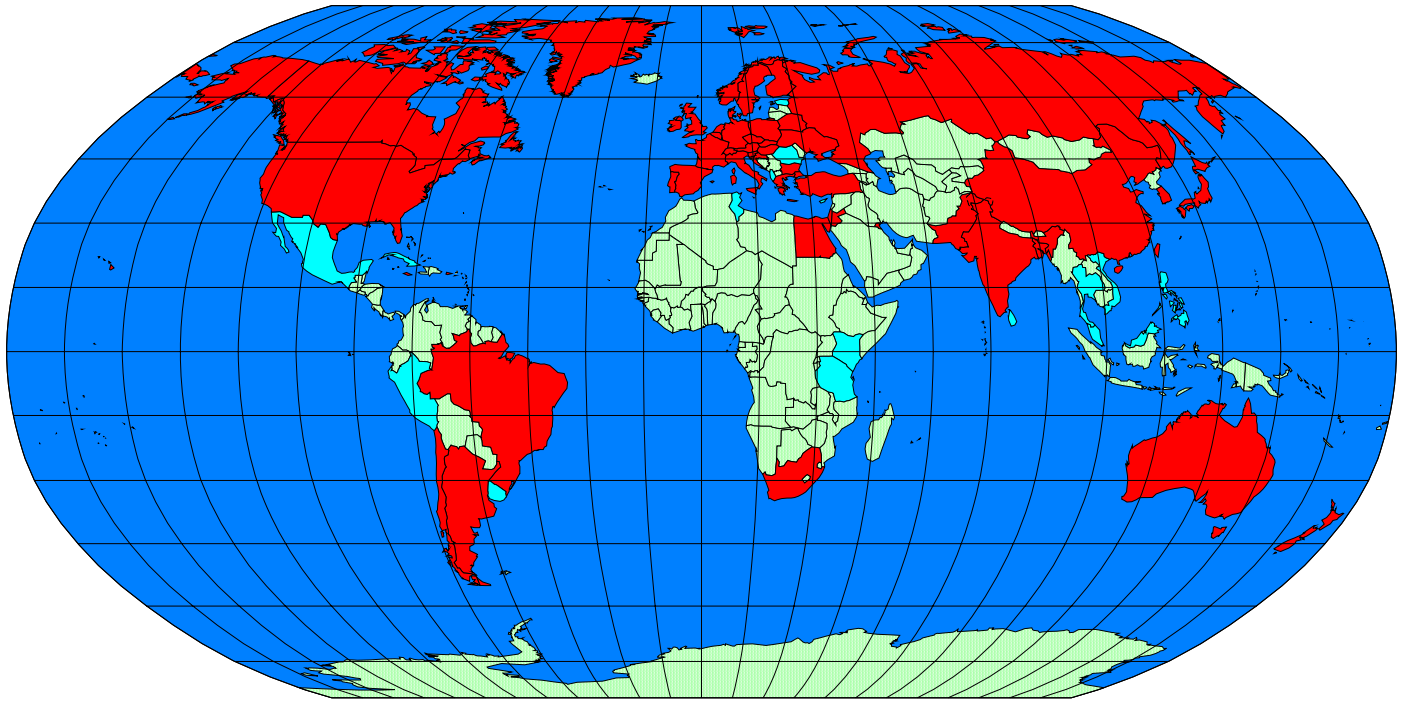
IUPAC

Advancing Worldwide Chemistry

IUPAC's mission is to advance the worldwide aspects of the chemical sciences and to contribute to the application of chemistry in the service of Mankind.

