

the House that Abdus Built...

by Juan G. Roederer **The ICTP in Trieste**

The Abdus Salam International Centre for Theoretical Physics stems the brain drain of physicists from developing nations at a time of new scientific challenges.

In the early 1960s, both the decision-makers and the public in the industrialized world, shared a faith in the usefulness and importance of fundamental science. There was unfaltering trust in the scientific community. Although the world was ideologically split into two camps, science was recognized as an integral part of human culture and development. Science, however, did not fare as well in most developing countries, some of which had just gained their independence. The number of scientists active in research in such countries was small. As scientists emigrated to more developed nations, the resulting brain drain delivered serious blows to the scientific communities of those researchers, leaving deep scars in the intellectual fabric of their countries.

Abdus Salam, a Nobel Prize-winning Pakistani physicist, recognized that improving science locally would not be enough to stem the flight of fledgling scientists from developing countries. International mechanisms would be needed to allow scientists—especially those returning home after training abroad—to stay connected with the world, to refresh their knowledge periodically, and to engage in international research collaborations. The time was right for the conception of an international centre for theoretical physics. And Trieste, Italy, was the right place, located in the West, but at the doorstep to the Eastern bloc.

Not Just Another Institute—A Home

Established in 1964 under the aegis of the IAEA, the Abdus Salam International Centre for Theoretical Physics (ICTP) was intended to be not just another international research institute. The intention was a model organization designed to promote training and research in the physical and mathematical sciences in developing countries; serve as a forum for scientists from all over the world; and operate as a first-class scientific institution.

All three goals reflect the desire of its founding director, Abdus Salam, to confront the issues of isolation and brain drain that have continually dimmed the prospects for scientific excellence across the developing world.

Today ICTP each year hosts some 6000 scientists in its facilities in Trieste, Italy, while maintaining strong and enduring links with scientific communities in more than 170 countries. Closer to home, it has forged cooperative relationships with many Italian scientific institutions. Through its efforts, the Centre has built a worldwide family of loyal alumni—tens of thousands of associates, lecturers, and students, many of whom are now internationally recognized scientists, university leaders, research-council presidents, and leading statesmen in their own countries.

Adhering to its original vision, ICTP is an institution of the highest academic standards that many young physicists from Third World countries consider their second home—a welcoming place where they are treated with dignity and respect. The Centre affords its visitors access to the critical tools of modern science, including a world-class library and state-of-the-art computer facilities. While ICTP focuses on promoting science in the Third World, many scientists from industrialized nations also benefit from its programmes. Indeed nearly 50% of its visitors come from developed countries, creating a truly global forum for science on the shores of the Adriatic in northeastern Italy.

Why Theoretical Physics?

People unfamiliar with the history and role of the ICTP may ask: “Isn’t theoretical physics the last thing a Third World country would want to consider on its road to development?” Consider the following:

Research in theoretical physics does not demand a costly infrastructure. It gives young scientists early exposure to the great mysteries of the universe, stimulating their scientific imagination and making them feel they are participants in the great quest for knowledge. The study of theoretical physics trains the mind in scientific thinking and strategies of problem solving that scientists can later apply to any part of science. Theoretical physics is the glue that binds physics subdisciplines together and links them to mathematics. It is a key component of basic science, which is being seriously challenged in many parts of the world these days by peo-

ple who are demanding more societal-good or economy-driven research. In short, the study of theoretical physics is in accord with the admonition from the late Argentine Nobel laureate Bernardo Houssay: “Before you can apply science, you must first *have* science!”

Starting from its original programme in high-energy physics, ICTP extended its activities to condensed matter physics in 1967 and mathematics in 1971. In the 1980s, the Centre moved into subjects of more direct relevance to society, such as the study of the structure and dynamics of Earth. A decade later, ICTP established a group in the physics of weather and climate and a programme on mathematical modelling and simulation of complex realities. Most recently, under the leadership of its current director, K.R. Sreenivasan, ICTP has added to its research and training agenda and is now contemplating the creation of a broad-based programme that would apply its scientific research and training capabilities to issues of sustainable development.

The Centre has not only expanded into new areas; it has also strengthened its capabilities in its traditional sectors of high-energy physics, mathematics, and condensed matter physics as part of an abiding belief that all developing countries must have a strong foundation in the basic sciences if they hope to build a strong framework for sustainable growth.

ICTP is not a university. But it does have a permanent scientific staff of 30 that is responsible not only for conducting research but also for organizing ICTP’s training programmes. Each year, ICTP holds about 60 training activities on topics ranging from string theory to seismological risk management to the preservation of cultural resources through the use of accelerators.

ICTP also organizes several long-term activities to assist graduate students from developing countries. The ICTP Diploma Course, established in 1991, provides graduate-level training to students with undergraduate degrees from universities in the world’s least developed countries. Many of these students, upon completing the one-year Diploma Course at ICTP, either return to their home countries or enrol in master’s and doctorate programmes at universities in Europe and the United States. More recently, ICTP has partnered with the University of Trieste to offer doctorate degrees in several different fields of science. The Centre also extends its reach through its support of affiliated institutions in developing countries and by serving as a source of active support and a sounding board for those seeking to build research centres in their countries along the lines of ICTP.

Keeping Pace

The world of science has changed profoundly since the establishment of ICTP more than four decades ago, not only

in terms of the fields of study but also in terms of its reach and structure. When Abdus Salam first proposed the creation of a centre for theoretical physics, the age of computers had barely begun; the field of biotechnology would not emerge for another decade; and the words ‘nano’ and ‘technology’ bore no relationship to one another. Meanwhile, China was experiencing a cultural revolution not a scientific renaissance; India was bearing the first fruits of the green revolution; and Brazil was entering a dark period of military dictatorship.

Today, the Centre’s scientific staff and visitors often pursue fields of inquiry that did not exist five (let alone 40) years ago, and they do so with startling effective new tools at their disposal—most notably high-powered computers and the Internet. Meanwhile, the vastly improved quality of education and training in a number of countries—most notably, Brazil, China and India—enable a growing number of our visitors to come to the Centre as instructors instead of students.

ICTP itself is seeking to extend its reach by holding an increasing number of its activities in partnership with scientific institutions in the developing world. And, it is seeking to apply the knowledge and principles of physics and mathematics to ever-larger circles of concerns, including ecology, seismology, sustainable development, weather and climate.

Yet, while ICTP’s initiatives have changed to meet the changing circumstances of the world of science, the Centre’s fundamental goals have not. As was the case 40 years ago, ICTP is determined to be not just another international research institution. Instead it continues to pride itself as a model organization designed to promote science in developing countries while doing science itself; to serve as a forum for the exchange of information among scientists worldwide; and to operate as a first-class research institution. It seeks to accomplish all of this without losing sight of its fundamental purpose: to help scientists from the developing world acquire the knowledge and skills they need to be productive researchers and teachers at home and not become another sad statistical entry in the chronic brain-drain problem.

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For additional information about the Abdus Salam International Centre for Theoretical Physics (ICTP), see www.ictp.trieste.it.