Associating science and development – the Trieste Centre

by A. Hamende*

The poverty from which the developing countries suffer is not just material, it is intellectual also. And the first of these evils can never be eradicated until the second is effectively relieved. Many international and national agencies exist to help satisfy the world's material needs, but the International Centre for Theoretical Physics is almost unique in catering for the world's intellectual hunger.

The Centre's menu offers very strong meat. Its scientific Fellows and Associates carry out research at the very frontiers of theoretical physics; the "students" who attend its training-for-research courses are almost all post-doctoral scientists. All the Centre's work is done to the highest international standards of rigour. Why is this so? Do the developing countries really need a coterie of scientists doing abstract and esoteric research which has no direct application to the harsh problems these nations face?

The principle which animates the International Centre for Theoretical Physics is that until the developing countries can compete with the developed in the areas of fundamental science, for as long as they are misdirected exclusively into applied or technological areas, then the developing countries will always remain intellectually inferior. In the past many countries took the view that technology was like a supermarket: one could go and buy whatever one wished. One function of the Centre is to train people so that when they do go to the international technological supermarket, they will at least be informed buyers. It is vital to establish in developing countries an indigenous scientific capacity for research and development. This is needed, at the very least, to achieve an awareness of the significant development of world science and technology, an awareness which would enable a country to select and negotiate the purchase, and ensure the proper assimilation, of the technologies which its economic and social objectives require.

But there is a deeper point here. If technology is the only basis of a country's economic and social development, then science is the only foundation on which a technology-using society can be built. Without science, imported foreign technology will always remain a graft which will not take root and flourish. And without science, the developing countries will always be in a position of dependency, consumers of other nations' technology, and will never achieve the independence which comes of creating their own. "Know-how" is not enough, the developing countries need "know-why" as well.

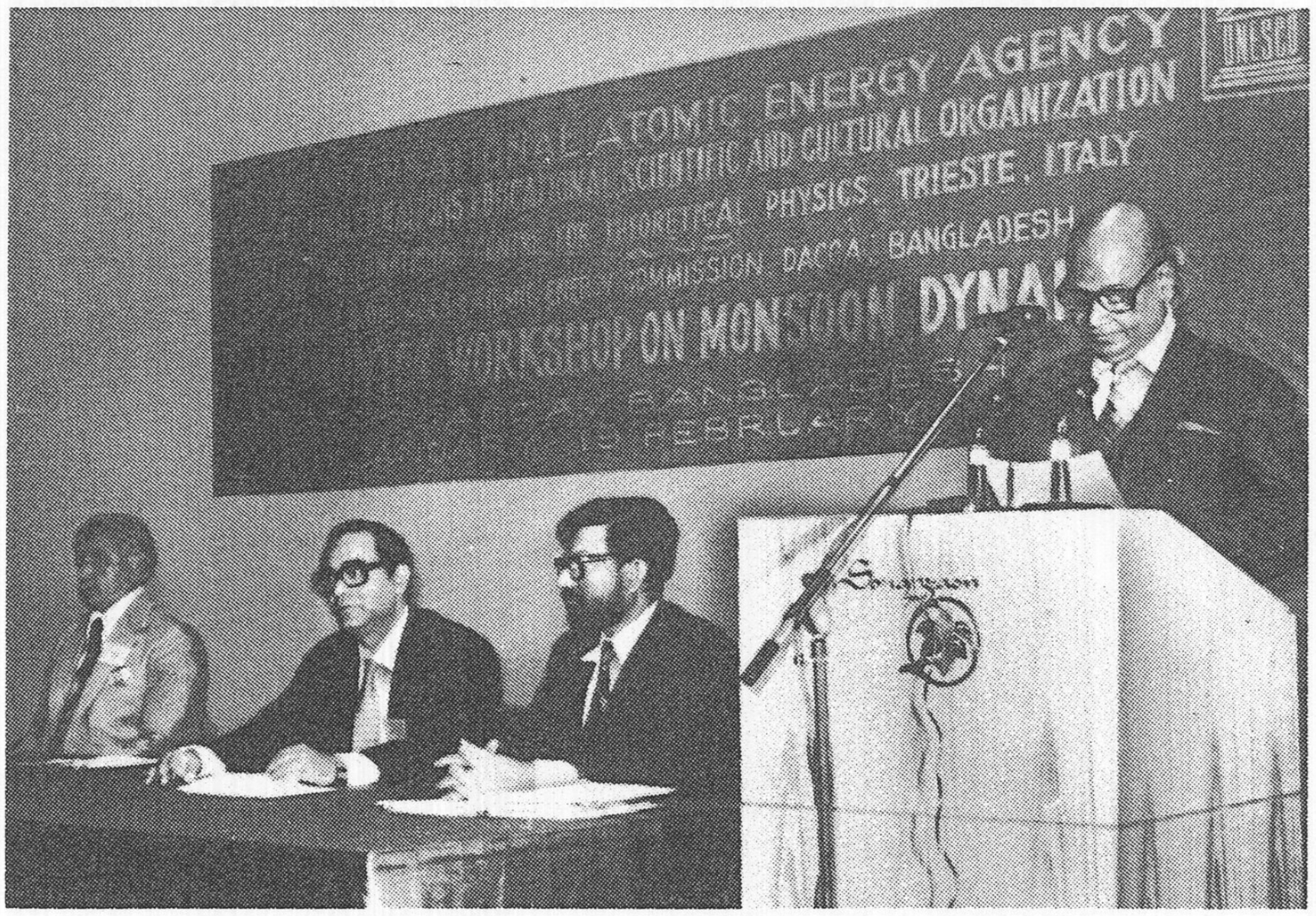
One other function of an indigenous research and development capacity must not be overlooked. In most developing countries the research community is made up of only a few individuals trained to very high levels. These men and women will be responsible for all norms and all standards in the entire spectrum of the country's science education. The preservation of high standards in basic science teaching is necessary not only to turn out good physicists, chemists and other "pure" scientists, but also for good engineers, economists and others whose science is more immediately applicable. Establishing a scientific research community is thus not an esoteric waste of a country's resources but a vital investment in its future.

