



NEWS

from

ICTP



the
abdus salam
international centre for theoretical physics



2 WHAT'S NEW

Tunisia and Trieste

8 DATELINE

Kalinga Prize
SciDev.Net
UN Day

13 PROFILE

Jesús Juyumaya

3 COMMENTARY

Safety First

10 REPORTS

October-December
2001

14 MONITOR

SISSA and ERA

4 FEATURES

Weather in Bangladesh

Microprocessing at ICTP

WINTER 2002

#99

15 WHAT'S NEXT

Conferences, Schools,
Workshops

WHAT'S NEW

Tunisia and Trieste

Italy's President Carlo Azeglio Ciampi and representatives from Trieste's scientific community, including ICTP Director Miguel Virasoro, met with their counterparts in Tunisia in late October to discuss potential avenues of future cooperation. The meeting, which took place in the villa, *El Kousour*, at Gamarth, near the capital city of Tunis, was opened by Abdelkrim Zbidi, representing Tunisia's Minister for Scientific and Technological Research, and Armando Sanguini, Italian Ambassador to Tunisia, who was responsible for organising the event.

Discussions focussed on how the "Trieste System" of scientific institutions—ICTP, Third World Academy of Sciences (TWAS), InterAcademy Panel on International Issues (IAP), International Centre for Genetic Engineering and Biotechnology (ICGEB), International Centre for Science and Technology (ICS), University of Trieste, and Area Science Park—could pursue projects of mutual interest to Italy and Tunisia. One positive outcome of the meeting was the creation of an ICTP affiliate centre in applied mathematics at the Polytechnic of Tunis, which will begin operations next year.

President Ciampi was in Tunisia both as representative of the Italian government and the European Union. As a result, his presence carried wide-ranging significance for future relationships between scientific communities in Europe and those in Tunisia and the entire African continent. In fact, the seeds of cooperation, planted and nurtured by Trieste's scientific community with scientists and scientific institutions throughout the developing world over the past three decades, may be on the verge of blossoming into full partnerships—thanks to the convergence of a number of factors.

First, nations such as Tunisia are making sustained investments in science and technology. The positive impacts of these investments were clearly on display at the meeting in Tunisia not only in terms of the scientific discussions that took place, but also in the engaging interactive exhibits found in the recently opened Tunis Science City, which has been designed to encourage enthusiasm for science among students of all ages. Representatives from Tunis Science City will soon sign a memorandum of understanding with *Fondazione internazionale Trieste per il progresso e la libertà delle*

scienze and other Trieste institutions designed to enhance cooperative activities for scientific education and public understanding of science in both countries.

Second, ICTP has enjoyed a long track record of success in forging cooperative programmes with scientists from the developing world and, as a result, has earned a good deal of trust and support from both individual researchers and institutions in the South.

That trust and support was also on display at the meeting in Tunisia, most notably in a presentation by Zohra Ben Lakhdar, professor of physics at the University of Tunis and co-coordinator of the ICTP-supported Northern African Network on Spectroscopy (NANS). Lakhdar shares her 'network' responsibilities with Yosr Gamal, a physicist at Cairo University's National Institute of Laser Enhanced Sciences. NANS has proven instrumental in improving the state of physics, and more specifically of spectroscopy, throughout Africa. Algeria, for example, has joined NANS, and Cameroon and Senegal have sent scientists to Tunisia for training and research in programmes supported by ICTP.

Third, the presence of President Ciampi and the probing questions he asked about the future of the Trieste System indicate that the Italian government will remain a strong ally of science in the developing world and that Trieste will continue to be a focal point of its efforts to promote scientific and technical skills throughout the South. President Ciampi's emphasis on results—people trained, knowledge transferred, and science utilised to address local, regional and national needs—conforms to the historic mission of the Trieste System and is likely to serve as a valuable framework for progress in the future.

And fourth, global events since last September show that there has never been a more important time in recent history for supporting efforts to promote North-South cooperation in ways that prove fruitful to the entire global community. Science, with its emphasis on international exchange and universal knowledge, will likely be one of the underlying elements of such endeavors.

The Trieste System, which is now approaching its fourth decade of institutional life, is likely to remain a key player in these efforts. The meeting in Tunisia offers one more example of how. □

Safety First

Earthquakes mean trouble—big trouble—wherever and whenever they may strike. But if a nuclear power plant is located near an earthquake zone, a regional or national catastrophe could possibly turn into a global catastrophe.

That's why the International Atomic Energy Agency (IAEA), headquartered in Vienna, Austria, has been involved in safety and risk issues related to earthquakes and other potential natural disasters since the agency's inception in 1957.

Pierre B. Labbé, head of the Design Unit within the IAEA's Department of Nuclear Safety, notes that the agency devotes much of its attention and resources to nuclear nonproliferation issues, seeking to ensure that nuclear materials do not find their way into the wrong hands. But IAEA's mandate also calls on the agency to promote the "peaceful uses of atomic energy," which include the generation of nuclear power. Labbé recently visited ICTP to lecture at the Sixth Workshop on Nonlinear Dynamics and Earthquake Prediction, held from 15 to 27 October 2001.

Worldwide the number of nuclear power units now stands at 438. Together, these plants generate nearly 2500 terawatt-hours (TWh) of electricity, some 16 percent of the world's total power output.

As Labbé notes, "responsibility for the operation of these plants is divided among 32 nations. Eight of these nations are developing nations and another 8 are nations in economic transition from socialist to capitalist frameworks."

"Our focus has been on such developing countries as Argentina, Armenia, Brazil and Mexico, and such countries in economic transition as Bulgaria, the Czech Republic, and Ukraine, all of which have built and operate nuclear power plants, usually just one or two."

Basic scientific knowledge among staff working in these power plants often is equal—if not superior—to the basic scientific knowledge among staff working in nuclear power plants in the developed world. "The problem," Labbé says, "is that staff working in nuclear plants in the developing world don't have the engineering and managerial skills to operate the plants at the same level of efficiency and safety as you find in the developed world. That's where the IAEA can help."

The major shortcomings found in the operation of nuclear power plants in the developing world have evolved around two issues. First, organisations responsible for the oversight of the plants in many of these nations have never devised clear lines of management accountability. That has made it difficult to identify whether the operator, designer or regulator is responsible for a particular aspect of the power plant's performance. "It is easy to see," says Labbé, "why sorting out operating and safety issues would be difficult under such circumstances."

