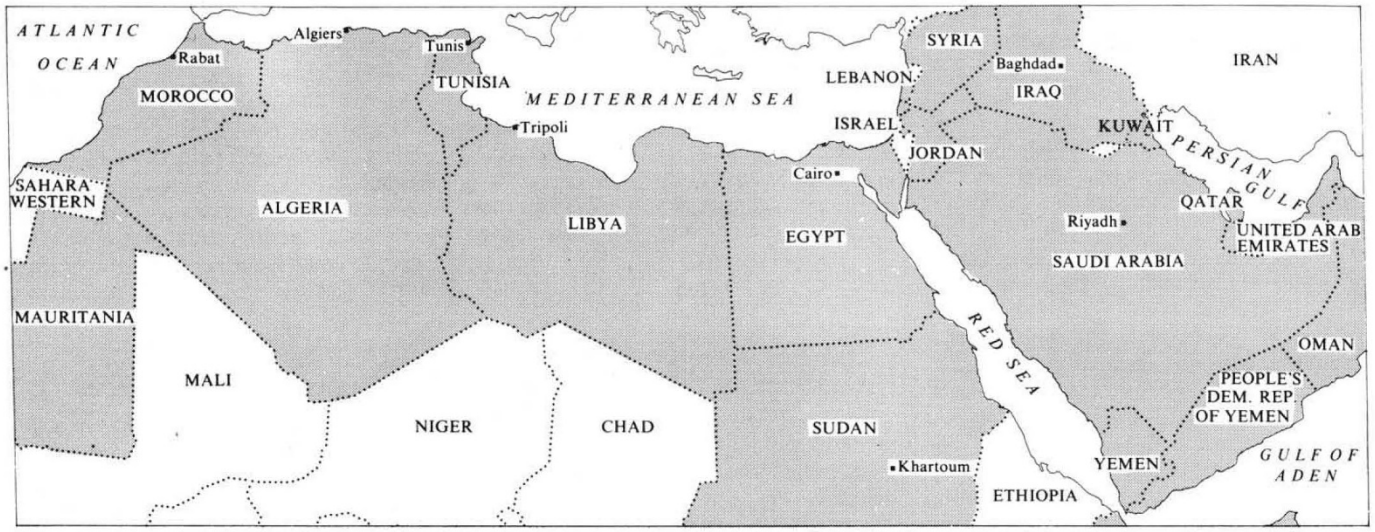
FEATURES



Shaded countries are members of the League of Arab States. Somalia, not on the map, is also a member

Planning science in the Arab world

Many problems faced by scientists in the Arab world are common to all Third World countries. Dr A B Zahlan takes the Arab case to test some general assumptions about the problems of science and technology in developing countries

SCIENTIFIC research in the Arab world has been growing at a steady pace during the past three decades. Two thirds of this activity has been in the agricultural and medical fields where extensive institutions and qualified manpower now exist. The research work is generally of an applied nature and dwells on current problems. By contrast, research activity in all other fields is on a limited scale. In the basic sciences, for example, it does not account for more than 5% of publication output, and in areas of a vital developmental, industrial and defence nature — such as metallurgy, civil engineering, hydrocarbon chemistry, electronics, aerospace, — it is on a vary small scale.

The fields of scientific research that are normally undertaken by university professors have been severely affected by the generally poor working conditions in the fifty or more Arab universities. Teaching loads are high, job security is low, libraries are poor or non-existent, laboratory and work-shop facilities are restrictive, administrative red tape is excessive, intellectual stimulation is limited, standards for academic promotion are wanting, and technical and secretarial support staff remain scarce. These conditions of course do not prevail at the same level in all institutions, and an active research programme often flourishes in difficult circumstances thanks to the energies of a few researchers. Moreover, a small number of scientists have created permanent links with research groups in Europe or the US.

Various statistical compilations set a figure of about 40,000 for the number of researchers in Arab countries. These staff more than 500 R&D institutions and 50 universities, the latter enrolling more than 1 million students. However, the constraints on their capabilities have reduced their contributions to the scientific literature to a meagre 1,500 per annum. The absence of adequate publications in the applied sciences at one stroke limits the development of appropriate teaching materials and condemns workers to researching and rediscovering similar problems. The present level of funding in the range of $1-2 per capita per year during the 1970s has, of course, also been a constraining factor.

