

Where are the new patrons of science?

Muslim nations must take a big leap forward in developing science and technology to catch up with the rest of the world, argues **Herwig Schopper**, or they risk falling behind in the global economy.

Spending on research and development in the Islamic world is an order of magnitude below the global average. According to a series of highly self-critical reports assembled by Arab scholars, and released by the United Nations, countries in the Arab world are finding it hard to improve the situation. As commentators from that region have noted, they continue to fall behind not only the developed countries in the West but also emerging nations in east Asia. In the past decade, Taiwan and South Korea have shown a breathtaking expansion of science and technology coupled with rapid economic growth. Can a similar leap forward occur in the Muslim world?

Lack of funding is a major obstacle but not the only reason for the appalling status of science in the wider Muslim world. Certainly for poorer nations, lack of resources is a problem, and they may view science as a luxury they can not afford. Governments mostly exacerbate the problems of low investment because they lack the strategies to foster science and to prioritize research projects.

One of the biggest challenges facing Muslim countries is that science is too often viewed as a commodity that can be separated from the thought processes that led to it. Believing that oil money can simply buy Western technology, wealthy Arab states do little beyond consuming science and technology products. But to flourish, science and technology need a cultural base that can only be acquired by science education and by undertaking research programmes. This effort requires, above all, a return to the patronage of the past, when science had support at the highest echelons of Muslim society.

Another factor is poor integration within the international scientific community. In 2000, under the auspices of UNESCO (the United Nations Educational, Scientific and Cultural Organization), an international laboratory for synchrotron radiation for the Middle East and the Mediterranean regions, SESAME, was founded to promote science and technology in the region, to improve international cooperation and to bring nations together in peace. The laboratory is in Jordan, close to Amman. SESAME was created according to the model of CERN, the European Laboratory for Particle Physics near Geneva. Because of my experience with CERN,



Falling on deaf ears? The president of Sudan, among others, has called for greater support for science.

I was asked to chair the SESAME council, the governing body of the organization. That is how I got a chance to understand at first hand the problems of the Middle East, and the different mentalities and ways of operating.

After many discussions with people from the region — scientists, administrators and politicians — my main message would be that unless drastic changes occur, it will fall further behind the rest of the world, despite its great culture, its human capabilities and its relative wealth. Many reasons have been given for the unsatisfactory situation in science and technology at present — including conflicts and economic sanctions — but no

excuses will help. The competition in other parts of the world is progressing fast. A big jump in development is needed.

Muslim science had a golden age between the eighth and thirteenth centuries (see 'The golden age', overleaf, and timeline, page 23) and then declined. There are external reasons for the decline of Muslim science, including the Mongol invasion in the thirteenth century, but internal factors, such as growing isolation, growth of authoritative regimes, discouragement of innovation and restrictions on freedom of expression, were probably more decisive.

In general, there was a shift, starting around 1100, from a rational and tolerant attitude to a more conservative school of thinking that denounced philosophy and rationalism.

The older developed countries of Europe took some 150 years to evolve from an agriculture-based society into an industrialized one. But there is not enough time to repeat the European experiment in the Islamic world. If Muslim countries were to follow a similarly slow path to modernization, they would be doomed to insignificance in the global economy. There has to be a rapid leap forward to catch up with the industrialized world. That this is possible has been shown by countries such as Taiwan and South Korea, and more recently by China.

How to leap forward?

Above all, the mentality of political leaders must change to show more of a commitment to science. Political leaders in many Islamic nations simply fail to appreciate the importance of scientific research to their countries' development. This is not to ignore the real poverty of many Islamic nations, or the positive steps taken by some countries, such as Jordan, Pakistan, Iran and Turkey, which may still inspire others to action. And there are pronounced differences between the 57 Islamic countries that make up the Organization of the

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Islamic Conference (OIC) that are discussed in more detail elsewhere in this issue. In short, not all of the criticisms or recommendations expressed here can be applied to every Muslim nation. Nevertheless, all Islamic countries can do more to support science and technology. Socio-economic development cannot depend solely on natural resources. Nowadays, knowledge has become a major driving force of world economics.

Many proposals have been made by individual Muslim leaders or organizations to support science and technology. Unfortunately, most of these have had little effect. World Bank Development Indicators for 1996 to 2003 reveal that Muslim countries on average spend less than 0.4% of their gross national product on research. This figure compares with a world average of 2.36%. It is difficult to convince sponsors from other parts of the world to help the Muslim world if their own efforts are not stronger.

