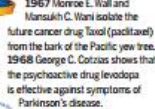
1962 The first high-resolution protein structure debuts: John C. Kendrew and Max F. Perutz determine myoglobin's structure with X-ray crystallography. **1960** The birth control pill is approved for use in the U.S. Carl Djerassi and Alejandro Zaffaroni developed it in the 1950s from yam extracts in a lab in Mexico. **1960** Theodore H. Maiman demonstrates the first working laser. **1961** M. Patricia Jevons finds strains of *Staphylococcus aureus* resistant to the antibiotic methicillin. **1961** Countries begin to pull the morning-sickness aid thalidomide from the market because it causes severe birth defects.



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1976 First 2-D NMR experiment is published by Walter P. Aue, Enrico Bartholdi, and Richard R. Ernst. **1977–78** Bruce N. Ames and Ariane Blum demonstrate that two flame retardants in children's pajamas have mutagenic properties. **1978** Chemical waste leaking from a former industrial dump prompts the Love Canal, N.Y., neighborhood evacuation. **1985** Robert F. Curl Jr., Harold W. Kroto, and Richard E. Smalley make the first observation of a new form of carbon: fullerenes. C₆₀ becomes known as buckminsterfullerene, or buckyball for short. **1985** Kary B. Mullis reports the first polymerase chain reaction.



