ICTP – an Italian crucible for the developing world

The International Centre for Theoretical Physics has stimulated scientific and technological development in many countries, and in Trieste too. **Paolo Budinich** explains how

THE Second World War left Trieste in an awkward position – literally. Close to the Yugoslav border, which coincided with the Iron Curtain, the region was exposed to strong political and nationalist pressures, and associated difficulties.

In 1947, the faculty of science in the University of Trieste was created. It would have been tempting to try to ameliorate Trieste's problems by establishing a scientific centre of international reputation there and then, but the lack of resources and the region's problems made such a target hopelessly utopian.

Nevertheless we were able to draw inspiration from Trieste's history. The city achieved its greatest splendour when, in the 19th century, it became the main harbour of the Austro-Hungarian empire, which embraced a good part of Central Europe. For us it was natural to hope that such historical roots would yield the resources for a revival: a new Trieste acting as a harbour for Central Europe's traffic not so much of material goods but, rather, of commodities less susceptible to political contingency: knowledge and ideas, especially in science.

With these hopes in mind we made the first attempts at collaboration – not only with our Italian colleagues to the west at the Universities of Padova and Bologna but also, and especially, with friends in Yugoslavia, Austria, Hungary, Czechoslovakia and Poland.

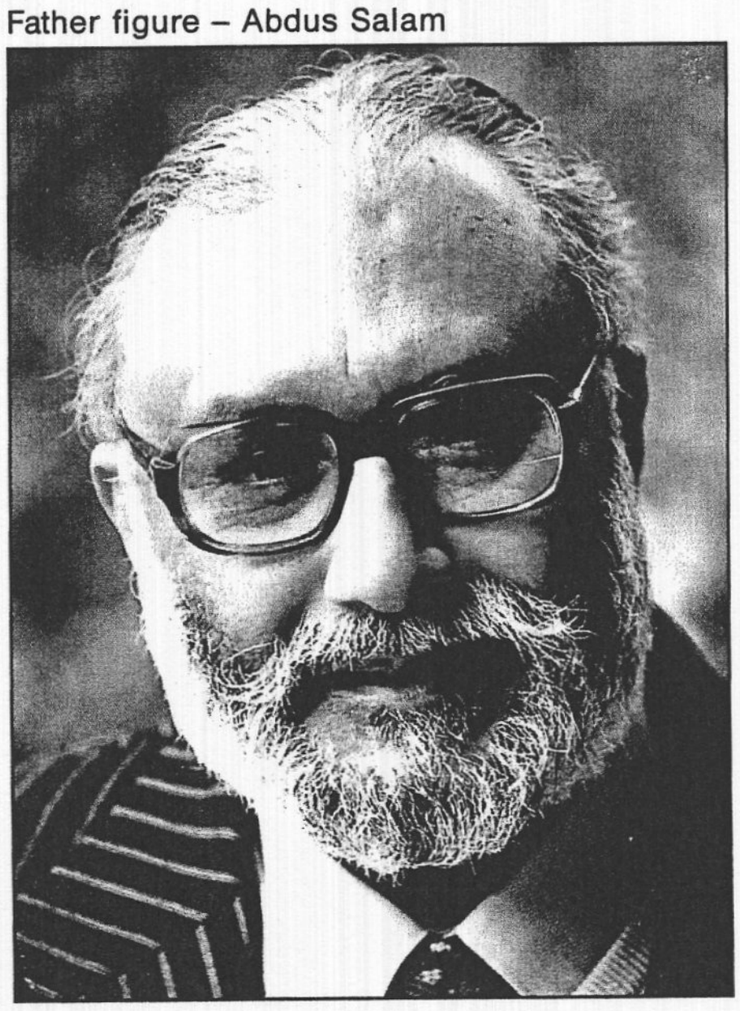
The response was immediate and constructive. For example, in the summer of 1960, during one of several scientific meetings we organised over this early phase, we gathered in Trieste not only many Italian friends (Dallaporta, Villi, Fubini, Amati, Bertocchi), but also Walter Thirring from Vienna, Vladimir Glaser and George Alaga from Zagreb, and Abdus Salam from London. Such meetings helped establish the contacts that were to prove so fruitful. This was in the year that, following a proposal by Salam, the Pakistani delegation at the general conference of the International Atomic Energy Agency (IAEA) had presented a resolution for the creation of an International Centre for Physics.

