



NEWS from ICTP



the **abdus salam**
international centre for theoretical physics



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**AUTUMN
2003
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Aiming Higher

When ICTP director K.R. Sreenivasan travelled to South Africa to participate in a roundtable discussion at the inaugural ceremony of the African Institute for Mathematical Sciences (AIMS) on 18 September, he felt right at home.

AIMS, the brainchild of Neil Turok, a world-renowned cosmologist at the University of Cambridge, UK, will seek to stem Africa's chronic brain drain in mathematics by establishing a pan-African centre of excellence dedicated to the advanced training of the continent's most outstanding young mathematicians.

The centrepiece of the effort is a one-year postgraduate diploma programme in mathematical sciences modelled after ICTP's own Diploma Programme, which recently celebrated its 12th anniversary.

The AIMS diploma programme works like this: Students who have earned high marks as undergraduates are selected on a competitive basis to attend a one-year advanced training programme focussing on the mathematical aspects of a wide variety of subjects that includes astrophysics, bioinformatics, computational science, demographics, ecology and economics.

Upon successful completion of the course, students will receive credit from one of three degree-granting South African universities now associated with the initiative: the universities of Western Cape, Cape Town and Stellenbosch that are working jointly with Cambridge University in the United Kingdom in the organisation of this effort.

African Institute for Mathematical Sciences (AIMS) at Muizenberg

In addition to drawing on the faculty of all these institutions for its instruction, AIMS has also received commitments from more than 100 academics from around the world who will serve as guest lecturers at the institute. Among those who have volunteered their services is George Ellis, professor of cosmology at the University of Cape Town and a former collaborator with ICTP's High Energy Physics Group.

The institute, located in Muizenberg, a small seaside suburb of Cape Town, was launched with the help of a US\$120,000 grant from the International Council of Science (ICSU). In addition, more than US\$500,000 in donations from South Africa's government and several foundations and private firms, including the international communications company Vodafone, have been granted to cover the institute's annual operating expenses.

The first class of AIMS students has just begun their studies. A group of 30 students, coming from 15 African nations, has been chosen from a candidate pool of 85.

"The goal of AIMS is to build capacity in African mathematics and science," Turok says. "By recruiting bright young students and teaching them well in an institute that focusses on Africa and African development, we hope to encourage them to pursue their careers in Africa."

"The ICTP Diploma Programme," adds Sreenivasan, "has earned an excellent reputation for serving as a training ground for the developing world's brightest students in high energy and condensed matter physics, as well as in mathematics—especially students from the world's least developed countries."

"ICTP," he adds, "is indeed delighted to have served as a model for AIMS and we warmly welcome the institute's efforts to provide training to develop a critical mass of skilled mathematicians in Africa."

"While it is clear that the continent as a whole needs a larger scale effort," Sreenivasan notes, "it is also clear that any good effort is worthwhile. The larger the number of efforts like AIMS, the greater the impact on African mathematics. ICTP is pleased to show its support for AIMS and wishes the endeavour great success." □

New Course of Action

For nearly 40 years, ICTP has worked diligently—and successfully—in cultivating the talents of scientists from the developing world.

The Centre's achievements are remarkable and indeed worthy of praise. However, if we examine the status of scientists in some developing countries, we find that, despite ICTP's efforts, neither their working conditions nor their career prospects have improved greatly.

ICTP should not be criticised for these shortcomings. The Centre's scientific and administrative staff have done their best to advance the institution's lofty goals. However, the results have proven less successful than Abdus Salam envisioned four decades ago.

ICTP has concentrated its efforts on assisting promising young scientists in developing countries. The Centre has tried to nurture their talents so that they could return home to help their countries. While this strategy makes sense at a certain level, it is based on a blueprint for action that can only be achieved at a very slow pace.

Let us take the example of the ICTP Diploma Programme, which is one of the Centre's most important training activities.