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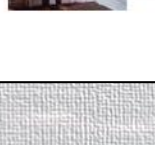
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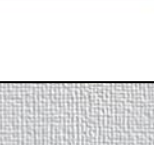
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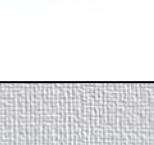
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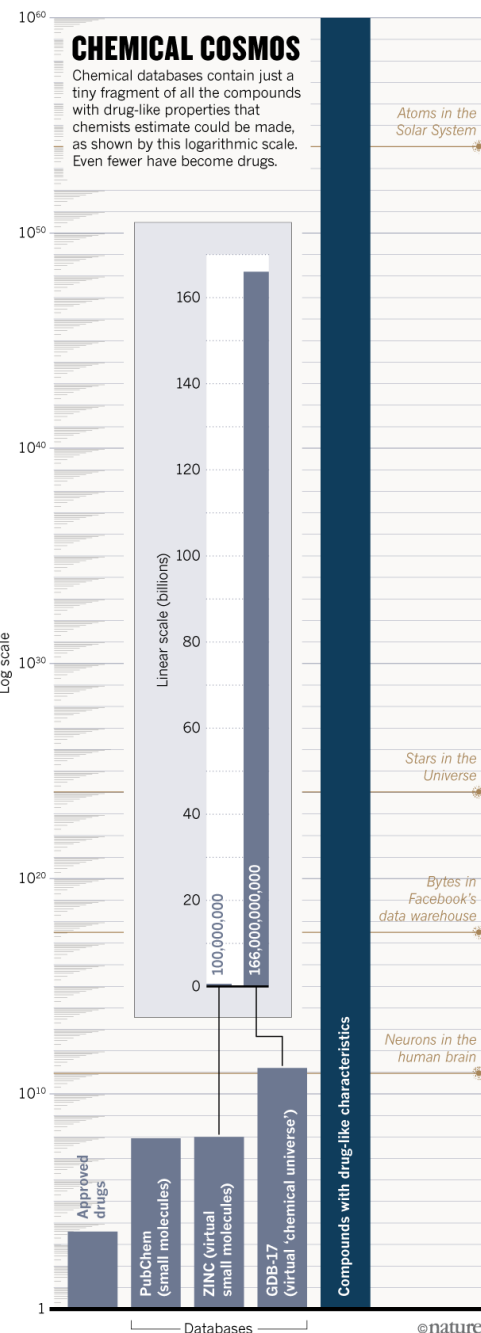
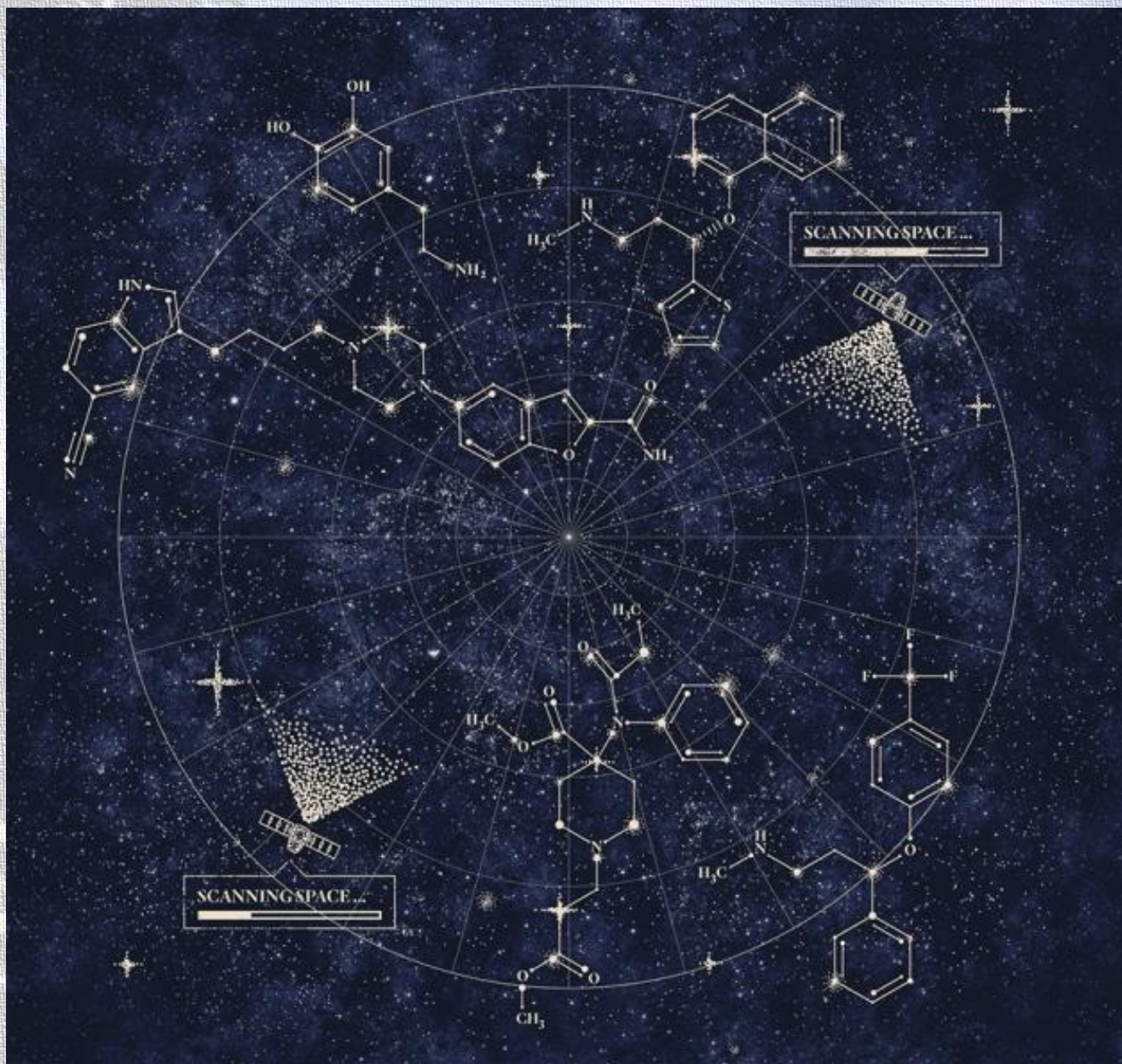
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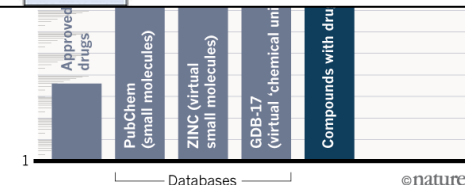
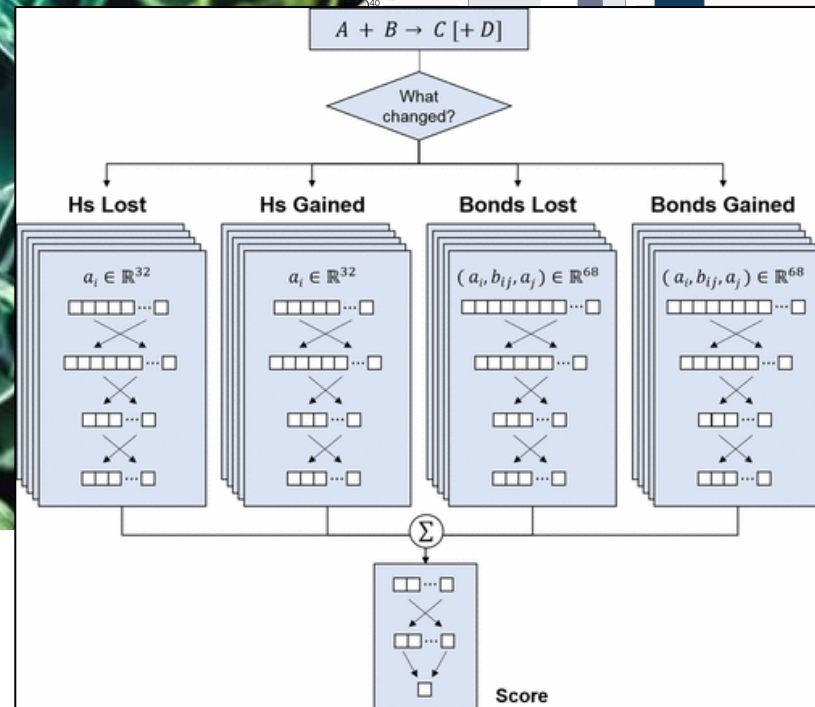
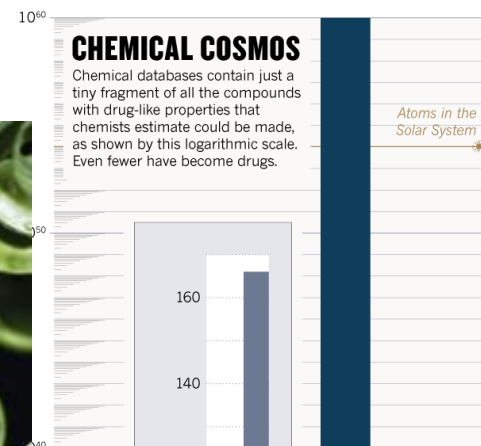
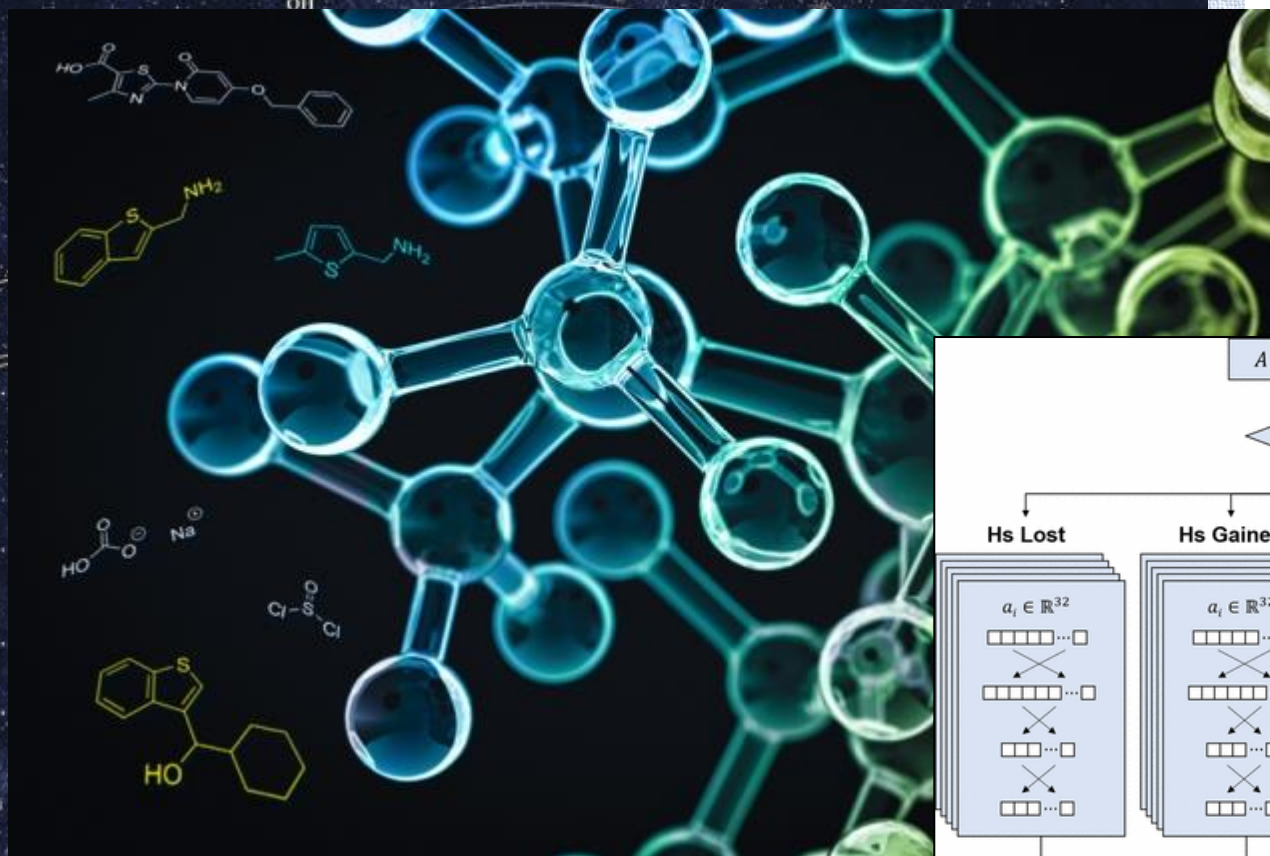


