This is the first in a series of articles written by other organizations within the UN Family illustrating their co-operation with the IAEA, either in a particular joint project or on an over-all basis.

AN EXAMPLE OF UNESCO-IAEA CO-OPERATION

The International Centre for Theoretical Physics

by Daniel Behrman, UNESCO Science Writer

Back in 1966, the director of the International Centre for Theoretical Physics at Trieste, Professor Abdus Salam, wrote an article to explain the reasons why he had worked for the establishment of the Centre, then only two years old. He started by telling this story:

"Five hundred years ago — around 1470 A.D. — Saif-ud-din-Salman, a young astronomer from Kandhar, working then at the celebrated observatory of Ulugh Beg at Samarkand, wrote an anguished letter to his father. In eloquent words Salman recounted the dilemma, the heartbreaks, of an advanced research career in a poor, developing country:

'Admonish me not, my beloved father, for forsaking you thus in your old age and sojourning here at Samarkand. It's not that I covet the musk-melons and the grapes and the pomegranates of Samarkand; it's not the shade of the orchards on the banks of Zar-Afshan that keeps me here. I love my native Kandhar and its tree-lined avenues even more and I pine to return.

'But forgive me, my exalted father, for my passion for knowledge. In Kandhar, there are no scholars, no libraries, no quadrants, no astrolabes. My star-gazing excites nothing but ridicule and scorn. My countrymen care more for the glitter of the sword than for the quill of the scholar.

'In my own town I am a sad, pathetic misfit'."

Professor Salam, who is one of the world's leading theoretical physicists, continued with a parallel of contemporary times:

"For Samarkand of 1470 read Berkeley or Cambridge; for quadrants read high-energy accelerators; for Kandhar read Delhi or Lahore and we have the situation of advanced scientific research and its dilemmas in the developing world of today as seen by those who feel in themselves that they could, given the opportunity, make a fundamental contribution to knowledge."

He noted that present-day governments of developing countries, unlike the emirate of Kandhar, are eager to foster research but seldom have the means to carry out their intentions. The result is isolation for the young researcher, who is then either driven out of science or out of his country to work abroad and add to the "brain drain."

HISTORICAL BACKGROUND

1. The idea of creating an International Centre for Theoretical Physics was discussed at the fourth General Conference of the IAEA in September 1960. In 1961 the Director General of the IAEA convened a scientific panel which strongly recommended such an initiative.

2. A second IAEA panel in 1963 drew up a detailed project for the institute. Several governments showed an interest in being the host and after detailed consideration the Board of Governors decided in June 1963 to accept the offer of the Italian Government and established the centre in Trieste in October 1964 on an experimental basis for four years.

3. At the end of the successful experiment, the IAEA decided to continue the centre and to increase its financial contribution. The Italian Government undertook to continue to contribute $250,000 a year.

4. In 1969 the IAEA and UNESCO agreed that from 1970 both organizations would be equal partners in sponsoring the centre. Each agency contributes a minimum of $150,000 a year and there is equal responsibility for the functioning of the centre. To simplify day to day operation, the IAEA continues to be responsible for administrative services.

5. During its existence the centre has received generous grants from various sources such as the FORD Foundation, the Swedish International Development Authority (SIDA), UNDP and the Governments of Denmark, Sri Lanka and Brazil.

Professor Salam's dream was to end the loneliness of the fundamental scientist, and he saw no better place to start than in his own field, theoretical physics. He considered it one of the few disciplines, apart from mathematics, which is ideally suited for a developing country because no costly equipment is involved. When the scientist trained abroad returns home, he can continue his work without the need for apparatus available only to wealthy institutions. But he must be able to keep up his contacts with the active workers in his field, if he is to be useful to his country, in University teaching, in advice to his Government, in providing the small but important reservoir of high level talent in the developing countries needed for discriminating over-all development of these countries.

