

# Summary of the Workshops at Malta-VI

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At the conference, *Frontiers of Science: Research and Education in the Middle East*, held in November 2013 (Malta-VI), workshops examined scientific, educational, and regional issues.

## **Chemistry and Bio-Medicinal Chemistry**

A wide range of topics were explored in this workshop, including cancer therapy, tumor markers, HIV activity, and myocardial infarction, as well as chemical synthesis and computational studies. Of great interest was a presentation on clinical trials on the analysis of breath samples for the early detection of lung cancer in which chemical nanoarrays and GC-MS are used for the comparison of the signatures and compositions of the exhaled volatile organic compounds that are created as a result of the biological pathways that occur in the human body. The results show a clear distinction among 1) head and neck cancer patients and healthy controls, 2) lung cancer patients and healthy controls, and 3) head and neck cancer patients and those with lung cancer. Other clinical trials aimed to explore the difference in the breath print of the four most widespread cancers in the developed world (lung, prostate, colorectal, breast), which account for half of the cancer deaths; the results showed that each cancer has a unique pattern of volatile organic compounds when compared with healthy patients.

## **Analytical, Nanotechnology, and Material Science**

The current trends in these areas that were described included the atmospheric measurement of pesticides, the extraction, separation, and analysis of lignans, and electron transfer in biological systems. The realm of complex functional bio-composites has attracted a good deal of interest, in particular plant cystoliths, which are mineralized objects formed by specialized cells in the leaves of certain plants, that scatter incident light. Cystoliths are regularly distributed in the epidermis of leaves and protrude into the photosynthetic tissue such that the photosynthetic pigments generate a steep light gradient in the leaf. Under most illumination regimes, the outer leaf layer is light saturated, rendering the photosynthetic apparatus kinetically unable to use the excess light for photochemistry.

## **Energy, Environment, Air and Water Quality**

This workshop had many interlocking components. Inasmuch as collaborations that involve renewable energy among several Middle East countries are currently ongoing, this aspect of the workshop concentrated on current research activities; the hope was expressed that new collaborations could be established to lead to the further development of sustainable resources that do not impact adversely on the environment, particularly air quality. With regard to water, the shared resources are under heavy natural and human pressures in terms of quantity and quality, which affect every aspect of life from ecosystems and the environment to food security and health. Because of population growth and urbanization, and despite a general improved

standard of living in the region, many communities still lack access to safe drinking water and basic sanitation. The problem of water scarcity provides important opportunities for cooperation and conflict prevention, and could be at the core of programs to promote peaceful coexistence and collaboration among people in Israel, the Palestinian Authority, and Jordan, to the mutual benefit of all the stakeholders.

### **Chemistry Safety and Security**

The awarding of the 2013 Nobel Peace Prize to the Organization for the Prohibition of Chemical Weapons (OPCW) placed in clear focus the work of that group in the development of the international Chemical Weapons Convention (CWC) and the removal of chemical weapons from current areas of conflict in the Middle East. Especially relevant is the fact that some of the participants at Malta-VI were from the several countries that have not ratified or signed the CWC. It was pointed out that OPCW is working toward the creation of an international code of conduct for chemists, especially in connection with the problems created by the dual use of chemicals for both peaceful and terrorist purposes.

### **Science Education at All Levels**

In addition to the presentations on innovative pedagogy, systemic assessment, and the use of technology, there were several that attracted particular interest. The talk on the ethics of scientific research emphasized the importance of stressing the basic values of honesty, reliability, and objectivity in all of science education. A representative from Saudi Arabia described the enormous progress made by women scientists in the Arab world with a particular focus on her own country where there has been a significant increase in the number of highly qualified women scientists although career opportunities remain limited. A speaker from Egypt reminded the audience that the use of gas weapons in North Africa and the Middle East against civilians engaged in peaceful political protests puts an ugly face on the public perception of chemistry.

For more details about Malta-VI, see <[www.MaltaConferencesFoundation.org](http://www.MaltaConferencesFoundation.org)>.