The Diploma Programme began 12 years ago. Over the years, ICTP has spent a great deal of time, effort and money to provide advanced academic training to about 400 young scientists in the fields of high energy physics, condensed matter physics and mathematics.

As a graduate of the Diploma Programme, I experienced first-hand the staff's skill and dedication. Most Diploma Programme students go on to earn Ph.D. degrees and many are appointed to postdoctorate positions at excellent universities in Europe and North America. Yet, when they return to their home countries to teach the next generation of students, many find the situation so fraught with problems and disappointments that they soon decide to pursue their careers elsewhere.

Many ICTP Diploma Programme students from Arab countries, for instance, have sought to work in Persian Gulf countries. As a result, it seems as if these countries have benefitted from ICTP's efforts. Yet, if history is any guide, most of these students will choose to leave the region for teaching and research posts elsewhere.

ICTP Diploma Programme students cannot be blamed for their unwillingness to stay home. It is not possible to ask them to remain in countries within their regions when earning salaries that they cannot comfortably live on. Moreover, most do not have access to work environments that would allow them to do world class research; nor have they been given positions that would facilitate their career advancement.

In such settings, young professors find themselves able to teach young students but unable to do research. As a result, many of ICTP's Diploma Programme students often spend as much time as possible abroad even if they do not leave their home countries permanently. I know. I am one who has taken this career path.

Although the situation for scientists in some Third World countries is not much different than it was 40 years ago, I remain stubbornly optimistic.

Yet, to correct this situation, ICTP should begin to work closely with other organisations throughout the developing world to help alter societies' view of science and to convince governments of the benefits that can be derived from providing greater support to their scientists and scientific institutions.

ICTP has made a significant difference in the lives of thousands of scientists from the developing world over the past 40 years. What I am suggesting now is that ICTP develop mechanisms for encouraging the societies of the Centre's visitors to become more science-friendly.

Specifically, I propose ICTP create branches in the Arab world and other developing regions to promote research activities that help scientists remain in their own countries.

Such endeavours, I believe, will ultimately advance ICTP's most cherished goal, which is to build scientific expertise and capacity in countries throughout the developing world.

In a sense, this new course of action would not be new at all. Instead it would parallel the broad strategic vision that Abdus Salam had for ICTP when he first launched this venerable institution in 1964. □

*Khalil Shaaban Said
Diploma Programme student in 1991*

Lê Dung Tráng recently returned to Vietnam. His mission: To help repair the long-severed ties between the United States and his home country.

FEATURES

Reconciliation Through Science

The images are imprinted into history books around the world: Snapshots of desperate people stranded on the rooftop of the US embassy awaiting the landing of helicopters to lift them from the violence and chaos below. Saigon was 'falling' and those who had supported the defeated US forces were frantic to leave.



suspicion should come as no surprise. Twenty-five years of war have left searing scars on both the victor and vanquished.

A group of high-ranking US officials—all members of the US Senate and veterans of the Vietnam War—are trying to move beyond the mutual suspicions and hostilities that the two countries still have for each other. To help them in

this quest, they have called on Vietnamese-born Lê Dung Tráng, head of ICTP's Mathematics Group.

In September 2000, during the waning days of the Clinton administration, the US Congress passed the Vietnam Education Foundation Act. The purpose of the act is to carry out a series of bilateral programmes between the United States and Vietnam that enable Vietnamese university students to pursue advanced studies in basic science and technology. At the same time, the act encourages US professors to teach at universities in Vietnam.

The ultimate goal is "to promote reconciliation between the two countries." US senators John Kerry, John McCain and Chuck Hagel, and

VEF delegation in Vietnam former senators Bob Kerrey, Charles

Robb and Max Cleland, all of whom fought in Vietnam, are the chief sponsors of the legislation, which calls for US\$5 million in public funding each year over a 15-year period. The Vietnam Education Foundation was created to oversee financial and administrative matters.