In 1964, the International Centre for Theoretical Physics was inaugurated by Dr. Sigvard Eklund in the centre of Trieste, and since 1968 is located at Miramare, a quiet spot on the Adriatic just outside Trieste. The Centre was operated by the International Atomic Energy Agency with generous support from the Italian government and the city of Trieste. Then in 1970, UNESCO became an equal partner with the IAEA in the financing and the operation of the Centre. Today, as it observes the tenth anniversary of its foundation, the Centre stands as perhaps the most outstanding achievement that can be attributed to co-operation between these two United Nations agencies, the IAEA and UNESCO.

Professor Salam, who has been director since its inception, regards it as one of the first examples of an international academic faculty that could serve as the start of a world university. He points out that the Centre is devoted to imparting training for and conducting research in all disciplines of theoretical physics at the highest level. It draws its scientific faculty (mainly visiting professors and lecturers) and research Fellows from some 70 countries from all parts of the world. It has built up a number of unique modalities to increase international co-operation. For example, the Centre has built up federation links with some twenty research institutes in various countries – on a cost-sharing basis – which affords mobility of their staffs and research Fellows. It is one of the few places in the world where physicists in subjects as sensitive as plasma research from the East and the West meet regularly, and for prolonged periods, with no national pride or sensitivities inhibiting scientific concourse.

The figures bear Professor Salam out. From the start of 1972 to the end of last year, 1 723 scientists from 73 countries had participated in the activities of the Centre. At the end of 1973, the Centre had 58 Associates in elementary particle, solid state and nuclear physics from 26 developing countries.

More than 50% of the man/months spent at the Centre by scientists represent time spent there by scientists from the developing countries and many of these are at a more senior level. A unique feature of the Centre is its practice of awarding Associateships to scientists from developing countries who are actively working in their own countries. Such appointments are normally for a five-year period, during which the Associate has the opportunity to spend from 6 weeks to 3 months every second year at the Centre. Such visits are of critical importance in preventing the professional isolation of these scientists from the mainstream of activity in their chosen field of enquiry.

An idea of the range of the activities of the ICTP can be had by looking at the past two years in Trieste. The highlights of 1972 were two extended courses of three months' duration each, one on electronics in crystalline solids and the other on global analysis and its applications, in addition to a three months' research workshop in solid state physics and a symposium on the physicist's conception of nature.

The Winter College on electrons in crystalline solids in 1972 was the third in the series of seminars in the field of condensed matter physics. It drew a total of 187 applications, and 116 scientists participated in it. Eighty-five were from developing countries, 77 of whom were financed by the Centre.

The Summer College on global analysis and its application was the second in the series of extended seminars in Applied Mathematics and Computer Sciences, sponsored by the United Nations Development Programme with UNESCO as executing agency, and with support also from the Battelle Institute. A total of 218 scientists, chosen from nearly 400 applicants, attended the course, 103 of them from developing countries.

The symposium on the physicist's conception of nature was organized with the University of Trieste and the University of Texas with 179 participants, among them seven Nobel Prize winners. These were Professors P.A.M. Dirac, W. Heisenberg, W.E. Lamb, Jr., J. Schwinger, C. Townes, E. Wigner and C.N. Yang, certainly an enviable roll of honour for any gathering of physicists.

In 1973, the main features of the scientific programme were a Winter College on atoms, molecules and lasers, and extended seminar on nuclear physics, an autumn course on mathematical and numerical methods in fluid dynamics, with research workshops in solid state physics in the summer and in particle physics throughout the year.

In addition there were organised activities in plasma physics, astrophysics and relativity, a topical meeting on weak interactions and a Summer School on the physics and mathematics of the nervous system. This last activity was jointly sponsored by the ICTP and the Institute for Information Sciences of the University of Tübingen and supported financially by the Volkswagen Foundation.

