

# INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS IN TRIESTE

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Consider the following combination: an institution which is administered jointly by two inter-governmental organizations (both several hundred kilometers away), employs four professional staff members (only two of whom are available for scientific counselling and planning), is a major international centre dealing with nearly all disciplines in contemporary theoretical physics, in particular aids physicists working in developing countries, and maintains continuous contact with a major fraction of the world physics community. The combination is indeed unlikely; yet, a dozen years after its founding, the International Centre for Theoretical Physics, which answers to the above description can justly lay claim to being a most successful enterprise. It involves each year around a thousand physicists, from some ninety developing and advanced countries.

The original idea for the ICTP came from Professor Abdus Salam, now Director of the Centre, who, sensitive to the problems of physicists in developing countries, evolved in consultation with colleagues from many other countries, the concept of an international centre to which high level physicists of all countries could come as a matter of right and which would maintain the highest academic standards. Cutting across national boundaries, it would provide a mixture of fundamental science and subjects more directly related to the requirements of society. In Salam's view, the existence of such a centre could only lead to the advancement of physics, both at the international level and within those countries most in need of more advanced institutions concerned with science and its applications.

The period required for the realization of this radical project was extensive. Happily, however, the Government of Italy and the City of Trieste, stimulated mainly by Professor Paolo Budini, make available land and facilities as the International Atomic Energy Agency began to develop interest in the concept as a means of encouraging the further development and wider dissemination of physics. As a result, the Centre was able to open

its doors in Trieste in 1964, moving subsequently to its present permanent headquarters at Miramare near Trieste in June 1968. The opening ceremony was impressive with eight Nobel laureates among the more than 300 distinguished participants, who commemorated the occasion with a month-long review of contemporary physics led by world leaders of scientific thought, many of whom had been the creators of the disciplines concerned.

From the very beginning, the Centre has acted both to alleviate the intellectual isolation of theoretical physicists working in developing countries, and create an exciting meeting place for physicists of all nationalities irrespective of political or other extra-scientific considerations. Its pattern of operation was established early, and after some initial experimentation has altered little in format. Two particularly innovative programmes developed by the Centre in response to the requirements of scientists working in the developing areas of the world have been the appointment of Associates and the award of Federation Agreements. Selected physicists from developing countries, are appointed Associates of the Centre for a five-year period, on the condition that they remain and work in their own country during this period. Each is accorded the right to visit the Centre, for research in his own discipline, three times during the course of the appointment, and each visit may be for as long as three months. The Centre pays travel costs and a modest subsistence allowance. In Federation Agreements with institutes in developing countries, the Centre shares the cost of visits to Trieste for research purposes, of scientists selected by the institutes.

These schemes were designed to ensure continuing contact between the scientists involved and their counterparts from other areas. They are supplemented by participation grants, covering travel and subsistence costs, to some 300 physicists a year from developing countries who are thus able to take part in the various courses and workshops the Centre runs throughout the year. These opportunities have contributed substantially to a

reduction of the brain drain of practising theoretical physicists, the possibility of collaborating at the Centre with colleagues from other countries often being of critical importance in rekindling enthusiasm for their work. Regional co-operation has also been stimulated and a number of collaborative efforts are directly attributable to contacts made at the Centre.

In 1970 began the association of UNESCO with the Centre and arrangements for joint sponsorship and operation by UNESCO and the IAEA. This materially increased the resource base of the Institute and, through UNESCO, extended its contact to the world's major centres of education.

Scientific guidance for the Centre's activities is provided by the Scientific Council, which is convened once a year to advise on programme activities covering the following two to three years. The present composition of the Council is: Chairman: A. Kastler of the University of Paris, France; A. Kaddoura of the University of Damascus, Syria (currently serving as Assistant Director General for Science at UNESCO); Malu wa Kalenga of the Commissariat des Sciences nucléaires, Zaire; V. Latorre of the Universidad Nacional de Ingeniería, Peru; M.A. Markov of the Academy of Sciences of the USSR; B.D. Nag Chaudhuri of the Jawaharlal Nehru University, India; M.N. Rosenbluth of the Institute for Advanced Study, Princeton, USA; and J.M. Ziman of the University of Bristol, UK. Past members of the Council included: S. Vallarta (Mexico); J.R. Oppenheimer (USA); V.F. Weisskopf (USA); A. Bohr (Denmark); R.E. Marshak (USA); L. Van Hove (CERN); and H. Yukawa (Japan). Specialized guidance in major subject areas, particularly for courses and workshops, is provided by Advisory Committees composed of eminent specialists in the field.