Despite these drawbacks, the scientific communities in the Arab world have accumulated considerable experience and have experimented with a broad range of ideas and instruments. Many of the problems faced by Arab researchers are common to Third World countries, and the Arab experience thus has a universal value.

The concepts underlying much of current thinking in science and technology in developing countries emphasise the need for high level manpower, the integration of research activities in science and technology with development plans, the central planning and management of the activity, the linking of the central management, (often called 'science policy making body', SPMB) to the highest decision maker, and so on. These notions are so reasonable that very little in the way of empirical testing has been attempted. The Arab experience in the use and application of these notions has made it possible to evaluate these concepts in real-life situations.

One finds, for example, that science policy making bodies still subscribe to the belief that the shortage of scientific manpower is an obstacle to the development of research programmes. However, the expansion of the secondary and university educational systems in the Arab world as well as the access to foreign educational systems (the USSR, eastern and western countries, and North America) have combined to eliminate the supply of high level manpower as the determining factor in scientific research or in any other function where such manpower is needed. Thus, although the Lebanese National Council for Scientific Research (NCSR) subscribed to the principle that the formation of scientific manpower was a necessary step prior to the funding of research projects, only 10% of its own grants went to recipients of NCSR

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advanced study fellowships; and the recipients of the remaining 90% of the grants had not required NCSR support for their higher education, having completed their advanced education before the NCSR adopted its manpower formation policy.

The feasibility of centrally planned scientific activity has been taken for granted by developing countries, and especially by UNESCO's Science Policy Division. Egypt has been committed to such an approach. More than eight major changes in its SPMB's during the past two decades clearly undermines the effectiveness of central planning. The Science Council (established in 1956) created a system of committees for the planning and management of scientific activity. Between 1958 and 1960, it mobilised 3,000 Egyptian scientists to prepare a five-year plan. This effort was sidetracked, however, in 1961 by the establishment of the Ministry of Scientific Research. There were further changes in 1964, 1965, 1968, 1971, 1975 and finally in 1976.

Since 1956 the councils and committees established to plan and manage scientific activity have grown in size and number. By 1977 the Academy of Scientific Research and Technology had 17 research councils and 97 subject committees involving more than 1,300 members for planning and managing its programmes. Of the 97 subject committees only a third held one or more meetings attended by 50% or more of their committee members; and 53% held no meetings. A detailed analysis revealed that there was no correlation between the number of meetings held and the amount of funds appropriated, or between the declared priorities of the Academy's science policy and the activities of the committees or councils or the funds appropriated. Although a basic objective of the Academy is to concentrate on the solution of urgent problems, only 5.6% of 1977 appropriations were committed to projects whose duration was two years or less, and 51% were granted to projects whose duration was five to ten years.

The linkage of the SPMB to the decision-makers has posed a number of interesting problems. UNESCO, for example, advocates that this linkage be to the highest decision maker in the country in order that financial support be guaranteed and that the integration between development planning and science and technology be efficiently effected. Despite the importance given to this linkage in the international literature on the subject, one finds surprisingly little concern for the actual behaviour of these Third World institutions. Since SPMB's are central to the relationship between the scientific community and the decision maker, their stability is vital to the development of effective personal and institutional relationships. The eight major changes in the SPMB in Egypt noted earlier reduce the credibility of such an assumption; such a high level of discontinuity in the institutional framework undermines both the linkage to the decision maker and the human and social relationships within the community itself. In addition to institutional instabilities one must also consider the frequent changes of the officials responsible for the SPMB.

The situation on the decision-maker's side is no less incoherent. Frequent changes in ministers and in policies also occur. Civil disturbances and economic crises take their toll of scientific activity. The first year of the Lebanese civil war, for example, reduced the output of the scientific community there by more than 42%.

Much of the international discourse on science and technology in the contexts of UNCSAT and the UN conference on science and technology for development revolved around the notion of "applying" science and technology to the development process. Yet the major obstacles to achieving such a useful objective were left out of most of the deliberations. These obstacles are due to the structure of the planning process, the inadequate communications between the scientific community and planners, bureaucratic resistance to data collection and dissemination, and the domination of the central planning process by economic, political and financial considerations. The widespread utilisation of the turnkey type of contracts with foreign firms reduces opportunities for applying indigenous science and technology considerably. The character of government operations is important, rather than the institutional link of the SPMB to central authority. As a matter of fact, it does not seem to matter whether the linkage is to the head of state or to the minister of higher education and scientific research.

