A New Synchrotron Radiation Research Facility in the Middle East:

Scientific Progress as an International Right

Credit: http://www.sesame.org.jo/images/1_6-sep_06.jpg.

by Erika Williams

A synchrotron from Cold War era that divided Berlin now makes its home in Jordan, fostering cooperation from scientists in the Middle East

Thanks to the efforts of Stanford Professor Emeritus Herman Winick of the Stanford Linear Accelerator Center (SLAC) and the Applied Physics Department, a new synchrotron radiation research facility is under construction in the Middle East that will provide scientists from the region the opportunity to carry out frontier research, as is currently being done at more than 50 such facilities around the world. The facility, called "Synchrotron-light for Experimental Science and Applications in the Middle East" (SESAME), is located in Jordan, about 19 miles away from its capital, Amman. With its first operation planned for 2010, scientists hope the research center will serve as a symbol for international collaboration that will unite scientists from all over the region, including Middle Eastern nations.

The Origins of SESAME

Winick arrived at Stanford in 1973 to join others in developing the Stanford Synchrotron Radiation Laboratory (SSRL) at SLAC. The SSRL was one of the first electron accelerator-based facilities in the world to provide X-rays that are a million times more intense than those available from more conventional sources, such as medical and dental X-ray tubes. Though Winick is now part of the emeritus faculty at Stanford, he is still in high demand to advise on similar projects being initiated around the world.


Credit: http://www.sesame.org.jo/images/2_6_sep_06.jpg

Construction continues on the project. With luck, the new synchrotron will be running by 2010.

After the fall of the Berlin Wall, the newly reunited Germany wanted an up-to-date synchrotron to replace an obsolete device constructed in the early 1980s. The previous facility, called BESSY I, was built in Berlin during the Cold War communist blockade of the city. Winick was asked to join an international committee to review the design and planning of the new facility, called BESSY II. When Winick learned that the German government planned to scrap the old machine, he and his colleague, Gustav-Adolf Voss, a scientist at Germany's Electron Synchrotron (DESY in German) particle physics lab, suggested that the country donate it to the Middle East instead.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

UNESCO works to promote the spread knowledge, improve its member states' human and institutional capacities, stimulate dialogue among countries, and to encourage respect for other cultures and human rights. The organization played a vital role in the planning and implementation of SESAME.

Establishing the International Synchrotron Research Center

With the help of the United Nations Educational, Scientific and Cultural Organization (UNESCO), efforts to build a synchrotron in the Middle East began. The organization played a vital role in the planning and implementation of the new synchrotron because it promoted cooperation among Middle Eastern countries, as none of the countries alone could afford to build or operate the synchrotron solely. To further

What is a Synchtron?

A synchrotron light source is a ring of magnets that guide high energy electrons around a circle. This circular motion, or centripetal acceleration, results in the emission of intense electromagnetic radiation extending from the infra-red to the X-ray parts of the electromagnetic spectrum. The energy lost to this radiation is replaced by radiofrequency cavities so that on average the energy of the electrons is maintained at a constant level as the circulating beam is stored for many hours. Since X-rays are short wavelength light, they can be used to study objects with dimensions of the order of the wavelength, down to the nanometer and sub-nanometer range.

With such a powerful microscope, scientists can study the structure of muscular or digestive proteins or the atoms in hemoglobin. Understanding the structure of such important molecules can help fix defects. As Winick states: "The path to solving many problems, in biology or medicine…is understanding its structure." The current antiretroviral drugs used to combat HIV, for example, were developed because of knowledge of the viral structure. The drugs go in the exact place necessary to prevent replication. The X-rays can also identify industrial pollutants to help solve environmental problems. According to Winick, "X-rays are a vital and ubiquitous tool to study all matter."

its progress, Winick and other scientists organized scientific workshops to teach Middle Eastern scientists about the principles and applications of synchrotron radiation.

There are now eight members of the council that governs SESAME: Bahrain, Egypt, Jordan, Cyprus, Turkey, Pakistan, Israel and the Palestinian Authority. According to Winick, because "everyone's interested in improving the Middle East," there are also observers on the council from regions outside the area such as the United Kingdom and the United States. Other observers include Middle Eastern countries that have attended all the meetings but have not signed the legal agreement requiring monetary contributions. Iran and the United Arab Emirates are current observers that are expected to officially join the council soon. Despite the current animosity between Israel and many Middle Eastern nations, all members involved with SESAME are united by the common goal of creating and maintaining the facility. "It's just a group of scientists with a common interest," says Winick. "It's no different than getting a bunch of artists or musicians together."

Professor Winick, the originator and driving force behind SESAME.

dominant role in its development. Since the old German synchrotron was rather outdated, UNESCO and scientists like Winick are helping to raise money to build new parts for the SESAME, instead of solely modifying existing parts on the old machine. While they still need about $20 million, the project has been progressing well due to international financial support and the durability of the original injector - a vital, expensive part that does not require replacement.

The eight countries are providing the annual expenses and will continue to do so when the facility begins operation in three to four years. Winick has been pleased with the progress of the SESAME project: "I've worked really hard on it for ten years now. And it's going. It takes longer than it should, but it's going."

SESAME is not an unusual project for Winick, as he has a history of involvement in international science and human rights. "Science is by nature international," he says. During the 1960s, he braved the heights of the Cold War to pursue research in the Soviet Union. In 1992, he served as the chair of the American Physical Society's (APS) Committee on the International Freedom of Scientists. His current role is chair of the Forum on International Physics in APS.

The donation of a synchrotron to the Middle East represents Winick's passion to make science truly international and cooperative. "Travel and communication between countries are necessary because no one has a monopoly on bright ideas," he remarks. S

Scientists hope SESAME will serve as a symbol for international collaboration that will unite scientists from all over the region, including Middle Eastern nations and Israel

The Future of SESAME

Scientists from the Middle East have filled leadership positions for the project and are asserting a more

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To Learn More

-- Please visit the SESAME website: **http://www.sesame.org.jo**
-- Visit UNESCO's section on the project: **http://www.unesco.org**