A change in US administrations on 1 January 2001 and the rush of worldwide events following the terrorist attacks on 11 September 2001 in the United States caused the Vietnam Education Foundation to get off to a slow start. To help reinvigorate the stalled agenda, this year, officials at the Vietnam Education Foundation invited Lê Dung Tráng to join a US delegation on a two-week-long visit to Vietnam's scientific institutions. Lê Dung Tráng's ultimate responsibility was to provide advice on how to best invest the US\$5 million funds that are at the foundation's disposal.

Much, of course, has changed over the past 30 years. The city that 'fell' into the hands of Vietnamese national liberation forces is now Ho Chi Minh City, named after the revered Vietnamese leader who led his country to victory. Meanwhile, communist economic principles, put into place even before the smoke cleared, have morphed into a capitalist economic framework bolstered, in large measure, by small, privately owned firms and family farms.

Indeed the violence and chaos that marked the final days of America's presence in Vietnam have long since faded into history, replaced by the mundane rhythms of life characteristic of a hard-working people determined to improve their well-being.

What lingers, however, is the mutual suspicion that Vietnam and the United States have for each other. That

"I was anxious to participate in this initiative," says Lê Dung Tráng, "both for personal and professional reasons."

"The effort," he explains, "to reconstruct ties between the two nations is well-worth pursuing. The war, after all, ended more than 25 years ago. That means an entire generation of Vietnamese and Americans have grown up since the final contingent of US troops and civilians left Saigon. It's time to move on. Even more importantly, both countries would benefit in the future—culturally and economically—from closer ties."

Lê Dung Tráng was born in Ho Chi Minh City in 1947. He left Vietnam for France in the 1950s, first to study at *Lycée Louis-le-Grand*, and then to pursue advanced academic training at *Université Paris* (Sorbonne), where he received his Ph.D. degree in mathematics in 1969.

Before arriving at ICTP last November, he had taught for more than two decades at *Université Paris 7* and had served five years as director of research at France's *Centre National de la Recherche Scientifique* (CNRS).

While working in France, he frequently visited the United States to conduct research at Harvard University and later to teach at Northeastern University, both in Boston, MA. His acquaintance with Philip Griffiths, a former mathematics professor at Harvard University and presently director of the Institute for Advanced Study in Princeton, New Jersey, led to his involvement in the Vietnam Education Foundation.

"Over the past three decades, I have often travelled to Vietnam," explains Lê Dung Tráng, "but in recent years I only visited the University of Dalat and the Mathematics Institute of Hanoi. I didn't know much about the quality of teaching and research at other places and I was anxious to find out what went on at institutions that I was not familiar with."

What Lê Dung Tráng discovered surprised him.

"Vietnam," he notes, "has developed vigorous scientific research and training programmes, not just at the National Center of Science and Technology in Hanoi, but in several other institutions, including the National University, which has campuses in both Hanoi and Ho Chi Minh City."

"The quality of education in Vietnam," says Lê Dung Tráng, "is often quite good and the research is continually improving. However, the number of well-trained teachers still falls far short of the demand."

"As a result, I believe a strong partnership between the two countries would prove beneficial to both—helping to increase Vietnam's teaching pool while exposing US professors to excellent and eager students."

To date, the Vietnamese Foundation has spent US\$500,000 of the US\$5 million that has been allocated for the first year of operation. The money has funded scholarships for 19 Vietnamese master's and doctoral students who are now

attending universities in the United States.

To ensure that the best students are given preference, each application has been vetted by researchers who have been assigned the task by the US National Academy of Sciences. The fellows are studying in a broad range of locations—including Brown University in Rhode Island and the University of Hawaii.

"Not only does the Vietnam Education Foundation hope to double the number of Vietnamese students receiving fellowships," says Lê Dung Tráng, "but it would also like to develop a vigorous broad based programme of bilateral institutional collaboration that focusses, for example, on the training of faculty, joint lectureships, academic curriculum assessment, and development of scientific libraries and internet access. One of the primary goals of my trip was to examine the quality of research at Vietnam's universities and research centres to determine how they compare to others in the developing world and assess the kind of programmes they would most benefit from."