Most of the Arab countries have now reached a phase where the major obstacles to further progress lie in the weaknesses of the existing institutions, the planning practices of ministries, the means available to university professors to undertake scientific research, and cultural policies.

The international connection

The scientific communities and institutions of the Arab world have evolved a complex set of relationships with foreign countries. To begin with, most scientific manpower engaged in research have relationships with scientists in Europe, the USSR or US. A number of scientific unions already exist in the Arab states and many of these are members of the International Council of Scientific Unions (ICSU). Egyptian scientific councils belong to most of the ICSU councils, and research councils in roughly half the Arab states are members in one or more of the ICSU councils.

Numerous research institutions in the Arab world have been established through bilateral agreements. The nuclear research centres in Baghdad and Cairo, and the bilharziasis research institute in Cairo were established by the USSR and Federal Republic of Germany respectively. In 1942, the US Navy established in Cairo the US Naval Medical Research Unit Number Three (NAMRU-3) which by 1977 had grown to 26 military personnel and 206 civilians (203 from Egypt). NAMRU-3 has played an active role in medical research in Egypt. In 1976, the US and Saudi Arabia signed an agreement through which the US is to assist Saudi Arabia to establish the Saudi Arabian National Centre for Science and Technology (SANCST). The US and Saudi Arabia also have a joint five year $100 million research programme in solar energy.

UN agencies have been involved in a number of different ways in the application of science and technology in developing countries. UN support to scientific research activity, or to the strengthening of indigenous technological capabilities of Third World countries, consumes no more than 1.5% of the $3 billion UN budget. The Arab world share of these $45 million is of the order of $1-2 million.

The number of scientific and technical meetings in the Arab world has been steadily increasing. The Cultural Department of the League of Arab States sponsored these meetings in the fifties. Since then the Arab League Educational Cultural and Scientific Organisation (ALECSO) has been instrumental in convening them. The growing number of scientific associations and societies have also been actively organising scientific meetings.

Likely trends

On the national and regional level, a large number of small scale but steady changes have been registered. New institutions and new universities are created annually. The position that Egypt (with 25% of the population of the Arab world) held in 1950 with virtually the only Arab centre for scientific work (more than 80% of Arab publications in 1950 were by Egyptians) has been changing steadily. In 1967 Egypt produced 63%, and in 1976 55%, of Arab publications; by the year 2000 Egypt's share will be below 40%. This reduction is not due to a decrease of activity in Egypt but rather to an expansion in the other Arab states. For example, the combined output of Kuwait, Libya and Iraq (11% of Arab world population) which was 8% in 1967 increased to 14% in 1976. It is likely that the share of these three countries would have increased to 30% in the year 2000.

The internal movement of scientific manpower between Arab states has been steadily increasing. This has made the development of social and educational services in Arab oil producing countries at a high rate possible. During the past decade

most of the increases in the allocations for R&D in the Arab world have taken place in oil producing countries; elsewhere, little increase in funding is recorded.

The Arab scientific communities, the educational systems, their immediate environments, their relationships to the users of technology, and the resources of the Arab states have all been undergoing far-reaching changes. It is very difficult at this moment to identify clearly the new directions that are emerging. On the surface, it would seem that the traditions of the past three decades are firmly entrenched. This can be seen from the CASTARAB 1976 meeting in Rabat, the 1978 Kuwait Fund for Arab Economic Development feasibility study on the proposed Arab Fund for Scientific and Technological Development, as well as the national papers submitted to UNCSTD. Nevertheless a large number of indicators point to the possibility of major departures. Since the early fifties, the production of scientific and technical manpower has been expanding at an exponential rate, with a doubling time of about 5.3 years. If this rate continues, the one million university graduates of 1978 would have grown to more than 12 million by the year 2000. The 24,000 foreign trained doctorate holders could reach a level of 150,000–250,000 by the year 2000.

