

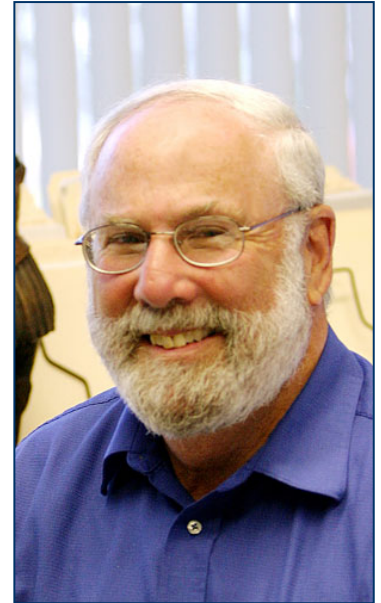
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SESAME to open: Particle accelerator spurs Middle East science partnership

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Herman Winick

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About 19 miles northwest of Amman, Jordan, this building will house a new particle accelerator. The project, the brainchild of physicist Herman Winick, will use donated German equipment to build the Middle East's first synchrotron radiation source. Winick said he hopes the effort will bring together scientists from Arab nations and Israel.

When Stanford physicist Herman Winick heard that Germany was planning to throw out an old particle accelerator, he thought, why not donate it to the Middle East? This idea has sparked plans to build a new state-of-the-art research facility in Jordan using pieces of the old German equipment. The lab will speed up electrons in a circle to produce high-energy light called synchrotron radiation, which is useful for a host of experiments. The project's leaders hope that the new facility will help solve important scientific questions and bring together researchers from different parts of the region.

"My main motivation is to help create a project in which people can work constructively and collectively," Winick said. "There will be collaborations between Israeli and Arab scientists, in particular. This is reasonably unusual." Previous cooperation has been bilateral (between just Israel and Palestine, for example). This is the first time that scientists from many different Arab nations, along with Israel, will all work together, he explained.

Winick first conceived of the project in 1997 when he heard that Germany's BESSY I facility was headed for the junkyard.

He thought it was a perfectly good machine, and with his friend Gustav-Adolf Voss, a scientist at Germany's DESY particle physics lab, suggested offering the accelerator as a gift to the Middle East to serve as the centerpiece of a new research center. Winick has long been interested in human rights and international scientific collaboration. In 1992, he served as chair of the American Physical Society's Committee on International Freedom of Scientists.

"Scientists can meet and discover common interests," Winick said. "SESAME will provide opportunities for frontier research for graduate students, who will not



have to go abroad for such training, and attract senior scientists already working abroad to return."

German leaders quickly agreed to the plan. Under the auspices of UNESCO, the United Nations Educational, Scientific and Cultural Organization, the project was born.

Researchers named it SESAME, for Synchrotron-Light for Experimental Science and Applications in the Middle East.

Winick thinks the name SESAME is appropriate because the lab will bring people together. "Sesame Street is where young people are taught to cooperate and respect each other," he said. "That's one of the objectives of the SESAME project."

A council of eight countries—Jordan, Bahrain, Cyprus, Egypt, Israel, Pakistan, Palestine and Turkey—will run the project together. Other countries, such as Iran and the United Arab Emirates, plan to join soon. Each country gets one vote on the council. Together they approve the annual budget and agree on each country's financial contribution, taking into account each nation's ability to pay.

The council elected to build the lab in Jordan, which was offering a site and \$7 million to construct the building. "There was no outside pressure from Germany or the U.S. to decide where it should be," Winick said. "It is a regional project that belongs to those people and they are taking ownership."

The member countries will pay for the operating costs of the facility, and UNESCO funds of about \$700,000 will cover moving the equipment from Germany to Jordan. The project still needs money for some new parts and equipment that cannot be salvaged from BESSY I.

Under construction in the hills about 19 miles (30 kilometers) northwest of Amman, the capital of Jordan, the building housing SESAME should be finished and occupied by the spring of next year. Researchers expect the facility to be operational by 2010.

Currently at least 50 synchrotron radiation labs exist around the world, but SESAME will be the first in the Middle East. The only other region without a synchrotron facility is Africa, although a proposal for one there has sprung up in the wake of SESAME. South America and Asia have synchrotron labs. Stanford has a major synchrotron radiation research facility, the Stanford Synchrotron Radiation Laboratory at the Stanford Linear Accelerator Center in Menlo Park, Calif.

'A melting pot'

SESAME will accelerate electrons to near light speeds inside a hollow ring. As the particles fly around the loop, they will emit extremely intense beams of X-rays, as well as ultraviolet and infrared radiation, called synchrotron light.

"If we shine X-ray beams onto material, we can see things in more detail than we can see with visible light," Winick explained. "That has to do with the fact that the wavelength of the X-ray is shorter."

Scientists can use the light from SESAME to look at anything they want to, including proteins, viruses and other molecules that are too small to see with visual light microscopes. In fact, the discovery of the double-helix shape of DNA was made with X-rays—using machines that were a million times weaker than SESAME.

Synchrotron technology has applications in chemistry, physics, biology, archaeology and many other fields. One of its main applications is environmental

science.

In order to fight pollution, scientists must understand the chemical makeup of environmental contaminants. Synchrotron radiation allows researchers to probe these molecules on a small scale. This kind of study would benefit people in the Middle East directly.

"Environmental issues and concerns are local," Winick said. "Oil drilling generates toxic waste. That's a big deal in the Middle East. They have their own unique environmental concerns, and they can study them, as well as local biomedical issues and concerns, with synchrotron radiation."

SESAME also will help the region in other ways. "A lot of people are needed in administration, security, groundskeeping, the cafeteria, as well as scientific jobs at the high level, so money will flow in," Winick said.

Because the region has never had a synchrotron facility before, most Middle Eastern scientists are not trained in the technology of particle accelerators or in the many uses of synchrotron light. To train the staff who will use and run SESAME, the project sent 18 scientists from the Middle East abroad to study synchrotron technology; they were funded by the International Atomic Energy Agency, the International Centre for Theoretical Physics and the scientists' home countries and labs. Winick also raised money from the U.S. Department of Energy to bring 20 Middle Eastern scientists to synchrotron labs in the United States to learn about scientific topics that can be studied with synchrotron radiation.

Abdel-Megid Mamoon is an Egyptian scientist who has been training at a synchrotron facility at the Brookhaven National Laboratory in Upton, N.Y. He is studying damage to cells caused by melanoma, a type of skin cancer that is especially prevalent in Egypt because of bright sunlight near the equator. Once SESAME is running, however, he plans to work there because it is closer to home.

"There are definitely cultural benefits involved in having scientists from different countries working close together," he said. "Developing a common scientific language and sharing access and understanding of new technologies may help bridge the cultural gaps and misunderstandings that divide the world. So the synchrotron SESAME will be in a way a melting pot for the different cultures."

Clara Moskowitz is a science writing intern with Stanford News Service.