Second, developing nations have failed to devise adequate strategies for quality assurance. That has made it difficult to determine whether a plant's design and construction specifications meet international standards. "As a result," Labbé observes, "we often have difficulty determining with certainty whether the work was done according to plan."

IAEA's involvement in these issues, Labbé says, "has helped spur a great deal of progress in the management and operation of nuclear plants in the developing world." The agency now plans to lend a helping hand in improving the management of some 600 nuclear research facilities, housed in universities, research institutes and hospitals around the world.

Labbé is pleased to see that ties between IAEA and ICTP have been strengthened over the past several years. "The training provided by activities like the Workshop on Nonlinear Dynamics and Earthquake Prediction undoubtedly helps enhance the skills of developing world scientists and technologists," he notes. "At the same time, research conducted by ICTP's SAND (Structure and Non-Linear Dynamics of the Earth) group has enhanced our knowledge of the mechanisms that drive earthquakes. That, in turn, has helped us attain a better fix on earthquake probability and also on the potential impact that an earthquake may have on structures located within range of the epicentre." □

For additional information about IAEA's Department of Nuclear Safety, contact p.b.labbe@iaea.org or see www.iaea.org/ns.



Pierre Labbé

Weather Matters in Bangladesh

Bangladesh is a nation where catastrophic weather events are so common that it's fair to say such events have become a part of everyday life—continually testing the resiliency of a resilient people. That's why the introduction of satellite technology and computerised assessments, which are designed to provide and analyse detailed information about weather patterns and potential weather-related impacts, have become such a welcome addition to the nation's long-standing battle against nature's fury.

One of the pioneers of this effort has been Abdul Musawwir Choudhury, a former ICTP Regular Associate (1981-1994), who has served as director of research and chairperson of the Space Research and Remote Sensing Organization (SPARRSO) since 1980. SPARRSO is a government-sponsored research organisation specialising in remote sensing and computer modelling. With a staff of 150 (including about 50 research scientists), SPARRSO, headquartered in the capital city of Dhaka, works closely with other governmental agencies responsible for water, forestry, fishery and land-use management.

"A unique confluence of circumstances—both natural and human-made—has placed social and environmental well-being in Bangladesh at risk year-in and year-out," says Choudhury.

"First, Bangladesh sits on a broad delta plain—a sea of silt—built by soil deposits from the Ganges and Brahmaputra rivers. While this gives the nation potentially some of the most fertile soil on Earth, it also makes it vulnerable to flooding. In fact, half of the nation's land mass is less than 25 meters above sea level. Think of Bangladesh as The Netherlands of the Asian subcontinent."

While Bangladesh may look like The Netherlands in terms of topography," Choudhury adds, "the size of its land mass is comparable to England, but with a population 2.5 times as large." That makes Bangladesh, with a total of about 130 million people, one of the most densely populated nations on Earth.

And, as endless news stories and research reports have noted, the people of Bangladesh are poor. The World Bank estimates that the annual gross national product per capita is about US\$350 and that 75 percent of the population lives on less than US\$2 a day. That makes Bangladesh one of the poorest countries on Earth.

"Simply put," notes Choudhury, "geography has created natural hazards for Bangladesh; poverty has made it difficult for the nation to respond effectively."

There is one additional factor, however, that makes the experience of Bangladesh even more unique than the experience in other poor, overcrowded coastal nations in the

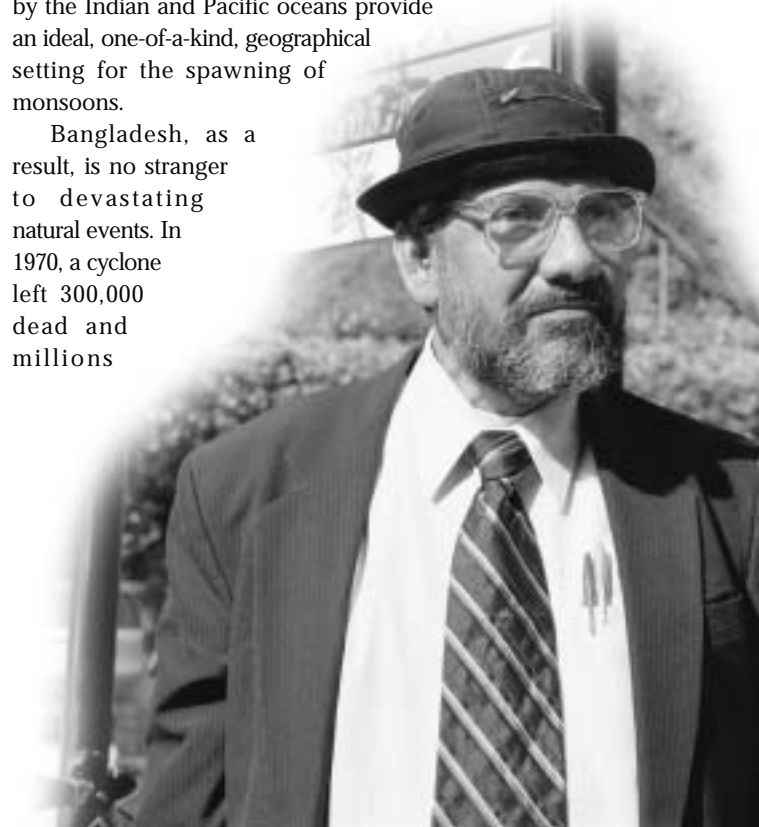
developing world. That factor is the monsoons, seasonal winds that often carry heavy, sometimes torrential, rainfalls between May and September each year, and, at the same time, are one of the prime forces behind such catastrophic weather events as cyclones and tornadoes. Bangladesh receives 85 percent of its annual rainfall (which can total more than 5 metres a year) during the monsoon season—and suffers most of its weather-related catastrophes during this period as well.

Choudhury explains: "In southeast Asia, land covers 60 percent of the area; in the rest of the world, land cover averages 20 percent with the rest submerged in water. Since water tends to absorb a much higher percentage of the sun's radiative heat, regions with large water masses tend to have cooler, more temperate, climates.

"In Bangladesh," he continues, "temperature differences between the land and the sea can sometimes reach 10°C. Such differences generate variations in pressure that kick up the seasonal monsoon winds and supply the energy that fuels cyclones and tornadoes."

