



Sesame People



Sesame People

SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East) is a major scientific facility under construction near Amman (Jordan), which is expected to begin operation in 2015. SESAME will foster scientific and technological excellence in the Middle East and the Mediterranean region, build scientific bridges between neighbouring countries, and foster mutual understanding through international cooperation. The Members of SESAME are currently Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority and Turkey.

SESAME will be used by scientists based in universities and research institutes across the region. This brochure features some of these future SESAME users and the young people who are involved in constructing SESAME, who explain how they will benefit from SESAME. Those at the beginning of their careers have already benefited from the SESAME Users' Meetings and the extensive SESAME training programme. This programme is supported by the International Atomic Energy Agency, various governments, and many of the world's synchrotron laboratories, demonstrating their confidence in the project.

More information on how SESAME works, what it will do and how it will be used is given elsewhere in this brochure. A detailed description of the status and aims of SESAME can be found in a 12-page brochure produced by UNESCO, which is the parent body of SESAME: it is available on-line at

<http://www.sesame.org.jo/brochure.pdf>

Major synchrotron light sources in the world.



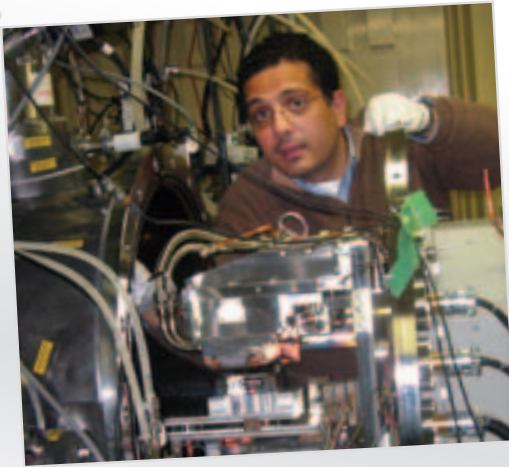
Places where the SESAME people featured in this brochure are based; SESAME site shown in red.

The SESAME building at Allan (Jordan), some 35 km north-west of Amman. This building was specially built for SESAME by the Jordanian Authorities.

As in everyday life, in advanced scientific research we learn by 'seeing' things using light – except that scientists use light that ranges beyond the visible spectrum. In recent decades, the extraordinary power of synchrotron light has made it an essential tool for studying matter on scales ranging from biological cells to atoms, using radiation from the infrared to X-rays. It has had an immense impact in fields that include archaeology, biology, chemistry, environmental science, geology, physics, and medicine. There are some 60 synchrotron light sources in the world, but none in the Middle East.

SESAME

Sesame People

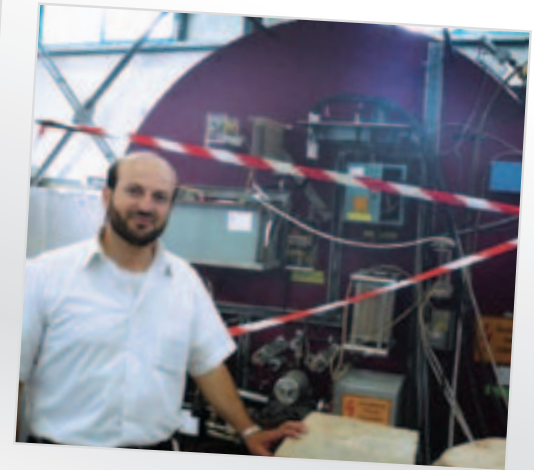


Mohammad Yousef

Mohammad Yousef, shown here inspecting a monochromator at the Japanese Photon Factory, is a biophysicist and structural biologist from Cairo University who works on analyzing proteins, protein/DNA and protein/ligand complexes. The use of X-ray crystallography to determine the three-dimensional structures of biological macromolecules at atomic resolution is central to his work. The results of such studies provide the basis for understanding biological functions and guide the rational design of new therapeutics.

Mohammad, who has attended and spoken at many SESAME meetings, says "My research requires X-ray synchrotron beamlines, which are currently unavailable in the Middle East. Therefore, I do most of my research abroad. SESAME, when operational, will bring me home!"

Maher Attal attended the first SESAME workshop in Jordan (at Al-Balqa University) in 2000, was subsequently a SESAME trainee at the French synchrotron LURE, and has attended all the SESAME technical meetings and several of the Users' Meetings. He says that "As the first synchrotron light source in the Middle East, SESAME is a valuable and challenging experience through which I learned a completely new scientific field and obtained my PhD in accelerator physics. I think it will be a vital scientific research center which will activate, and make it much easier to carry out, scientific research in the region."



