projects on electronic delivery of critically evaluated data.

The bulk of the meeting was a wide-ranging discussion of participants' experiences, perspectives, and challenges in critical evaluation. In this context, several themes emerged. The goal of the meeting was to exchange ideas and perspectives; no attempt was made to reach consensus during the discussion. Consequently, not all participants may agree with all thoughts expressed here.

- An essential goal of critical evaluation is to convey to data users, whatever their level of chemical sophistication, a well-supported estimate of the consensus value based on experimental results for the quantity under consideration and of the uncertainty associated with that value. The metrological approach to the expression of uncertainty is an important tool in this context.
- Advances in computer-based handling of scientific data are leading to new possibilities for data manipulation and interpretation. These advances enable more efficient handling and presentation of data and present new challenges in providing information about the data (meta-data) in formats that are assessable to both humans and computers.
- The delivery of data to users is presently in flux because of continuing rapid changes in electronic methods of data aggregation, analysis, and presentation. It is essential to make evaluated data available through channels that potential users prefer, or at least will actually use, as well as accessible for automated functions and collation.

Communication among meeting participants is continuing and interest is coalescing around two interdivisional activities. The first of these is assembling an interdivisional Task Group to prepare a Technical Report describing best practices for the critical evaluation of data. And the second is the establishment of an Interdivisional Subcommittee on Critical Evaluation of Data to continue the discussion of topics of mutual interest and to develop additional projects as the need arises. Wider participation in this interdivisional activity is welcome.

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www.iupac.org/project/2016-043-1-500

Middle east regional cooperation and sustainable water management of transboundary water

The Middle East is in turmoil in various ways, especially through the long-standing political crisis and conflicts affecting the people of the region. Widespread conflict and human rights violations, spurred by unsustainable water and energy supplies, coupled with climate change, are causing the displacement of the population, as well as environmental migration. Poor conservation of the environment and inadequate treatment of pollutants led to the degradation of chronically depleted water resources and the trans-boundary movement of pollutants from one political entity to another, endangering the drinking water quality and contributing to the ongoing conflicts in the region. Thus, the role of water in improving human lives has never been more important, as stated by the UN Sustainable Development Goals (SDGs) [1]. The sustainable management of water resources and the quality of water in rivers, lakes, and aquifers plays a key role in meeting the challenge of climate change and in achieving a secure food supply and improved public health.

The continuous and severe drought over the past few years has raised water scarcity issues and water quality degradation in the region is worsening. As noted by Tal and Abed (2010) and by Schoenfeld (2011), the possibility of dealing with these issues requires experts detached from the political conflict and able to work across geopolitical borders. The involvement of scientists from neighboring nations and the international community is considered the right avenue to address regional issues [2,3].

To review these issues, a workshop titled, "Regional Cooperation and Sustainable Water Management of Transboundary Water", was organized with the support of IUPAC's Chemistry and the Environment Division. It took place in Malta, 10-15 December 2017, as part of the biennial Malta Conferences Foundation (MCF), MALTA VIII, "Frontiers of Science: Research and Education in the Middle East—a Bridge to Peace". This continues previous initiatives, including a prior program of workshops in collaboration with the MCF on regional water chemistry which yielded positive results and several publications and

presentations through IUPAC and at other international conferences.

The workshop was set against this background with the aim to use science to help build bridges across borders and cultures where other mechanisms are less effective. The participants included chemistry and environment researchers and scientists, government regulatory agencies, as well as non-governmental advisory bodies and advocacy organizations concerned with climate change, transboundary water resources management, and regional conflicts.

The workshop was planned to bridge the gap between the science and practice of water management in order to discuss and crystallize practical solutions that would help to achieve the UN 2030 Sustainable Development Goals for water and the following objectives:

Objectives

- To establish a regional alliance of chemists and water engineers to interact and discuss the different aspects of hydrology and transboundary water quality.
- To encourage the multinational activities required to address regional challenges, facilitating the exchange of information and ideas on water chemistry, and harmonizing the approaches available for the scientific community to evaluate water suitability for human consumption and to handle multiple uses of water, while avoiding potential conflicts between the riparian countries.
- To highlight sustainable management strategies for resources that prevent the depletion of the transboundary surface- and groundwater aquifers and the deterioration of water quality, developing closer relations between neighbors and strengthening water security for all.
- To discuss selected case studies and potential mitigation strategies to motivate appropriate multinational actions against transboundary anthropogenic and emerging pollutants.
- To suggest supplementary research to confront issues of food and energy security, the environment, and climate change, as required.
- To recommend applicable standards, enabling valid water monitoring across the region.

Workshop Sessions

During the workshop, over 50 professionals from the regional water community, including students and early-career scientists (supported by IUPAC) from universities and national institutes in 15 Middle East and North Africa (MENA) countries met for 4 days to turn water challenges and risks into an opportunity that delivers benefits well beyond the water sector and the region. In three different sessions, the speakers presented the issues of climate change and the consequence of water scarcity on water availability and water quality including:

- Water insecurity and prospects in the Middle East
- Water quality of critical transboundary water resources
- Going beyond aid for the development of sustainable wastewater treatment and water quality crisis in Gaza Strip (Case studies)
- Stock-taking and critical review of on-going research, evaluating water chemistry issues of relevance to the whole region
- Nano-filtration, bioremediation, and bio-sorption processes for the removal of chemicals and micro-pollutants from the soil and from aqueous solutions.
- Conservation of water resources and ecosystems, as well as reuse of wastewater and desalination technologies.

Mitigation measures and water treatment systems were presented, as well as soil and water pollution prevention systems, highlighting the use of nano-filtration membranes and bio-remediation for the removal of persistent pollutants. Posters displayed throughout the entire meeting included presentations on the impact of climate change, water and wastewater treatment systems, the removal of specific pollutants, and electro-chemical and electro-catalytic oxidation processes.