Put another way, the vast Eurasian land mass dominated by the Himalayan Mountains and Tibetan Plateau and encircled by the Indian and Pacific oceans provide an ideal, one-of-a-kind, geographical setting for the spawning of monsoons.

Bangladesh, as a result, is no stranger to devastating natural events. In 1970, a cyclone left 300,000 dead and millions



Abdul Musawwir Choudhury

homeless in one of the worst natural disasters in human history. In 1991, another catastrophic cyclone left 100,000 people dead. And in 1998, two-thirds of the country was inundated by flood waters that rose some 20 metres above normal in some places, forcing more than 20 million people to evacuate their homes.

But that's not all. Shifts in monsoon winds can sometimes cause rains to cease or not arrive at all. As a result, Bangladesh, a land noted for too much rain, also periodically suffers from too little rain. In 1770, the great Bengal drought wiped out an estimated one-third of the population. In 1943, drought took the lives of one-fifth of the population. More recently, droughts in 1973, 1979 and 1994 left millions of Bangladeshis without access to adequate supplies of food.

But the news of late is not all bad. Improved irrigation systems and agricultural practices have raised the level of food production in Bangladesh, helping to mitigate the adverse, life-threatening, impact of droughts. Moreover, recent weather-related catastrophes in Bangladesh have not caused as much havoc and death as in the past, in part because both citizens and government officials have been able to respond more effectively to the risks posed by natural disasters. For example, Bangladesh experienced two weeks of floods in September 2000 but the loss of lives and the extent of property damage were minimal compared to previous floods. In fact, less than 1000 people died—a catastrophe in its own right but of a much lesser dimension than in the past.

One reason for the thankfully limited impact of the storms in 2000 was the fact that the most intense rain storms were confined to the southwest quadrant of the country. Another reason, however, lies in significant improvements that have taken place in Bangladesh's disaster management programmes, which are better funded and more sophisticated than in the past. In fact, Bangladesh's disaster management strategy has moved increasingly from post-disaster response (cleaning up the mess after it takes place) to preparedness (trying to anticipate potential disasters before they occur and putting plans in place to minimise their potential damage).

That's where the work of Choudhury and SPARRSO comes into play. For more than two decades, SPARRSO, with the help of satellite and computer technologies, has been assembling detailed statistical profiles of Bangladesh's weather and climate. More recently, it has begun to develop computer models that have become increasingly adept at anticipating rain and temperature patterns throughout the country.

The government of Bangladesh has found such information invaluable in addressing a host of vital environmental problems ranging from its annual projected levels of water-irrigation releases for farmland (which helps boost agricultural productivity) to anticipated changes in water quality (which help improve the management of the nation's fish industry, an important source of nutrition for many people) to projected levels of rain associated with monsoons (which is instrumental in devising effective strategies for risk management).

One of the most important insights provided by SPARRSO has to do with the development of a computer model that can accurately project whether a particular monsoon season will result in moderate or heavy rainfall. The model, which

draws on information related to barometric pressure readings across the globe, has proven instrumental in anticipating the impact of *El Niño* and *La Niña* on rain levels in Bangladesh, thus helping to determine whether a particular monsoon season is likely to leave excessive flooding in its wake. The conclusion of these studies, in their most simple form, is this: *El Niño* tends to blunt the force of monsoon rains. *La Niña*, meanwhile, tends to fuel the quantity and intensity of rainfall during monsoons, making a dangerous situation even more dangerous.

Choudhury recently visited ICTP to give a lecture during the Course in Inverse Methods in Atmospheric Science. But this was by no means the first time that he has been to Trieste. Indeed Choudhury's affiliation with the Centre dates back to the late 1970s when he attended an international workshop on monsoon dynamics in Dhaka, which was jointly organised by ICTP in cooperation with the World Meteorological Organization (WMO) and the Canadian International Development Agency (CIDA). His participation in Centre-sponsored activities accelerated after 1981 when he was appointed an ICTP Associate. As a result, in the early 1980s, Choudhury attended Trieste-based training and research activities related to numerical weather prediction, geophysics, applications of physics to meteorology, geomagnetism and mathematical ecology.

"While other organisations—for example, the US National Aeronautics and Space Administration (NASA)—provided staff at SPARRSO with access to satellite data that made it possible for us to conduct research at home, ICTP provided the training and know-how to effectively use this information in ways that addressed compelling national needs. This is an untold story of how ICTP has helped put physics and math

to work to deal with one of Bangladesh's most critical problems—weather-related disasters."

"Despite our recent modest measures of success, we still have a long way to go," says Choudhury. "Nevertheless, we should be proud of the science-based progress that has recently been made in dealing with the inevitable risks that Bangladesh experiences due to an unusual mix of natural and social conditions that, in turn, have created an unusual set of challenges for a nation struggling to improve the quality of life for its people." □

For additional information about the Bangladesh Space Research and Remote Sensing Organization (SPARRSO), please contact A.M. Choudhury, sparrso2@bangla.net.

Microprocessing at ICTP: Twenty Years Young

When Ang Chu Suan, a lecturer at this year's ICTP Workshop on Distributed Laboratory Instrumentation Systems, stepped up to the podium for his presentation, he glanced down at his computer, pressed four or five keys and then watched with others as the overhead screen displayed the current room temperature in his office in Malaysia, some 10,000 kilometers away. A toasty 34°C, thank you.

"It's easy," Ang says. "My laptop computer here in Trieste is connected via the internet to my desktop computer in Malaysia. My computer in Malaysia, in turn, is equipped with an embedded microprocessor system that receives data from the thermometer. The data is relayed to my computer in Malaysia, which sends the information back to Trieste. All I do is turn on the switch and call up the information through a web-browser."

This year marks the 20th anniversary of ICTP's microprocessor training courses. Ang's modest, flip-of-the-fingers, demonstration conveys the dramatic changes that have unfolded in the field over the past two decades. Catharinus Verkerk, a retired staff scientist from CERN (the European Laboratory for Particle Physics), who was given the task of organising and directing the first college in 1981 and has remained in that capacity ever since (in what he clearly considers a labour of love), recalls the early years.