This idea had been circulating for many years among physicists, having originated from the deep concerns expressed by Bohr, Einstein and Oppenheimer following the explosions of the atomic bombs at Hiroshima and Nagasaki. The hope was that an International Centre for Physics under the flag of the United Nations would constitute a meeting place between East and West, where ways and means of avoiding the repetition of such disasters might be devised.

For us in Trieste, at the border between East and West, it was natural to propose our candidature for such a centre, and we had strong arguments for obtaining the support of our foreign neighbours and the government in Rome.

At the IAEA in Vienna there followed three years of difficult diplomatic battles. All the great powers, including the USA, USSR, UK and France, opposed the project, maintaining that it was sufficient to extend their current fellowship programmes to include developing countries.

Father figure – Abdus Salam



Others formed the impression that the great powers were reluctant to compromise their privileged access to good minds from the Third World.

Thanks to the Pakistani delegation, however, we obtained the support of most developing countries. Italy and Austria were actively favourable and, with the help of major figures such as Niels Bohr, Denmark, Sweden, and Norway were also recruited to the cause.

Eventually the creation of the International Centre for Physics was approved by the general assembly of the IAEA in 1963 – one of those rare occasions in the UN's history when the small and developing countries defeated the big ones. The International Centre for Theoretical Physics (ICTP) was finally created at Miramare near Trieste in 1964. Its founding director was Abdus Salam, who was to be a co-winner of the Nobel prize in 1979, and who continues to hold the post.

Despite widespread scepticism in diplomatic circles, it soon became clear that the centre could attain and maintain a high scientific level, thanks to strong support from the wider scientific community. In the words of Robert Oppenheimer (written in 1965) "In all the work at the Centre, of which I know, very high standards prevail. In less than a year it has become one of the leading institutions in an important, difficult and fundamental field [particle physics]". The new centre was also able to accomplish good work in plasma theory, stimulating East–West collaboration.

But the main thrust of its efforts and resources was devoted to developing countries. Several initiatives were devised and explored to help them build up and foster their own universities and scientific communities, resulting in structural links that operate today (see below). It was difficult, but successful, work which soon became a model for other UN activities in science, to such an extent that in 1970 UNESCO requested the International Atomic Energy Agency to become a partner in its management; in 1978 the ICTP became the model for the creation of the UN University in Tokyo.

Today

Every year some 4500 scientists – mainly postgraduate researchers or young university professors – visit the ICTP, of which more than 70% come from the Third World. Some also attend Italian universi-

ties and research laboratories for training in experimental disciplines.

The Centre's activities span research in pure and applied physics and mathematics, producing over 400 preprints a year. It also runs training courses and workshops (about 40 a year) mainly for scientists from developing countries. With 160 permanent staff, it also supports the organisation of about 50 courses and workshops per year in those countries.

Administered by the IAEA, the ICTP has an annual budget of about $20m, provided by Italy (90%), IAEA (6%), UNESCO (1.5%) and others (2.5%). One of the main problems for the ICTP is that, as at its beginning, its existence is based on international agreements between the Italian government, the IAEA, and (later) UNESCO. Until recently the agreements lasted four years – now eight. Every renewal has to be approved by the Italian parliament, sometimes a cumbersome and lengthy operation which may give rise to periods where critical shortages of funds arise. This occurred, somewhat dramatically, at the end of 1991, when Iran stepped in to provide temporary funds (see *Physics World* December 1991 p6).

Scientists in the Third World tend to experience several common problems: isolation, a lack of support or awareness from their governments, and brain drains. During its 28 years, the ICTP has explored several schemes to help such scientists cope with these adversities. The most successful are as follows:

Associates are talented and active physicists from developing countries who are entitled to visit the Centre three times within six years, each visit lasting 6–12 weeks, and all fully financed by the Centre. The ICTP has 444 Associates from 69 developing countries, with more than 1000 on the waiting list.

"ICTP Associate" has become a title of prestige in developing countries: so much so that several Associates have progressed rapidly in their careers to become university rectors, presidents of research councils, even government ministers.

Federated institutes are universities, departments, or research centres in the Third World, which are assigned funds to support a number of days (from 40 to 120) for visits to the ICTP, the visitors to be selected by the organisation in question.