Round table discussions were organized to discuss and share new ideas and feasible innovative projects on some of the major water, wastewater, and environment challenges, as well as to foster new collaborations. The workshop addressed the challenges and risks and identified the opportunities to drive the regional agenda to meet the needs and expectations of the millions of Middle East citizens by improving water availability, quality, safety, and security.

The water professionals were briefed on the transformation of water in the Middle East, as outlined by presentations focusing on the delivery of water infrastructure solutions to fill the massive gaps in the provision of clean water around the region. This was followed by a discussion on how management programs

can lead water utilities in emerging economies to deliver vastly improved services, even to the poorest in society.

Participants argued that business as usual is not an option if we are to achieve universal access to water and sanitation at the scale that lies ahead. Therefore, it is critical to explore innovative chemical and engineering sciences to help us reach the SDGs, and to seek out non-traditional ways of providing and funding water and sanitation for all. New policies, technology, and management systems are required to improve the regional ecology, as well as social equity, and to empower water professionals to find solutions to:

- climate change
- urbanization and demand for food and energy
- release and dumping of hazardous chemicals
- disposal of untreated waste from industrial, urban and agriculture
- devastation of terrestrial and aquatic ecosystems

Good governance, involving the public, the private sector, local communities, and transboundary cooperation are fundamental elements to achieve sensible water withdrawals, water conservation, and rational use, including:

- Applied advanced irrigation and agricultural production systems
- Advanced treatment of wastewater, allowing complete reuse
- Extending waste to energy and resources recovery
- Accelerating brackish groundwater and sea water desalination

In the Middle East, poor governance, population growth, global warming, and the denial of water and food supplies fuel conflicts, making population displacement and environmental migration prevalent. Signs of climate change are everywhere: long droughts, rising seas, violent storms, melting ice, and the flooding of coastal zones are apparent. These events affect high- and low-income countries across the world. All face water catastrophes, as recognized by the Paris Agenda and the UN SDGs in 2015, and the World Economic Forum in 2016. All see water management as a key to meeting the world food and public health safety, placing water at the top of global risks.

To Conclude:

- Today, more than ever, water scarcity and global warming are at the top of the global agenda. The world is confronted with security and strategic issues: water scarcity is a factor of tension and conflict.
- In the Middle East, environmental degradation, high population growth, fast urbanization, and the displacement of refugees are all causing economic, political, and environmental distress in the region and beyond.
- Adopting active regional hydro-science diplomacy would lead to a fruitful collaboration among the riparian countries, securing water for current and future generations.

As further dissemination of this workshop, a chapter titled, “Impact of Persistent Droughts on the Quality of the Middle East Water Resources”, will be published in an upcoming book edited by Satinder Ahuja [4].

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Chemical and Biochemical Thermodynamics Reunification

According to the IUBMB-IUPAC joint commission on biochemical nomenclature (JCBN), two categories of thermodynamics based on different concepts and different formalisms have been established: i) chemical thermodynamics that employs conventional thermodynamic potentials to deal with chemical reactions; ii) biochemical thermodynamics that employs Legendre-transformed thermodynamic potentials to deal with biochemical reactions based on the formalism proposed by Alberty [1].

With this recently approved project, a task group lead by Stefano Iotti will attempt to show that the two worlds of chemical and biochemical thermodynamics, which so far have been treated separately, can be re-unified within the same thermodynamic framework.

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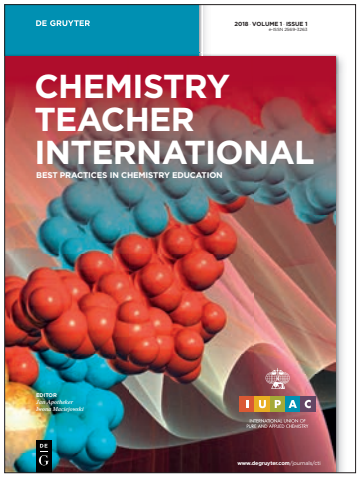
Chemistry Teacher International

As part of IUPAC's publishing partnership with De Gruyter, the Committee on Chemistry Education (CCE) will launch a new open access journal, *Chemistry Teacher International* (*CTI*), in summer 2018.

This open access journal will be published biannually, with the inaugural issue released in June 2018 and the second issue in December. The online journal will be peer reviewed and focused on good practices. The target groups are teachers in secondary education, as well educational researchers. CCE expects about 24 articles per year from different sources, in part from selected proceedings of the International Conference on Chemical Education, which the Committee organizes every two years.

Jan Apotheker will function as the executive editor, together with Iwona Maciejowska of the Division of Chemical Education of EuCheMS.



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https://www.degruyter.com/view/j/cti

Human Health Risk Consideration of Nano-Enabled Pesticides for Industry and Regulators

Previous IUPAC Nanopesticides projects (*e.g.,* projects 2012-020-3-600 and 2016-016-2-600) have developed risk assessment frameworks and key criteria that could help risk assessment processes for nano-enabled pesticides (especially for ecological risk assessments) [1,2].

While the approach elucidated in the above IUPAC projects is now being considered by regulatory agencies internationally (*e.g.*, US EPA, Environment Canada, APVMA Australia, EFSA Europe), there is a need to expand our thinking and provide more practical information to answer some key questions, such as those listed below:

1. When a new product is presented to regulators, what are the key questions that they would like to ask? This essentially defines the problem formulation step in the health risk assessment framework.
2. What are the key characterization and analytical requirements for the specific product that may be necessary to answer the questions posed as part of Question 1 for a specific product type?
3. What are the specific methods or approaches for human health effects that are readily available and appropriate to answer the questions for the specific product under consideration?