Sowing the seeds of SESAME

Eliezer Rabinovici argues that the SESAME synchrotron-light source being built in the Middle East still needs more support and funding if it is to fulfil its true potential

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Building a united future The SESAME facility in Jordan seeks to bring together scientists from the Middle East.

Nestling under the shade of the olive groves at Al-Balqa Applied University in Jordan stands a unique project that began nearly a decade ago. It is special in that it has brought together Baharanian, Cypriot, Egyptian, Greek, Iranian, Israeli, Jordanian, Pakistani, Palestinian and Turkish scientists – all of whom are working towards a common goal of extending human knowledge.

The scientists in question are all part of a collaboration seeking to build a high-quality light source known as SESAME (Synchrotron light for Experimental Science and Applications in the Middle East). But in this part of the world, where war, hatred and bloodshed are abundant, whether science can give hope for peace is not yet clear. Still, SESAME could certainly be the start.

SESAME is, of course, not the first attempt to use science to build bridges between nations. The CERN particle-physics lab near Geneva is perhaps the best known and most successful example of such an idea. CERN was set up shortly after the Second World War, when many European cities still lay in ruins, with the idea of bringing scientists and administrators together, quite a few of whom, just years before, had been deliberately trying to destroy each other.

The courage of the idea has been matched only by its success. Indeed, the ideals of CERN and of the scientists who have worked there have played a key role in the formation of SESAME. One big difference, however, is that some of the scientists collaborating on SESAME are from nations that still do not have peaceful relations with each other. Despite this problem, the infrastructure of the project has already been created. Now, however, more funds and support are needed to complete the installation of the synchrotron and maintain what is a unique collaboration.

First steps

As an Israeli born in Jerusalem, whose family home was shelled upon as a young child, I have lived with conflict my entire life. I have therefore been incredibly heartened by the ability of individuals from very different backgrounds to collaborate when it comes to science. Scientific dialogue can indeed pave the way to other aspects of mutual appreciation and even understanding between people from different nations. As a particle theorist, I have seen this at first hand at CERN.

But how should one form meaningful collaborations in the Middle East? My natural inclination would be for what I call a "bottom-top approach", in which scientists come up with ideas and put pressure on governments to fund them. In most cases this is better than the reverse "top-bottom" approach, in which governments decide what it is best to fund and the scientists are invited to follow. Given political realities, though, sometimes one needs to compromise, which is why SESAME was formed through a mixture of both approaches. Still, no matter how these collaborations are formed, we should never compromise on their scientific quality.

For me the path to SESAME can be traced back to 1994 when the Italian physicist Sergio Fubini, whom I met at CERN and had many political discussions with, invited me to Turin on the occasion of his 65th birthday to give a lecture on string theory and another talk describing the status of Arab–Israeli scientific collaborations. Although many of the people that I spoke to while preparing the latter talk were quick to tell me that any such joint projects do not work, I soon found that there were many successful collaborations in the Middle East in fields such as agriculture and oceanography.

In 1995 a delegation that I and Fubini were part of met officials from Egypt, including the county's higher-education minister Venice Gouda, to discuss a possible Arab–Israeli scientific collaboration in physics. It was agreed to involve as many countries as possible in the region and so protect the collaboration from becoming a political football. As a result, another meeting took place in November 1995 in Dahab, Egypt, that was supported by many scientific institutes in the region and by the International Centre for Theoretical Physics (ICTP) in Trieste, Italy, directed at the time by Miguel Virasoro.

That meeting, which concluded with a commitment to use it as a launch pad for future collaborations, was attended by many outstanding scientists from all over the world, including Egyptian, Israeli, Jordanian, Palestinian and Moroccan physicists. It included a poignant moment when Gouda asked the participants to stand for a minute's silence in honour of Yizhak Rabin, the Israeli prime minister who had been murdered just three weeks earlier. The silence in the room will echo inside me for as long as I live.