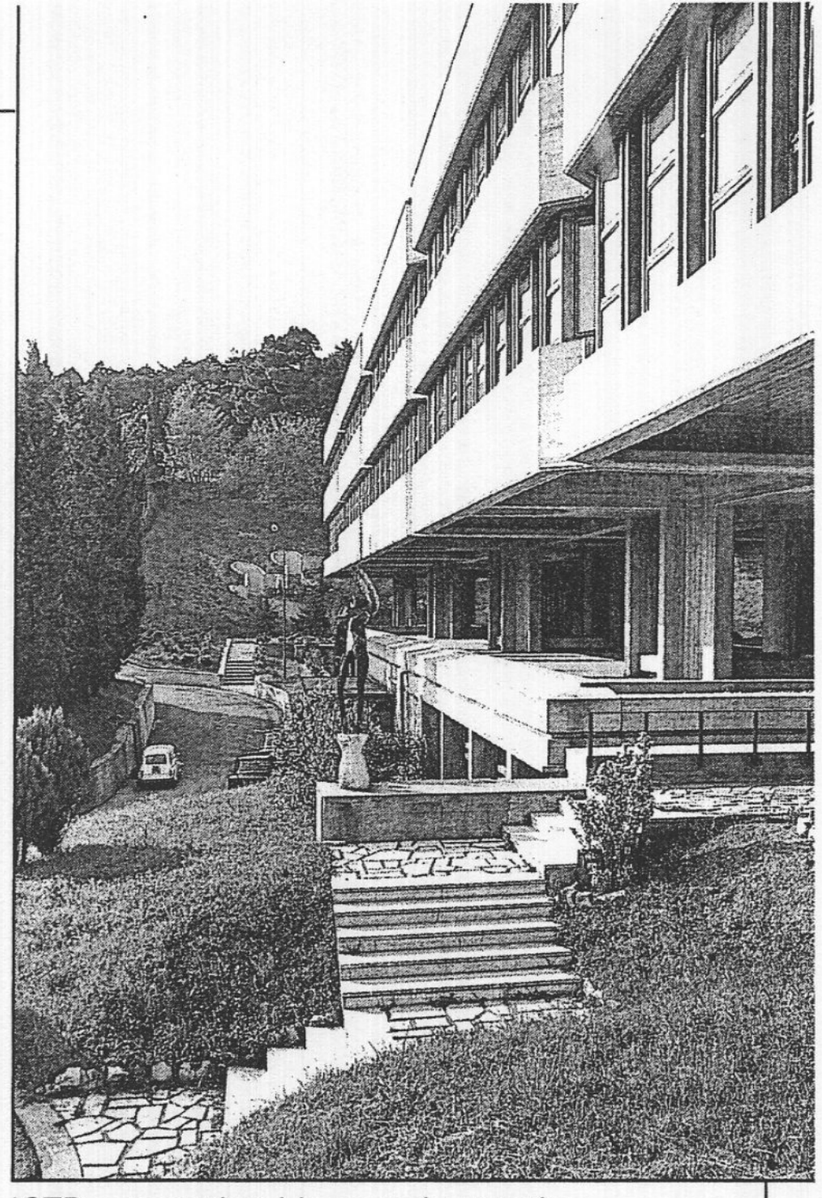
Affiliated centres are long-established federated institutes which are specially supported in order to perform, locally, the kind of work which the ICTP is performing globally. They are intended eventually to constitute a network that will enhance the impact of the ICTP's activities on the scientific communities in the South (i.e. the developing countries), by catalysing South–South links and cooperation.

Cumulatively, the ICTP has been particularly effective in creating efficient and lasting links with universities and scientific institutes in several developing countries. It has established direct contacts between them and the scientific community at large, reducing their chronic isolation. And last, but not least, it has helped give those institutions credit and prestige in the eyes of their own governments. As a result of 28 years of hard work, there are now signs of slow evolution in certain universities and centres in developing countries that may constitute the basis for the scientific and technical emancipation of at least some nations. Such changes should also provide good models for others.

An especially important instrument for assistance, advice and action in developing countries is the Third World Academy of Sciences, founded by its president Abdus Salam in 1983. Its 311 members – who include 11 Nobel laureates – are mainly Third-World scientists; some have emigrated but still maintain links with their mother countries.

