The International Year of Light and Light-based Technologies

Numerous conferences have been held on themes related to the Islamic golden age of science during the mid-eighth to thirteenth centuries. But the event reported here is the "event of events," so to say. The United Nations declared 2015 the International Year of Light and Light-based Technologies (IYL-2015) to stimulate global interest in light-related sciences and technologies. The IYL-2015 partnership, formed in 2010, is a cross-disciplinary educational and outreach project with over 100 partners from more than 90 countries, accompanied by UNESCO's International Basic Sciences Program. UNESCO's executive board adopted this resolution during its October 2012 session; the UN declared IYL-2015 in December 2013.

The year 2015 marks numerous anniversaries in the field of optics. The oldest among these is the 1000th anniversary of the appearance of Ibn al-Haytham's (965-1040) encyclopedic *Book of Optics* (*Kitāb al-Manāẓir*) by the Arab scientist. Ibn al-Haytham became a central figure in the documents submitted to UNESCO'a board and eventually the UN. The International

Steering Committee of IYL-2015 launched an International Working Group "Ibn al-Haytham" (IWG, http://www.IbnAlHaytham-iwg.org/) to highlight the contributions of other Arab scholars to optics. Azzedine Boudrioua, a professor of optics from the University of Paris, is the IWG's chair and coordinator; Roshdi Rashed, the world-renowned mathematician, science historian, and 2007 King Faisal International Prize Laureate, is the honorary chair.

During this long-ago era, intellectual activity in the Islamic world passed through two stages simultaneously: (1) the translation into Arabic of countless ancient Sanskrit, Pahlavi, Syriac, and Greek scientific and philosophical texts as well as (2) original contributions of the highest caliber made by both Muslim and non-Muslim scholars living in the Islamic world. Even if these original contributions were to be set aside, the very act of translation and preservation entitles all of those involved to a very special place within the history of science. These Arabic-language works were later translated into Latin and other European languages and thereby paved the way for the Renaissance.

In the context of optics, the encyclopedic works of Ibn al-Haytham and his teacher Ibn Sahl (940-1000) deserve special mention. Rashed both examined and translated the Arabic manuscripts into French and English and thus shed new light on the Muslims' contributions to science and to optics in particular. For instance, in 1990 Rashed examined Ibn Sahl's original manuscripts, which are available in the libraries of Damascus and Tehran. From this study, he made the sensational historical discovery that the geometric study of refraction, hitherto attributed to Willebrord Snell (1580-1626), René Descartes (1596-1650), and/or Pierre de Fermat (1601-65) in its sine law form, was known and written upon by Ibn Sahl in his *On the Burning Instruments,* written in 984. Similar researches by Rashed and others have clearly shown that many of the discoveries in optics and other sciences were known in the Islamic world centuries before they became known in Europe.

As part of the IYL-2015, UNESCO hosted an international conference from September 14-15, 2015, at its Paris headquarters. This event, which focused on the accomplishments made during Islamic civilization's golden age and by Ibn al-Haytham, had a very high profile inauguration. Among the dignitaries present were Irina Bokova (director-general, UNESCO), John Dudley (president of the Steering Committee, IYL-2015), Mohamed Amr (ambassador and chairperson of UNESCO's executive board), Ziad Aldrees (ambassador and permanent delegate of Saudi Arabia to UNESCO), and Sheikh Faisal bin Qasim Al Thani (founder and chairman, the Al Faisal Without Borders Foundation, http://www. AlFaisalFoundation.org).

Putting the conference in perspective, Bokova stated that "today, at this time of great change, when ignorance and violent extremism are rife, it is essential [that] we do everything to teach the common history of humanity, to share the histories of women and men who did so much in the past to impact on the world as we know it today. Ibn al-Haytham stands out in this pantheon as a great scientist and humanist." Dudley noted that "studying the history of science and the lives and works and ideas of its pioneers such as Ibn al-Haytham can yield many important lessons, and provide inspiration for the future." The inaugural session was covered by scores of media personnel.

The event featured about thirty presentations distributed into eight sessions: "History Guiding the Future: The Example of Ibn al-Haytham," "Light-based Technologies for the Future," "Education and Investment in Science & Technology," "The Legacy of the Ibn al-Haytham Conference," "History of Optics-1," "History of Optics-2," "The Impact of Light Science and Technology," and "Optics and Photonics in the Arab and Islamic Worlds." Each session was moderated by a distinguished expert.

Renowned speakers in the history of light science, as well as international experts in research, technology, and education, presented talks over two days and provided decision makers, scientists, and the public at large with new historical insights and informed discussions. They further debated the current trends and challenges of research and education in Arab, Islamic, and other countries worldwide. Simultaneous translations were made in UNESCO's official languages: Arabic, Chinese, English, French, Russian, and Spanish.

A co-located exhibition showcased the digital images of these golden age documents and scholarly works, courtesy of the Qatar Digital Library (http://www.qdl.qa). It also featured an exceptional piece, the microscope built by Antonie Philips van Leeuwenhoek (1632-1723), which was exhibited to the public for the first time due to its scientific and historical value. In addition, a documentary film produced by the Qatar National Library displayed various golden age scientific manuscripts. The Ibn al-Haytham Exhibition highlighted his achievements and manuscripts (in digital form).

About 400 scientists, science historians, diplomats, and science policy experts, along with the IWG's members, participated in the event. While some speakers concentrated on the historical aspects, others focused on the current situation in the Arab countries and the developing countries in general and suggested various improvements. Several speakers pointed out that inadequate supplies of electricity and poor lighting conditions affect a sizeable part of the world's population. They suggested some interesting technical and practical solutions to save power and significantly improve lighting systems.

Various speakers concentrated on the status of education and research in the Arab world. In their co-authored "Need to Create International Science Centres in the Arab Countries," Sameen Ahmed Khan (Dhofar University, Oman) and Azher Majid Siddiqui (Jamia Millia University, India) proposed that such centers be modeled after European institutions. They reasoned that photonic technologies can serve as a vehicle for international collaboration across the Arab world, citing Jordan's SESAME Synchrotron facility, which is jointly operated by nine countries.

The need to initiate the African Synchrotron Program was also covered. A synchrotron light source produces very intense pulses of light/X-rays that allow detailed studies of objects at the atomic level with a precision that is not possible by traditional X-rays and lasers. The extraordinary power of synchrotron light has had an immense impact in such fields as archaeology, biology, chemistry, environmental science, geology, medicine, and physics. Synchrotrons cost billions of dollars and require substantial technical expertise, meaning that international collaboration is essential for their continued operation.

A significant component of the conference was the "White Paper on Optics and Photonics" produced by the Ibn al-Haytham Working Group. Among its suggestions were the translation and digitalization of this scholar's works, the creation of an Ibn al-Haytham International Society as well as such societies for other golden-age luminaries, and the establishment of a database of experts. The IWG has created a forum in which these and other ideas arising from the presentations and discussions can be pursued.

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