- Promotes norms, values, ethics of science
- Advocates free exchange of scientific information and access of scientists
- Addresses global issues as a scientific, international, non-governmental, objective body

IUPAC Member Countries



49 National Adhering Organizations (NAOs)
19 Associate National Adhering Organizations (ANAOs)

IUPAC Organization

Divisions and Standing Committees manage IUPAC's scientific work

- **Physical & Biophysical Chemistry**
- **Inorganic Chemistry**
- **Organic & Biomolecular Chemistry**
- **Polymer**
- **Analytical Chemistry**
- **Chemistry & the Environment**
- **Chemistry & Human Health**
- **Chemical Nomenclature & Structure Representation**
- **Committee on Chemistry and Industry (COCI)**
- **Committee on Chemistry Education (CCE)**
- **CHEMRAWN Committee**
- **Committee on Printed and Electronic Publications (CPEP)**

Major IUPAC Activities

- Development of the Language of Chemistry
  - Nomenclature, Symbols, Terminology
- Standardization of Chemistry Methods
  - Data Presentation, Study of Analytic Methods
- Critical Evaluation of Physico-Chemical Data
  - Atomic Weights, Thermodynamic Data, Kinetic Data
- Data Exchange Standards for Computers and Instruments
- Sponsorship of Conferences
- Chemistry Education
- Industrial Safety and Environmental Programs
- CHEMRAWN Conferences addressing Chemistry and Societal Impact

IUPAC/OPCW International Workshop: Impact of Advances in Science and Technology on the CWC

- 22-25 April, 2007 in Zagreb, Croatia
- 68 participants from 30 countries
- Sessions included:
  - **Context of the Chemical Weapons Convention**
  - **Trends in the chemical industry**
  - **Developments in chemical synthesis, analysis and production**
  - **Advances in fields such as nanotechnology and decontamination technology**
  - **Expert commentary on the presentations and break-out discussion sessions**
- Report published in *Pure and Applied Chemistry, Vol. 80, No. 1, pp. 175–200, 2008.*

Workshop Findings and Conclusions

Divided into Five Categories:

- Technical challenges to the CWC
- Technical challenges relating to the implementation of the CWC
- Protection against the effects of chemical weapons
- Opportunities in the field of international cooperation
- Awareness-raising, education, and outreach

Workshop Proposals to the OPCW

- Additional efforts to ensure national implementation of the CWC, especially with regard to the General Purpose Criterion
- Agreement on the need for declaration of toxic chemicals held by States Parties for law enforcement
- Further enhancement of verification
- Further development of OPCW analytical capabilities, including capability to analyze toxins and biomedical samples
- Inclusion of relevant nonscheduled chemicals in analytical database
- Training of chemists, particularly in the developing world, in the use of these analytical methods and equipment
- Strengthening linkages and collaboration with other international treaties and mechanisms related to managing chemicals and minimizing their adverse impacts

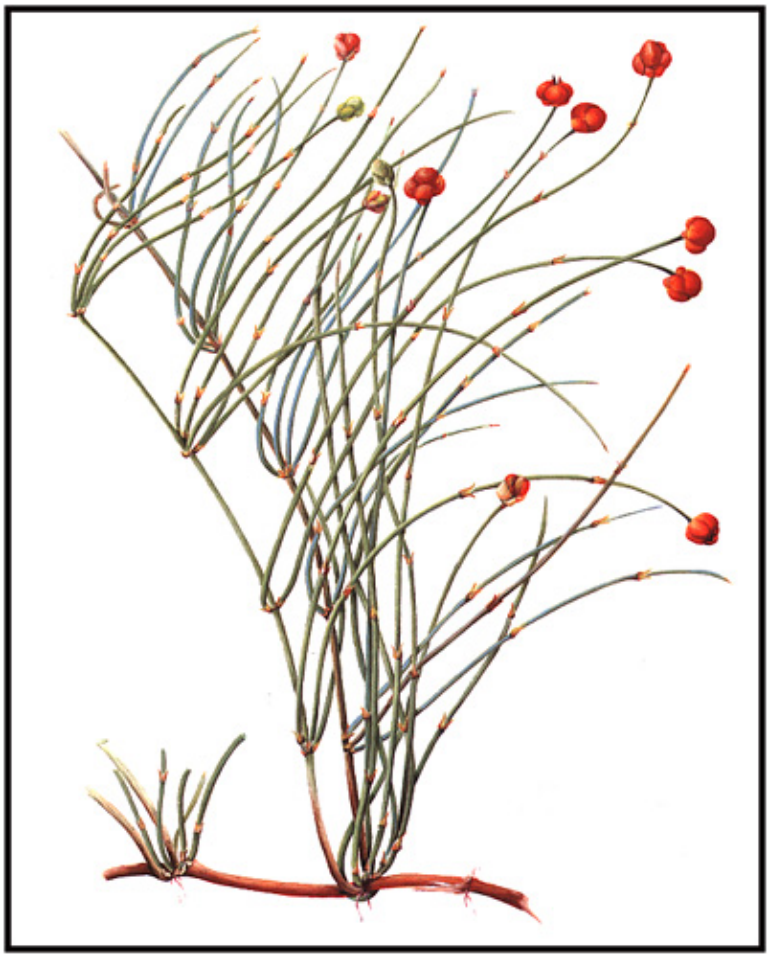
Chemical Weapons Convention:
Educational and Outreach Challenges