The Chemical Universe



<https://www.nature.com/news/the-drug-maker-s-guide-to-the-galaxy-1.22683>

The Chemical Universe



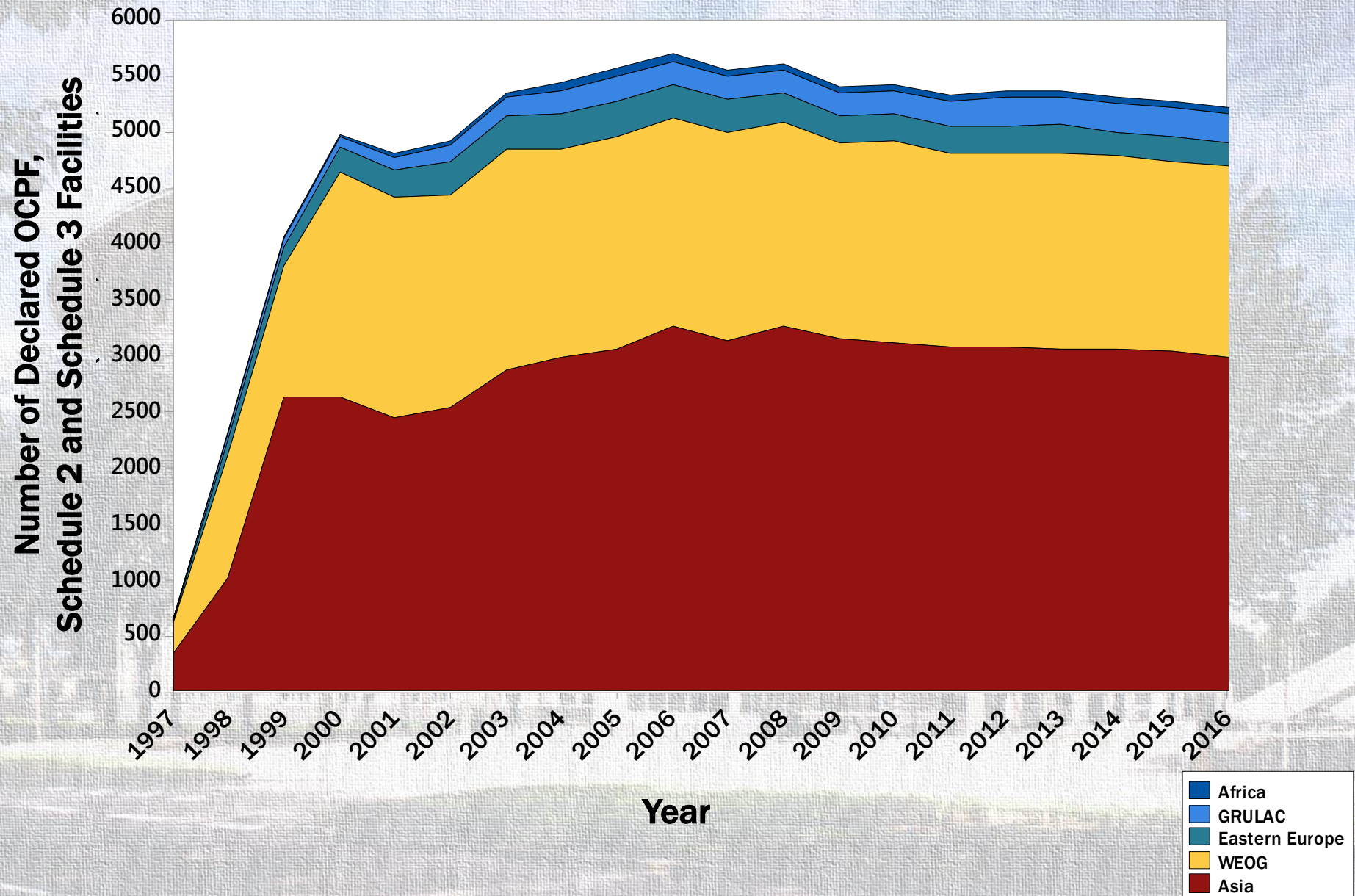
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Prediction of Organic Reaction Outcomes Using Machine Learning

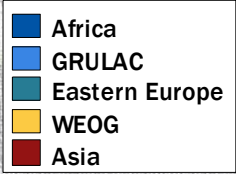
Connor W. Coley,[†] Regina Barzilay,[‡] Tommi S. Jaakkola,[‡] William H. Green,^{*,†} and Klavs F. Jensen^{*,†}

[†]Department of Chemical Engineering and [‡]Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139, United States