"The future of the initiative," observes Lê Dung Tráng, "remains at risk. The downturn in the US economy has made funding both from the US government and the private sector more difficult to obtain. And the bitter memories of



Lê Dung Tráng, far right

the Vietnam war are still never far from the surface."

In fact, just after Lê Dung Tráng had returned from his trip to Vietnam, the US Congress passed a bill asserting that any assistance to Vietnam must be contingent on improvements in Vietnam's human rights' record.

"The memories of the Vietnam war are sometimes stronger than the reality of circumstances in Vietnam today," he notes. "Yet the only way we can put the past behind us is by moving forward, and scientific exchange is one avenue that is definitely worth pursuing." □

For additional information about the Vietnam Education Foundation, see www.vef.gov.

Life in a Bottle

A standing ovation greeted Stanley L. Miller following his lecture delivered on 16 September at ICTP's 7th Conference on Chemical Evolution and the Origin of Life.

Confined to his wheelchair by a double stroke and speaking with painful difficulty, the 73-years-old chemist, now professor emeritus at the University of San Diego, California, USA, offered a personal account of his seminal origins-of-life experiment in the autumn of 1952, in which he synthesised several amino acids (the 'building blocks' of proteins) in prebiotic conditions.

The experiment marked the first successful laboratory experiment illustrating the chemical origin of life, which transformed the field from philosophical speculations to hard science.

At the time Miller was just a 23-years-old graduate student at the University of Chicago, Illinois, USA, where he was inspired by a recent lecture given by his mentor, Nobel Laureate Harold C. Urey (1893 - 1981). The goal of Miller's experiment was to recreate, in a laboratory setting, the Earth's early oceanic-atmospheric ecosystem, which was presumably taking shape around 4 billion years ago, as the scorching temperatures and searing winds following our planet's formation began to subside.

To create this micro-environment, Miller subjected a mixture of methane, ammonia, water vapour and hydrogen to an electrical spark continuously for a few days. What Miller detected in the flask startled him: faint residues of protolife amino acid glycine.

Eager to broaden his findings, he then repeated the experiment over a week-long period. What he then detected startled him even more: an oily material had formed along the lining of the flask that was embedded with several amino acids.

Encouraged by Urey, Miller submitted an article describing his findings to *Science*. Plainly titled "A Production of Amino Acids Under Possible Primitive Earth Conditions," the article was published in the 15 May 1953 edition of the journal. It didn't take long for the scientific community to realise the profound implications of his experiment.

The silver plaque that ICTP director K.R. Sreenivasan gave to Miller to commemorate the 50th anniversary of his historic article elegantly displays the scheme of the spark-discharge apparatus that produced for the first time organic molecules in a test tube. The apparatus itself has come to symbolise the 'origins' of origins-of-life research.

Today, the world of astrobiology that Miller has been instrumental in creating concerns itself with a wide range of scientific explorations that extend from the mundane confines of scientific laboratories to the most remote and exotic corners of our planet and universe.

These explorations, for example, include tabletop experiments like Miller's, seeking to recreate conditions where life takes hold; examinations of volcanic ocean beds where stressful ecological conditions may resemble those of the earliest days of Earth; explorations of such planets and satellites as Mars and Jupiter's moon Europa in search of harrowing ecosystems where primitive life may still exist and, in fact, may have originated; and a blending of chemical and biological investigations to examine—both through experimentation and modelling—how inorganic material



Stanley Miller receiving the plaque

can, under certain conditions, be transformed into organic material.

More than 120 people from 28 different nations attended ICTP's conference. Among them were many of the most renowned scientists in the field of astrobiology/bioastronomy, a rapidly evolving, interdisciplinary initiative that draws on research in astronomy, radioastronomy, planetary science, molecular biology, ecology, chemistry, geology and oceanography.

