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Enhancing Regional Security through Scientific Cooperation in the Middle East

Attracting SESAME Users' Community to the Technical Dimensions of CBRN Activities, Disarmament, and Non-Proliferation

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SESAME, which stands for Synchrotron-light for Experimental Science and Applications in the Middle East, is a large-scale techno-scientific project that was established under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and is set up according to the model of the European Organization for Nuclear Research (CERN) in Geneva. This multilateral endeavour, located in Jordan, brings together experts and researchers from the Mediterranean/Middle East, including from countries that do not have diplomatic relations (e.g. Israel and Iran, Cyprus and Turkey). It is conceived primarily as a project combining research capacity-building with vital peacebuilding efforts. In principle, these efforts may include the manifold technical and cooperative dimensions of anti-terrorist activities related to weapons of mass destruction (chemical, biological, radiological, and nuclear, or CBRN), and also to disarmament and non-proliferation. The country where SESAME is located – Jordan – has been heavily involved in the fight against the so-called Islamic State of Iraq and Syria (IS).

This Policy Forum issue deals with the genesis of SESAME, and then describes its functioning, achievements, and potential benefits; the challenges it faces, especially funding; and its peacebuilding element. The SESAME project can be improved in concrete ways by meeting two peacebuilding-related criteria: firstly, by living up to its claim of being a contribution to rapprochement between the peoples of this conflict-torn region, whose security is affected by national rivalries or violent non-state actors; and, secondly, by providing inputs for the users' community without adversely affecting that community's predominant focus on research. This Policy Forum aims at acquainting especially young scientists with the technical and cooperative dimensions of SESAME's CBRN-related counter-terrorist activities, as well as its disarmament and non-proliferation measures. Such scientists can make use particularly of International Atomic Energy Agency (IAEA) programmes and of the nearby Amman-based academic and educational infrastructure.

Background and Context

As outlined in Policy Forum No. 1 (Kubbig, 2018), the entire blue series is devoted to exploring the (potential) role of various scientific/academic communities – especially those in the Middle East – in helping to overcome traditional sources of conflict as a concrete contribution to advancing peace by enhancing security/stability in the region. In our previous work we have focused on two communities: the traditionally splintered and stalemated non-proliferation community and the more technical – and more promising – nuclear security community, which aims at better protecting sensitive installations against threats emanating from CBRN materials/weapons that could be used especially by non-state/hybrid actors such as al-Qaeda and IS. One of our working assumptions – and, indeed, hopes – is that positive developments in the area of nuclear safety, where, despite many challenges, actors are involved in vital and constructive dialogue mechanisms and forums, will spill over to the non-proliferation community. Also, we start from the assumption that the major features of the Middle East – unilateralism, military build-ups, and zero-sum thinking – are detrimental to the security of the region. In our view, multilateralism, compromise, and the search for politico-diplomatic solutions through dialogue mechanisms and appropriate forums are the ingredients for real, sustainable regional security.

Objective of This Policy Forum and Its Structure

The approximately 40 staffers and growing users' community of the large-scale techno-scientific SESAME project constitute a new and distinct group of scientists who differ especially from other Members of the non-proliferation community in that they are expected to be primarily guided by cognitive-scientific/scholarly standards and presumably (somewhat) less by normative criteria such as peacebuilding and cooperation. This assessment is based on the assumption that the selection process for SESAME's staff and users' community prioritises applicants' scientific excellence, although political and normative factors are, of course, present in all stages of the application and working processes. Former CERN Director-General Herwig Schopper, a central figure in the process of establishing SESAME, has made very clear in his presentation (Schopper, 2016) preceding his substantive article on SESAME (Schopper, 2017) that for the multilateral project the "main principle" of scientific excellence is "essential" to promoting international cooperation within "internationally competitive research facilities".

SESAME's long (and at times cumbersome) story displays both a delicate tension and (at crucial junctures) positive interaction between science/technology and politics at all levels. At the same time, Schopper (2016) has emphasized the principle "Concentrate on scientific objectives, keep politics out as much as possible." This principle is somewhat at odds with SESAME's peacebuilding goal, which clearly implies the adoption of some kinds

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of policies (but admittedly not necessarily politics). In this regard, the SESAME Council has adopted a resolution that it would not debate or issue statements on any political issues (Eliezer Rabinovici, quoted in Deighton, 2017).