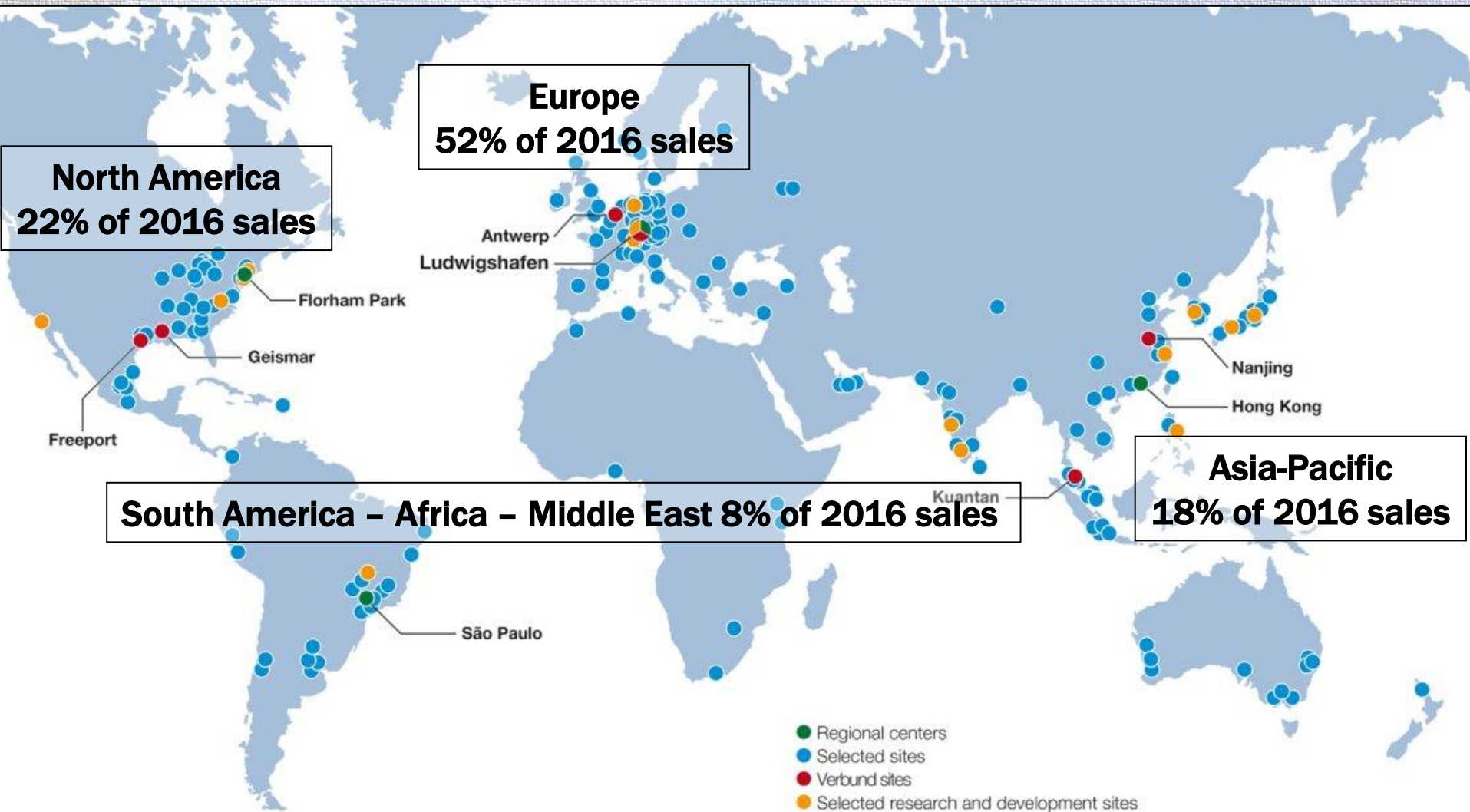
Declared Article VI Facilities



Number of Declared OCPF, Schedule 2 and Schedule 3 Facilities



Chemical Economies



One Chemical Company: production & research facilities in > 80 States Parties!

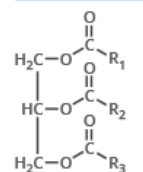
Today's Chemistry Lesson



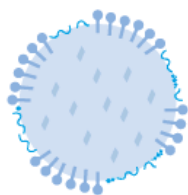
THE CHEMISTRY OF ICE CREAM

Ice cream is a combination of air, ice crystals, fat globules, and a liquid syrup. These are combined to make a colloid, a solution with very small insoluble particles suspended in it. This graphic looks in detail at the components of this colloid, and some molecules that produce ice cream flavours.

FATS, PROTEINS, & EMULSIFIERS



FAT (TRIGLYCERIDE)
R = fatty acids



- LIQUID FAT
- EMULSIFIER MOLECULES
- MILK PROTEINS
- FAT CRYSTALS

Fats are important for the creaminess of ice cream. Proteins from milk form a membrane around the fat droplets, making it harder for them to come in contact with each other. Emulsifiers replace some milk protein on the surface of the fat droplet. As ice cream is made, some of the fat in the droplet solidifies, and the fat 'needles' that form help droplets to partially cluster. These clusters, along with milk proteins, help stabilise air bubbles in the ice cream.

THE STRUCTURE OF ICE CREAM



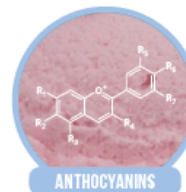
ICE CRYSTALS	30%
AIR BUBBLES	50%
FAT DROPLETS	5%
LIQUID SYRUP	15%

% by volume for typical composition

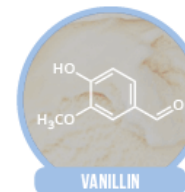
During freezing, most water is frozen into ice. Small ice crystals are needed for smooth ice cream. Beating and aeration occur at the same time as freezing to form small air bubbles, stabilised by de-emulsified fat. Air makes up 30-50% of ice cream's final volume. Sugar sweetens the ice cream, and lowers the freezing point of water, reducing the amount of ice. Soft ice cream contains less ice.



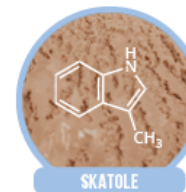
FLAVOURS AND COLOURS



ANTHOCYANINS



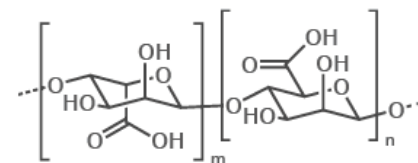
VANILLIN



SKATOLE

Natural ice cream flavours contain a number of flavour-contributing compounds. Flavouring can also be achieved artificially. Artificial vanilla flavouring is often simply vanillin; other artificial flavours are more complex. Other compounds can be used as flavour enhancers – an unusual example is skatole, also found in faeces, but which has a floral odour at lower concentrations. Colours can be added artificially; anthocyanins from plants are amongst the colouring agents used.

STABILISERS



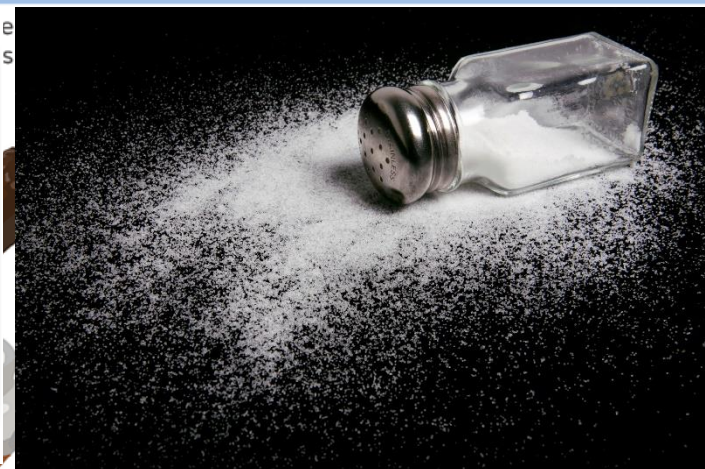
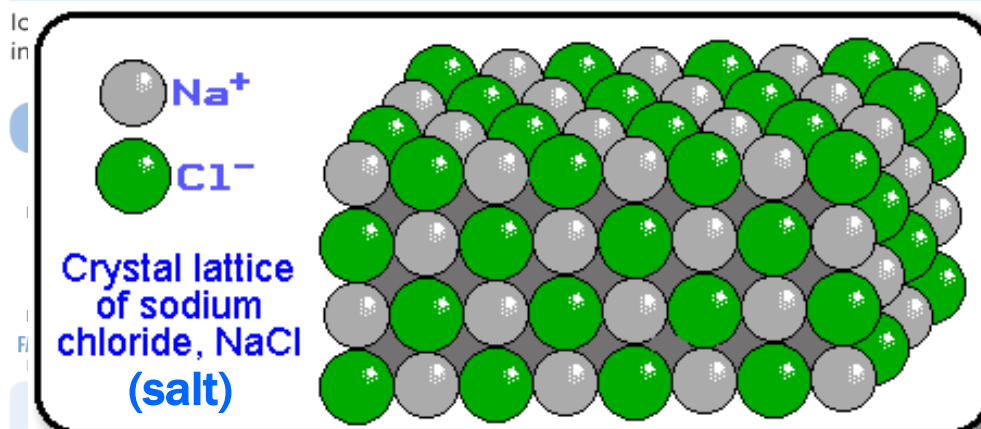
ALGINIC ACID

Sodium alginate is the sodium salt of alginic acid. Another stabiliser that can be obtained from seaweed is carrageenan.