Among the participants were these 'star-studded' scientists:

- Frank Drake, founder and president of the Search for Extraterrestrial Intelligence (SETI) Institute, Mountain View, California, USA, which seeks to determine whether other distant life forms exist in the universe by scanning the skies with Earth-bound radiotelescopes for faint discernible radiowaves that may have been produced and broadcast by other beings.

- Michel Mayor, professor at *Observatoire de Genève*, in Switzerland, who in 1995 discovered the first non-solar system planet orbiting a distant star, indicating that other planetary systems anchored by their own stars—just as ours is anchored by the Sun—could exist elsewhere in the vast reaches of space.
- Rosalind Grymes, deputy director, US National Aeronautics and Space Administration's (NASA) Astrobiology Institute (NAI), in Washington, DC, a partnership between NASA and 16 leading institutions in the United States that focusses on interdisciplinary research in the field of astrobiology.
- Torrence Johnson, lead project scientist at the Jet Propulsion Laboratory in Pasadena, California, for the Galileo spacecraft, which spent eight years in orbit around the solar system's most massive planet, Jupiter, and its four main moons. The Galileo spacecraft, which was named after the famed Italian astronomer who discovered Jupiter's moons in 1610, gathered a wealth of information about these distant celestial bodies, suggesting that primitive life could indeed exist beneath the icy crust of Jupiter's largest moon, Europa. Galileo's successful mission ended just three days after the close of ICTP's conference. All told, Galileo travelled some 4.6 billion kilometres in space, opening up a distant, once-dark world to scientific exploration and discovery.

ICTP's series of conferences on the origin of life began in 1992 under the able leadership of the late Cyril Ponnampertuma, an internationally renowned biochemist from the University of Maryland, USA, who was born in Sri Lanka. Today, the triennial conferences are largely organised by ICTP's staff scientist Julian Chela-Flores, who works closely with Tobias Owen, professor of planetary science at the University of Hawaii, USA, and François Raulin, director of *Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA)*, Paris, France.

"While there are other astrobiology conferences that have gained an international reputation over the past decade, including the Exo/Astrobiology Network Association (EANA) held in Europe each year since 2001," notes Chela-Flores, "the triennial event at ICTP has emerged as one of the world's most noteworthy global gatherings of experts in the field."

Chela-Flores adds that "Not only have we been able to attract the world's greatest researchers, but we have designed the conference in ways that make it a seminal event for astrobiologists from the developing world. About one-third of the participants this year came from Asia, Africa, and Latin America. And, with such countries as Brazil, China and India showing keen interest in space programmes and cutting-edge biological research, including origins-of-life research, the involvement of scientists from developing countries is bound to grow in the years ahead." □

THE THIRD WORLD AND THE WORLD BEYOND



Antonio Lazcano

As president of the International Society for the Study of the Origin of Life (ISSOL), I have witnessed first-hand the intense interest that issues related to the origin of life generate among scientists in the developing world.

Eminent scientists from India and Mexico are devoting their careers to this issue; regional groups in the South dedicated to the topic are as active and

rigorous as their counterparts in the North; and gifted young scientists from the South continue to flock to the field despite limited funding and job opportunities.

Why is this so? Doesn't the developing world face enough problems in the here and now not to be investing resources and brain power to the then and there? Shouldn't its scientists be more concerned about examining how to improve the well-being of people today than in understanding how life began?

On behalf of my fellow 'origins-of-life' scientists in the South, let me try to answer these critical questions.

First of all, we pursue this topic because it is clear that the extraordinary development of biological sciences during the past few decades has made it necessary to examine not only the mechanisms by which life evolved, but how it originated. On the one hand, such pursuits are motivated by a scientist's enduring desire to know what is not known; on the other hand, seeking answers to origins-of-life questions could have a profound impact on broad areas of biology, chemistry and physics that lie beyond the subfield itself.