Maher Attal

Maher, seen here with the SESAME Microtron injector, is a Palestinian accelerator physicist who works at SESAME on accelerator physics related issues.



Irit Sagi

Irit Sagi is a professor of biophysics at the Weizmann Institute of Science in Rehovot. She is applying a unique, multidisciplinary approach to investigating enzymes, the complex molecular machines that regulate the chemistry of cells and organisms. Using synchrotron radiation in the X-ray regime, she advanced a method for precisely tracking, in real time, changes taking place in active enzymes at the level of single atoms. This method is currently employed by her research team to decipher the enzymes' mechanisms of action and to develop a new generation of safe and effective drugs.

Irit, who has been a member of the SESAME Scientific Advisory Committee since it was established, says "I have strongly supported SESAME for many years. Having a synchrotron in our area will create a unique opportunity to merge scientific expertise without regard to borders or nationalities. SESAME is designed to promote regional scientific projects and advance young scientists by extending their horizons with modern technology. I am looking forward to that day."

Sumera Javeed, who attended the 8th SESAME Users' Meeting in 2009, is interested in studying the growth of carbon nanoparticles and their disintegration using different techniques, says "For most of the experiments of interest to us, the diagnostics can be most effectively carried out using the soft X-ray beamline of SESAME. The broad spectrum of research programmes at SESAME will cater for the synchrotron radiation needs of the region, including specifically those of Pakistan. There are definitely cultural benefits involved in having scientists from different countries working close together."



Sumera Javeed

Sumera, pictured working on a hollow cathode DC magnetron sputtering setup for carbon film deposition, is based at the Accelerator and Carbon based Nanotechnology Laboratory, Pakistan Institute of Nuclear Science and Technology, in Islamabad. Her basic field of research is carbon-based nanotechnology and ion physics. She is currently working on the formation of carbon thin films on metal substrates using a wide range of techniques.

Sesame People

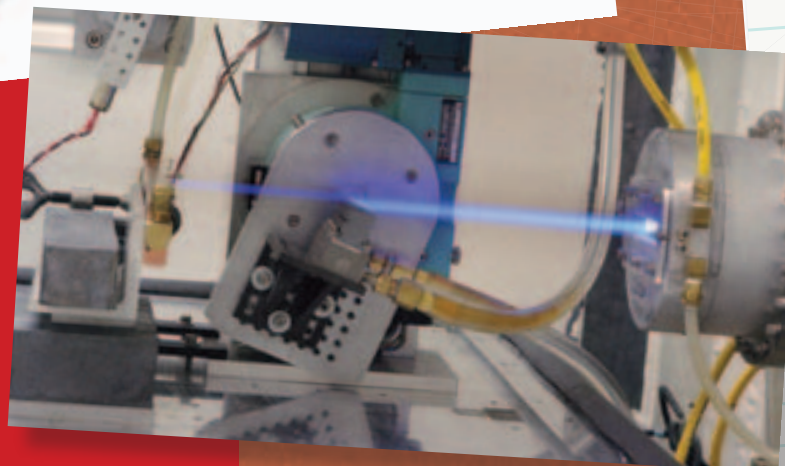
How SESAME works and what it can do

In SESAME, bunches of electrons will circulate at nearly the speed of light for several hours inside a long narrow evacuated pipe bent into the form of a closed ring 133 metres in circumference. As magnets surrounding the pipe steer electrons around such a ring, the electrons emit 'synchrotron light', with wavelengths that range from infrared radiation to X-rays. This light is collected by different 'beamlines' (optical systems) connected to the ring, and focussed on experimental samples; thus, many experiments can be carried out simultaneously. SESAME will be able to support up to 25 independent beamlines, each of which can serve several experiments. It will incorporate special devices called 'undulators' and 'wigglers' which enhance the emission of synchrotron light, making it a competitive 'third generation' facility.