The asymmetrical relationship between SESAME's research-related priorities and its peacebuilding component is, of course, respected in our concrete proposals. These proposals are not meant to be intrusive and are not intended to challenge the specific self-understanding of SESAME's staff, which focuses on scientific research, and even more so of its users' community. The latter's Members, we assume, are probably not really interested in CBRN-related issues, and may not have heard a great deal about disarmament and non-proliferation. They may even be almost completely averse to politics. Our proposals therefore do not aim to touch on or in any way undermine the self-understanding of the experts who constitute this users' community, who are presumably guided primarily by scientific standards. These proposals are not meant to be an attempt to politicise SESAME, but rather to extend this self-understanding by offering ways to substantiate the project's explicit goal of peacebuilding, which needs to be further developed. We focus on the modest role of an informed (mainly young) scientist, not the demanding (and ideal) dual role of a scientist and well-versed disarmament/non-proliferation expert.

Our sources indicate that donors and SESAME's leadership see peacebuilding and bridge building as by-products of cooperation among scientists. We recognise that the focus on scientific matters can function as a form of protection against any malicious inquiries or negative allegations. And yet a collaborative attitude does not fall fully formed from heaven but needs to be nurtured. Therefore, with the informed (young) scientist in mind, the question arises as to whether the bodies that guide and govern the project find it meaningful to make the SESAME community familiar in an informal and cautious way with the manifold technical and cooperative dimensions of the three key areas of CBRN-related activities, disarmament, and non-proliferation. These dimensions all belong in the portfolio of the IAEA, which conducts training programmes for SESAME. Ideas could be developed jointly, preferably through the various Amman-based institutions dealing with capacity-building at the nexus between academia and the political realm. It would certainly make sense to benefit from this established infrastructure and these institutions' interconnected activities.

Because of the manifold and distinct specifics of the SESAME project, our proposals are focused on improving the peacebuilding element of this large-scale techno-scientific project. SESAME can hardly work as a model for the great number of Track I, I.5, II, and combined cooperative initiatives aimed at strengthening stability and security in the region across all policy fields. Apart from their different magnitudes, designs, and levels of investment, these initiatives are in most cases characterised by a different self-understanding among the experts who implement them. They fall basically into two groups: as already mentioned, Members of the first group are guided by cognitive-scientific/scholarly standards and sometimes by normative standards; the experts in the second category of initiatives act as interest-guided advocates representing interest groups or institutions usually with specific missions and instrumentalising knowledge to pursue their specific interests and goals (Kubbig, 2018).

These proposals appear as recommendations at the end of this Policy Forum, while the preceding sections deal with SESAME's genesis, functioning, achievements, and benefits, as well as the challenges it faces. The sections centre around the terms 'cooperation' and 'collaboration', both at the scientific and broader regional level, as the mainstay of what we have thus far called peacebuilding, which is a somewhat vague term for enhancing security/stability.

The Genesis of SESAME: Creating Opportunities to Promote Regional Security

The idea of scientific cooperation aimed at fostering peace and cooperation in the Middle East has been raised on several occasions, in particular by Dr Abdus Salam, the Pakistani Nobel Prize laureate (Salam, 1979). The model of the Geneva-based CERN complex, which had shown that scientific collaboration was possible among adversaries during the Cold War, was in many people's minds. Looking back, the major CERN scientists, who became key drivers of SESAME, cited a number of cases where CERN-related dialogue between Western scientists and the West's ideological opponents in the Soviet Union and China successfully worked as a confidence-building measure (Schopper, 2016). The Arab-Israeli Peace Process that started at the 1991 Madrid Conference, followed by the 1993/5 Israeli-Palestinian Oslo Accords, created a new positive atmosphere in the region. The Egyptian Minister of Higher Education, Venice Gouda, and two theoretical physicists, Eliezer Rabinovici from the Hebrew University in Jerusalem and Sergio Fubini from the University of Turin with strong links to CERN, met in 1995 to establish the Middle East Scientific Cooperation Committee (MESCC) to promote Arab-Israeli cooperation (CERN, 2015).

