

# Developing countries need more scientists

Western nations are not fulfilling their obligation to provide international centres of learning for scholars from developing nations. **Professor Abdus Salam**, co-winner of the 1979 Nobel prize in physics, makes a plea for new international universities of scientific teaching and research run by United Nations organisations.

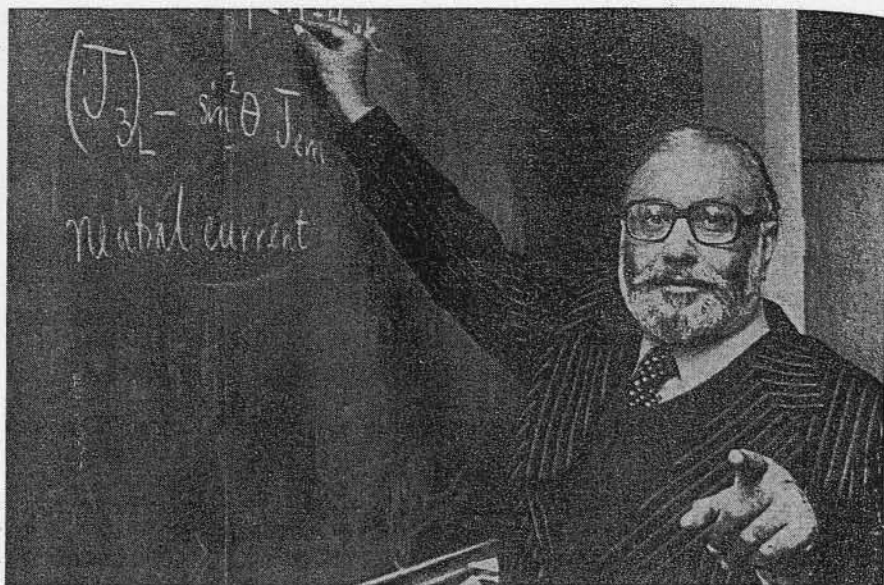
THE history of science, like the history of all civilization, has gone through cycles.

Seven hundred and fifty years ago, an impoverished Scotsman left his native glens to travel south to Toledo in Spain. His name was Michael, and his quest to live and work at the Arab Universities of Toledo and Cordova, where the greatest of Jewish scholars, Moses Bin Maimoun, had taught a generation before. Michael reached Toledo in 1217 AD. Once in Toledo, Michael formed the ambitious project of introducing Aristotle to Latin Europe, translating, not from the original Greek, which he knew not, but from the Arabic translation then taught in Spain.

Toledo's school, representing as it did, the finest synthesis of Arabic, Greek, Latin and Hebrew scholarship, was one of the most memorable of international assays in scientific collaboration. To Toledo and Cordova came scholars not only from the rich countries of the East, like Syria, Egypt, Iran and Afghanistan — but also from developing lands of the West like Scotland. Then as now, there were obstacles to this international scientific concourse, because of economic and intellectual disparity between different parts of the world. Men like Michael the Scot and his contemporary, Alfred the Englishman, were singularities. They did not represent any flourishing school of research in their own countries. With all the best will in the world, their teachers at Toledo doubted the wisdom and value of training them for advanced scientific research. At least one of his masters counselled young Michael to go back to clipping sheep and to the weaving of woollen cloths.

Perhaps I can be more quantitative on this cycle of scientific disparity. George Sarton, in his monumental five-volume

*Professor Salam, Director of the International Centre for Theoretical Physics, and co-winner of the 1979 Nobel prize in physics with Sheldon Glashow and Steven Weinberg for the unified theory of the weak and electromagnetic interactions, first gave this address to the Unesco executive board shortly after the award of the Prize and the award by Unesco of the Einstein Medal.*



*Professor Abdus Salam demonstrating his Nobel prize-winning theory. He calls for a ten fold increase in scientists in developing countries.*

History of Science chose to divide his story of achievement in science into ages, each age lasting half a century. With each half-century he associated one central figure. Thus 450 BC - 400 BC Sarton calls the Age of Plato; this is followed by half-centuries of Aristotle, of Euclid, of Archimedes and so on. From 600 AD to 650 AD is the Chinese half-century of Hsüan Tsang, from 650 to 700 AD that of I-Ching, and then from 750 AD to 1100 AD — 350 years continuously — we have the unbroken succession of the Ages of Jabir, Khwarizmi, Razi, Masudi, Wafa, Biruni and Omar Khayam; — Arabs, Turks, Afghans and Persians — men belonging to the culture of Islam.