However, a prerequisite of a flourishing scientific research group is that its members must keep abreast of the latest developments in their field and must be able to meet and discuss science with their colleagues throughout the world. Unfortunately, scientific isolation is a widespread condition throughout research institutes in the Third World. All too often, bright young scientists in the Third World are faced with the stark choice either of remaining in their country so occupied with administrative and teaching work that they are lost to science, or of leaving for some attractive research post in the developed world and so being lost to their country.

Meeting the need

To try to end this intellectual isolation in the Third World, the International Centre for Theoretical Physics was established in 1964 under the aegis of the IAEA. Instigator of the project and Director of the Centre since its inception is Professor Abdus Salam of Pakistan, who in 1979 shared the Nobel Prize for Physics. The Centre organizes research sessions, workshops and extended courses on advanced topics in the physical and mathematical sciences and encourages scientists, especially from developing countries, to visit the ICTP for extended periods. To extend the reach of its influence beyond the necessarily limited number of visitors the Centre can entertain in any one year, it has organized an

* Mr Hamende is senior professional officer at the International Centre for Theoretical Physics, Trieste.



One of the regional activities which the International Centre for Theoretical Physics has co-sponsored recently was a Winter Workshop on Monsoon Dynamics held in Dacca, Bangladesh from 11 January to 19 February this year. The workshop, jointly organized with the Bangladesh Atomic Energy Commission, was opened, as this photograph shows, by Mr Justice Abdus Sattar, President of Bangladesh.

Associateship programme and a network of Federated Institutes which maintain extensive and fruitful links between the Centre and the world's scientific community.