Second, we pursue this topic because, although one may contend that countries with severe economic and social problems should devote their meagre resources to applied science, the debate over applied science versus pure science is a false one: There is only good science and bad science, and clearly each nation has an obligation to embrace the former in all fields of inquiry.

Third, we pursue this topic because nurturing a scientific tradition in developing countries, regardless of the issue under investigation, helps in the long run to forge a science-based cultural identity. Developing countries should be seen not just as potential sources of good researchers for developed nations, but as extraordinary intellectual reservoirs for the advancement of global science. The importance of such endeavours for the entire world is obvious: Although science is universal, different scientific traditions and cultural backgrounds represent a vital resource for the advancement of science.

In contrast to what happens in the USA, where creationists continually challenge the teaching and study of evolution for religious reasons, such groups are not found in Mexico and other Latin American countries. Despite our problems, we still adhere to the 19th century liberal belief that education and knowledge are the driving force in individual and social development.

Moreover, in some cases, the appeal of problems like those of the origin of life is deeply rooted. In Mexico, for example, Alfonso L. Herrera, a distinguished naturalist who played a major role in teaching and the founding of museums, worked for many decades developing a theory on the origin of life. Such stories testify to the interest and devotion that scientists in our countries have shown for this topic. For them and those who have followed in their footsteps, the question is not why—but how.

Antonio Lazcano
Universidad Nacional Autónoma de México
Mexico City

Director's Trip

K.R. Sreenivasan made his first international trip as director of ICTP in July. The initial leg of his three-week tour took him to the University of Newcastle in Australia, where he helped to organise and gave the opening lecture for a meeting on turbulence, his field of expertise. He then went on to visit the Indian Institute of Science and the Jawaharlal Nehru Centre for Advanced Scientific Research, in Bangalore, India, to give the keynote address at an international conference on fluid dynamics. His final destination was Rio de Janeiro, Brazil, where he presented the keynote lecture on singular-like structures in hydrodynamic turbulence at the Brazilian Mathematical Society's annual meeting. In Brazil, he also met with officials of the Latin American Center of Physics (CLAF), one of the most successful scientific networks in Latin America whose collaboration with ICTP dates back to the mid 1960s.

Calendar 2004

The Joint DEMOCRITOS-ICTP School on Quantum Monte Carlo Methods, scheduled to begin 12 January, will mark the Centre's opening research activity for 2004. More than 40 schools, colleges, workshops and conferences have been scheduled for next year. Topics range from optics to earthquakes; ecological economics to scientific e-learning; climate variability to nanotechnology; cosmology to medical physics; and complexity to neurophysics. Centre activities taking place outside Trieste include the Asian/Pacific Regional School on Electronic Structure Methods and Their Applications, scheduled to be held in China, and the Microprocessor Laboratory Second Central American Regional Course on Advanced VLSI Design Techniques, scheduled to take place in Mexico. In addition, plans are now underway for a series of scientific events marking the Centre's 40th anniversary. A preliminary listing of scientific activities has been posted on the Centre's homepage at www.ictp.trieste.it (under Scientific Calendar 2004).



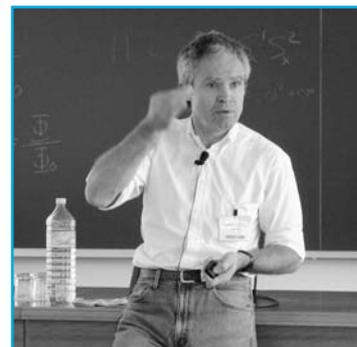
ICTP director K.R. Sreenivasan and Vladimir E. Zakharov