Following an agreement signed between the IAEA and the Government of the Federal Republic of Germany, a number of physicists from developing countries who are visiting the International Centre for Theoretical Physics in Trieste will now have the opportunity to advance their research further at the Max Planck Institute of Nuclear Physics in Heidelberg, or the Max Planck Institute for Solid State Research in Stuttgart. These scientists will be selected jointly by the Centre and the Institutes, and can be invited for a period of up to three months each year, at the expense of the FRG.

The work on the physics and mathematics of the nervous system shows how the Centre has been able to break away from its original focus on theoretical physics alone. The Summer School was designed to bring biologists, chemists, physicists and mathematicians together to explore these problems. One of its aims was to create an environment in which participants from various disciplines could crystallize particular problems or develop work projects in such areas as the molecular and cellular biophysics of the nervous system; nerve networks and brain function; application of dynamical systems and structural stability or organism behaviour; and artificial intelligence.

In 1973, the Centre played host altogether to 826 scientists, 346 from developing countries. Asia accounted for the largest contingent, with 140 scientists visiting Trieste. Next came Europe (for the Centre's purposes, certain European countries are placed in the "developing" category) with 104, Africa with 43 and Latin America with 38 physicists.

These programme trends will continue during the next four years. In 1975, the Centre plans to hold a Winter College on the physics of the ocean and the atmosphere, a subject of great current interest because of the study of the circulation of carbon dioxide in the atmosphere and the possibility of using thermal gradients in the ocean for energy production. And this year (1974), a course is being held on control theory and topics in functional analysis, another application of mathematics to problems of importance to modern societies.

The International Centre for Theoretical Physics at Trieste, with its outdoor sculpture by the Triestine master Mascherini. Photo: Dominique Roger, UNESCO. ▲

Research workers from many countries gather in the library of the International Centre for Theoretical Physics, Trieste. Photo: Dominique Roger, UNESCO. ▶


THE
PHYSICAL REVIEW

As in the past, the Centre's future scientific programme will continue to seek ways to bridge the gap between more advanced, basic and sophisticated research and its practical applications, especially for the benefit of the developing countries. However, it will continue to seek an audience from both developing and advanced countries.

The ICTP will also go on serving as a focal point for scientists working on fundamental problems. In the 1974 programme one finds seminars on such subjects as theoretical physics, astrophysics, and general relativity, as well as a Congress on the origin of galaxies. Next year, there will be a workshop on lasers and non-linear optics, but the Centre will remain true to its original vocation with another workshop on nuclear physics. It is still a place where the principal apparatus required by the scientist is a pencil and paper, chalk and a blackboard, and a good library. Work goes on at the Centre day and night, for the opportunity is too rare to be wasted by the scientist who has come thousands of miles for such unique stimulation.

As the above recital of joint sponsorship shows, the Centre has been able to rely on a number of sources of financial support and this also is an indicator of its success. Among the major contributors outside the United Nations system and the Italian Government have been the Ford Foundation and the Swedish International Development Authority.

Professor Abdus Salam is convinced that the ICTP has helped to stem the brain drain, and he cites the case of a group of scientists from one South American country who actually returned home from jobs abroad after their stay in Trieste on the promise of being made Associates of the Centre. They could thus be assured of continued association with active physics, even while living in their own countries. Thanks to efforts, such as those mentioned, by the Centre, the isolation of the scientist in the developing world is not as harsh as formerly. Governments in many countries, such as Brazil, India or Professor Salam's home country Pakistan, now pay for good equipment at home and help to defray the costs of the scientists coming to Trieste. But it was not always like this. Professor Salam remembers his own experience some twenty years ago when he returned home after doing theoretical work in high-energy physics at Cambridge and Princeton.

"My chief said, 'We all want research men here, but never forget we are looking more for good, honest teachers and good honest college men. This college has proud traditions to uphold. We must all help. Now, for any spare time you may have after your teaching duties, I can offer you a choice of three college jobs: you can take on wardenship of the college hostel, or be chief treasurer of its accounts, or if you like, become president of its football club.' "

"As it was, I was fortunate to get the football club."