"In 1981," says Verkerk, "computers were just beginning to take hold. ICTP didn't even have one. In the meantime, microprocessors had been around for just six or seven years and no one was quite sure where they would lead. In fact, the idea for the training course began with an off-the-cuff remark by Abdus Salam to Luciano Bertocchi, who was then head of training courses and scientific personnel at ICTP. (In 1983, Bertocchi would be appointed ICTP's deputy director).

"These new microprocessors," Salam said, "seem like interesting gadgets. Maybe ICTP should do something with them." Bertocchi quickly relayed Salam's sentiments to

Paolo Zanella, director of CERN's Data Handling Division.

Salam's remark—and Zanella's enthusiastic response—led to the organisation of the first College on Microprocessors: Technology and Applications in Physics, held in early September 1981.

Getting ready for this initial activity proved an unforgettable experience that Verkerk vividly recalls as if it had happened just yesterday. "My colleagues at CERN, including Wolfgang Von Rüdén, Sandro Marchioro and Ian



Catharinus Verkerk and Abhaya Induruwa

Barnet, spent endless hours over a three-month period both to build the necessary hardware and software and to prepare the training material. Once these tasks were completed, we packed a van to carry the boards, terminals, cables, connectors and tools from Geneva, Switzerland, where the headquarters of CERN is located, to Trieste—a 15-hour journey."

"Upon our arrival, we had to unload and assemble everything. The training course in the first year was held in the basement of the Galileo Guesthouse, which was almost but not quite finished. Participants were housed in off-campus rooms and apartments scattered in and around Trieste."

Despite the logistical difficulties, the first college proved a success. Some 400 researchers from the developing world

submitted applications. About 120 candidates were accepted, with 20 showing up the first day of the college without having officially notified the organisers. The laboratory was filled beyond capacity. In fact, laboratory sessions took place in three two-hour shifts, beginning at 2 in the afternoon and lasting until 8 in the evening.

"We immediately knew that we had launched an activity that would continue in the future," says Verkerk. "There was just too much interest and excitement for this to be a one-time event. So plans for the next college began even before the conclusion of the first college."

Indeed the expansion of microprocessor activities at ICTP unfolded rapidly during the early 1980s.

- In 1983, the second college was held in Trieste.
- In 1984, the microprocessor college was organised for the first time outside Trieste in Colombo, Sri Lanka, establishing an administrative framework that has resulted in colleges being held both in Trieste and in developing countries. Over the past 15 years, colleges have taken place in Bogota, Colombia (1985); Hefei, China (1986); San Luis, Argentina (1988); Cape Coast, Ghana (1995); Hanoi, Viet Nam (1998); and Dakar, Senegal (1999).
- In 1985, ICTP opened a microprocessing laboratory, under the direction of Alberto Colavita, an Argentinean physicist who had participated in the second college. The laboratory is designed in part to provide technical assistance to college participants and in part to pursue independent research projects. Under Colavita's direction, ICTP's Microprocessor Laboratory has developed partnerships with the United Nations University (UNU), CERN and the Italian National Institute of Nuclear Physics (INFN).
- In 1985, the United Nations University (UNU) also agreed to provide funding principally for colleges held in developing countries. The partnership with UNU would continue for some 15 years.

"ICTP's microprocessing activities," explains Abhaya Induruwa, a computer engineering professor at the University of Moratuwa, Sri Lanka, who has co-directed the colleges with Verkerk since 1994, "have experienced three major shifts in focus over the past 20 years."

"First, from 1981 to 1994, participants worked with 'one-of-a-kind' microprocessor development systems that were essentially built to conform to our unique work environment. Building these systems was both fun and a learning experience but their utility was restricted to the Trieste campus."

"Second, the introduction of the free-of-charge Linux operating system at our 1994 college marked a giant step forward in our ultimate goal: to provide a practical means for the transfer of knowledge and skills through a common cost-free computer operating system that could be accessed on computers not just in Trieste but in countries throughout

the developing world. In brief, course participants could now take their acquired knowledge and skills home—and, more importantly, apply what they learned to solving local and regional problems."

"Third," Induruwa notes, "this year we have changed 'course' again by fully recognising the enormous growth—and even more importantly, the enormous potential—of the internet. Our newly revised training workshop, presented for the first time this year, is essentially designed to teach participants how to control instruments distributed over the internet by using web-based technology."

Regardless of the changes in format that have taken place over the years, the courses have remained tightly focussed on the same goal: to help those involved in data acquisition, experimentation and equipment-control to take advantage of microprocessors to improve the efficiency and accuracy of what they do.

"While the majority of participants are researchers in universities," notes Induruwa, "our colleges have also attracted staff and technicians working in medical institutions and industrial firms. In addition, the participant list has become increasingly multidisciplinary. This year's list, for example, includes physicists, mathematicians, biologists and agriculturalists from 37 different countries."

"Our lecturers," Verkerk adds, "have also become more diverse. When we began, the entire group consisted of scientist from Europe. The 2001 workshop, in contrast, involves 11 lecturers from 11 countries, including Chile, Malaysia, Nigeria, and Ukraine."

Each year, ICTP's microprocessor training activities chooses 60 individuals from the developing world (usually from an applicant pool that exceeds 250). That means some 1200 scientists in total, virtually all from the developing world, have participated in these activities over the past 20 years.

Keeping pace with the rapid development of microprocessor technology has been a major challenge for scientists and technicians from around the globe—a challenge most acutely experienced in the developing world. As part of its larger mandate, ICTP has tried to meet this challenge by providing the most up-to-date microprocessor training activities and computer facilities that it possibly can.

The effort has not only helped boost the use of microprocessors in countries throughout the South but also has played a major role in changing the face of ICTP. Participants today have access to the Centre's newest addition: the Informatics Laboratory in the lower level of the Adriatico Guesthouse, home to some 50 state-of-the-art workstations. These workstations can be easily attached to embedded microprocessor systems that can provide, among other things, real-time recordings of room temperatures in an office in Malaysia.