After 1000 AD the first western names appear; Gerard of Cremona, Jacob Anatoli, Roger Bacon — but the honours are still shared with the names of Ibn-Rushd (Averroes), Moses Bin Maimoun, Tusi, and Ibn-Nafis — the man who anticipated Harvey's theory of circulation of blood. After 1350 AD, however, the developing world loses out except for the occasional flash of scientific work, like that of Ulugh Beg, the grandson of Tamurlane, in Samarkand in 1400 AD; or of Maharaja Jai Singh of Jaipur in 1720 AD — some 40 years after the setting up of Greenwich — who corrected the serious errors of the then western tables of eclipses of the sun and the moon by as much as six minutes of arc. As it was, Jai Singh's techniques were surpassed soon after, with the development of the telescope in Europe. As a contemporary chronicler wrote: "With him on the funeral pyre, expired also all Science in the East". And this brings us to this century when the cycle begun by Michael the Scot turns full circle, and it is we in the developing world who turn to the West for science. As Alkindi wrote 1100

years ago: "It is fitting then for us not to be ashamed to acknowledge truth and to assimilate it from whatever source it comes to us, even if it is brought to us by foreign peoples. For him who scales the truth there is nothing of higher value than truth itself; it never cheapens nor abases him."

During our present century, in the world of physics the first name is that of C.V. Raman — the Nobel Laureate of 1930, and there is then Yukawa, Tomonaga and Esaki; in between Lee, Yang and Ting. Most recently there is the great Jamaican economist, Sir Arthur Lewis, awarded this year's Nobel prize in economics.

In this context the question we must ponder is this; are we in the developing world today firmly on the road to a renaissance in sciences — as the West was in the 13th century at the time of Michael the Scot? Unfortunately the answer is No.

There are two prerequisites to this renaissance: one, the availability of places like Toledo for international concourse, where one can light a candle from a candle. Second, the passionate, consuming desire in our own developing societies to give the topmost priority to the acquisition of knowledge, and the removal of all internal barriers to this end. Unfortunately the prognosis here is not very bright.

And as to the first point, regretfully the opportunities for international scientific concourse are shrinking fast, with greater and greater restrictions in the traditional countries like the UK and US on the acceptance of overseas scholars, including those from developing countries. It is becoming increasingly clear that the developing world will need internationally run — UN and UNESCO run — institutions, universities of science, not just for research, but for the high level teaching of traditional technology and sciences, both

re and applied.

But for a series of accidents, Einstein may have been lost to physics, — such was the measure of financial, economic and other frustrations which he faced, even in a country like Switzerland. Unfortunately the same still applies so far as developing countries are concerned, in a far greater measure. Perhaps I can illustrate this with my own case.

The fact that I became and remained a research physicist is due to three accidents. First, the second World War: as soon as I showed some competence in science, my well-wishers, my parents, and all those around me, destined me for a career in the then prestigious Indian Civil Service. As it happened, with the war the civil service examination was suspended for the duration. But for this I would be a civil service functionary today. The second accident, which sent me to Cambridge for research, was again connected with the war. The then prime minister of my home State, the Panjab, collected some funds for the "War Effort". The war ended; the funds were left unutilized. He decided to institute "Small Farmers' Son's Scholarships" for study abroad. A number were offered; I was one of those fortunate to be selected, and sailed the same year — 1946 — to Cambridge. Several other scholarships were awarded, but unhappily the other scholars were only promised admission for subsequent years. In between, the subcontinent was partitioned and with it the scholarships disappeared. The entire exercise of the then prime minister succeeded in one thing only — in sending me for research at St John's College, Cambridge, where Professor Dirac lived and worked.

### Centre for Theoretical Physics

The third accident happened after I returned to Pakistan, both to teach, and to try to found a school of research. In no uncertain terms, it was made plain to me that this was impossible. I must either leave physics research, or my country. With anguish in my heart, I made myself an exile — and it was this anguish which led me to propose the creation of an International Centre for Theoretical Physics, with the most active sponsorship of the government of Pakistan and other developing countries. The idea was to award what we call "Associateships" of the Centre, so that a deserving young man may spend his vacation in an invigorating environment in close touch with his peers in research, to charge his batteries with new ideas, while still spending nine months of his academic year in his own country, working at his university.

