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ADAM HART-DAVIS/SPL

The SESAME accelerator will circulate electrons at high energies, creating beams of intense radiation that will be used to study cultural treasures.

PHYSICS

Middle Eastern X-ray factory readies for action

SESAME project set to revolutionize science in the region, but is strapped for cash.

BY ELIZABETH GIBNEY

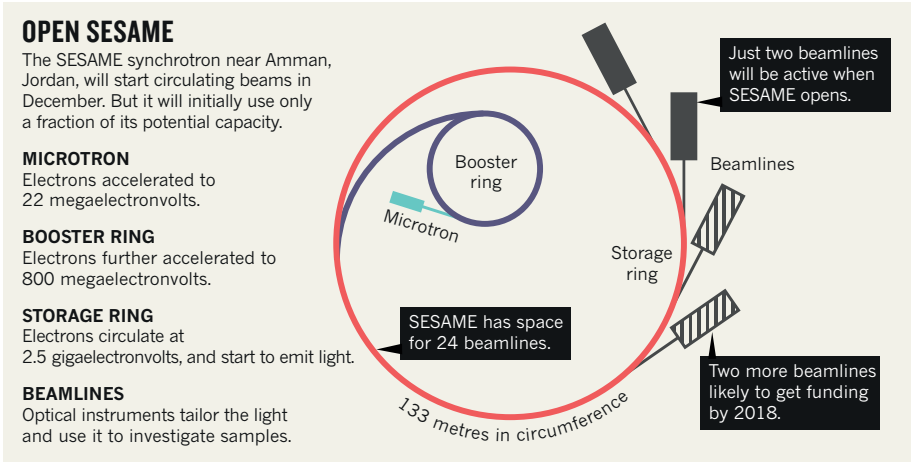
The Middle East's first major international research centre has weathered political unrest, international sanctions and even the assassination of two delegates. Now, the Synchrotron-light for Experimental Science and Applications in the Middle East, or SESAME, is on the brink of circulating its first subatomic particles.

The machine, which lies outside Amman, Jordan, will start accelerating electrons around its 133-metre ring in December and begin using the resulting beams of intense radiation to do science from May 2017.

Strapped for cash, SESAME will initially operate at half its planned capacity. But its location in the Middle East means that it will make a significant contribution to science. "It will set the stage for a culture of state-of-the-art technology and science in our region," says director Khaled Toukan.

SESAME is a collaboration between Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority and Turkey. Created under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO), it has also received funding from other countries and from the European Union.

The machine will generate light in a range of wavelengths and then channel it into intense 'beamlines' of specific frequencies (see 'Open SESAME'). These can be used to reveal the ▶



structure of materials, biological samples and artefacts down to the atomic scale. SESAME has space for 24 beamlines. The plan was initially to open with four of the slots filled, but a lack of funding means that it will open with just two — one infrared and one X-ray.

"SESAME is in a part of the world where you have very difficult times politically, and a lot of instability, and the money just didn't come," says Toukan. Iran couldn't pay its contribution until January, owing to sanctions that prevented it from transferring money internationally. Cyprus has not paid its share of the running costs since it was hit by a financial crisis in 2011, says Toukan, and Pakistan has paid only half of its dues this year. Jordan and Turkey are the only countries to have paid their annual and capital contributions in full, he says. Politics has touched SESAME, too: two Iranian physicists killed in car-bomb attacks in 2009 and 2010 were members of its council.

Still, engineers are expected to have finished testing the synchrotron by May, and a group of 260 researchers, largely from universities in the Middle East and in fields from pharmacology to physics, will then be able to apply for time on the two beamlines.

Toukan hopes that the facility will ease brain drain from the region, boost collaboration between the scientific community and industry and create opportunities for researchers who lack the funds to leave the Middle East.

Because of its proximity to many of the world's archaeological treasures, the facility presents a fresh opportunity for studying the region's cultural heritage. Jan Gunneweg, an archaeometrist at the Hebrew University of Jerusalem, hopes that scientists will use SESAME to collaborate on understanding their shared history. Many artefacts — such as Egyptian mummies and delicate papyrus — are fragile and must be insured at high cost if they are to travel long distances. "If that material has to go in the air, you destroy it," says Gunneweg.

He wants to use the synchrotron to further his studies of the composition, and therefore origins, of parchments including the Dead Sea Scrolls, the oldest known biblical texts.

SESAME cost around US$110 million to build, just one-sixth of the price of the European Synchrotron Radiation Facility in Grenoble, France, one of the world's most advanced synchrotrons. Pared-back ambition helped, but SESAME also relied on parts donated from dismantled European facilities, and was built on land that was given for free.

Two more beamlines are due to be installed by the end of 2018. SESAME has secured $2 million from the Jordanian Scientific Research Fund for its third beam, which will perform protein crystallography. And Toukan is confident that the collaboration will find funds for a fourth beam dedicated to materials science.

Beyond these four beams, there is no set schedule for filling the remaining 20 slots. "A few tens of million of dollars could make this dream come true," says Roy Beck, a biophysicist at Tel Aviv University in Israel and a committee member of the SESAME users' group. He laments that more nations have not been willing to swallow national differences for the sake of science. Some Gulf countries will not take part because of Israel's participation, he says, and the United States has made only a small contribution, which both Beck and Toukan attribute to political considerations (see page 468).

Advocates hope that SESAME will foster peace in the same way that CERN, Europe's particle-physics laboratory, near Geneva, Switzerland, helped to heal the wounds of the Second World War and brought Soviet and Western scientists together at the height of the cold war.

But crucial factors in that success were CERN's communal spaces, where scientists could share a coffee and get to know each other, says Beck. SESAME is scheduled to open without a cafeteria or dedicated accommodation, although a committee is trying to raise US$32,000 in donations to create the former.

"I hope people from all round will understand that this is a true chance for people within the Middle East to join hands and talk about things that unite them," says Beck. ■

SOCIETY

Immigrant and minority scientists shaken by Trump win

Worries include job prospects, discrimination — and safety.

BY HEIDI LEDFORD, SARA REARDON & RAMIN SKIBBA

As the US presidential election results rolled in, Naglaa Shoukry watched a door slam shut. An immunologist at the University of Montreal in Canada, she had been contemplating a move to the United States in search of better research funding. But when Donald Trump clinched the presidency, she knew that she would probably not go.

Shoukry, a Muslim from Egypt, did postdoctoral research in Ohio and was there when the United States tightened security after the terrorist attacks of 11 September 2001. When Trump pledged to use "extreme vetting" to determine which immigrants could enter the country, Shoukry recalled the humiliations her family experienced when travelling to see her in Ohio. "You have an interesting name," a US border official once told her brother, Mohamed, before detaining him for extra security checks. Under Trump, Shoukry decided, it would surely be worse.