Innovative new technologies for chemical security, safety, and health

by Bernard West

The Organisation for the Prohibition of Chemical Weapons (OPCW), which was awarded the Nobel Peace Prize in 2013, is in the process of updating its strategic plan. Workshops are being held to produce reports that will assist in this strategic planning process.

IUPAC has had a relationship with OPCW for several years (see L.K. Sydnes, *Chem Int.* July 2013, pp. 4-8; doi.org/10.1515/ci.2013.35.4.4). The nature of this relationship has been that OPCW seeks advice from IUPAC on matters of science, particularly concerning chemistry in its broadest sense. Dr. Mark Cesa, Past President of IUPAC, has been the key link with OPCW and has been working to update the Memorandum of Understanding between OPCW and IUPAC (iupac.org/iupac-opcw-take-partnership-new-level/), as well as participating in meetings of OPCW and its Science Advisory Board (SAB).

One of the recent planning workshops focused on new innovative technologies that might play an important part in OPCW in the future. A organising team was led by Dr. Jonathan Forman of OPCW, Dr. Mark Cesa of IUPAC, and Dr. Camly Tran of the US National Academies of Science, as key persons in assisting in the development of the workshop agenda.

The workshop took place in Rio de Janerio from 3-5 July 2017 at the Brazilian Academy of Sciences and the Brazilian Chemical Society offices. Several members of the OPCW SAB were present, along with the organising team and the speakers—over 40 people in all. The result of the meeting is a report by the SAB which was completed by the end of the meeting and posted on the OPCW website update to (www.opcw.org/fileadmin/OPCW/SAB/en/sab26wp01_SAB.pdf). A summary of the meeting is available in Portuguese on the Brazilian Academies site, www.abc.org.br/

The Scientific Advisory Board (SAB) of the Organisation for the Prohibition of Chemical Weapons (OPCW) discussed the potential uses innovative scientific and technological tools in the implementation of the Chemical Weapons Convention (CWC) at a workshop "Innovative Technologies for Chemical Security", held from 3 to 5 July in Rio de Janeiro, Brazil.

The event was organised in cooperation with the International Union of Pure and Applied Chemistry (IUPAC), the National Academies of Science, Engineering and Medicine of the United States of America (NAS), the Brazilian Academy of Sciences and the Brazilian Chemical Society.

"This workshop brought together an international transdisciplinary group of experts whose work involves integrating remote sensing technologies, autonomous systems, and/or mobile devices with data analytics into enabling technologies, many of which could find application in the implementation of the Convention," explained SAB Chairperson, Dr Christopher Timperley.

The attendees presented their work in areas that included remote sensing of biochemical change in vegetation, satellite imagery analysis, mobile and wearable sensing technologies, digital health, and automated systems for data collection in dangerous environments.

They also heard from OPCW experts, who discussed their experiences in chemical weapons related investigations, including those in the Syrian Arab Republic. OPCW Science Policy Advisor and Secretary to the SAB, Dr Jonathan Forman explained: "New advances across the chemical and biological sciences are increasingly enabled by ideas and tools from sectors outside these disciplines, with information and communication technologies playing a key role across 21st century scientific development. In the face of such rapid advances, we look for technological opportunities that strengthen our capabilities in the field of chemical disarmament."

The workshop discussions provided useful insights into the use of innovative new technological tools for the implementation of the CWC that will inform the SAB's report on developments in science and technology for the Fourth Review Conference of the CWC in December 2018.

The workshop, held at the Brazilian Academy of Sciences, was attended by 45 scientists and engineers from 22 countries, and enabled through generous support from IUPAC, the NAS and the European Union.

OPCW press release; www.opcw.org/news/article/scientists-review-innovative-technologies-for-chemical-security/

centenario/?Ciencia-para-a-paz. At the conclusion of the workshop, OPCW published a press release (see box).