The Associateship scheme was started in 1964, when the Centre was founded, for the benefit of senior physicists working in the developing countries. The scheme allows these scientists to spend, at a time of their choosing, between six weeks and three months at the Centre, three times in six years. They are thus enabled to research and discuss research in a creative environment which may not obtain in their own scientifically isolated institutes. By means of this scheme, which is complementary to the extended courses and visiting scientist programme, the brain-drain from developing countries to scientifically more advanced ones can be halted, or at least slowed. By coming to the Centre, the Associates can keep in the mainstream of modern physics and carry out better research and teaching when they return home. Currently the Centre has nearly 90 Associates.

In the early years of the Centre's existence, it became clear that there was an urgent need to help young theoretical physicists in isolated areas with poorly developed scientific standards. The Centre is thus fostering these young scientists by appointing Junior Associates who gain access to books, journals, and scientific articles through the ICTP. In 1981 there were some 39 such Junior Associates.

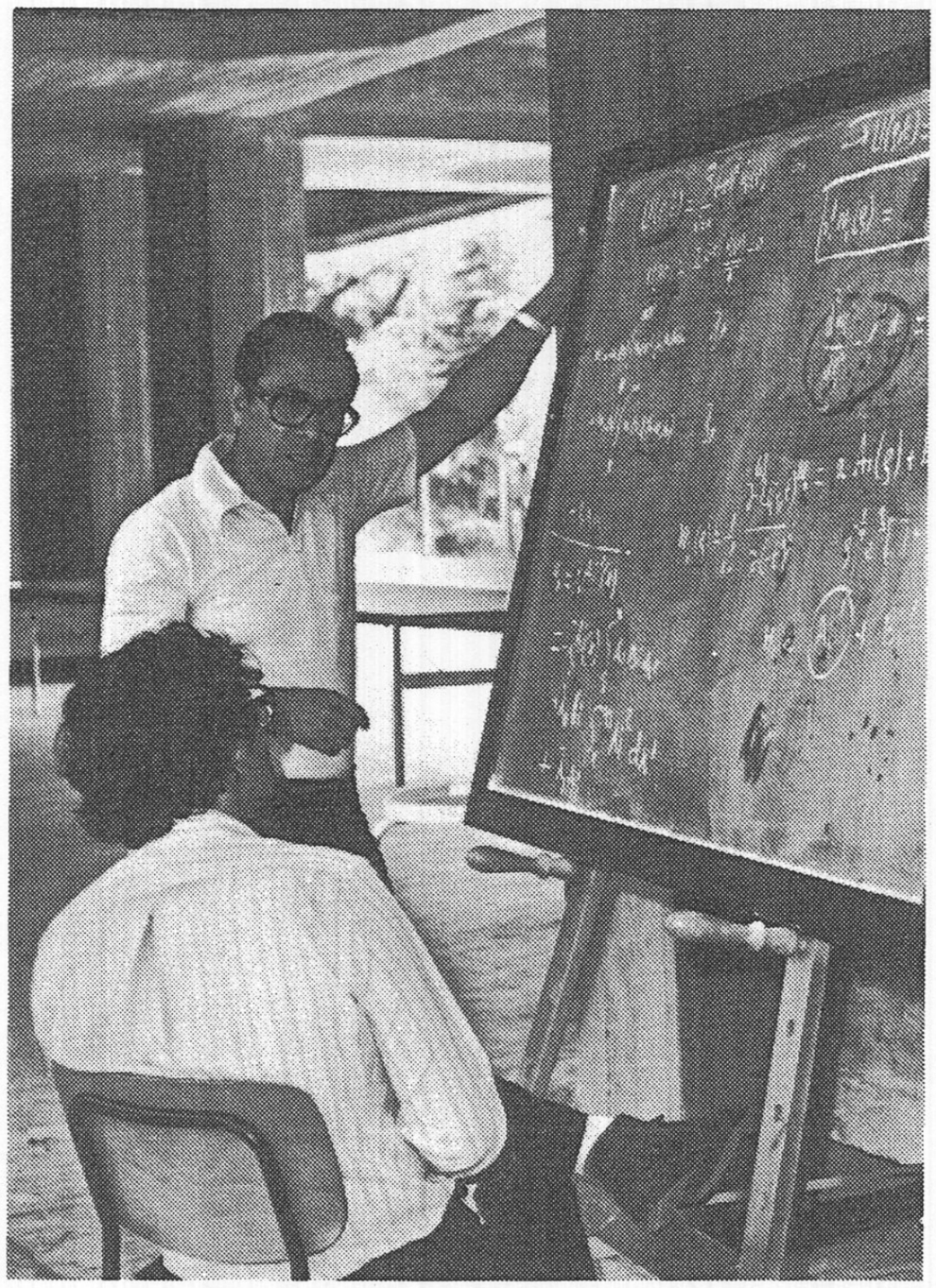
Situated mainly in developing countries there are over 60 Federated Institutes whose main problem is scientific isolation. Under the terms of the federation scheme, the institute can, by arrangement, send scientists to the Centre for between 40 and 120 man-days each year.