However, the real launch of the SESAME project resulted from an opportunity offered by Germany. The BESSY I synchrotron located near Berlin was decommissioned in 1999, to be replaced with a new-generation machine (BESSY II), and became available to be transferred to the Middle East. Several scientists encouraged this initiative: in addition to Fubini, they included Herman Winick, a US professor at the Stanford Linear Accelerator Center; Gustav-Adolf Voss, the German Director of the DESY synchrotron; and Tord Ekelöf, a Swedish professor at Uppsala University.

After a series of meetings of Arab and Israeli scientists in 1997 and 1998, the former Director-General of CERN, Herwig Schopper, who the MESCC designated as chair of the SESAME project's planning committee, called on the Director-General of UNESCO, Federico Mayor, to support the SESAME endeavour as an international venture similar to the Geneva-based CERN accelerator complex. Rapidly, in June 1999, a regional group of countries decided to launch the project, and one year later Jordan was approved as its host country, "after difficult negotiations by secret vote of the Interim Council", according to Schopper (2016). Jordan was selected because it was regarded as a politically moderate, relatively stable country with good/official relations with all its neighbours, including Israel. Also, King Abdullah II's involvement and support were central to bringing SESAME to Jordan – and into being. In 2000, reassured by the establishment of SESAME under the auspices of UNESCO and with financial support from donors, the German government decided to donate the BESSY I synchrotron to the regional project.

After an official ceremony in January 2003, SESAME officially came into existence in April 2004 when its Permanent Council was established. The Founding Members were Bahrain, Egypt, Israel, Jordan, Pakistan, and Turkey, who were later joined by Cyprus, Iran, and the Palestinian Authority. Observers are Brazil, Canada, CERN, China, the European Union (EU), France, Germany, Greece, Italy, Japan, Kuwait, Portugal, the Russian Federation, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Herwig Schopper was elected President of the Council with two vice Presidents (Dr Khaled Toukan from Jordan and Dr Dincer Ülkü from Turkey). The project's first premises were formally opened in November 2008 by King Abdullah II of Jordan (CERN, 2015), who also officially inaugurated the whole compound on 16 May 2017 (CERN, 2017; see also Lindinger, 2017).

In short, despite its at times rocky history, SESAME has become not only a multilateral success story, but can be regarded as a rare – if not unique – case of an institutional transfer from a Europe-based re-

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search organisation with an open-minded spirit to a regional setting reflecting the specifics of the Middle East. Also, the interaction between the techno-scientific and political areas has been a permanent feature of SESAME.

SESAME's Functioning: An Original Model Ensuring Close and Continuous Collaboration

When the donation of the German BESSY I machine was envisaged, some scientists pointed to its capacity to produce plutonium and therefore to create a risk of nuclear proliferation. Confronting his main critic, chemist Reinhard Brandt, Herwig Schopper demonstrated that the SESAME accelerator could only produce single atoms of uranium or plutonium that are totally insufficient to produce the quantity needed to manufacture a nuclear weapon (Schopper, 2017). The fully peaceful and cooperative nature of the project was thus confirmed.

In the spirit of its creation on the CERN model, the structure and institutional base of the project combine decision-making powers (and funding) by representatives of governments with a process whereby scientists and researchers strongly influence the functioning of the organisation. Herwig Schopper (2016) has aptly emphasized the close and complex links between scientists and politicians by stressing that an undertaking like SESAME require scientific, administrative, and political efforts at a "lower level" that "irradiate" upwards to "even [the] highest government levels". SESAME's purpose (UNESCO, 2004), according to its statutes deposited with UNESCO, ("Purpose and Functions"), is to "provide for collaboration in the Middle East and the Mediterranean Region with free access to all scientists of SESAME Members in relevant areas of research" – being also open to scientists from the "whole world, in basic and applied research using synchrotron radiation or closely related topics". Also, "SESAME shall not undertake classified work for military purposes or other secret research and the results of its experimental and theoretical activities shall be ultimately published or otherwise made generally available".