Dirac Medal

The ICTP Dirac Medal 2003 was awarded to two international experts in the field of turbulence. **Robert H. Kraichnan**, Santa Fe, New Mexico, USA, and **Vladimir E. Zakharov**, Landau Institute for Theoretical Physics, Moscow, Russian Federation, and University of Arizona, Tucson, USA, were recognised "for their contributions to the theory of turbulence and for identifying classes of turbulence problems for which in-depth understanding has been achieved." Each winner received a US\$5,000 cash prize. Zakharov delivered his Dirac Lecture on 10 September on "Weak-Turbulent Theory of Ocean Waves." K.R. Sreenivasan presented Kraichnan's Dirac Lecture, "Order and Randomness in Fully-Developed Turbulence." Kraichnan could not attend the ceremony because of ill health. The Dirac Medal is given in honour of Nobel prize winner Paul A.M. Dirac, one of the Centre's closest friends and most ardent supporters, who died in 1984. For additional information about the Dirac Medal, see the Centre's web page at www.ictp.trieste.it.

Nobel Bookends

Two Nobel Laureates 'bookended' the Third Stig Lundqvist Conference on Advancing Frontiers of Condensed Matter Physics: Fundamental Interactions and Excitations in Confined Systems. Nobel Laureate **Alan Heeger** (Chemistry 2000), a physicist and long-time friend of ICTP's Condensed Matter Physics Group, was the first speaker. Heeger, who won the Nobel Prize "for the discovery and development of conductive polymers", teaches at the University of California at Santa Barbara, Institute for Polymers and Organic Solids and Department of Physics and Materials. **Horst L. Störmer**, who won the 1998 Nobel prize in physics for his discovery of the fractional quantum Hall effect, delivered the concluding lecture. His talk, which took place on 15 August, examined "Recent Results on Two-Dimensional Electrons." German-born Störmer, professor of physics at Columbia University, and part-time adjunct physics director at Bell Labs, Murray Hill, New Jersey, USA, is a leading specialist in the field of nanotechnologies.



Horst L. Störmer

Preprints Archives

Scanned copies of all ICTP preprints issued from 1964 to 2000 are now available on the ICTP Library's home-page at library.ictp.trieste.it. The preprints can be retrieved in PDF format by searching under the author's name and/or title words. The database, which contains more than 6000 documents, also allows users to browse through each annual collection by selecting the year of interest.

Diplomas: Old and New

29 August was graduation day for ICTP's 2002-2003 Diploma class. Twenty-seven students received their diplomas. This marks the 12th year of the Centre's Diploma Programme. Since its inception in 1991, nearly 400 students from the developing world have successfully completed the programme. Five days before the concluding ceremony, the new 2003-2004 class, consisting of 28 students from 19 countries, arrived at ICTP campus to begin their one-year course of study.



Diploma Class 2002-2003

Full Press

The Seventh Conference on Chemical Evolution and the Origin of Life, which took place at ICTP between 15-19 September, received extensive coverage in the Italian press. A feature article was published in *Corriere della Sera*, Italy's leading newspaper, and a pair of interviews appeared in *il manifesto*, one of Italy's national newspapers. In addition, the daily national radio science programme *Radio3scienza* devoted two transmissions focussing on the 50th anniversary of Stanley Miller's seminal experiment on the chemical origins of life. Stanley Miller was a guest of honour at the conference. The British weekly science magazine *New Scientist* published a conference report on the event in its 27 September edition. (See "Life in a Bottle," p. 6-7.)

Top Teacher

Gandham Ramana Rao, principal of University P.G. College in Godavari khani, Andhra Pradesh, India, was selected best university teacher for 2003. The award ceremony took place at the state capital, Hyderabad, on 5 September. Ramana Rao's affiliation with ICTP dates back to 1983 when he participated in the Winter College on Lasers, Atomic and Molecular Physics. During the 1980s, he was a Fellow of the Training and Research in Italian Laboratories (TRIL) programme, working at *Politecnico di Milano*.