Layout of a typical synchrotron.
(Courtesy of Synchrotron SOLEIL)

Seven beamlines, selected on the basis of requests from scientists in the region, will be available in the first few years of operation. Their properties and capabilities, which span the physical and biological sciences, are described in the SESAME brochure (<http://www.sesame.org.jo/brochure.pdf>), where examples are given of discoveries that have been made with similar beamlines at synchrotron light sources round the world. These examples include: work which provides insights into how antibiotics kill bacteria but not human cells; studies that have led to better understanding of motor neuron disease and are helping in the design of drugs to treat this condition; experiments that provided new insights into how certain diseases, including liver diseases, develop; work that is helping to improve the performance of photovoltaic solar cells; studies of materials that could be used to store carbon dioxide to prevent it entering the atmosphere; and an investigation that has shown that the ancient Egyptians developed a new technology to make opaque glass. Similar discoveries will surely be made at SESAME by users such as those featured here.



Synchrotron radiation emerging from a beam port. The blue colour comes from oxygen and nitrogen atoms in the air, ionised by the X-rays. (Credit U.S. Department of Energy)

Vasilis Promponas, who is interested in predicting the structure, function and evolution of biological macromolecules using information encoded in amino acid sequences, says that "Our research so far is based on purely computational approaches to exploit experimental data. SESAME will provide unique opportunities for enriching our research with custom-produced experimental data, and the possibility for joint computational-experimental high-impact research activities. By predicting folding features of important classes of protein molecules (e.g. bacterial membrane proteins) we hope to open new directions for combating diseases."

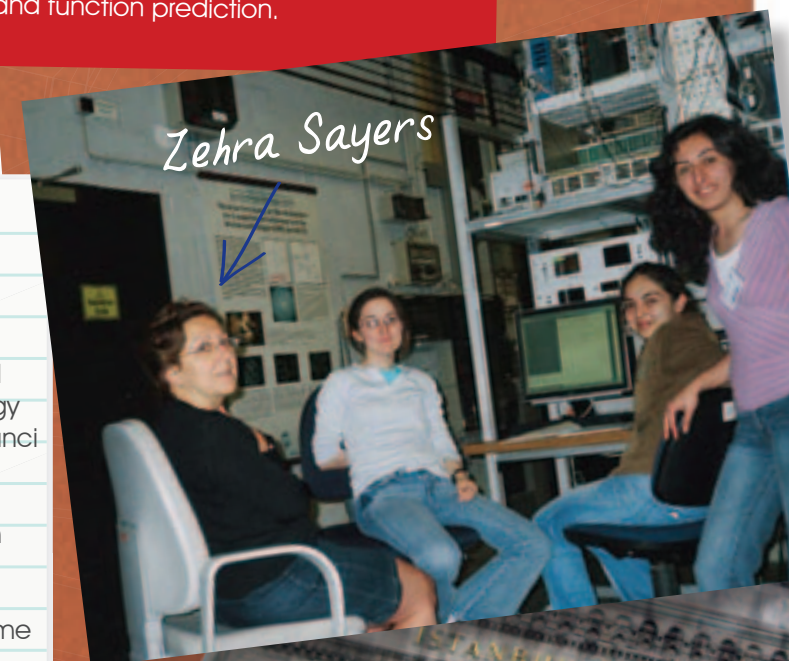


Vasilis Promponas

Vasilis, seen here preparing a sample for a yeast protein expression microarray experiment at the European Laboratory for Molecular Biology, is a lecturer of bioinformatics in the Department of Biological Sciences at the University of Cyprus, and head of the Bioinformatics Research Laboratory, where he works on large-scale genome sequence analysis and protein structure and function prediction.

Zehra Sayers, pictured here with her students while collecting data at the synchrotron (DESY) in Hamburg, Germany, is a biophysicist. She worked for several years at the European Molecular Biology Laboratory Outstation at DESY before joining Sabanci University in Istanbul to establish the Biological Sciences and Bioengineering Programme. Her research, which combines molecular biology with structural analyses to investigate stress responses in plants, needs intense X-rays from a synchrotron light source. SESAME will provide enough beamtime to perform extended experiments on samples prepared on site.

Zehra Sayers



Zehra, who has chaired the SESAME Scientific Advisory Committee since 2002 and has been active in the organization of several SESAME Users' Meetings and specialized workshops, says "SESAME is a unique project; it provides means for training young scientists in top technologies with the clear goal of bringing this know-how to the Middle East, it will facilitate world-class research in the region and it provides an environment in which people, who otherwise live in constant conflict, can communicate and cooperate through the language of science".

Sesame People



Mukhles Sowwan

Mukhles Sowwan, pictured here in his laboratory (5th from left) with Nobel Laureate Torsten Wiesel (7th from left) and a number of his current and previous group members, is Director of the Nanotechnology Research Laboratory and the Vice Dean of the Faculty of Engineering at Al-Quds University, the Arab Palestinian University in East Jerusalem. His work focuses on the fabrication, synthesis and characterization of multifunctional organic/inorganic nanoparticles for different applications from drug delivery through molecular electronics to energy applications.