These two crucial points defining SESAME's "Purpose and Functions" highlight the specific character of the large-scale project as a techno-scientific undertaking within a multilateral setting. "Collaboration" is the key word, and it is explicitly related to the common research endeavour that focuses on "synchrotron radiation or closely related topics". "Free access" in "relevant areas of research" is also highlighted as a central feature of this techno-scientific enterprise. Science policy creeps in, because the second point banning military research makes SESAME a purely civilian, transparent project. There is no doubt as to the priority of the scientific character of SESAME and its aim of undertaking world-class research on subjects ranging from biology and medical sciences through materials science, physics, and chemistry to archaeology. Although the term "international cooperation" appears in this basic document, it is strictly confined to SESAME's activities as described above and also reflects the self-understanding of the scientists involved in the project as being mainly guided by cognitive standards. Nothing points to the underlying politico-normative underpinning of this multilateral undertaking – as if these realms could be effectively separated from each other.

And yet SESAME's key drivers and supporting institutions also acknowledge the relevance of its politico-scientific goals. The multilateral setting and the working mode of cooperation, focused as it is on synchrotron-related research, are associated with the objective of "[b]uilding scientific and cultural bridges between neighbouring countries, promoting understanding and tolerance through international cooperation, and fostering a regional community of scientific users who will work together at SESAME" (UNESCO, 2017a). In the same vein, the EU, as the main contributor to the facility north of Amman, has emphasized that "SESAME is a testament to the fact that science diplomacy and international cooperation can build bridges between people and nations, and encourage peaceful relations where other kinds of politics and diplomacy fail". How can this be achieved? By bringing together scientists from different countries to work "under the same roof" (EU, 2017). While such statements may at times give the impression that donors are overselling SESAME's impulses for peace, they and other supporters have pointed to the project's growing users' community – but with the implication that cooperation automatically leads to peace. SESAME's supporters have, of course, an additional valid point by referring to the (potential) benefits of the multilateral large-scale project (see below).

SESAME's main governing body is its Council, where each Member and Observer is represented by up to two Members, who can be accompanied by up to two advisers. Only Members and UNESCO representative have the right to vote (UNESCO, 2004). Although the composition of each delegation is the Member's prerogative, in practice this allows Members to be represented by both a government official and a scientist. Decisions, including the election of the President, are adopted by a two-thirds majority, which requires a high degree of unity among the Members, but prevents domination by some stakeholders and protects minority groups.

Since the Council only meets twice a year or for extraordinary sessions, the daily management of the organisation is entrusted to the Directorate with its five Support Offices (Chart in SESAME, 2019). The cooperative spirit and structure do not always prevent the long-standing rivalries characterising the Middle East from resurfacing, as we will see below. However, the President of the Council, Rolf-Dieter Heuer, a former CERN Director-General, was positive and optimistic about SESAME's activities in an interview with *Frankfurter Allgemeine Zeitung* (2017). He emphasized that "it is a small miracle when Jordan, Turkey, Cyprus, Pakistan, Palestine, Israel, Egypt and Iran join forces and engage in a large-scale scientific research project and overcome religious and political barriers". This echoes Schopper's (2016) earlier remark that such a large-scale techno-scientific project is associated with the promotion of human values like rationality, honesty, and tolerance. In more specific terms (making any horizontal replication of the SESAME model almost impossible), and diverging from all other cooperative initiatives in the Middle East and beyond, scientists speak with a specifically authoritative voice by using techno-scientific arguments

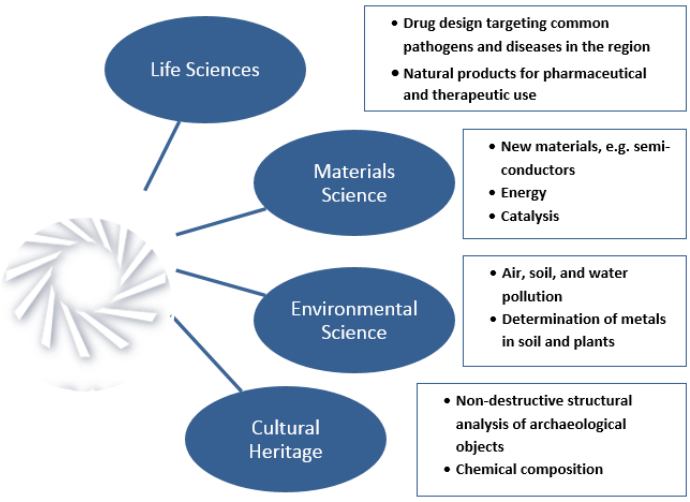
to cover up ideological differences, and thus are able to reach agreements especially with authoritarian rulers (Schopper, 2016). Against this mixed backdrop it would be interesting to learn if SESAME's internal rules and regulations provide for mechanisms to resolve disputes.