With UNESCO's active help, and with very generous assistance from the government of Italy and the town of Trieste, the Centre was created by the International Atomic Energy Agency (IAEA) in Trieste in 1964. UNESCO

joined as equal partners with IAEA in 1970. Over the 15 years that the Centre has existed now, it has veered from emphasis on fundamental and basic physics towards subjects on the interface of pure and applied physics — subjects like physics of materials, physics of energy, physics of fusion, physics of reactors, physics of solar and other unconventional sources, geophysics, physics of oceans, and deserts, systems analysis — this, in addition to high energy physics, quantum gravity, cosmology, atomic and nuclear physics and mathematics. This shift from pure to applied physics was not made because we thought that pure physics is less important for developing countries. It was simply that there was not any other international institute responsive to the needs of technological hunger involving the discipline of physics. Every year around 1,500 physicists — half from developing countries — spend of the order of six weeks or more at the Centre attending extended symposia or research workshops. The Centre has brought credit to UNESCO besides strengthening physics in the developed and developing world.

But over the 15 years that I have directed the Centre, I have felt more and more strangled, and never more so than now. I used to pride myself on spending half a day every day in research, half a day in administration. Progressively over the last five years this has become impossible. This is not because the task of administration has become more arduous; it is simply because the uncertainty of the Centre's standing in the ecology of international institutes has increased, despite its success, despite its demonstrated need. Its very existence is uncertain from year to year.

Briefly, half the budget of the Centre comes from the Italian government; the other half is shared between IAEA and UNESCO. I am fully aware of UNESCO's limitations in shouldering the responsibilities for such an enterprise; UNESCO defined its mandate 24 years ago as a catalyst of new institutions and not as their long-term sustainer. The realities of the situation now demand a revision of this mandate and newer stable funds to achieve this.

As I said earlier, the world needs today international institutions with requisite stability, for example, on the applied side, institutes like the Wheat and the Rice Research Institutes; and the educational and physics side, institutes like the International Centre for Theoretical Physics. To my distinguished colleagues on the Executive Board of UNESCO I say: that if you cannot find ways and means of keeping alive an initiative you took in 1970, and one now universally acclaimed and recognized to be essential to the health of physics in the developing world, then no one else can and no one else will. Institutes like the International Centre for Theoretical Physics must become part of the normal, continuing, stable United

Nations scene; otherwise the science and technology gap of the North and the South will never, never be bridged.

In science, as in other spheres, this world of ours is divided between the rich and the poor. The richer half — the industrial North and the centrally managed part of humanity — with an income of \$5 trillion, spends 2% of this — some \$100 billion — on non-military science and development research. The remaining half of mankind — the poorer South, with one fifth of this income (one trillion dollars) — spends no more than \$2 billions on science and technology. On the percentage norms of the richer countries, they should be spending ten times more — some \$20 billions. At the United Nations-run Vienna Conference on Science and Technology last August, the poorer nations pleaded for international funds to increase the \$2 billions to \$4 billions. They obtained promises, not of \$2 billions, not of \$1 billion, but only one seventh of this.

### Three appeals

I would like to conclude with three appeals. The first to the international community — both of governments and of the scientists. A world so divided between the haves and the have-nots of science and technology cannot endure; at present an International Centre for Theoretical Physics (with a budget of \$1.5 millions) is all that is internationally available for physics in 100 developing countries. Compare this with European joint projects involving physics alone, of a half billion dollars annually.

My second appeal is to the developing countries. In the end, science and technology among them is their own responsibility. Speaking as one of them, let me say this: your men of science are a precious asset. Prize them, give them opportunities, responsibilities for scientific and technological development of their own countries. The goal must remain to increase their numbers tenfold, to increase the \$2 billions spent on science and technology to \$20 billions. Expenditure on science will pay tenfold.

And then finally, and in all humility, I wish to make a particular appeal to my brothers in the Islamic countries. To some of you Allah has given a bounty — an income of the order of \$60 billion. On the international norms these countries should be spending \$1 billion annually on science and technology. It is their forebears who were the torchbearers of international scientific research in the 8th, 9th, 10th and 11th centuries. Be generous once again. Spend the billion dollars on international science, even if others do not. Create a Talent Fund — available to all Islamic, Arab and developing countries, so that no potential high-level talented scientist is wasted. My humble personal contribution to this Fund will be all I possess — the \$60,000 the Swedish Academy has so generously awarded me. □