Mukhles, who has attended all of the SESAME Users' Meetings and serves on SESAME's Scientific Advisory Committee, says "I need synchrotron radiation to study the structure and phase stability of nanoparticles. SESAME will produce extremely bright X-rays that can be used to study very small objects like nanoparticles to man-made materials with unusual properties."

Seadat Varnasseri, shown here carrying out measurements on the SESAME booster, became involved in accelerator technology at the Daresbury Laboratory in the UK in 2001 and then worked on linear accelerators in his native Iran. He worked at SESAME from 2004 to 2010 on the finalisation of the design, with the help of colleagues at European light sources, especially SOLEIL in France, which he visited with support from UNESCO and the Canon Foundation.

During his time at SESAME Seadat tried to present one or two technical papers a year at international conferences, which he attended with support from the organisers, in order to promote and introduce the project to colleagues in Europe, Asia and the US. He says "SESAME from my point of view is an experimental laboratory not only for developing science and technology, but also for collaboration between different nations, religions and political views in the region of the Middle East".



Seadat Varnasseri

Aslam Baig, shown here aligning the laser system of an experiment designed to study multi-step laser excitation of atoms, founded the Atomic and Molecular Physics Laboratory at the Quaid-i-Azam University, Islamabad, after having worked for more than a decade at the Bonn Synchrotron Radiation Facility, Germany. After having been Pakistan's representative on the Interim SESAME Council and then on the Council, and a UNESCO consultant for SESAME, he worked as SESAME's founding Science Director until 2007.



Aslam Baig

Future SESAME users doing laboratory work during a 2006 Workshop in Alexandria.



Aslam, who organized the first SESAME Users' Meetings and actively participated in, and contributed to, the technical and scientific meetings that began the development of SESAME's scientific programme, says that "SESAME is an exciting experimental facility that has brought scientists from nations having diverse ideologies to work on scientific problems of common interests. As soon as SESAME is operational, I would like to set up an experiment to extend my on-going research on excited states of atoms, which uses lasers."

Who Will Use SESAME?

The scientists who will use SESAME will mostly be based in universities and research institutes in the region. Typically, they will visit SESAME two or three times a year for periods of up to a week to carry out experiments, often working in collaboration with scientists from other countries. While at SESAME they will be exposed to the highest scientific standards in a stimulating environment for international collaboration. When they return home to analyze the data they have obtained, they will take with them scientific expertise and knowledge to share with their colleagues and students.

From day one of operation, several hundred scientists, working in disciplines ranging from archaeology to the biological and medical sciences, are expected to use SESAME, which will be a unique multidisciplinary centre in the region. The number of users is expected to grow to 1000 or more as more beamlines are installed.



Sesame People



Azadeh Shahsavari

Azadeh Shahsavari, pictured at the 8th SESAME Users' Meeting at Petra (Jordan) in 2009 (which she attended with support from a fund to support potential SESAME users established by the American, British, European and German Physical Societies), is an Iranian PhD student at the Faculty of Pharmaceutical Sciences, University of Copenhagen. Her passion for science led her to work on structural biology.

Azadeh needed an X-ray source for her work: none was available in the Middle East, but she was able to use the Diamond synchrotron light source in the UK. She says "SESAME will provide me with a great opportunity to access a synchrotron light source nearer home. I expect SESAME to support a broad range of science and technology in the Middle East and bring together bright scientific minds."

Golan Tanami is a PhD student in Professor Gad Marom's laboratory at the Hebrew University of Jerusalem, where he is pictured. His research focuses on combining acicular nanofillers in a polymer matrix with reinforcing fibres, with the aim of achieving improved material properties by forming a judicious multiphase combination. The final outcome should be a lightweight yet strong material.

Golan says that "Synchrotron X-rays, from a source such as SESAME, are necessary for us to be able to investigate the morphology (crystallinity) of the material, as well as the interface between the matrix and the filler".



Golan Tanami

Hamed Tarawneh, seen here with a radio frequency cavity for the SESAME booster, is a Jordanian accelerator physicist. He attended the first SESAME workshop in Jordan in 2000 and then worked for a PhD in accelerator physics at the MAX-Lab, Lund University, Sweden, which he obtained in 2006. Since then he has worked as a staff member at SESAME, where he coordinates work on the SESAME booster synchrotron and is also involved in many aspects of the design of the main storage ring.