SESAME's Achievements and Prospects: Operational Research with (Potential) Benefits

Non-experts may wonder what synchrotrons are and what they are used for. They are large machines that produce very powerful beams of bright X-ray light. In a synchrotron, bunches of charged particles – in this case electrons – circulate at nearly the speed of light for several hours inside a long ring-shaped tube under vacuum. As magnets surrounding the tube bend their trajectories, the dancing electrons radiate energy, so-called synchrotron radiation or synchrotron light, with wavelengths that range from infrared radiation to X-rays. The emitted light is collected by different beamlines and is guided through a set of lenses and instruments, where the X-rays illuminate and interact with samples of material being studied (EU, 2017).

Today the 60 synchrotrons in the world, including SESAME, are used for a wide range of applications ranging from condensed matter physics to structural biology, environmental science, and cultural heritage (see Figure 1). SESAME will explore environmental and material sciences with links to industries in the Middle East region (ESRF, 2019). According to UNESCO (2017b), SESAME will generate several beamlines designed to produce light with a range of characteristics suited for the types of applications mentioned above. Some 300 Middle East scientists have taken part in the selection of projects for SESAME from the 70 proposals received; these projects are now operational or will be in the near future (SESAME, 2019).

Figure 1: Summary of Possible SESAME Applications of Interest to Its Members



Source: Based on Schopper (2017).

Although it may still be too early to provide solid facts about SESAME's achievements and benefits, the main mechanism for involving the current and potential users' community has become clear. Young scientists and graduate students in research institutes and universities especially in the Middle East are regarded as constituting the major Membership of the users' community. They are expected to visit the laboratory periodically to carry out experiments, mostly in cooperation with others. So far a considerable number of the 300 Middle East scientists who participated in the selection of projects and who are working in the broad range of disciplines mentioned above have used the meetings and training opportunities supported by UNESCO and the IAEA. In addition, many of the world's synchrotron laboratories have established special training fellowships that scientists interested in working at the Amman facility will be able to utilise. As more beamlines are built, SESAME's users' community could grow to 1,000 or more (UNESCO, 2017a; SESAME, 2019).

In terms of (potential) benefits, donors such as the EU have emphasized that SESAME contributes to stabilizing the Middle East by "boosting economic growth locally and helping to prevent or reverse the risk of brain drain" in the region (EU, 2017) and will attract many of the Middle East's young people to pursue higher education in the sciences as a way of contributing to the development of knowledge-based economies in their countries of origin (UNESCO, 2017b). Concrete figures would certainly be helpful to endorse these claims. In addition, the locally based SESAME will be especially relevant for women scientists from the region who might face additional obstacles while travelling abroad (Grotelüschen, 2017).

Challenges Abound: Demanding Funding Needs and Political Frictions amid Defiant Signs of Optimism

As Herwig Schopper (2017), the Founding President of SESAME's Council, has explained, in light of the initial funding needs for both investment and operating costs, an original and innovative strategy was chosen that made use of the specific multilateral setting by targeting a mix of regional and extra-regional actors/donors. The costs were shared by several stakeholders, the major donors being outside the Middle East:

- Jordan paid for the site preparation, building, and infrastructure (roads, electricity, and water).
- SESAME Members fund the annual operating budget (including items such as salaries and various consumables).
- Among the facility's technical components, Germany donated the injection system, the EU partly financed the main ring, and Observers provided some in-kind contributions.
- Other laboratories or individual Members' specific projects funded the beamlines.
- Finally, extra-budgetary contributions from the IAEA, the United States, and other donors covered the costs of the training of technicians and scientists.

