Chemical Safety and Security in a Rapidly Changing World

by Peter Mahaffy, Jonathan Forman, Alastair Hay, and Christopher Timperley

What will the world look like in 50 years? What do models show are the likely changes to our biophysical environment and planetary boundaries? How will science, technology, and education change in response? How has warfare changed over the past decades? What is likely to be the role of non-state actors in conflicts of the future? What are the implications of changes in all of these areas for chemical safety and security?

Key questions such as these shaped three days of provocative presentations and discussions at OPCW Day, the first public event organized by the Organization for the Prohibition of Chemical Weapons (OPCW) to commemorate the founding of the organization 19 years ago. The event, held 2-4 May 2016 in the Hague, opened with remarks from OPCW Director General Ahmet Üzümcü [1] and included a message to the conference and exposition from the UN Secretary General Ban Ki-moon, who highlighted the role of OPCW and its partners in working toward disarmament and facilitating the use of chemistry for the betterment of humanity and the environment. [2]

Some 60 speakers and discussion leaders brought diverse perspectives from OPCW, international and intergovernmental organizations, the chemical industry, academia, and a wide range of science- and technology-based organizations, including the disarmament community.

Why this wide-ranging look to the future at this point in time for OPCW? Medium-Term priorities for the organization are shifting [3] in response to strategic planning for OPCW's future, following the successes achieved in obtaining widespread ratification of the Chemical Weapons Convention, the destruction of chemical weapons stockpiles, and a Nobel Peace Prize. A major focus for OPCW going forward is to understand how the world will change in the next 50 years, and to anticipate how chemical safety and security cultures, as well as emerging and enabling technologies, will need to evolve to prevent the re-emergence of chemical weapons.

On the scientific side, OPCW Day participants learned about advances in the use of sensors, space technologies, autonomous systems, and data collection and informatics with potential applications to chemical security. Participants in the interactive education and outreach sessions learned about the remarkable changes in the incorporation of sustainability concepts in industry over the past 20 years, including both self-commitment and regulation.

Yet chemistry education has not been equally successful in infusing green chemistry, sustainability, the UN Sustainable Development Goals, and chemical safe-

OPCW Day special guests and keynote speakers. Back row (left to right): Vernon Gibson (Chief Science Advisor to the UK Ministry of Defense), Ivo Šlaus (Honorary President of the World Academy of Arts and Science), and OPCW Deputy Director-General Hamid Ali Rao. Front Row (left to right): H.E. Jozias Johannes van Aartsen (Mayor of The Hague), Martin Karplus (Harvard University), H.E. Renée Jones-Bos (Secretary-General of the Ministry of Foreign Affairs of The Netherlands), OPCW Director-General Ahmet Üzümcü, H. E. Eduardo Ibarrola Nicolín (Chaiperson of the Conference of States Parties to the Chemical Weapons Convention), Lassina Zerbo (Executive Secretary of the Comprehensive Nuclear Test Ban Treaty Organisation) and H.E. Carlos Foradori (Vice-Minister of the Ministry of Foreign Relations and Worship of Argentina). (credit OPCW)

Professor Alastair Hay (University of Leeds) "working the room" during his Keynote address "Why Principles?" (credit OPCW)

ty and security considerations throughout chemistry curricula. Participants at one session proposed implementing an overall framework of "Responsible Chemistry Education" (in parallel with the industry's successful "Responsible Care" initiative) to raise the profile of educating for the use of chemicals and to guide efforts to modify both the curriculum and pedagogy to more meaningfully address chemistry at its important interfaces with sustainability, safety, and security.

IUPAC has a longstanding working relationship with OPCW. [4] From the inception of OPCW in 1997, IUPAC has supported OPCW at the scientific level in its efforts to rid the world of chemical weapons. Every five years, IUPAC has convened scientific conferences to review advances in science which may affect the Chemical Weapons Convention. These advances include, among other things, new synthetic methods, advances in nanotechnology that may influence the delivery of chemicals, and technologies for detection. IUPAC has also made important contributions to the OPCW Scientific Advisory Board. Over the past decade, building on the recommendations of a 2005 joint IUPAC/OPCW Conference in Oxford, the two organizations have partnered on projects and working groups to provide materials and evidence-based approaches for education and public outreach, including the 2015 Hague Ethical Guidelines. [5] IUPAC was represented at OPCW Day by President Natalia Tarasova and by present and past members of the Committee on Chemistry Education and several scientific divisions.

References

1. www.opcw.org/fileadmin/OPCW/ODG/uzumcu/OPCW_Day_opening_remarks.pdf
2. www.opcwday.org/wp-content/uploads/2016/03/UN-SG-Note.pdf
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4. *Chemistry International* Sep 2014, p.9 (http://dx.doi.org/10.1515/ci.2013.35.4.4) and July 2013, p.4 (http://dx.doi.org/10.1515/ci-2014-0508)
5. The Hague Ethical Guidelines: www.opcw.org/special-sections/science-technology/the-hague-ethical-guidelines/ (translations in French, Russian, Spanish, Chinese and Arabic are also available).

Peter Mahaffy is a past chair of IUPAC Committee on Chemistry Education. He served on the working group on education and outreach for OPCW, and has co-led several joint IUPAC/OPCW projects that communicate through interactive, electronic educational resources* the need to make responsible choices about the multiple uses of chemicals and chemical weapons. He is Professor of Chemistry at the King's University in Edmonton, Canada and co-director of the King's Centre for Visualization in Science.

*** www.opcw.org/special-sections/education/multiple-uses-of-chemicals**

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Alastair Hay is Emeritus Professor of Environmental Toxicology at the University of Leeds. He has worked on chemical weapons issues for nearly 40 years and has published widely on chemical warfare issues. Part of this work has included six investigations of actual and alleged chemical weapons use. He has also partnered with IUPAC on several projects addressing the need for education and outreach.

Christopher Timperley is Chair of the OPCW Scientific Advisory Board (SAB) and has contributed to the SAB's Temporary Working Groups on the Convergence of Chemistry and Biology, Education and Outreach, and Verification. He is the Capability Advisor for Chemistry Hazard Assessment, and a Technical Fellow at the Defence Science and Technology Laboratory (Dstl), Porton Down, UK.

POLYCHAR 24 World Forum Advanced Materials

by Michael Hess

The 24th World Forum on Advanced Materials (POLYCHAR) (derived from Polymer Characterization) was hosted by Poznan University of Technology, Poznan, Poland, and organized by the Institute of Materials Technology of the Faculty of Mechanical Engineering and Management and the Faculty of Chemical Technology, 9-13 May 2016 (www.polychar24.divisia.pl). It is the policy of POLYCHAR to visit a different part of the world each year and to give, in particular, students and young scientists from all over the world an opportunity to present their scientific work to a larger international audience, to meet prominent scientists, and to attend a tutorial, or short course, held by international scientists.

The previous conferences had been in Denton, Texas, USA (where POLYCHAR was founded in the year 1992), Guimaraes, Portugal (2004), Singapore (2005), Nara, Japan (2006), Buzios, Brazil (2007), Lucknow, India (2008), Rouen, France (2009), Siegen, Germany (2010), Kathmandu, Nepal (2011), Dubrovnik, Croatia (2012), Gwangju, South Korea (2013),