The Centre has a guaranteed income from three sources: substantial annual grants from the Italian Government, from the United Nations Educational Scientific and Cultural Organization (UNESCO), and from the IAEA. (Since 1970 the Centre has been operated jointly by the IAEA and UNESCO.) Unfortunately, the Centre's stable sources of income have not kept pace with the growth in number of visitors. Indeed, for some years now its stable income has not even kept pace with inflation in Italy. In 1964 the Centre's stable financial resources were US $360 500, which rose to US $1 961 000 in 1981. Consequently, financial support has been sought, and received, from various other sources: the Ford Foundation; the Swedish International Development Authority; the Canadian International Development Agency; the United Nations Development Programme; OPEC; the Italian Department of Co-operation for Development; the Kuwait Foundation for the Advancement of Science and the Governments of Denmark; the Netherlands; Fed. Rep. of Germany; Japan; Qatar; and the USA. Requests for funding from these bodies must be submitted annually, and all funds from these donors were earmarked for specific projects.

In order to plan its activities, the Centre has to know its likely income well in advance. But to maintain the range and quality of the Centre's activities it will probably have to continue to rely on individual donations, although this makes forward planning difficult.

A successful venture

Originally the Centre was housed on the Piazza Oberdan in the heart of Trieste, Italy. In 1968, thanks to the generosity of the Italian Government and of the



One of the advantages of theoretical physics is that the only apparatus it needs is a pencil and paper or, as in this case, a blackboard and chalk. But the really important inputs to the subject are access to the scientific literature and the opportunity to discuss with one's peers. It is these vital necessities that the ICTP supplies.

regional community, the Centre was established in its own purpose-built premises in Miramare, just outside Trieste. The modern three-storey building has three lecture-rooms; a library of nearly 21 000 books and over 11 000 bound volumes of scientific periodicals; and 65 offices capable of accommodating up to 115 scientists. The building is so arranged as to enhance a spirit of close and informal collaboration, but as the Centre's activities have expanded so it has become increasingly difficult to find space and provide adequate facilities for the visiting scientists and researchers.

One minor problem consequent upon the Centre's situation outside the city should be solved this year. At present, participants in the Centre's activities have to commute daily from Trieste. Later this year, a new guest house close to the Centre will accept its first residents, allowing some visitors to live, in modest accommodation, near their work.

The success of the Centre in meeting the needs of scientists from developing countries and overcoming their scientific isolation is evident from the growth in numbers visiting Trieste. In its first year of operation the Centre welcomed 154 visitors who put in a total of 410 man-months of work. Visitors from developing countries accounted for about 44% of this total of man-months. During 1981, however, the Centre received 1933 visitors who contributed over 1520 man-months of work. Nearly three-quarters of this work was put in by visitors from developing countries.

The programme of work has changed over the years since the Centre's foundation. The range of subjects dealt with has expanded, and there has been a shift of emphasis from research to training-for-research. In its early days, the work of the Centre was devoted almost exclusively to research in high-energy physics and in plasma physics. Lasting over one month, the extended seminar on plasma physics which the Centre held in 1964, and which was followed by a one-year research workshop, served as the beginnings of what is now a flourishing East-West exchange programme. One characteristic of the early days of the Centre was that it provided an opportunity not only for scientists from developing and developed countries to meet and collaborate but also for scientists from the CMEA countries to co-operate with their OECD counterparts. As many other channels now exist for such co-operation, this latter aspect of the Centre's role has tended to recede. One reflection of the growth of other forums for East-West co-operation on plasma physics and fusion energy is that much less work is now done by the Centre on these subjects than formerly.