Meanwhile, the capacity of the US and Europe to drain unwanted high level manpower has been reduced by the economic recession registered there. Furthermore, the size of Arab technical manpower is rapidly reaching a level that makes likely drains an insignificant portion of the total pool of educated manpower. The absorption of this enormous manpower cannot be achieved without effecting major structural changes in current practices of planning and executing development projects. All Arab countries are undergoing rapid social and economic change. Ministries, institutions, industrial installations, and transport systems are all being developed at a high rate. But many developmental projects are being executed in a manner that does not utilise existing technical skills or institutions. This leads to a low level of employment generation within the Arab countries themselves. An interesting comparison provides an indication of the extent of this fact: Imperial Chemical Industries (ICI) provides direct and indirect employment in the UK comparable to that of the hydrocarbon sector in the Arab world; but the sales of Arab oil are roughly ten times those of ICI. Obviously the only way in which the five million graduates in the applied and basic sciences are going to find employment is if the present technological dependence is reduced through the use of indigenous firms and institutions. Technology policies will certainly assume increasing social and political importance during the next two decades. The very stability of Arab countries will depend on the development of employment-generating technology policies.

A profound religious and ethical rejection of the stark contrast between wealth and poverty pervades the Arab world. This has so far led to the establishment of a number of Arab funds (national and regional) that aim to assist sister countries in their development. Finally, the difficulties and mechanics of development are becoming clearer, the social and political cost of inaction is growing increasingly evident, the enormous resources of the Arab world are gradually coming under the control of local institutions and governments. What, when and how a zipper action will operate to cohere all of these disjointed resources is difficult to forecast. But when it does happen the scientific communities of the Arab world will be called on to play a leading role. □

Mountains out of molehills

KENNETH MELLANBY

ONE of the less attractive habits of our species, *Homo sapiens* (sic), is the way in which we attribute our unpleasant behaviour patterns to other animals. Thus the human glutton is described as a pig or a hog, and the term swine is used to cover a multitude of our sins. Male chauvinists are pigs, and their women bitches when they assert their rights, cows when they do not, and cats when they criticise other women. Occasionally diminutives like kitten are used more affectionately, but as a rule the comparison with an animal is a derogatory one.

1979 has been called 'The Year of the Mole' — with the mole cast as the villain of the piece. Thus while the majority of viewers could not make head or tail of the BBC television serial *Tinker, Tailor, Soldier, Spy*, they did understand that there was a traitor high up in the security organisation who was passing vital information to the enemy — in other words, a 'mole'. This programme had hardly left our screens when we had the real life case of Anthony Blunt, a distinguished art historian and advisor on pictures to the Queen, who confessed to having been a Communist agent passing information to the Russians when he was attached to the British secret service. He was the mole *par excellence*. Then for some years British Leyland, the ailing motor manufacturer, has had its troubles exacerbated by the actions of a Communist shop steward, commonly called the 'red mole'.

Yet the furry little insectivore *Talpa europaea*, has little in common with a spy or a disruptive agitator. It must be admitted that it is equally unlike the loveable and friendly animal featured in Kenneth Grahame's delightful children's book *The Wind in the Willows*, and presented so vividly on stage in London each Christmas by the redoubtable octogenarian actor Mr Richard Goolden in the play *Toad of Toad Hall*. Moles do indeed live underground in burrows, but their most striking characteristic is their solitariness. Rudyard Kipling wrote, in this case with reasonable accuracy, about 'The Cat which Walked Alone', but the mole is very much more independent than the most self-centred domestic pussy.

In fact it is difficult to see anything in the life history of the mole in common with that of a spy. For almost the whole of their lives, both males and females occupy their own separate sections of underground tunnell, and spend the time in sleep or in running up and down picking up worms and insects which have dropped into the burrow. Should a mole be foolish enough to invade another's territory, it is usually driven off at once. Except for a brief period once a year when the female accepts the attentions of the male, when mole meets mole there is at once open hostility and even bloody combat. There is nothing subtle, deceitful or underhand in the behaviour of *Talpa*.

Gardeners who suffer from the appearance of molehills on their carefully manicured lawns may perhaps be excused for saying nasty things about the culprit, but at least they must admit that by making its presence so noticeable the burrower is hardly being secretive or underhand. So should we not try to find some other zoological sobriquet for a traitor or an industrial troublemaker? I fear that any suggestions will arise the wrath of some other mammalologist involved with the libelled species.

Finally, I find that I am, unwittingly, involved in an attempt to cash in on the current interest in moles. I read in the London newspaper *The Financial Times* that: "Collins the publishers tell me that they have had some discussions about expanding the title of Professor Kenneth Mellanby's book *The Mole* to *The Mole — the Blunt Truth*".

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