Abdus Salam's intuition was right: these gadgets do have the potential to do some interesting things. □

Kalinga Prize to Fantoni

Stefano Fantoni, professor of theory of nuclear interactions at SISSA (International School for Advanced Studies) and an ICTP consultant, has been awarded UNESCO's 2001 Kalinga Prize for the popularisation of science. The award ceremony took place on 19 October at UNESCO's headquarters in Paris. Since 1993 Fantoni has been director of SISSA's Master in Science Communication programme, a biennial course that brings together some 30 students from Italy to learn about science communication. Fabio Pagan, an Italian science writer who is a staff member of the ICTP Public Information Office, is one of the course's primary organisers. The Kalinga Prize, the world's most prestigious prize in science communication, was created in 1952. The 'hall of fame' list of prize winners includes Bertrand Russell, George Gamow, Arthur C. Clarke, Fred Hoyle, Konrad Lorenz, and Margaret Mead.

Tosatti APS Fellow

Erio Tosatti, professor of physics at the International School for Advanced Studies (SISSA) and long-time ICTP consultant in the condensed matter physics group, has been elected a fellow of the American Physical Society. Tosatti is being recognised for "his seminal contributions to the theory of solids" and his efforts in "fostering international ties via worldwide collaborations and the organisation of conferences."



Erio Tosatti

Beamline for Third World

As a result of an agreement recently signed by ICTP director **Miguel Virasoro** and **Carlo Rizzuto**, chairman of *Sincrotrone Trieste*, scientists from the developing world will have access to a new beamline at the *Elettra* synchrotron light source, located in Trieste's Area Science Park. The beamline, called XAFS (an acronym for X-Ray Absorption Fine Structure), can analyse the structure of new materials. ICTP will invest US\$1.5 million for the beamline, which is expected to be ready by the middle of this year. About 60 developing world researchers will be able to use XAFS as well as other *Elettra* beamlines for a total of 1500 hours per year.



Miguel Virasoro and Carlo Rizzuto

New Access

SciDev.Net, the first global web site dedicated to both reporting on and discussing the role of science and technology in meeting the needs of the developing world, was launched in December in London. The project, which is receiving editorial support from the world's two leading scientific journals, *Nature* and *Science*, has been undertaken with the cooperation of the Third World Academy of Sciences (TWAS). Funding for the project comes from the UK Department for International Development, the Swedish International Development Cooperation Agency and the International Development Research Centre in Canada. To learn more about SciDev.Net and/or to register to receive regular e-mail alerts providing information on new material added to the site each week, visit www.scidev.net or contact twas@ictp.trieste.it.

In the News

Filippo Giorgi, head of ICTP's Physics of Weather and Climate Group, was quoted extensively in a *Science* news article (26 October, p. 765) focussing on the UN-sponsored report, *Climate Change 2001: The Scientific Basis* (Cambridge University Press), for which Giorgi served as one of the co-ordinating authors. In the same issue, *Science* examined efforts by scientists from Islamic nations to strengthen ties with the West in the aftermath of the 11 September terrorist attacks in New York and Washington, D.C. The feature article begins with observations and comments by **Farouk El-Baz**, the Egyptian-born director of Boston University's Center for Remote Sensing, who served as a member of the Centre's Scientific Council from 1986 to 1993. A lengthy article on Islamic science published in *The New York Times* on 30 October cites both El-Baz and the late **Abdus Salam**, the founding and long-time director of ICTP. **Mohamed Hassan**, executive director of the Third World Academy of Sciences (TWAS), based in Trieste, was quoted in a special feature article on technology and development published in the 10 November issue of *The Economist*.

2001 ICTP Prize

The ICTP Prize Selection Committee has announced that the 2001 ICTP Prize in honour of Hans Bethe in the field of high energy physics has been awarded to **Soo-Jong Rey**, a researcher at Seoul National University Centre for Theoretical Physics in Korea. Soo-Jong Rey has authored more than 90 articles in the fields of string theory, cosmology and particle physics. In the early 1990s, his work on the non-perturbative aspects of string theory set the stage for the discovery of various dualities in string theory later that decade.

UN DAY

ICTP celebrated UN Day for the first time on 23 October 2001. The celebration took place in the Kastler Room of the Adriatico Guesthouse with some 200 people in attendance. Among those who gave brief presentations were Miguel Virasoro, ICTP director; Roberto Dipiazza, mayor of Trieste; Arturo Falaschi, director, International Centre for Genetic Engineering and Biotechnology (ICGEB); Stanislav Miertus, deputy director, International Centre for Science and High Technology (ICS); and Khavtgain Namsrai, physics professor at the University of Ulaanbaatar, Mongolia, who represented the Third World Academy of Sciences (TWAS). There was also a recorded video message from UN Secretary General, Kofi Annan, winner of the Nobel Peace Prize for 2001, an honour that he shared with UN staff worldwide. In his talk, Virasoro reaffirmed the Centre's role as a meeting place for diverse cultures, a role that has assumed even greater significance in light of the terrorist attacks of 11 September and the subsequent war in Afghanistan. The following day, 24 October, ICTP honoured Centre employees who have worked for the UN for 20 years or more. Among the honourees was Mariuccia Fasanella, ICTP's head librarian, who has been with the Centre for 36 years.



ICTP Director Miguel Virasoro and Trieste Mayor Roberto Dipiazza



Long-time service awardees



COLLEGE ON BIOPHYSICS: FROM MOLECULAR GENETICS TO STRUCTURAL BIOLOGY

1 - 12 October

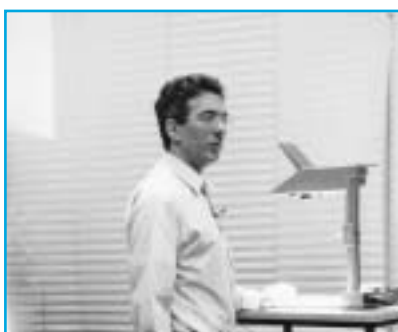
Co-sponsors: *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq, Brazil), International School for Advanced Studies (SISSA, Trieste, Italy) and International Centre for Genetic Engineering and Biotechnology (ICGEB, Trieste, Italy).

Directors: P. Carloni (SISSA), D. Lamba (ICGEB), A.J. Libchaber (Rockefeller University, New York, USA) and S. Pongor (ICGEB).