The Academy has not yet fulfilled its potential. I will mention just one of its programmes which could be of tremendous value: that of granting to every one of the developing countries at least one complete and up-to-date scientific library. This high-priority project should be considered a moral duty on the part of the rich countries. It could start almost immediately if properly financed (about $10m is required to start a five-year project).

Developing talents – at work in the laser and optical fibres laboratory



ICTP – exporting ideas and expertise

Impact in Italy

The ICTP marked the beginning of the Trieste "system" of international research centres. The ICTP's success was instrumental in raising the level of the new University of Trieste to international standard, in some fields of science at least. It also enhanced the work of other institutions, such as the astronomical and geophysical observatories.

Furthermore, the ICTP's standing stimulated other initiatives in Trieste like the Research Area, where experimental laboratories in pure and applied physics, some of them supported by industry, are being established. And in the vicinity of the Research Area, a new synchrotron radiation laboratory, Elettra, is being created.

From the outset it was felt that, as soon as possible, the ICTP's work should spread from theoretical physics to other lively fields of science of particular interest to developing countries. Its programmes soon included several areas of applied physics: physics of materials, advanced computing, science teaching, biophysics and medical physics, and the environment – in particular oceanography, meteorology, and the physics of the deserts. Mathematics, pure and applied, was soon started at the ICTP itself. Experimental research and training laboratories (in microelectronics, high-temperature superconductivity, lasers) were established in the 1980s.

Biology was established in this context through an initiative of the UN Industrial Development Organisation (UNIDO) which in 1980 proposed to set up an International Centre for Genetic Engineering and Biotechnology modelled on the ICTP. It was natural to propose the Italian candidature for the location of the centre

near the ICTP. The centre was founded in Trieste in 1983 under the direction of Arturo Falaschi with two main laboratories, one in Trieste and one in New Delhi, and a number of associated centres in developing countries.

Another project, the International Centre for Sciences (ICS), was started recently under the auspices of UNIDO in Trieste. It is intended to oversee the creation, in the vicinity of the ICTP, of experimental training laboratories in fields of interest to developing countries – high technology, chemistry, and earth sciences.

Lessons learnt

During the ICTP's 28 years, the good relations with our northern and eastern neighbours have flourished. The flag of the UN flying over the Centre has proved very effective in catalysing scientific collaboration, particularly with those behind what was the Iron Curtain.

Scientific collaboration with Eastern Bloc countries was facilitated through the ICTP's Federation Agreements with many universities and academies; a key aspect of those agreements was that we managed to have them signed at a very high level, by the Director General of IAEA and possibly by a minister. Because they constituted high-level UN agreements, administrators were instructed to proceed automatically and quickly. Some of the lessons we have learned in Trieste by direct experience are:

- the social (demographic), economic, political problems of the South are huge at present, and apt to increase in the future;
- a significant, though preliminary, contribution to their solution is to help these countries to set up decent universities and education systems, a necessary condition for their social and economic emancipation;
- the work done at the ICTP in Trieste represents only a drop in the ocean – much more is needed;
- the ICTP should be considered as a pilot plant, to be enhanced in size and in the diversity of its science, and to be reproduced elsewhere; host countries of such institutions might consider them as an investment; Italy has benefited from contacts established through the ICTP.

Now that fundamental changes in Europe have eliminated the political impediments to multilateral collaboration, the scientific links that we have established with our northern and eastern neighbours should be intensified. They should be enlarged to encompass other cultural activities, so that Trieste can – to an even greater extent – act as a European fulcrum for the exchange of knowledge and ideas.

The ICTP will, of course, continue to export ideas and expertise to the South, where they are badly needed. One treasure accumulated by the ICTP is the large number of channels to deserving people in the South represented by present and ex-Associates, federated and affiliated institutes, and societies of ICTP friends. These channels must be exploited by other initiatives of this kind, in Italy and beyond.

Scientific links with our northern and eastern neighbours should be intensified to encompass other cultural activities, so that Trieste can – to an even greater extent – act as a European fulcrum for the exchange of knowledge and ideas

Paolo Budinich was founding deputy-director of the ICTP from 1964 to 1979, and is now a consultant to the Centre.