To carry out its programme, including the financing of visits of Associates and the partial financing of visits of staff members of Federated Institutes, the Centre must currently manage on a total annual budget of \$ 1.5 million, part of which comes from sources other than the three princi-

pal donors (IAEA, UNESCO and the Italian government). In this context the generosity of the host government – that of Italy – deserves special mention, in that not only did it make a great contribution to the starting of the Centre but also has continued its help, year after year, since the Centre's inception. One should also single out the Swedish Development Authority (SIDA) and the Ford Foundation who have helped generously, particularly with the Associates programme referred to above.

In recent years, considerably more emphasis has been placed on physics in relation to the more immediate needs of society. This has been reflected in such activities as a recent course on physics of the oceans and atmosphere, on solar energy, and in the continuing support of work in solid state physics as well as courses in applied mathematics. It is significant, in this respect, that some 30% of the participants in the Centre's courses are experimental physicists.

#### Programme in 1977

Winter College on Atomic, Molecular and Laser Physics January-March (7 weeks)

College in Theoretical and Computational Plasma Physics, including during the last week, the Third International Conference on Plasma Theory (Kiev Conference ) March-April (13 weeks)

Research Workshop in Solid State Physics July-Sept. (17 weeks)

Ecole d'Été sur l'Enseignement de la Physique au Niveau Universitaire (Course on teaching of physics at University level held in the French language for physicists from developing countries) July-August (6 weeks)

Course on Physics of Solar Energy Conversion September (3 weeks)

Autumn College on Physics of the Earth and Seismology September-December (9 weeks)

Winter College on Applicable Mathematics (Differential Operators) November-December (3 weeks)

Elementary Particle Physics (Research in this field is pursued throughout the year, including three topical meetings/workshops during June/July)

Summer College on Physics and Contemporary Needs (Nathiagali, Pakistan) June-July (3 weeks)

The 1978 programme will include Nuclear and Reactor Physics, Physics of Materials, and Physics of Solar Energy.