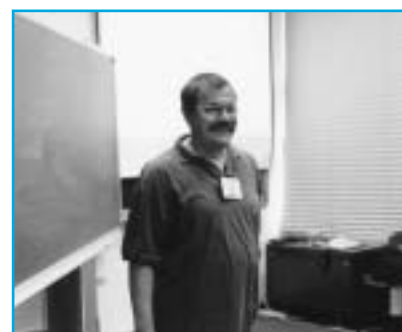
Local Organiser: J. Chela-Flores (ICTP and *Instituto Internacional de Estudios Avanzados*, Caracas, Venezuela). *The College focussed on the most current theoretical and experimental approaches designed to better understand and utilise the explosion in information related to biological structures. Special emphasis was placed on genome sequence searches, comparative genomics, gene and protein expression and function, correlations between gene expression and protein pathways, techniques to measure mRNA, nuclear magnetic resonance, X-ray diffraction, protein crystallisation and synchrotron radiation. Molecular dynamics, modelling and databases were afforded special attention. The College was designed for scientists and students with interdisciplinary backgrounds in physics, chemistry and biology.*



Paolo Carloni



Amos Maritan



Sandor Pongor

COURSE ON INVERSE METHODS IN ATMOSPHERIC SCIENCE

1 - 12 October

Co-sponsors: Italian Space Agency (ASI, Rome, Italy) and European Space Agency (ESA, Paris, France).

Directors: D. Fussen (Belgian Institute for Space Aeronomy, Brussels, Belgium), R. Guzzi (Institute for the Study of Atmospheric and Oceanic Sciences, ISAO, of the National Research Council, CNR, Bologna, Italy) and C. Rodgers (Clarendon Laboratory, Oxford, UK).

Local Organiser: G. Furlan (ICTP and University of Trieste, Italy).

Inverse methods in atmospheric sounding present the possibility of obtaining a tridimensional view of the atmosphere that would be useful in better understanding the transport, diffusion and transformation of atmospheric components. The Course, intended for M.Sc. and Ph.D. researchers working in the field of remote sensing, presented the most advanced methodologies. At the same time, it gave researchers the opportunity to strengthen their theoretical background in the physical

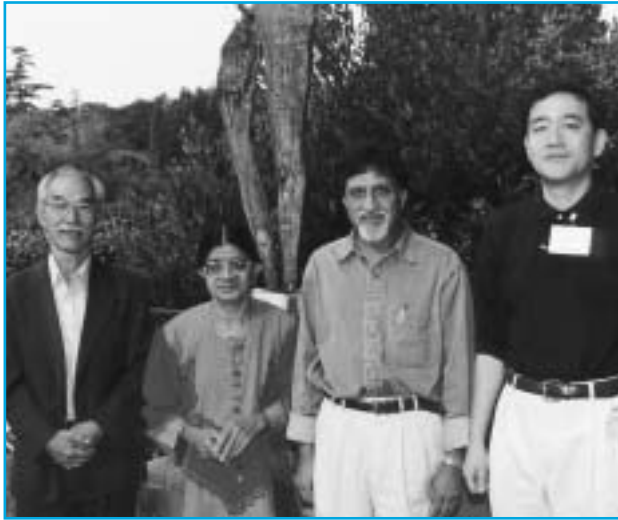
mechanisms of atmospheric remote sensing and related measurements. Topics included general inverse methods, information content and error analysis, constraint optimisation inversion, numerical methods for nonlinear problems, occultation, ground station measurements, aerosol size distribution, assimilation, and spectral channel optimisation. The Course also included computer exercises.



Rodolfo Guzzi and Giuseppe Furlan

AUTUMN COLLEGE ON PLASMA PHYSICS

8 October - 2 November



Paulo Sakanaka, Bimla Buti, Swadesh Mahajan and Zensho Yoshida

Directors: B. Buti (California Institute of Technology, Pasadena, California, USA), S.M. Mahajan (University of Texas at Austin, USA), P.H. Sakanaka (*Universidade Estadual de Campinas*, Unicamp, Brazil) and Z. Yoshida (University of Tokyo, Japan). *Understanding the nature of collective phenomena in plasmas (in which a large number of particles coherently participate) is a dominant theme of much of the complexity found in modern many-body physics. Collisionless plasma, because of its ability to sustain an endless variety of such motions, is a standard bearer for systems that display collective interactions. Due to recent technical advances, new regimes have emerged in which the notions and methodology of collisionless plasmas can be fruitfully exploited. Such new domains extend from cosmology to semiconductor physics. The College, which was devoted to a study of the collective phenomena in both conventional and the newly emerging plasmas, consisted of lectures, group discussions and poster sessions.*

SIXTH WORKSHOP ON NON-LINEAR DYNAMICS AND EARTHQUAKE PREDICTION

15 - 27 October

Co-sponsor: European Commission (Brussels, Belgium). **Directors:** V.I. Keilis-Borok (International Institute of Earthquake Prediction Theory and Mathematical Geophysics of the Russian Academy of Sciences, Moscow, Russian Federation) and G.F. Panza (University of Trieste and ICTP). *The Workshop was dedicated to the application of methods of non-linear dynamics for understanding the instability of the Earth lithosphere. It focussed on the interface between analyses of geophysical observations and mathematical models of chaotic systems; numerical modelling of lithosphere dynamics and the dynamics of other complex systems; and modelling of earthquake prediction. Attention was given to the accuracy and statistical significance of prediction methods, error rates, and the relationship between science research centres and disaster management agencies (see "Safety First," p. 3).*



Michele Caputo



Giuliano Panza

WORKSHOP ON ADVANCED NUCLEAR POWER PLANT SIMULATION

29 October - 9 November

Co-sponsor: International Atomic Energy Agency (IAEA, Vienna, Austria). **Directors:** G. Bereznoi (Chulalongkorn University, Bangkok, Thailand), W.K. Lam (CTI Simulation International Corporation, Toronto, Canada), S. Vigovsky (Moscow Institute for Physics

and Engineering, Moscow, Russian Federation) and R.B. Lyon (IAEA). *To contribute to the training of scientific and engineering personnel of nuclear power plants, IAEA sponsors the development of educational simulators designed to provide insight and understanding of the general design and operational characteristics of power reactor systems. The purpose is to provide university professors and engineers involved in teaching topics*

in nuclear energy with the tools they need to demonstrate reactor operational response characteristics. The Workshop included a combination of lectures and computer exercises on the use of several simulation packages. By using simulation software, in combination with training material, participants sought to improve their understanding of the operational response characteristics of various reactor types.

