Donated Synchrotron Will Further Middle East Cooperation

Sameen A. Khan and Susan M. Reiss

One of OSA's most important roles is to support the international growth of optics and photonics. The global importance of optics is reflected in the fact that one-third of the Society's members and almost two-thirds of the authors in OSA journals are from outside the United States. OPN's "Global Optics" column, edited by Susan M. Reiss, explores international optics and photonics news. To submit a story idea to "Global Optics," please send an e-mail to opn@osa.org.

The 800-MeV BESSY-I when it was installed in Wilmersdorf, Berlin. Once reconstructed in Jordan, organizers say, it has the potential to become an important example of scientific cooperation in the Middle East.

Since the first observation of synchrotron radiation took place at the General Electric Research Laboratory in New York in 1947, synchrotron beams have become a key research tool in the study of matter. When electrons whirl around vigorously in curved paths, they emit energy in the form of light with special properties.

This light, called synchrotron radiation, is extremely intense over a broad range of wavelengths. It is particularly useful for research in those parts of the electromagnetic spectrum in which laser sources are not yet available, such as the vacuum ultraviolet.

Facilities around the world are putting synchrotron light to use in areas ranging from medical imaging to microfabrication, a trend that has gotten a boost from the fact that countries with established synchrotron programs are donating equipment to less-developed nations that otherwise would have had to wait decades for the technolgy.

A gift to Jordan

Germany is among the nations to have made a donation in the spirit of scientific cooperation. Bessy-I, an 800-MeV synchrotron that functioned in Berlin for 20 years, has been donated to Jordan, which will become the first country in the Middle East to host such a facility. Germany's gift of the synchrotron is worth about $60 million.

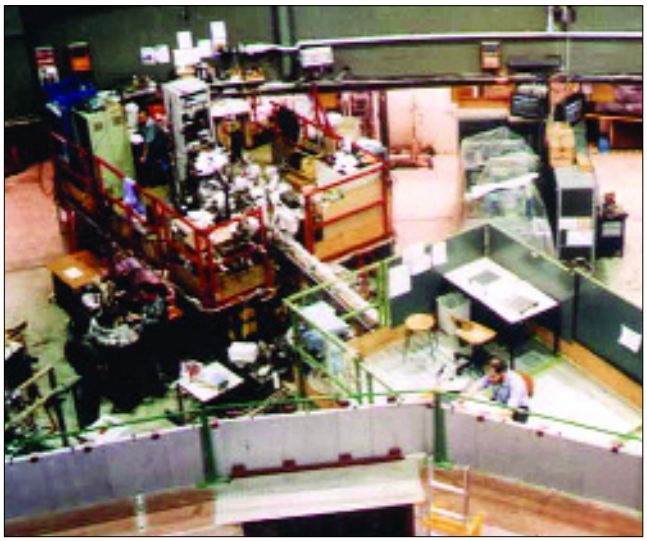
Bessy-II, a new 1900-MeV synchrotron, will replace Bessy-I in Berlin. Germany is giving up the original because it no longer meets the needs of its research groups. The facility is, however, still quite functional. Synchrotron storage rings are flexible devices in that they can be upgraded at a cost that is small compared with that of constructing a new synchrotron. Reinstalling and upgrading Bessy-I in Jordan will cost about $20 million.

The new facility, SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East), will cost about $3.5 million a year to operate. It will be supported by 13 member countries: Bahrain, Cyprus, Egypt, Greece, Iran, Israel, Jordan, Morocco, Oman, Pakistan, Palestine, Turkey and the United Arab Emirates. Armenia, France, Germany, Italy, Japan, Kuwait, Russia, Sudan, Sweden, Switzerland, the United Kingdom and the United States have agreed to lend technical support.

In the model of CERN

SESAME, a 2.0-GeV high-performance light source, will be the first regional center for cooperation in basic research in the Middle East. The 100,000-sq.-m site on which it will be constructed is in Allaan, about 30 km from Jordan's capital city, Amman.

As a fulcrum for collaboration in regional research, scientists hope the new center will mirror the European Laboratory for Particle Physics (CERN) in Geneva. Like CERN, SESAME will be managed under the auspices of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), which offers a political



(*Left*) The "experimental hall" before Bessy-I was disassembled for its trip to the Middle East. (*Right*) The booster synchrotron is disassembled. In Jordan, BESSY-I will be reassembled and upgraded to a 2.0-GeV light source.

umbrella to international science projects and helps coordinate and set guidelines for collaborative projects. UNESCO has contributed $400,000 to the project. Jordan's King Abdullah II has pledged $1 million a year for five years. The 13 member countries are expected to contribute $50,000 a year for the three years it takes to reconstruct the facility.

An open invitation

Starting in 2006, scientists plan to use SESAME to conduct research in the areas of structural molecular biology, molecular environmental science, surface and interface science, microelectromechanical devices, x-ray imaging, archaeological microanalysis, materials characterization and medical applications.

The synchrotron will be open to scientists from all over the world. Organizers say it has the potential to be not only a world-class research center but also an important example of scientific cooperation in the region.

For more on Bessy and SESAME, visit www.bessy.de/ and www.sesame.org.jo/. Sameen A. Khan (khan@fis.unam.mx) is a post-doctoral fellow in physics at the Universidad Nacional Autonoma de Mexico. Susan M. Reiss (smreiss@erols.com) is a professional science writer based in Arlington, Virginia.

Sharing Synchrotrons

Japan donated the first relocated synchrotron to Thailand in 1996. Now installed 250 km northeast of Bangkok, the Siam Photon Source—originally a 1.0-GeV accelerator designed for lithography applications—is intended to serve scientists throughout Southeast Asia.

The synchrotron was given as a gift to Thailand's Ministry of Science, Technology, and Environment, which invested $15 million to move and upgrade it. The upgrade involves doubling the machine's circumference to 81 m and tailoring it to produce narrow bright beams of soft-x-rays and ultraviolet radiation. A group of scientists from Japan have helped in the redesign and are training the scientists from Thailand to operate the new facility. The Siam Photon Source will be used for research in physics, chemistry, semiconductors, medicine, pharmaceuticals and agriculture.

In another example of international cooperation, to add to Russia's synchrotron capability an accelerator and storage ring used for nuclear physics were moved from Amsterdam, in the Netherlands, to the Joint Institute of Nuclear Research in Dubna.

For more information on the distribution of synchrotrons in the world, visit the world synchrotron map Web site, http://www-ssrl.slac.stanford.edu/sr_sources.html.