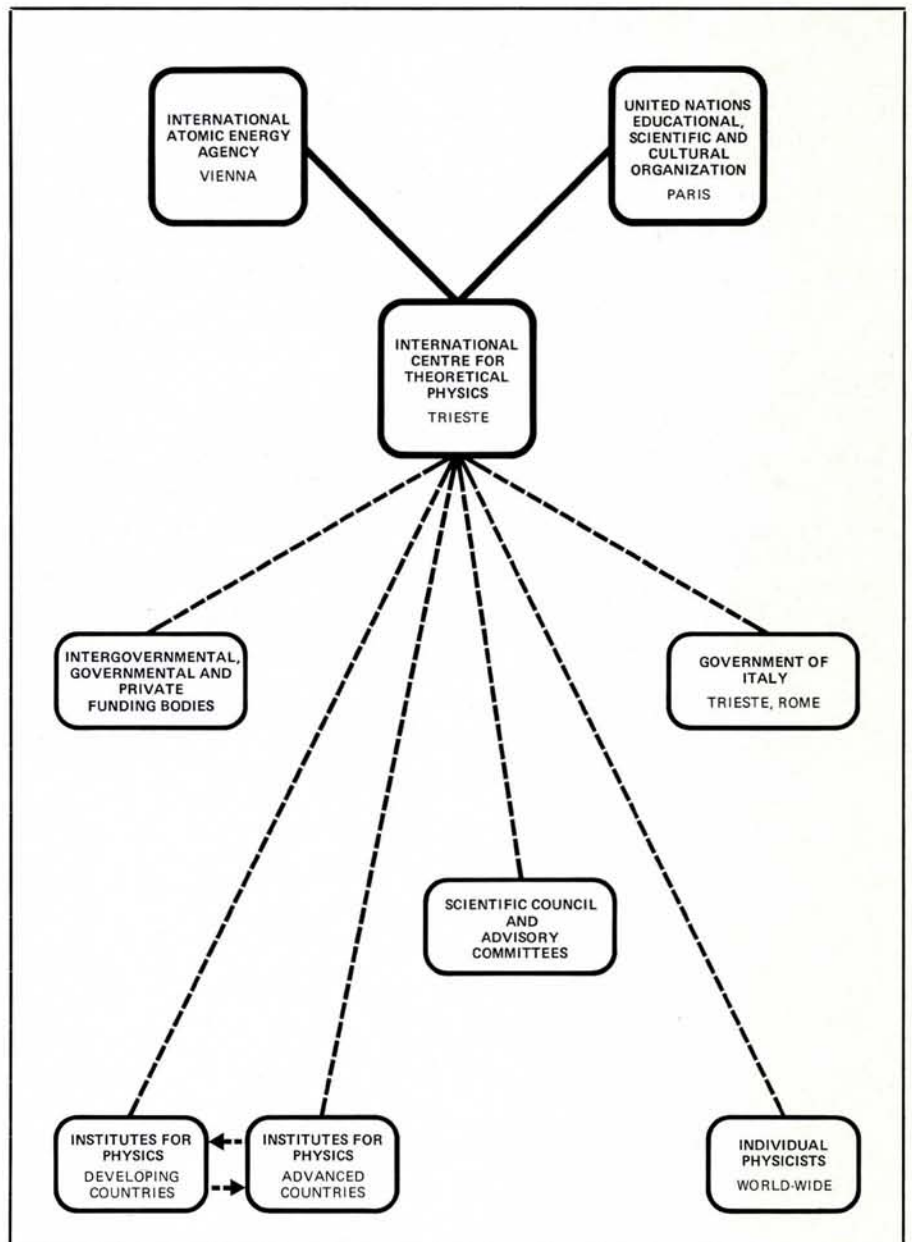


Fig. 1 The International Centre for Theoretical Physics in Trieste, showing its relationship to its various funding bodies and to the physics communities in the developing and advanced countries.

In addition to the creation of a meeting place and the holding of courses – valid as ends in themselves – a high level of achievement of research output is maintained, some 100 research papers being published each year; but this does not give a full measure of the effectiveness of the Institute. The question must also be asked as to what has been the impact on those countries and individuals the Centre has been designed to serve. This impact has perhaps been most evident in the field of physics of condensed matter. When the Centre first concerned itself with the subject, few people in any of the developing countries had any real knowledge of the field, which was unfortunate in view of the many possibilities for interaction

with other areas associated with the development of a modern industrial state. In recognition of this, the Centre organized in late 1967 the first of its many Winter Colleges in Solid State Physics. These courses stressed the relationship of this branch of science to a wide variety of contemporary problems including for instance those associated with chemical corrosion, catalytic cracking of petroleum, static electrification, electronic communication, and solar power production. Some 10 years later it is clear that the results have been rewarding, for a substantial corps of highly trained solid state physicists now exists in a number of countries in Latin America, the Far East and, to a limited extent, in Africa.