- Ownership – *"CWC is someone else's responsibility"*
- Concerns of negative impact on public image of chemistry
- Knowledge base of chemistry teachers at all levels about the issue
- Little formal attention to ethical issues in curriculum
- Remoteness of CWC structure to educational system

Multiple Uses of Chemicals

A Chemical Plant

Multiple Uses of Chemicals



(CNN)

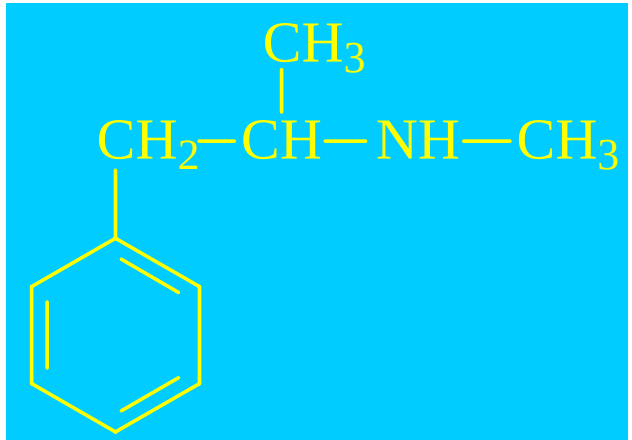
A Chemical Plant

Misuse of Chemicals ephedra extracts banned as diet supplements in several countries

Triple Stack

Epehedra
Caffeine
Aspirin (ASA)

pseudoephedrine
(cough suppressant)



methamphetamine
(crystal meth)


TRIPHED
COLD & ALLERGY RELIEF

Export Industry

Multiple-Use Chemicals

- Choices about the beneficial use, misuse, or abuse of these multi-use materials lie in our hands.

Role for Science Education? Break-Out Session

- Access to information
- Diversion of readily available materials
- Whose responsibility?
- Understanding and owning ethical responsibility
- Other examples

Chemical & Biological Weapons

$HOCH_2CH_2—S–CH_2CH_2OH$

thiodiglycol

$ClCH_2CH_2—S–CH_2CH_2Cl$

mustard gas

Water-based dyes in cloth manufacturing industry, including rural industries in developing countries

Organization for Prohibition of Chemical Weapons

CIVILIAN AREAS OF IRAN.

Chemical and Biological Weapons: Role for Science Education ?

- Access to information
- Diversion of readily available materials
- Whose responsibility?
- Understanding and owning ethical responsibility
- Other examples

Where we are now

- Project complete
- http://www.iupac.org/multiple-uses-of-chemicals
- Material – text and pictures
- Also 4 background papers in 6 languages
- Room for more
- Comments welcome!
  - Alastair Hay (a.w.m.hay@leeds.ac.uk)
  - Peter Mahaffy (peter.mahaffy@kingsu.ca)