Stabilisers are added in small amounts (~0.2%) to ice cream. Often extracted from plants, a common example is sodium alginate, the sodium salt of alginic acid, extracted from brown seaweeds. Stabilisers reduce the rate at which ice cream melts, add smoothness, and increase the viscosity of the liquid phase of ice cream. Use of multiple stabilisers can produce synergistic effects.

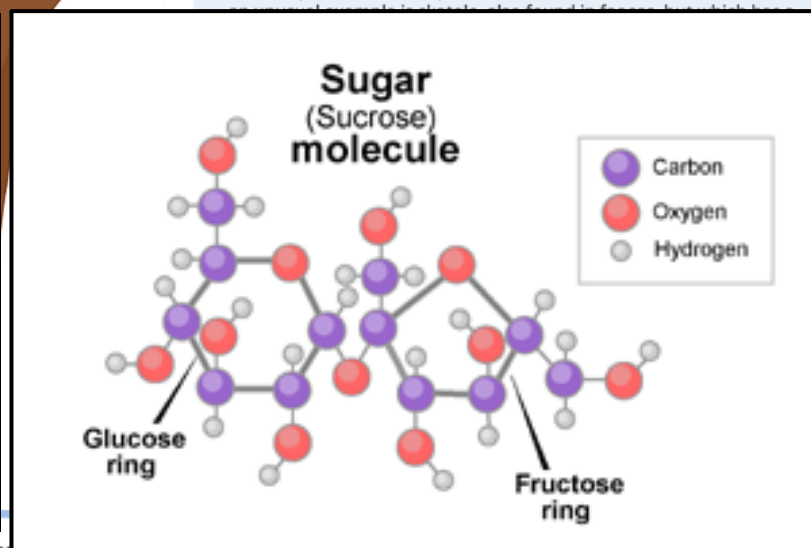


THE CHEMISTRY OF ICE CREAM



some milk protein on the surface of the fat droplet. As ice cream is made, some of the fat in the droplet solidifies, and the fat 'needles'

more complex. Other compounds can be used as flavour enhancers



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OPCW

Presentation by Mr Cheng Tang Vice-Chairperson OPCW SAB



SAB's Assessment on Verification Issues

OEWG Future Priorities
31 January 2017

Cheng TANG
Vice Chairperson, Scientific Advisory Board
tang_cheng@hotmail.com

CHAIRPERSON

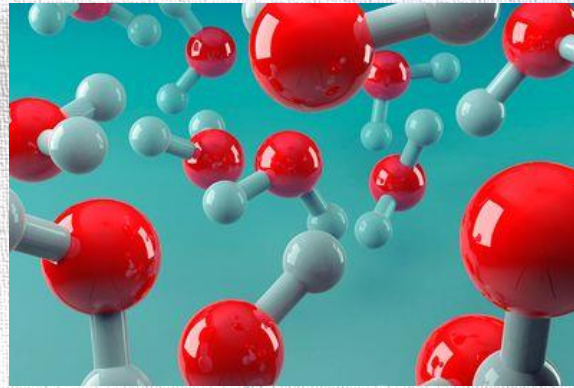


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One More Type of Chemical Process: *In-Situ* Production and Consumption



+



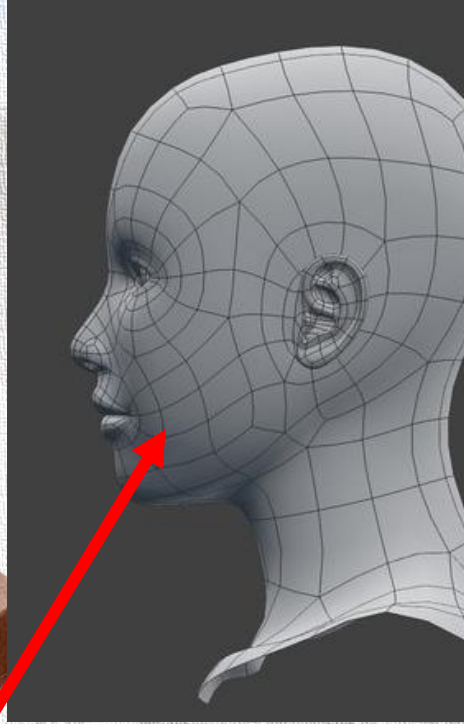
(water, H₂O)



One More Type of Chemical Process: *In-Situ* Production and Consumption



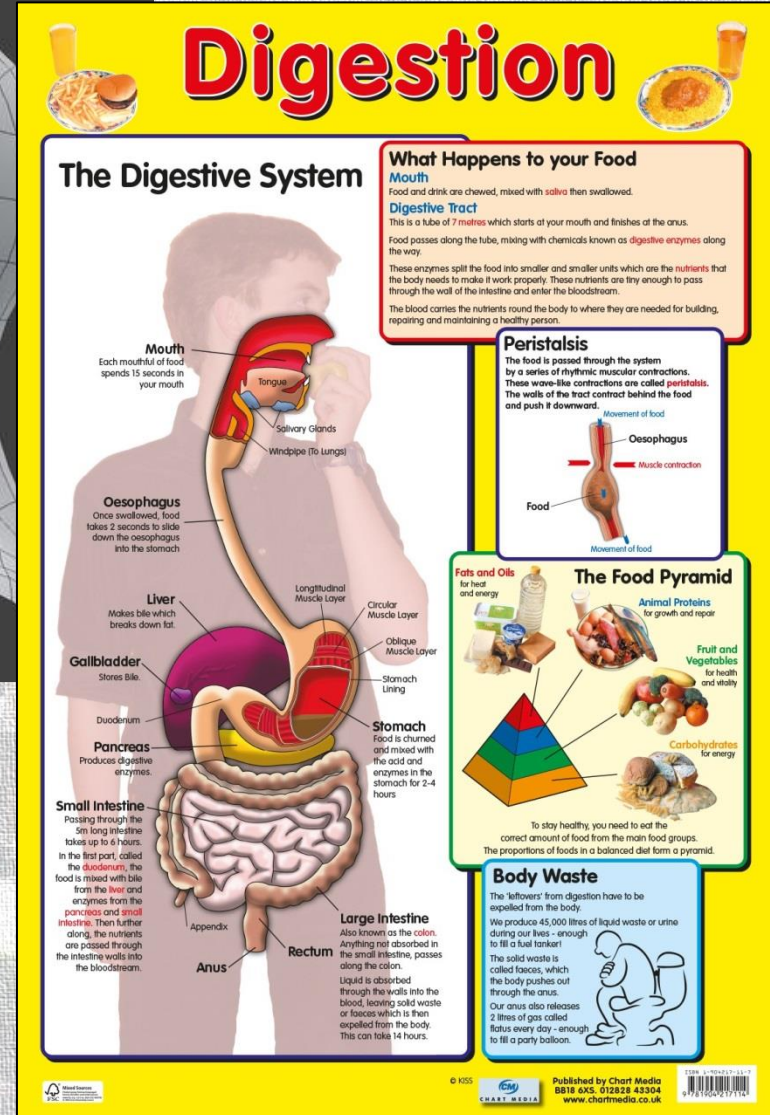
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“Raw Material”