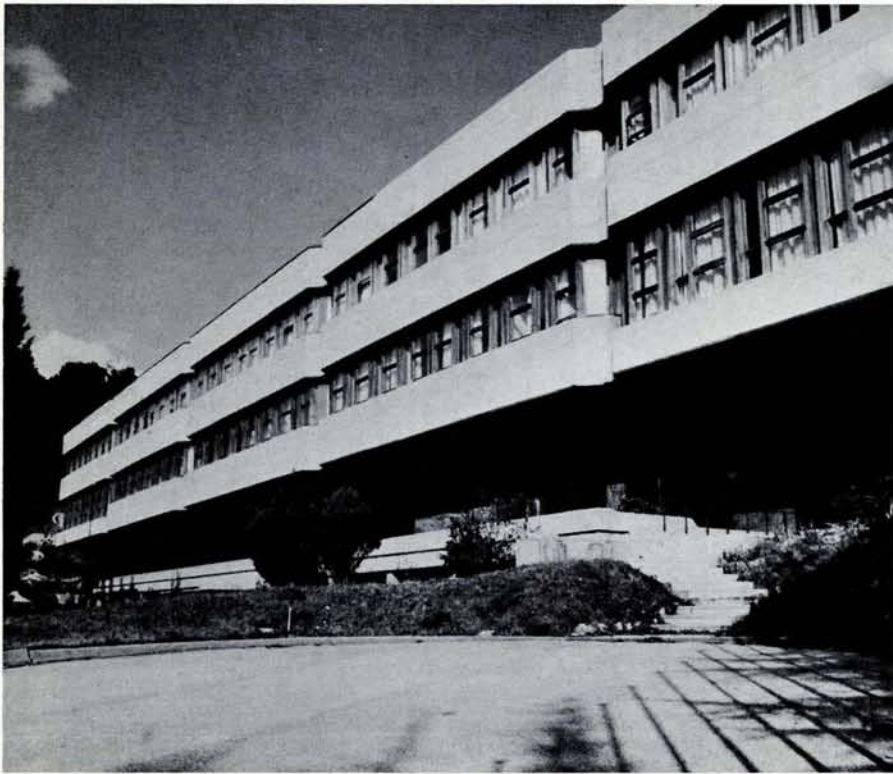


Fig. 2 The Centre at Miramare, located a few kilometres along the coast road leading westwards from the city of Trieste.

The advisory committees and the Scientific Council of the Centre have unanimously agreed that the Centre must concentrate on a limited number of central subjects, notably: high-energy and nuclear physics, solid state physics and applied mathematics. Because certain of the Centre's actual or potential funding bodies have a strong obligation to assist developing countries, it is sometimes suggested that efforts should be totally centred on those areas of physics which have more practical applications excluding areas which might be considered basic. This view fails to recognize the inter-relatedness of the various disciplines in physics, the weakness of both basic and applied science in most developing countries, and the fact that the Centre must maintain its competence in theoretical science in order to set a high standard.

Two important evaluation exercises were undertaken at the request of the sponsoring organizations. The first was organized in 1969 under the chairmanship of Professor H.B.G. Casimir and the second in 1974 under Professor L. Van Hove. Each group found the Centre to be exceptionally competent and strongly recommended its continued support. The latter group in particular noted that by helping developing countries to attain competence in advanced theoretical physics, the Centre "has helped to raise the whole scientific level and provide much-

needed background for work in applied science and engineering and even in management and government administration".

Equally rewarding, and in a personal sense far more so, are the comments received continually by the Centre from scientists in Asia, Africa and Latin America, who state in unequivocal terms their appreciation of, and often affection for, the Centre. That the relationship of the scientist to the society in which he serves has a clear meaning for many of them is perhaps best expressed by a Latin American physicist who wrote recently that "development is not only industry, food production, efficient health service, etc., all of which is essential, but by no means implies total development. Man's evolution is also an adventure in thinking, which is expressed in his creations in music, poetry, and science. A developing country which tries to get its full liberation by concentrating on creating only industry, has failed, for it will remain dependent on other more developed societies for the fulfillment of all of man's other needs and expressions. We state that developing countries have as much right as developed countries to share the role in the adventure of thinking and, in particular to share in the contribution to art and fundamental scientific creation."

It is likely that the "programme mix" will continue to vary in accordance

with the requirements perceived, resources available and new developments in physics, particularly in its application to the needs of society. For example, the presently peripheral disciplines like atomic physics, physics of the environment, or physics of non-conventional energy sources may come to be emphasized more, perhaps through regular Colleges held annually, rather than once every two or three years. It is also possible that further attention may be given to the organization of selected activities in various regions, e.g. the Far East, the Middle East, Africa or Latin America. The ultimate goal will nevertheless remain the development of science in the service of society.

In summary, the Centre has established itself as a meeting place for physicists from all countries and through the dedicated association of a number of outstanding physicists has earned a high scientific reputation. It has contributed directly to a reduction of the brain drain in developing countries, and continues to provide valuable post-doctoral research training opportunities at very low cost for scientists in these countries. It has developed strong links with a number of scientific institutions in both developing and advanced countries, and maintains a continuing contact with a significant number of scientists in most of the developing countries. The Centre has continuously sought new ways of enhancing the utility of physics to the developing world and extending our basic understanding of the science itself. These achievements combine to make it a unique institution.

#### UNIVERSITY OF OXFORD

#### University Lectureship in Nuclear Physics

Applications are invited for the above post, which is in the field, of experimental nuclear structure physics. Stipend according to age on the scale (under review) £ 3,333 to £ 7,087. The post may be held with a tutorial fellowship at St. Anne's College for either a man or a woman. Details may be obtained from Professor K. W. Allen, Nuclear Physics Laboratory, Keble Road, Oxford, OX1 3RH, to whom applications (one typed copy) and the names of 3 referees should be sent before 3 January 1978.