The meeting was very successful and interesting because of the wide range of new technologies that were discussed. These technologies will have significant effects on a variety of organisations, not just OPCW. IUPAC is preparing to publish a special issue of *Pure and Applied Chemistry* containing many papers based on the speaker's presentations. The listing below of the topics discussed is an indication of the extensive work of the OPCW and its links with the chemistry world.

- Contingency operations - challenges for OPCW inspectors; Katarina Grolmusova, Chemical Weapons Inspector, OPCW
- Aerial Platforms for Reconnaissance, Sample Planning and Basic Detection; Guy Valente, Assistance and Protection Branch, OPCW
- Technologies being adopted for precision agriculture and their potential applications; Ricardo Inamasu, Embrapa Labex, Brazil
- Optical sensors for the detection of biophysical and biochemical changes of plants: Case studies from plant-pathogen interactions; Matheus Kuska, University of Bonn, Bonn, Germany
- Remote Sensing of Terrestrial Ecosystems; Greg McCarty, USDA-ARS Hydrology & Remote Sensing Laboratory, USA
- Data Fusion – Satellites and Dispersion Models: The 2016 Al-Mishraq Sulphur Plant Fire; Oscar Björnham, FOI Sweden
- Promise of large-scale sensor networks and big data to measure and manage our environment; Melissa Lunden, Aclima, USA
- Targeted catalytic degradation of organophosphates: pursuing sensors; Elisa Orth, Federal University of Parana, Brazil
- Multisensor Systems (E-nose) for toxic gases detection and biomedical applications; Cristhian Manuel Durán Acevedo, Universidad De Pamplona, Colombia
- Flexible, foldable, and wearable paper-based electronics and electrochemical devices; Murilo Santhiago, Instituto de Química, Brazil
- Wearable Technology for Chem/Bio: Existing and Emerging Capabilities; Richard Ozanich, Pacific Northwest National Laboratory, USA
- Digital Health: What You Can Learn from your Smartwatch; Xiao Li, Stanford University, USA
- Understanding Smart Data Collection vs Big Data Collection and How to Focus AI Analysis; George Harris, Basil Leaf Technologies
- Unmanned Airborne Mass Spectrometer System (UAS-MS) for Autonomous in situ Chemical Measurements under Harsh Environment Conditions; Jorge Diaz, University of Costa Rica, Costa Rica
- Collection and Processing of Biological Samples in Remote and Dangerous Places; the ESP as a Case Study; Jim Birch, Monterey Bay Aquarium Research Institute, USA
- Modular robotic toolbox for counter-CBRN support; Grzegorz Kowalski, Industrial Research Institute for Automation and Measurements PIAP, Poland
- Unmanned Aerial Vehicle Equipped with CBRN DIM Capability to Enhance the Chemical Awareness; Marcel van der Schans, TNO CBRN-DIM UAV
- Monitoring Networks tracking biogeochemical changes in coastal and maritime environments from Argentina; Andrés Arias, Instututo Argentino de Oceanografia, Argentina
- Remote Sensing and Open-Source Research for Nonproliferation Analysis: Case Studies from the MIIS Center for Nonproliferation Studies; Catherine Dill, Middlebury Institute of International Studies at Monterey, United States Computer Aided
- Engineering Tools Applied to Chemical Weapons Convention implementation; Evandro de Souza Nogueria, OPCW SAB

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https://iupac.org/project/2017-001-1-020

Colloquium Spectroscopicum Internationale XL

by Alessandro D'Ulivo

The 40th edition of the Colloquium Spectroscopicum Internationale (CSI XL) was held in Pisa (Italy) 11-16 June 2017, at the Congress Center of Pisa. It is the third time that this prestigious conference on Analytical has been held in Italy, following CSI II (Venice, 1951) and CSI XVII (Florence, 1973). On this occasion, CSI XL took place together with the 9th Euro-Mediterranean Symposium on Laser Induced Breakdown spectroscopy (IX EMSLIBS, chaired by Vincenzo Palleschi), having a positive impact on both conferences by fostering connections among participants of all ages, as well as the level of conference participation, in the stimulating atmosphere of a beautiful Tuscan city of art.

Both conferences were organized by the Institute of