MICROPROCESSOR LABORATORY SEVENTH COURSE ON BASIC VLSI DESIGN TECHNIQUES

29 October - 23 November

Director: A.A. Colavita (ICTP). Head of laboratory exercises: A. Cicuttin. *The Course exposed scientists and engineers to the latest VLSI design techniques. Training sessions provided an introduction to top-down digital design procedures using VHDL, which is a hardware-design description language. The Course also included hands-on laboratory exercises, which comprised 60 to 75 percent of the Course. As a complement, the Course introduced scientists to FPGA and analogue design, using Spice, and included a broad overview of available silicon technologies.*



Andrés Cicuttin

ADVANCED COURSE: CLIMATE CHANGE IN THE MEDITERRANEAN REGION—PART II: SOCIO-ECONOMIC ASPECTS AND IMPACTS

12 - 16 November

Co-sponsors: European Project RICAMARE (with funding from the EC/DG Research and START programmes).

Directors: A. Garrido (*Universidad Politécnica de Madrid, Spain*), M. Schechter (*University of Haifa, Israel*), J.M. Moreno (*Universidad de Castilla-La Mancha, Toledo, Spain*) and F. Giorgi (ICTP).

The Course, the second component of a two-part workshop addressing climate-related issues, included investigations

into integrated impact assessments of climate change; economic effects of sea level rise; impacts of climate change on agriculture and water resources; climate change and biodiversity; adaptation to climate change; and assessments of mitigation policies. It was intended primarily for scientists and graduate students working in the fields of economics, social science, political science, geography, and environmental science. It was particularly geared to those seeking to learn more about the socio-economic aspects of climate change. The Course was part of a larger plan to build a cooperative research network in the Mediterranean region on global change research.

WORKSHOP ON DISTRIBUTED LABORATORY INSTRUMENTATION SYSTEMS

26 November - 21 December

Directors: A.S. Induruwa (*University of Kent, Canterbury, UK*) and C. Verkerk (ICTP, formerly CERN, Geneva, Switzerland).

The Workshop aimed to illustrate how automation in physics laboratories can

be advanced through greater access to the internet and Java. A distributed system was demonstrated, consisting of PCs interconnected through a Local Area Network that controlled measurement and data acquisition equipment. Seventy-five hours were devoted to laboratory exercises. Lectures were designed to introduce participants to the concepts and techniques underlying a distributed laboratory

instrumentation system and to prepare them for laboratory tasks upon their return home. Topics included object oriented programming techniques, internet technology and protocols, client-server web-based databases, and design of server-based web pages. In addition, lecture topics examined embedded and real-time systems, data analysis and processing, and instrumentation techniques (see "Microprocessing at ICTP," p. 8).



Workshop on Distributed Laboratory Instrumentation Systems



PROFILE

ICTP associate Jesús Juyumaya is a mathematician who enjoys knotty problems.

Knot a Problem

When Chilean-born ICTP Associate (1998-2003) Jesús Juyumaya goes to the ICTP library, he sometimes finds himself tied up in knots—theoretically speaking, of course. That's because knot theory, a subfield of topology and algebra that focusses on knot classification and how one knot may be deformed (a mathematician's way of saying altered) into another knot, is one of his major areas of research.

Juyumaya was born in Arica, a mid-sized Chilean city of 200,000 people that is located on the Pacific Coast just south of the Chilean border with Peru. He attributes his interest in mathematics to his father, a local food and vegetable vendor, who had a passion for numbers that he shared with his only son. In fact, both Juyumaya's father and mother encouraged him and his two sisters to earn university degrees, a dream that hard times had prevented either of his parents from pursuing.

Today both his sisters are school teachers in their home town. Juyumaya, however, chose to leave Arica when he was just 17 to seek a college education at the Catholic University of Valparaíso in Valparaíso, Chile, some 2000 kilometres away.

"I originally intended to major in physics," notes Juyumaya. "However, I soon discovered that mathematics could satisfy my intellectual curiosity just as well and that, quite frankly, I could grasp mathematical concepts more quickly and easily than those of physics."

Juyumaya earned his undergraduate degree in 1983 and his master's degree in mathematics, also from the Catholic University of Valparaíso, four years later. "By then my aptitude and interests were firmly set and I decided to immediately apply to the doctorate programme in mathematics at the University of Chile in the capital city of Santiago."

The University of Santiago, the largest and most prestigious university in Chile, has an enrolment of 15,000 students. Yet Juyumaya's class consisted of just seven students, a select group of math doctoral students who received personal attention and a great deal of professorial encouragement during their studies. Juyumaya took advantage of this opportunity to complete his doctorate in five years. His major area of study was representation theory of finite groups, which was a refinement of his master's degree studies in group and representation theory.

Soon after receiving his doctorate, Juyumaya was appointed a lecturer at Valparaíso University. He has remained there for the past decade rising to the rank of professor. "I am fortunate," he notes, "to be at Valparaíso because my teaching load is only two to three courses a year. That leaves plenty of time for my own research."

His research results have been published, for example, in the *Journal of Algebra* and *Comptes Rendus de l'Académie des Sciences Paris*. In addition, he has found time to organise a summer master's programme designed to help high school math teachers improve their skills in linear algebra, group theory and calculus, while at the same time learning more about the art of teaching.

Juyumaya has also been able to travel, most notably to the University of Paris 7 as a visiting scholar in the late 1990s, and the University of Warwick in the United Kingdom. In fact, it was in Paris that he first learned of ICTP's Associate Programme in 1997 from a wall poster tacked to a board outside his office. He applied the same year and was accepted on his first try.

Jesús Juyumaya

"ICTP has been an important boost to my career," he notes. "The Centre's stimulating research environment and excellent library allow me to explore new avenues of inquiry, including knot theory. Not only does the atmosphere at ICTP help keep my research fresh and exciting, but it also enables me to stay abreast with the latest developments in a host of research areas, enhancing both my own studies and teaching skills." □

IN MEMORIAM



Gianfranco Guerriero, who served as ICTP's Senior Administrative Officer from 1990 to 1997, died on 26 September in Rome. He was 59. In 1997, Guerriero played a prominent role in securing additional permanent funding for ICTP, marking a high point

in his years of service to ICTP. Centre staff and colleagues recall his kindness and remember him fondly as a valued colleague and sincere, warm-hearted person.