Until 2016 the total in-cash contributions were estimated at about $100 million (without training funding). However, this seemingly successful strategy could not prevent problems arising. As Rolf-Dieter Heuer explained (*Frankfurter Allgemeine Zeitung*, 2017), in 2012,

> the project was in financial crisis. The turn came when Israel, Iran, Jordan, and Turkey agreed each to pledge millions of dollars in addition. As a result, the European Union freed up funds with which CERN was able to build the deflection magnets for the 133-meter-long storage ring.

Had the oil- and gas-rich Gulf countries agreed to join the project, this financial crisis would have been avoided.

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Structural financial problems remain, but some have in part been solved. One of SESAME's highest operating costs was its electricity bills (estimated at $250,000 monthly), because of the huge energy volumes required by the synchrotron. This is why SESAME invested in a unique solar-power generator with a 6.48 MW capacity, which is now operational, and which makes SESAME the only large synchrotron complex in the world to be powered by renewable energy. The solar farm is located some 40 km from the SESAME site, but the Jordanian electricity provider deducts the price of the solar energy produced at the site and injected into the grid from SESAME's monthly bill. Jordan has allocated some $7 million to this project from funds provided by the EU (SESAME, 2019).

Apart from financial challenges, SESAME could not remain completely immune from the political divisions that affect the Middle East. As Israeli SESAME pioneer Eliezer Rabinovici recalled:

> Politics very rarely entered into our discussions. There were three times over the 20 years (it took to set up SESAME) where I remember politics attempted to enter, and the SESAME Council adopted a resolution that it will not debate or issue statements on any political issues. […] So in three places [Paris, Amman, and Cairo] there was a danger that politics threatened the fibre of SESAME, but we overcame it, and I hope we became stronger by overcoming it (quoted in Deighton, 2017).

The official opening ceremony chaired by Jordan's King Abdullah II in May 2017 was boycotted by Israeli government and Palestinian Authority ministers, while Palestinian scientists faced obstacles to their travelling from the West Bank (*Frankfurter Allgemeine Zeitung*, 2017). Two Iranian scientists who represented their country on the Council, Majid Shahriari and Masoud Alimohammadi, were assassinated in Iran in 2010 and 2011, respectively, and Tehran accused the Israeli Mossad secret service of being behind these crimes (Channel Four, 2010; Dehgan, 2011).

However, the optimistic conclusion of the current SESAME Council President, Rolf-Dieter Heuer, still prevails:

> There are diplomatic difficulties now and then, that is quite clear. But that should not be overrated. All Members are always represented at the Council meetings. […] I have always experienced a constructive atmosphere at the Council meetings that I have attended so far *(Frankfurter Allgemeine Zeitung, 2017).*

In addition, the yearly conferences of the users' community allow for exchange of views. About 100 scientists usually take part out of the community of currently some 800 people. Also, the newly constructed Guest House is open for communication among scientists. As the projects are being conducted at a national level in small working groups, political frictions do not occur: among them were at least two Israeli groups doing experimental work to their satisfaction.

Again, also on a broader scale, SESAME's politico-symbolic value should not be overlooked, since it is "one of the few projects in the region today where transnational dialogue is continuing despite a very difficult context" (EU, 2017). Israe-

li physicist Rabinovici has seconded this, emphasizing that although SESAME will not impact on the peace process in the region to any great extent, it is a sign of hope that there is an alternative to conflict and bloodshed (Grotelüschen, 2017).

SESAME's Staff and Users' Community: Encouraging Interest in the Technical Dimensions of the Relevant Policy Areas as a Way of Strengthening Security-building

SESAME's main initiators, such as Herwig Schopper and Eliezer Rabinovici, as well as major donors and supporters (e.g. the EU and UNESCO) have been reluctant to consider, if not outright negative towards, the possible horizontal transfer of the SESAME model as a "beacon of science diplomacy" (UNESCO, 2017b) to other initiatives working in various policy fields ranging from the environment to water, the economy, energy, and military/disarmament-related security. Their reluctance is understandable and convincing, given the many differences between SESAME as a large-scale techno-scientific project with its own complexities, standards, funding strategies, and dynamics, on the one hand, and often small-scale, civil-society-led initiatives, on the other. Rabinovici has talked only in very general metaphorical terms about this aspect: "We built a small lighthouse that people could gain support from when they try to embark on future projects which are in the same [cooperative, stimulating] spirit" (quoted in Deighton, 2017).