Programme of work

Soon after the Centre was started, nuclear physics was incorporated into the research programme. Following an in-depth review of its activities in 1969, the Centre added condensed-matter physics and applicable mathematics to its programme. After another review in 1975, the Centre's activities took on the approximate structure they now have. The Centre's scientific programme is divided up into five major disciplines:

- Physics and energy
- Physics and frontiers of knowledge
- Physics and technology
- Physics of the environment and natural resources
- Applicable mathematics.

The Centre also arranges workshops and seminars, sometimes on a rotating basis, on other subjects including, for example, biophysics and astrophysics. The range and scope of topics dealt with by the Centre is best illustrated simply by listing the activities arranged for one typical year: in the box can be seen the programme for 1982.

Many scientists visit the Centre to carry out individual research during periods when no specific activity in their particular field of interest is scheduled. The unique character of the Centre, its facilities, the presence there of other experts in their own or related fields present an invaluable opportunity to these scientists to bring their knowledge up-to-date and to exchange ideas on

ICTP activities for 1982

Winter College on nuclear physics and reactors	25 Jan.–19 March
Conference on applications of physics to medicine and biology	30 March–2 April
Research Workshop in condensed matter physics	21 June–10 Sept.
Spring College on amorphous solids and the liquid state	14 April–18 June
Summer Workshop in particle physics	21 June–31 July
Summer Workshop on fibre-bundles and geometry	5–30 July
Summer College in biophysics	2–27 August
Second Trieste International Symposium on statistical mechanics of absorption	26–29 July
Second Trieste Semiconductor Symposium "Surfaces and interfaces; physics and electronics"	30 Aug.–3 Sept.
College on solar energy (in French)	30 Aug.–17 Sept.
September School on supergravity and supersymmetry	6–18 Sept.
Autumn course on geomagnetism, the ionosphere and magnetosphere	21 Sept.–12 Nov.
Workshop on nuclear physics dynamics	11–16 Oct.
Autumn College on mathematical ecology	16 Nov.–10 Dec.
Topical Meeting on progress in the solution of quantum gauge theories	17–21 December
Research in particle physics and condensed matter physics	Throughout the year
Hosted activities	
EMBO Workshop on functional integration of cell surface and cytoskeleton control systems	5–7 April
Outside activities	
Regional College on theory of condensed matter (Legon, Accra, Ghana)	1 Dec.1981– 22 Jan.1982
Winter Workshop on monsoon dynamics (Dacca, Bangladesh)	11 Jan.–19 Feb.

research. The emphasis of the Centre's research work tends to be on the first three of the five disciplines mentioned above. This arises partly for historical reasons: these were the strengths of the founders of the Centre; and also for geographical reasons: there are strong research groups in these areas in the Physics Department of Trieste University.

Throughout its existence, the Centre has maintained in close and fruitful collaboration with the Institute of Theoretical Physics and the Advanced School of Physics of the University of Trieste. Indeed, they are housed in the same building as the Centre, as is the recently instituted International School for Advanced Scientific Studies. The Centre also has access to computing facilities – essential for the development of applicable mathematics – through a terminal connected to the computing centre of Trieste University.

The success of the Trieste Centre has clearly demonstrated that there was a hitherto unrecognized need for physicists from developing countries to practise their craft in a stimulating environment and to internationally accepted standards. The Centre is limited in budget and facilities: it can cater only for theoretical physicists or for those experimentalists who wish to deepen their theoretical understanding of their chosen field. The challenge for the future is not simply to continue or even strengthen this Centre's activities, but to meet the intellectual hunger of the developing countries across the whole field of science – experimental and theoretical.