Hamed Tarawneh

Hamed says that "Through SESAME, I have had the chance to visit different synchrotron radiation facilities such as ALBA in Spain, SSRF in China, SOLEIL in France, and the Photon Factory in Japan, and also CERN in Switzerland. Such opportunities are fruitful as I discuss and learn many issues which benefit the progress of my work at SESAME."

Maged Al-Sherbiny

Maged Al-Sherbiny is an immunologist and biotechnologist from Cairo University. He is currently the President of the Academy of Scientific Research and Technology and the Assistant Minister for Scientific Research of Egypt.

Maged has also been a member of the Scientific Advisory Committee of SESAME for the past four years, and since he joined the SESAME family has been very active in promoting SESAME activities through Users' Meetings and lectures for the scientific community. He says that "It is my strong belief that SESAME is an excellent model to promote peace and development through the science and technology which will be provided by the state-of-the-art facility now being built in Jordan. I wish that one day SESAME will be as successful as CERN in joining scientists from all over the globe for the benefit of humankind."



Sesame People



Constantia Alexandrou

Constantia, who has represented Cyprus on the SESAME Council, says "I am a strong supporter of SESAME because of the science and opportunities it brings to the region".

Constantia Alexandrou is Professor of Physics at the University of Cyprus and the Cyprus Institute. She is a theoretical and computational physicist, who leads work that will provide computational resources and know-how to scientists and engineers in Cyprus and the Eastern Mediterranean to enable state-of-the-art computer simulations. She coordinates a European Union project, which will fund a leased Internet line connecting SESAME to the Cyprus Institute. The latter will provide computational resources and expertise for the analysis of SESAME data. Joint work on this project is building strong links between the Cyprus Institute, SESAME and Jordan University.

Engin Ozdas, seen here aligning a sample capillary tube in an X-ray diffractometer in his laboratory, leads the Advanced Materials Research Group in the Physics Department, Hacettepe University, Turkey, where he works on superconducting materials, nanocarbon and layered intercalation compounds, which are commonly used for battery applications. His group is responsible for the design of SESAME's 'powder diffraction beamline'. This beamline, which incorporates some donated components from the Swiss Light Source, will be used to carry out experiments aimed at developing and characterising advanced materials.



Engin Ozdas

Engin, who has attended many SESAME Users' Meetings and Workshops and is a member of the SESAME Beamlines Advisory Committee, says "SESAME makes possible collaborative research between scientists from different countries (particularly those of the Members of SESAME) and with other synchrotron radiation centres, which have already welcomed several students from my group as visitors. The project has created trust and personal friendships between researchers in the Members of SESAME and developed countries, which may help solve regional and global political problems."

Zuheir El-bayyari, pictured here when visiting the Synchrotron Radiation Center at the University of Wisconsin-Madison, is currently receiving training through one of the numerous fellowships put at the disposal of SESAME. He is working mainly on early breast cancer detection using infrared micro-spectroscopy. When he gets home to Jordan he will work on the SESAME infrared beamline.



Zuheir El-bayyari

Zuheir, who has attended several SESAME Users' Meetings and Workshops, says "I hope to close technological gaps and perhaps ease tensions in the Middle East by bringing back to Jordan the knowledge I gained overseas".



Inside the SESAME building, showing the shielding (which will house the main storage ring) nearing completion in November 2010.

Sesame People



*Khaled Toukan,
Director of SESAME*

Message

SESAME will be a pivotal pole for science in the region. It will offer state-of-the-art facilities where scientists can come together to carry out advanced scientific work which will contribute to promoting research and technologies in their respective countries. The numerous training opportunities that SESAME can provide are already helping to build the region's scientific capacity.

In the long run, SESAME will have far-reaching effects on the development of national capacities; it will contribute to improving the standards of teaching and research at national universities and help to make industries more competitive, while the opportunity to work at the Centre will motivate leading scientists and technologists to stay in the region, or to return if they have moved elsewhere.

Scientists wishing to join the
SESAME fold are invited to
write to me at:

→ sonia@sesame.org.jo



A photograph of the SESAME team taken in 2008.



<http://www.sesame.org.jo>

or contact sonia@sesame.org.jo



International Basic Sciences Programme

This brochure was produced with support from the Canon Foundation
and the European Synchrotron Radiation Facility (ESRF).

Design M. Collignon (mc-graphisme.fr)