Sometimes the initiatives are full of good intentions, but the results are too often disappointing. In May 2002, the OIC's Standing Committee on Scientific and Technological Cooperation (COMSTECH) proposed that the Islamic Development Bank come forward with at least US\$1 million annually to upgrade some selected research institutes. At an Arab League summit of 22 nations in Khartoum, Sudan, in March, members agreed to collaborate more closely to increase science funding and encourage public-private research partnerships. Omar Hassan al-Bashir, president of Sudan, opened the summit with a call to put science at the heart of nations' strategic plans. He suggested that the increasing revenues from oil production should be used to fund science and technology development. To date, none of these statements has led to the concrete actions hoped for.

In the meantime, the Arab world is suffering an emigration of intellectuals to the West. According to a 2004 report by the Gulf Centre for Strategic Studies in Cairo, each year the Arab countries lose 50% of their newly qualified physicians, 23% of engineers and 15% of scientists, mainly to Britain, the United States and Canada⁵. In addition, some 45% of Arab students studying abroad do not go back to their countries after graduating.

Today's Muslim societies have generated few scientists of international repute, despite accounting for roughly one-fifth of the globe's population. Only two scientists from Islamic states have won Nobel prizes: Abdus Salam, a Pakistani (for physics in 1979) and Ahmed Zewail, an Egyptian (for chemistry in 1999). Both carried out their research outside Islamic countries.

Scientific progress in academia in Muslim countries is often hampered by isolation and a relatively immature university system.



Hope for the future: SESAME under construction in Jordan.

Promotions in institutions are often based on trustworthiness rather than merit. Salaries are so low in some countries that people have to find additional income. An excessively bureaucratic system often stifles innovation.

A few recommendations

Although my knowledge of the situation in Muslim nations is based on my personal experience in the region, I would not dare to make such negative statements on my own were they not confirmed by Muslim scientists. When I have presented my thoughts to people from these countries I have found support for many of the recommendations offered below.

First, the importance of research in contributing to the overall welfare of Muslim societies needs to be recognized, which in the short term will require a return to patronage at a high political level. This is possible, as some examples prove — the strong support of science and education by King Abdullah II in Jordan and by President Pervez Musharraf in Pakistan. Political leaders need to provide sufficient resources

can greatly improve cooperation between scientists.

Second, Muslim nations need to strengthen international links, in addition to purely national or bilateral cooperative projects. Excellence in scientific research can only truly be achieved by competing at the international level. Participating in centres of excellence supported by regional or international organizations can foster such integration, but only if there is solid commitment from the countries involved.

Third, individual scientists need better security — in jobs, salaries and pensions. Rebuilding links with expatriate scientists and encouraging them to return is vital, as is support for scholarships to study abroad and to bring back the skills required at home. This is one objective of the SESAME training programme, supported by the International Atomic Energy Agency in Vienna.

Finally, science can be an excellent tool for building trust and promoting peace. This is particularly true for large and costly facilities or projects, because such cooperation involves not only scientists but administrators and politicians, sometimes at the highest level. An outstanding example is CERN, which helped to bring together European states after the Second World War. Scientists from not-so-friendly countries work together in solving difficult scientific and technical challenges. They don't just exchange papers, but spend day and night shifts together. In the case of SESAME, Israelis and Palestinians, Turks and Cypriots sit around the same table with colleagues from other countries discussing their common problems peacefully. These are the reasons why organizations such as CERN and SESAME have been established by UNESCO under the slogan "science for peace". There is much to gain, and little to lose, by embracing such ideas. ■

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1. Arab Human Development Report, available at <http://cfapp2.undp.org/rbas/ahdr.cfm>
2. Atta-ur-Rahman & Nasim, A. *Nature* **432**, 273–274 (2004).
3. Maziak, W. *Science* **308**, 1416–1418 (2005).
4. World Development Indicators 2006; available at <http://devdata.worldbank.org/wdi2006/contents/home.htm>
5. Sahel, W. Brain drain threatens future of Arab science *SciDev.Net* (3 June 2004).

See Editorial, page 1; News Features pages, 19–29.

The golden age

Conditions favouring the ascendancy of Arab culture in the eighth to the thirteenth centuries.

- Patronage of science by persons in high positions. Important examples include the early Abbasid caliphs of Baghdad (AD 754 to 833). Princes and ministers found pleasure or reputation in supporting science. Sultan Ulugh Beg at Samarkand, in modern-day Uzbekistan, even performed his own astronomical observations.
- Support for injunctions in the Koran that it is the bounden duty of every Muslim, man or woman, to acquire knowledge.
- A liberal and tolerant attitude to knowledge from all sources; international contacts and exchange of ideas.
- Good social conditions for scientists. Imam Ghazzali (1058–1111) said: "There are no countries in which it is easier for a scholar to make a provision for his children."