The Israeli scientist working on the project, like Schopper, has been thinking in terms of a vertical increase of SESAME's impact, i.e. extending the number of beamlines, thus enlarging the project and increasing the number of SESAME users to 1,000 or even more. Such a development would in principle, although not in linear terms, increase the potential for extending scientific cooperation and its positive effects to other areas. UNESCO (2019 – "The Users of SESAME") has stressed that the mostly young users, i.e. scholars and graduate students, after having been exposed for a couple of weeks at SESAME to the highest scientific standards in an environment that stimulates international collaboration, "will bring back scientific expertise and knowledge, which they [will] share with their colleagues and students at home". In addition, as already mentioned, users have a variety of training opportunities available to them such as workshops to communicate and foster their knowledge. The former President of SESAME's Council, Chris Llewellyn Smith, stressed that, "nurtured" by SESAME's training programmes, a large number of scientists in the region who had become interested in using the Amman facility would obviously "hope that the diverse Members could work together harmoniously" (quoted in UNESCO, 2017b).

It is at this point that concrete and cautious proposals could be made to address SESAME's users' community via a variety of capacity-building initiatives to strengthen the project's security-/stability-building efforts, which do not seem to be supported to the same extent as the techno-scientific training opportunities and events that the project offers. For the purposes of this paper, we wonder whether it is true to say that scientific cooperation is continuously and invariably harmonious, can be strictly confined to scientific matters only, and automatically leads to the building of bridges between countries and/or cultures.

As we have shown, even the scientists at SESAME do not live in a vacuum, and the social practice of cooperating as scientists will at least to some extent reveal the human beings behind the scientific personae, each of whom will have his/her own specific history, country profile, and cultural context and experiences. We wish to make the case that it would be helpful to strengthen SESAME's explicit peace-building element, but without, of course, jeopardizing the self-understanding of the scientists involved that they should be mainly guided by scientific standards. The dual role of the scientist-cum-disarmament/non-proliferation expert, examples of which do exist in the Middle East and could be described as the ideal type for our purposes, would in practice not be very attractive to the community of young users who work at SESAME. Therefore, a scientist who is informed on the region's wider security-/stability-related matters would be our favourite type of expert.

With this much more modest goal in mind, flexible and perhaps mainly informal and pragmatic ways of reaching out to the technically oriented users' community would be adequate for our purpose, and could be discussed (if not developed) jointly with the SESAME leadership, initially perhaps outside the Amman facility. The current Director, Dr Khaled Toukan, who is also Chairman of Jordan's Atomic Energy Commission and recognised as a most experienced expert in the field, could play an important role here, too – given the fact that he has been active in virtually all the arenas and activities listed below.

We suggest starting with a distinct technical focus associated with the mission and work of the IAEA, and for obvious reasons confined to the CBRN area. Among the international organisations working in this area, the IAEA stands out due to the variety of tasks that the Vienna-based watchdog on nuclear security/safety has been tasked with in the context of the Nuclear Security Summits and in the aftermath of Jordan's chairing of the Nuclear Security Contact Group in 2017/18 (Auda, 2019). The relevant "Action Plan" for the IAEA issued at the previous Nuclear Security Summit in Washington, D.C., in April 2016 highlights the agency's essential role in strengthening the international nuclear security architecture and the leading role it plays in developing guidelines on nuclear security. It also coordinates cooperation among centres of excellence (see also below) and nuclear training and support centres, and produces guidance and provides training to address the threat of cyber attacks on nuclear and other radioactive material and associated facilities. In addition, the Nuclear Security Contact Group meets annually on the margins of the IAEA's General Conference to address current and emerging nuclear challenges.