“(Bio)Chemical Reactor”

**Consumed by other chemical
processes as it forms**





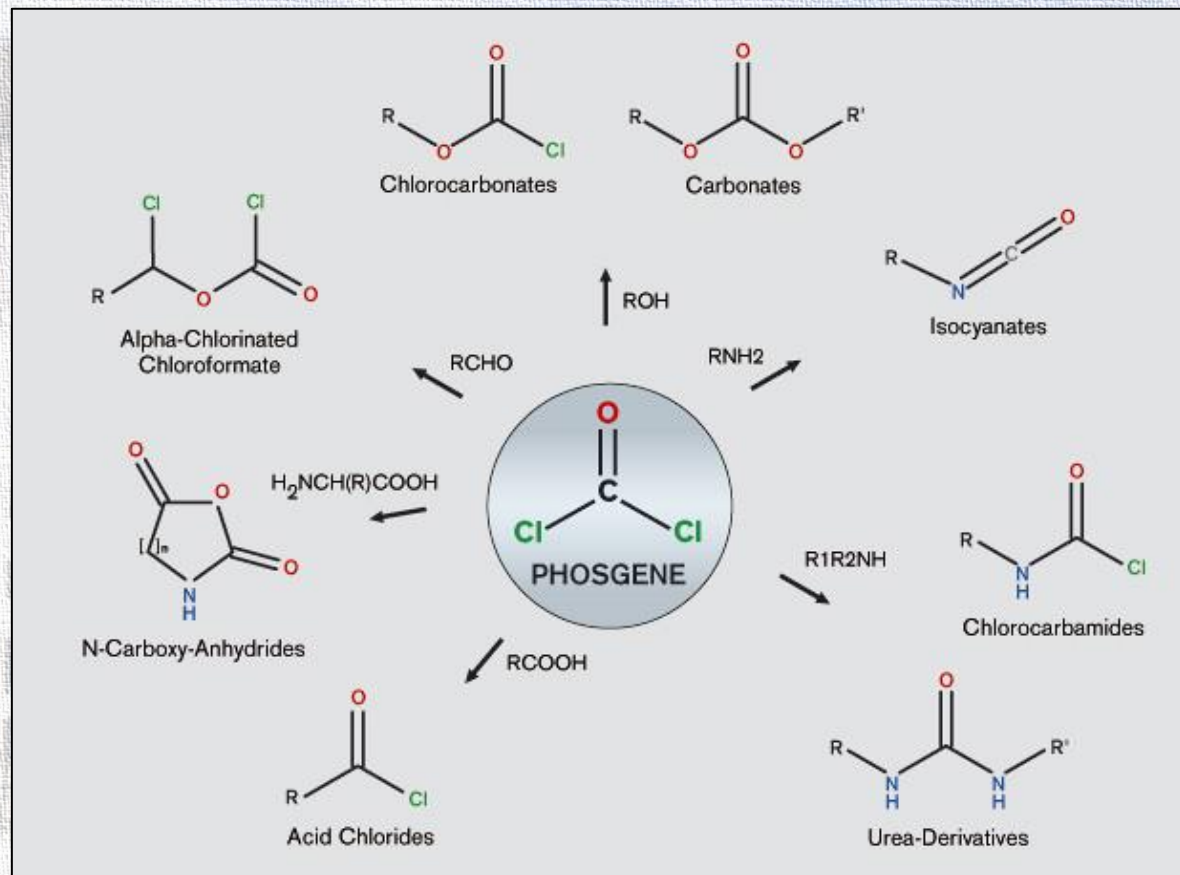
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Why Would You Do This?

