X-ray Source Produces a Glimmer of Hope

What do you do with a secondhand synchrotron? Two physicists had the idea of making it a gift to the troubled Middle East, where a home for it is now rapidly taking shape

ALLAN, JORDAN—The tawny hills around this village 30 kilometers north of Amman are fringed with pine, olive, and oak trees. Here, among shepherd boys tending sheep and goats, an unlikely building is taking shape. It will soon house one of the most advanced scientific instruments in the region, a synchrotron light source called SESAME, which is designed to allow researchers from across the Middle East to probe the shapes of proteins and the atomic structure of new materials.

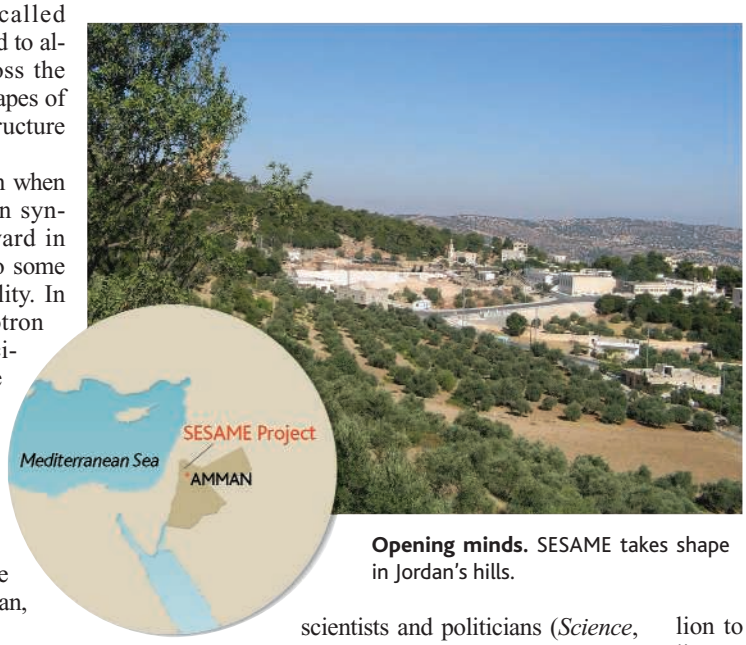
The project, which began when physicists rescued a Berlin synchrotron from the scrap yard in 1997, seemed far-fetched to some but is fast becoming a reality. In April, SESAME (Synchrotron Light for Experimental Science and Applications in the Middle East) became a self-governing UNESCO organization when Israel joined Jordan, Egypt, Turkey, Bahrain, and Pakistan as the sixth official member. Two more, the Palestinian Authority and Iran, are in the process of joining.

At the building site, donated by Jordan's government, the foundations are laid and walls are starting to rise. And last month, more than 90 scientists gathered in Turkey for SESAME's latest users' meeting to discuss the research they hope to do once the machine comes on line.

A synchrotron light source is a particle accelerator that propels electrons in a circle at close to the speed of light. The electrons give off intense beams of ultraviolet and x-ray light as they curve around the ring, and researchers use the light for everything from fundamental physics to microscopy of biological samples.

SESAME was the brainchild of physicists Herman Winick of the Stanford Synchrotron Radiation Laboratory in Palo Alto, California, and Gustav-Adolf Voss of DESY, Germany's particle physics lab in Hamburg. Both scientists were advising the German government on the building of a new synchrotron source, BESSY II, in Berlin, when Winick discovered that its predecessor, BESSY I, would be sold for scrap. "That was like a knife in my heart," he says. BESSY I had been a groundbreaking machine, he adds, "and it was still in huge overdemand."

Winick wondered if it couldn't be reassembled somewhere else, with a few updates and modifications. His proposal quickly gained support from European and Middle Eastern scientists and politicians (*Science*, 25 June 1999, p. 2077). In the hopeful days following the Oslo accords between Israel and the Palestinians, supporters argued that the machine would not only aid scientific development but also enable scientists to work together and build personal ties. Germany quickly agreed to donate the disassembled BESSY I, and in 2000, delegates from participating countries chose the Jordanian site.



Opening minds. SESAME takes shape in Jordan's hills.

Not everyone was convinced it would work. "I am one of the people who thought the project would never get off the ground," admits Zehra Sayers, a biophysicist at Sabanci University in Istanbul who now heads SESAME's Scientific Committee. But she soon changed her mind. "I could see how quickly it was moving and how much effort people were willing to put in," she says.

Support from Jordan has been particularly crucial to the project's early success, Winick says. The country's King Abdullah II has been a personal and enthusiastic supporter. He learned of the project in 1999, when he met briefly with Herwig Schopper, former director of the CERN particle physics lab near Geneva, Switzerland, and UNESCO's Maurizio Iaccarino, who were touring the region to build support for SESAME. "As soon as the meeting was finished, the king asked me to prepare a letter [requesting to join] on the spot," says Khaled Toukan, Jordan's research and education minister, who serves as the acting director of SESAME.

The Allan site in Jordan also had a geographical advantage. Scientists in Istanbul can reach Amman in a 2-hour flight, Sayers notes. And, in theory, it's a 2-hour drive for scientists from Israel and the West Bank. But Israel's current military crackdown has brought long waits at checkpoints, and that 70-kilometer trip can take more than 6 hours now. The Israeli and Jordanian governments have promised to streamline travel for SESAME users, says Moshe Deutsch of Bar Ilan University in Ramat Gan, Israel.

SESAME's main challenge now is to secure promised funding from the European Union. Member countries' contributions cover the day-to-day costs, but updating the machine requires outside funds. The E.U. has promised $12 million to upgrade the synchrotron from 0.8 to 2.5 GeV, but bureaucratic delays are holding up the final agreement. Once the E.U. money comes through, supporters hope that the United States and Japan will pitch in on the estimated $10 million to $15 million needed to build beamlines, the equipment that aims and focuses the x-rays onto the experiments.

Although SESAME won't produce its first x-rays until 2008, it is already fulfilling part of its mission, Sayers says. The project has sent more than two dozen scientists from the region to train at existing synchrotron sources. That effort has been a bit too successful, she adds: "The places [where] they were working have all offered them permanent jobs."

And, despite the dramatic increase in violence in the region, participants say SESAME provides a small glimmer of hope. "A synchrotron has a different kind of sociology," says Sayers. "It is a suitable project for the area, to bring people of different cultures together." Eliezer Rabinovici of the Hebrew University in Jerusalem agrees. "Politics is left for the coffee breaks or the evenings," he says. "As a string theorist, I work on parallel universes. I was always curious about what a parallel universe was like, and now I know. I'm living in one when I go to SESAME meetings." —**GRETCHEN VOGEL**

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