We regard the activities of two Amman-based institutions as being vital to our attempts to encourage the SESAME

community to address politically relevant technical issues:

- CBRN-related activities and expertise at the Middle East Scientific Institute for Security (MESIS) as part of the EU's Centres of Excellence Initiative (Nasser bin Nasser, 2019); and
- biological materials/weapons-related activities and expertise at the Royal Scientific Society in Amman (especially the Bio-Security and Bio-Safety Center).

The following activities that have been taking place in Amman on a regular basis could go one step further by providing capacity-building seminars and discussion forums involving a mixture of technically and politically relevant issues from all three fields (CBRN-related issues, disarmament, and non-proliferation). These activities include:

- The course "Building Arms Control Capacities in the Middle East and North Africa Region" organised and conducted by the Geneva Centre for Security Policy and partners (the Jordanian Ministry of Foreign Affairs and Expatriates, the Jordan Institute of Diplomacy, the Arab Institute for Security Studies [ACSIS], and the Swiss Foreign Ministry);
- the annual Amman Security Colloquium and Nuclear Forum organised and sponsored by ACSIS, the Nuclear Threat Initiative (NTI), and various governments; and
- the workshop "Towards a NextGen Group of Experts on Security and WMD Issues" organised and sponsored by ACSIS and the NTI.

Lectures on the factual basics of the three fields could be designed in a sensitive way for the SESAME staff and users' community. Broader and more fundamental topics could focus on science and politics, the link between weapons and diplomacy, war and peace strategies, and the dynamics of regional and international order.

Conclusions and Recommendations: Concrete Steps to Reach out to the SESAME Community

We cannot expect SESAME's staff and users' community to bring the two politically driven communities of non-proliferation and nuclear security experts together – nor should we; the main reason being that SESAME comprises a distinct group of scientists primarily guided by scientific standards and devoted to undertaking research. SESAME's agenda is science- and not politics-driven – and rightly so. Its ability to demonstrate that communication mechanisms and cooperative settings are possible in the fractured Middle East is a major achievements. Also, its aim of having a stabilizing impact on the region indirectly helps to improve conditions for progress in the areas of CBRN-related issues, disarmament, and non-proliferation. The experienced SESAME leadership – including Dr Khaled Toukan – certainly know how to draw the line between not meddling with politics but engaging with relevant policies and areas. With this in mind we have attempted to make the case that SESAME's declared goal of peace-building needs to be further developed.

Our proposals aim at making SESAME's staff and its mostly young users' community acquainted with the technical aspects of three politically relevant areas – among them primarily CBRN-related issues – in a cautious and gradual way. We respect the fact that SESAME's distinct character is that of a techno-scientific project. And yet we hold that scientific cooperation needs to be nurtured and is not self-propelling. Opening young scientists' minds up to the technical aspects of the three policy areas referred to above could lead to the creation of examples of the informed scientist described above. IAEA programmes offer a variety of activities that would assist this process, as do the relevant academic institutions based in Amman.

Adequate funding remains the basis for the multilateral project and our specific ideas. As noted throughout this Policy Forum issue, SESAME faces structural financial problems despite the fact that extra-regional funding for two beamlines currently amounts to more than $10 million (this is not at the expense of Jordan's overall contribution). The challenges were tackled at the December 2019 meeting of the Council in a constructive way. The operational limit of the annual budget amounting to $5.288,613 is regarded as too low. What is more, some of the eight Members have paid there share for 2019 in due time (Cyprus and Jordan: $518,551 each; Israel and Turkey: $912,651, i.e. the maximum amount possible of the capped country share). Egypt was expected to pay its contribution ($534,523) by the end of 2019, while the Palestinian Authority ($66,385), Pakistan and Iran (maximum amount each) have not paid their contributions in due time – in the case of Iran the sanctioned Member shows again the pattern of interaction between politics and technology.

The acute challenge is to find – preferably a regional – alternative to Iran. As indicated in this Policy Forum issue, the wealthy Gulf states, which have not been involved so far in SESAME, come to mind. In the wake of the positive funding record of extra-regional donors (which makes occasional criticism expressed in the region obsolete), the SESAME Council at its December 2019 meeting also opened up a new category of Associate Membership to existing Observers: They will be contacted as a new funding source for providing a maximum share of one-third of the highest annual amount of almost $1 million. ■

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