SMELLS LIKE MUSTY HAY

PHOSGENE

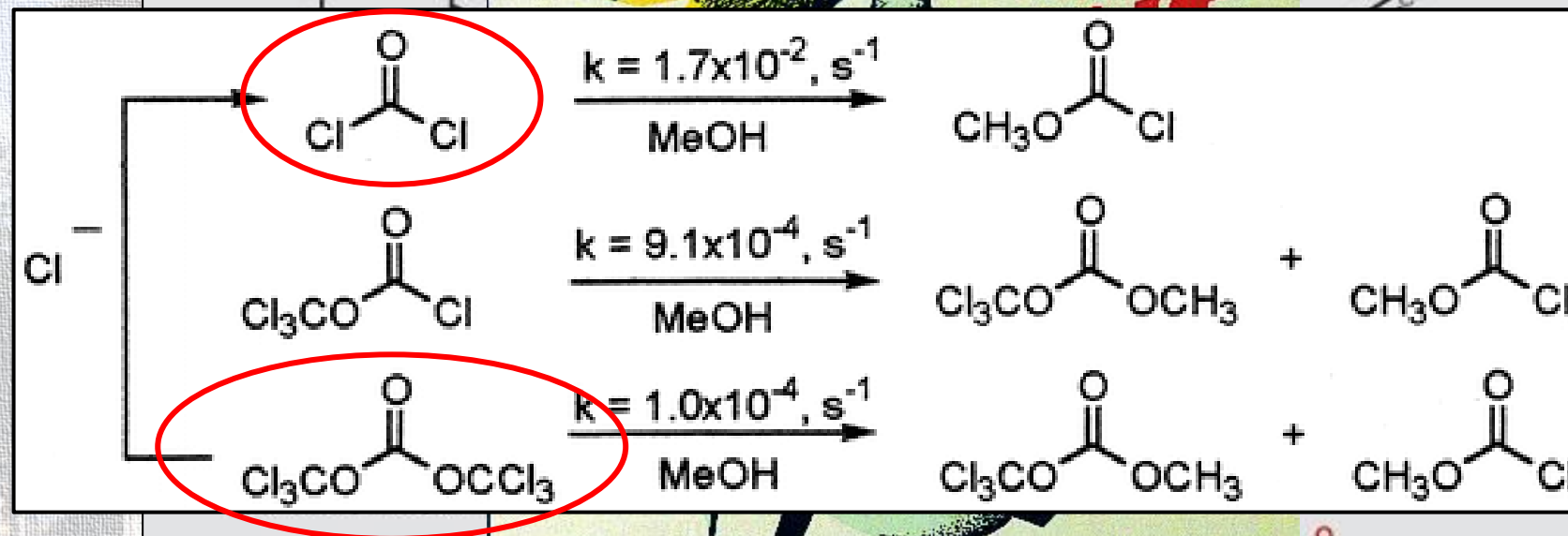
OR GREEN CORN • LUNG IRRITANT • CAUSES
INCREASED DOPEY FEELING • COLORLESS GAS



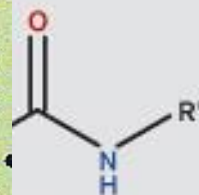


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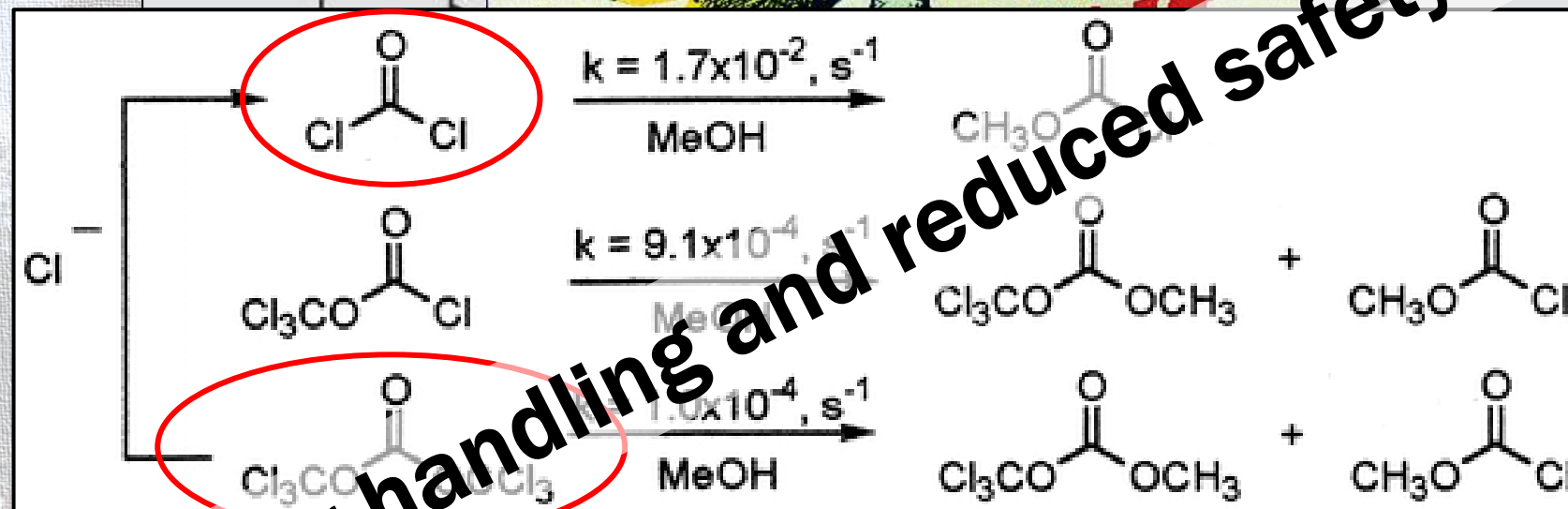
Derivatives



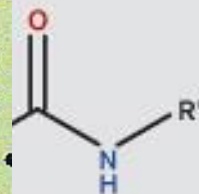
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Derivatives



The Scientific Advisory Board with the OPCW Director-General at their 25th Session (March 2017)

The OPCW Scientific Advisory Board (SAB)

"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)

Nationalities of SAB members in 2017



The membership of the Scientific Advisory Board includes experts from 25 States Parties each serving up to two consecutive 3 year terms.

Map: Modified from Map No. 4379 Rev. 13, UNITED NATIONS. The boundaries and names shown on this map do not imply official endorsement or acceptance by the Organisation for the Prohibition of Chemical Weapons. The final boundary between the Republic of India and the Republic of South Sudan has not yet been determined. The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

Topics considered in 2017 :

- » Emerging technologies
- » Nanotechnology
- » Toxins
- » Verification
- » Medical countermeasures and treatment
- » Chemical forensics and investigative technologies
- » Trends in chemical production


Recent Reports:

Report of the Scientific Advisory Board

 **25th Session**
(SAB-25/1, dated 31 March 2017)


 **24th Session**
(SAB-24/1, dated 28 October 2016)


 **23rd Session**
(SAB-23/1, dated 22 April 2016)

 **Response to the Director-General's Request to the Scientific Advisory Board to Provide Consideration on Which Riot Control Agents are Subject to Declaration Under the Chemical Weapons Convention**
(SAB-25/WP.1, dated 27 March 2017)

 **Report of the Scientific Advisory Board's workshop on Chemical Warfare Agent Toxicity, Emergency Response and Medical Countermeasures**
(SAB-24/WP.2, dated 14 October 2016)

 **Report of the Scientific Advisory Board's Workshop on Chemical Forensics**
(SAB-24/WP.1, dated 14 July 2016)

 **Response to the Director-General's Request to the Scientific Advisory Board to Provide Further Advice on Chemical Weapons Sample Stability and Storage**
(SAB-23/WP.2, dated 25 May 2016)

 **Response to the Director-General's Request to the Scientific Advisory Board to Provide Further Advice on Scheduled Chemicals**
(SAB-23/WP.1, dated 28 April 2016)



Report of the Scientific Advisory Board at its Twenty-Fifth Session
(SAB-25/1*, dated 31 March 2017)
URL: <http://q-r.to/bap1L1>



The Impact of the Developments in Science and Technology in the Context of the Chemical Weapons Convention, Response from the Director-General to SAB-25
(EC-85/DG.8, dated 19 May 2017)
URL: <https://q-r.to/bap1L0>



Report of the Scientific Advisory Board at its Twenty-Sixth Session
(SAB-26/1, dated 20 October 2017)
URL: <http://q-r.to/bap1La>



Response to the Director-General's Request to the Scientific Advisory Board to Provide Consideration on Which Riot Control Agents are Subject to Declaration under the Chemical Weapons Convention
(SAB-25/WP.1, dated 27 March 2017)
URL: <https://q-r.to/bap1Li>



Report of the Scientific Advisory Board's Workshop on Emerging Technologies
(SAB-26/WP.1, dated 21 July 2017)
URL: <http://q-r.to/bap1Ln>



Report of the Scientific Advisory Board's Workshop on Trends in Chemical Production
(SAB-26/WP.2, dated 19 October 2017)
URL: <http://q-r.to/bap1Lr>



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1997 2017
YEARS

serving up to two consecutive 3 year terms.

Map: Modified from Map No. 4170 Rev. 13, UNITED NATIONS. The boundaries and names shown on this map do not imply official endorsement or acceptance by the Organisation for the Prohibition of Chemical Weapons. The final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. The dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).



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Scientific Advisory Board to Provide Further Advice on Scheduled Chemicals
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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) can be used in the care and non-destructive measurement of evidence 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 to ensure the chain of custody and verifying authenticity, especially in regard to digital images?



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?