Louis Leprince-Ringuet, an expert in cosmic rays and a member of the first ICTP ad-hoc committee that helped design the broad framework for the Centre's research and training activities in the 1970s, has passed away at the age of 99. After completing engineering

studies in telecommunications at *Ecole Supérieure d'Electricité* in Paris in the early 1920s, he switched to physics in 1929 and subsequently obtained a doctorate from the University of Paris. Leprince-Ringuet's most noteworthy research, conducted in collaboration with Pierre Auger, confirmed that cosmic rays are comprised of charged particles. In 1936 Leprince-Ringuet became professor of physics at *Ecole Polytechnique* in Paris, where he played a leading role in the revival of physics in postwar France. After strongly supporting the creation of CERN, he chaired CERN's scientific policy committee.



Lung Chi Wei, one of the first Chinese scientists to be associated with ICTP, died on 5 December 2001. He was 73. In 1982, Lung was appointed an ICTP Associate and, in 1985, he became a member of the ICTP Solid State Advisory Committee. Lung visited

the Centre each year between 1985 and 2001 to help organise ICTP training activities.

Budinich and Amati Honoured



Paolo Budinich

who, with Abdus Salam, was instrumental in the founding and early development of many of Trieste's scientific institutions—from the launching of ICTP in the

mid 1960s to the creation of *Laboratorio dell'Immaginario Scientifico* in the 1990s—was honoured on 11 October on the occasion of his 85th birthday. Ambassador Francesco Aloisi de Larderel, director general for Cultural Promotion and Cooperation in the Italian Foreign Ministry, presented Budinich with a sculpture created by Trieste-born artist Valter F.G. Terzagò. The ceremony took place in ICTP's

Main Lecture Hall. Aloisi de Larderel also toured many of the city's scientific facilities in his first visit to Trieste since his recent appointment to this government post.

A Symposium on Future Challenges in Science, "dedicated to **Daniele Amati** for his next 70 years," took place in ICTP's Main Lecture Hall on 22 September. Amati, who succeeded Budinich as director of SISSA in 1986, has served in that capacity for the past 15 years.



SISSA's New Director



Edoardo Boncinelli, one of Italy's most renowned scientists, is the new director of the International School for Advanced Studies (SISSA), ICTP's next door neighbour and close collaborating institution for research and training. Boncinelli replaces

Daniele Amati, who headed SISSA for 15 years. Boncinelli was trained as a physicist at the University of Florence but soon after turned to research questions related to molecular biology and genetics. Since 1991 he has headed the Molecular Biology Laboratory at San Raffaele Hospital in Milan. Boncinelli's most recent interests have focussed on neuroscience. Besides his scientific interests, he has written several books for general readers on biology and evolution and is a frequent commentator for *Corriere della Sera*, one of Italy's leading newspapers.

Another ERA Again

The sixth edition of ERA, the Exhibition of Advanced Research, was held at the Trieste Conference Centre, *Stazione Marittima*, from 1 to 16 December. This biennial exhibition is organised by *Globo Divulgazione Scientifica* and Area Science Park in cooperation with several national and local scientific institutions. As in the past, ICTP participated in the exhibition with its own display area. Franco Molteni



of the ICTP Physics of Weather and Climate group gave a public lecture on *El Niño*. This edition of ERA focussed on the intricate scientific web formed by global research and policy initiatives related to water. Such efforts cross a broad range of fields, including meteorology, climatology, geology, forestry and agriculture, and involve all of the basic sciences—physics, chemistry, biology and mathematics.



28 January - 15 February

Advanced Course on System Simulation and Hardware Synthesis Using VHDL, to be held in Lima, Peru

31 January - 15 February

Joint ICTP-INFM School in High Performance Computing on Linux Clusters

11 February - 1 March

School on Radio Use for Digital and Multimedia Communications

18 February - 1 March

Winter College on Ultrafast Non-Linear Optics

25 February - 28 March

Workshop on Nuclear Reaction Data and Nuclear Reactors: Physics, Design and Safety

4 - 7 March

Research Workshop on Statistical Mechanics of Plastic Deformation

11 - 13 March

Workshop on Plasma Diagnostics and Industrial Applications of Plasmas

11 - 15 March

IV Conference on Quantum Interferometry

18 - 26 March

Spring School on Superstrings and Related Matters



Throughout the year, the most up-to-date information on ICTP activities may be found on the World Wide Web and via e-mail. Here's how to find out what's going on.

ON THE WORLD WIDE WEB (WWW)

Our address is <http://www.ictp.trieste.it/>

The site includes detailed information on our research groups and activities, and a listing of our preprints, awards and job opportunities.

ON E-MAIL

(1) For Yearly Calendar of Scientific Activities

Create a new e-mail message and type

To: smr@ictp.trieste.it

Subject: get calendar 2002

Leave the body of the message blank. Send it.

Your e-mail will generate an automatic reply from the ICTP server containing the most updated version of the yearly Calendar.

(2) For Information on a Specific ICTP Activity

Each activity in the Calendar has its own 'smr' code number, which is located on the last line of each activity description. The 'smr' number will enable you to obtain more information—if available—on those activities you are interested in. To receive this more detailed information, create a new e-mail message and type the smr code number that you found on the calendar:

To: smr####@ictp.trieste.it

Under the e-mail's subject, type

Subject: get index

Leave the body of the message blank and send it.

You will receive an automatic reply listing all documentation available on that particular activity—the announcement or bulletin and, in most cases, a separate application form.

To receive the full text of the announcement and/or application form, you will need to send another e-mail message to the same smr code:

To: smr####@ictp.trieste.it

Subject: get announcement application_form

Again, leave the body of the message blank, and send it.

(3) For Information on All ICTP Activities

A free online service for the dissemination of information on all ICTP activities, programmes and related announcements is available via e-mail. To subscribe, create a new e-mail message and type:

To: courier-request@ictp.trieste.it

Leave the subject line empty.

In the body of the message type

subscribe

and your e-mail address. Send the message.

Any comments or suggestions on this service are most welcome. Please address them to pub_off@ictp.trieste.it.

NEWS from ICTP

The Abdus Salam International Centre for Theoretical Physics (ICTP) is administered by two United Nations Agencies—the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Atomic Energy Agency (IAEA)—under an agreement with the Government of Italy. Miguel Virasoro serves as the Centre's director.

News from ICTP is a quarterly publication designed to keep scientists and staff informed on past and future activities at ICTP and initiatives in their home countries. The text may be reproduced freely with due credit to the source.

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