A resurgence of violence in the region meant that Turin was once again chosen as the venue for a meeting in late October 1997 on the uses of high-energy physics and light sources for international collaboration. It was there that Gus Voss from the DESY lab in Hamburg, Germany, raised a suggestion made by Hermann Winnick of the Stanford Linear Accelerator Center in the US and Voss himself to bring a synchrotron-radiation source to the Middle East. The suggestion was that the BESSY 1 facility in Berlin, which was about to be decommissioned and replaced, could be rebuilt somewhere in the region. It was at this meeting, which brought together people dedicated to using science for peace in the Middle East with those keen to use BESSY 1 for such aims, that SESAME was born.

Shining light

Light sources are accelerators in which electrons travel in a circle, emitting intense beams of coherent light as they do so. The resulting beams can then be used to study and analyse materials as a sort of powerful microscope. The accelerators at particle-physics labs like CERN are devoted to one purpose – the study of the fundamental structure of matter and the forces among them. Dedicated light sources, on the other hand, can be used by scientists from many different disciplines – from environmental science, engineering and pharmaceuticals to biology, chemistry and physics. There are dozens of such facilities around the world. A high-quality light source in the Middle East would easily have enough potential scientific users to justify the cost of its construction.

The decisive meeting on the path to SESAME was held at CERN in April 2000, when Jordan was chosen as the host country. Herwig Schopper – a former CERN director-general and member of the Middle Eastern Scientific Committee – tirelessly pushed the project forward on all fronts as he recruited scientists from all over the world to serve on various committees. Invaluable was the Jordanian condensed-matter physicist Khaled Toukan, who has since held various important official positions in Jordan such as minister for higher education. Committees were formed to set up the administrative rules of SESAME, modelled on those at CERN, to organize a users' community, to design the machine, and to decide on the science to be done there and the beamlines needed.

SESAME's council was set up in January 2003 as an independent body but with essential logistical support from the United Nations Educational, Scientific and Cultural Organization (UNESCO). That same month also saw construction of the facility start in Jordan. It was then decided that BESSY 1 would have to be significantly upgraded – the machine was already 18 years old – to make it attractive to scientists wishing to do top-quality research. This meant increasing its energy from 0.8 GeV to about 2.5 GeV.

Funding hurdles

Money has been the biggest hurdle in the construction of SESAME. The director-general of UNESCO Koichiro Matsuura gave the project about $500 000 to pay for scientists from Novosibirsk in Russia to disassemble BESSY 1. After being dismantled in 2002, BESSY 1 was then stored in Jordan for several years and partial assembly of the machine has only just begun. Jordan has paid for the construction of the building in which the light source will be housed.

The 10 partner countries in the project are paying dues, ranging from a minimum of $50 000 to $130 000. These fees have been used to support the emerging organizational structure of SESAME, which includes

Scientific dialogue can pave the way to other aspects of mutual appreciation and understanding

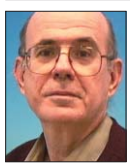
France, Germany, Kuwait, the UK and the US among the observers. In July last year, the International Atomic Energy Agency (IAEA) set aside $1m for staff training, the European Union (EU) has also given €1m for the installation process, while various light-source labs around the world have also made generous contributions in kind and in the form of training.

All of the countries involved will need to carry the burden of the running costs once the machine becomes operational in 2011. However, a substantial contribution will be needed to upgrade the machine. Jordan has set aside several million dollars for the purpose of initiating the upgrade, but it still needs to find another €17m or so.

A few years ago a detailed request to upgrade the machine was submitted to the EU for funding. This request was backed by the signatures of more than 30 Nobel laureates. Much of the burden of securing this money will fall on the shoulders of Chris Llewellyn Smith – another former CERN director-general – who was elected to be the next president of the SESAME council. He will take up his post in November 2008, with the official opening of the building planned for 3 November.

We also need money to provide beamlines. The plan is initially to have three or four , and some countries, in particular Pakistan, have already indicated a strong interest in funding them. Once the machine is up and running, the project will cost an estimated $1m per year to maintain and we need more countries in the Middle East to help shoulder the financial burden.

I plan to continue to dedicate my efforts to the success of SESAME, as do the many others involved in this project, yet for me its success is not the only issue. In the process of building SESAME we have discovered and demonstrated that scientists in the Middle East can work together with understanding for a shared positive goal. Given the struggles and past events in our region, the lesson should always be that collaboration in difficult circumstances can be done.



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