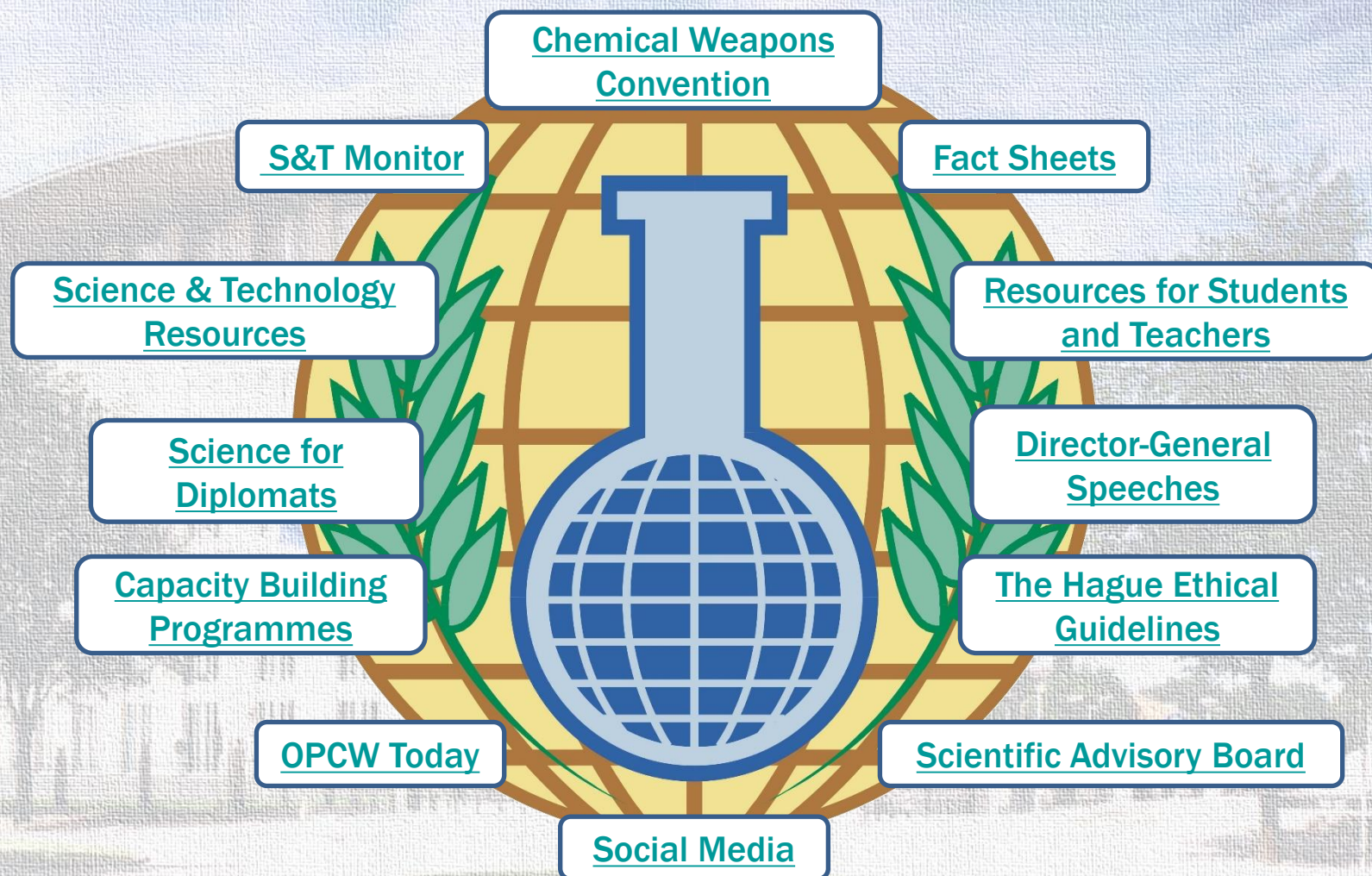
In addition, the TWG will provide advice on Technical Secretariat proposals for methodologies, procedures, technologies, and equipment for investigative purposes.





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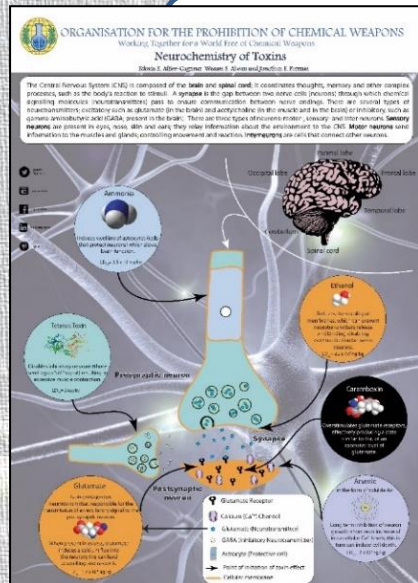
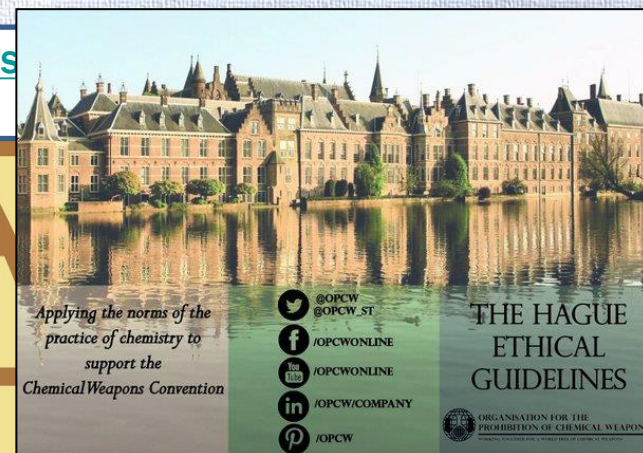
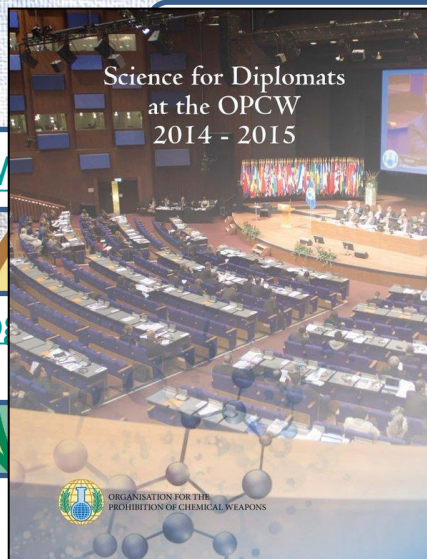
OPCW Science and Technology Resources





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OPCW Science and Technology Resources

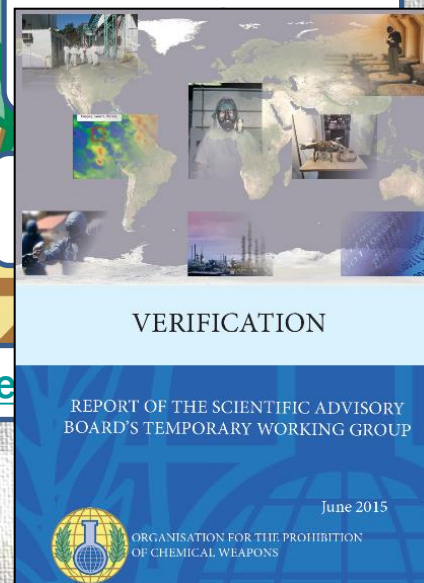


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