Gandham Ramana Rao (right) receiving the award from the Chief Minister of Andhra Pradesh

Virtual Toolkit

UNESCO's Free Software Portal at www.unesco.org/webworld/portal_freesoft includes a virtual laboratory toolkit that was developed with the help of ICTP staff member **Clement Onime** (right) and consulting scientist **Enrique Canessa** (left). The kit provides person-to-person and person-to-equipment communication tools enabling scientists to create or participate in a virtual laboratory targeted to specific research problems. For additional information and copies of the CD-Rom toolkit, contact canessa@ictp.trieste.it or onime@ictp.trieste.it.



Real Abstractions

More and more, theoretical physicists are intrigued by problems of everyday life that often seem far afield from their abstract interests. Two recent studies in which ICTP's researchers were involved offer an excellent example of this trend.

The first is an article published in the 28 August 2003 edition of *Nature* and coauthored by a group of scientists that includes Amos Maritan, a professor at the International School for Advanced Studies (SISSA) in Trieste and an ICTP consultant, and Jayanth R. Banavar, a professor of physics at Pennsylvania State University.

The article, "Neutral Theory and Relative Species Abundance in Ecology," published in *Nature's* "Letters" section, draws on a widely acclaimed yet controversial 2001 book, *The Unified Neutral Theory of Biodiversity and Biogeography*, written by Stephen Hubbell, one of the authors of the article. In the book, Hubbell challenges half-century old ideas on the formation of natural plant and animal communities. He contends that many of the ecological patterns we see may be more simply and better explained if we accept the fact that species live compatibly, not competitively, in their shared environments. This concept could have profound implications for our understanding of biodiversity and species extinction.

The second example of the new practical 'avenues' being paved by theoretical physicists is found in an article accepted for publication in *Europhysics Letters* written by a group of authors that includes Matteo Marsili, staff scientist, ICTP Condensed Matter Physics Group, and Roberto Mulet, ICTP junior associate, University of Havana, Cuba. A subsequent news article published on *Science Online* uses the mathematical equations presented in the forthcoming *Europhysics Letters* article to examine traffic patterns in New York City. What the *Science* article surprisingly concludes is that a detailed knowledge of traffic, based on empirical evidence, may not be helpful in avoiding New York City's clogged thoroughfares. Indeed the article concludes that taxi drivers and native New Yorkers would do better to choose their routes randomly. That may be something valuable to remember the next time you are listening to the traffic reports on your car radio. The best advice may be to change the station and listen to some soothing music.



ACTIVITIES

ADVANCED SCHOOL IN BASIC ALGEBRAIC GEOMETRY

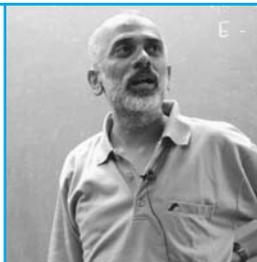
7 - 18 July

Cosponsor: Ministry of Education, University and Research (Rome, Italy).

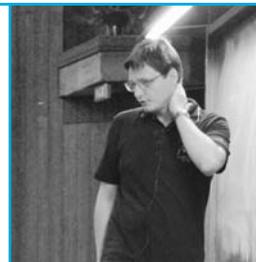
Directors: L. Göttsche (ICTP), C.S. Seshadri (Chennai Mathematical Institute, India) and A. Vistoli (University of Bologna, Italy).

Local Organiser: L. Göttsche (ICTP).

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Lothar Göttsche



ICTP-INFM CONFERENCE ON NEW FRONTIERS IN NANO-BIOTECHNOLOGY: MONITORING PROTEIN FUNCTION WITH SINGLE-PROTEIN RESOLUTION

14 - 19 July

Cosponsor: Italian National Institute for the Physics of Matter (INFM).

Directors: M. Giacca (International Centre for Genetic Engineering and Biotechnology, ICGEB, Trieste, Italy), V. Pellegrini (*Scuola Normale Superiore*, Pisa, Italy) and V. Tozzini (*Scuola Normale Superiore*, Pisa, Italy).

Local Organiser: P. Carloni (International School for Advanced Studies, SISSA, Trieste, Italy).

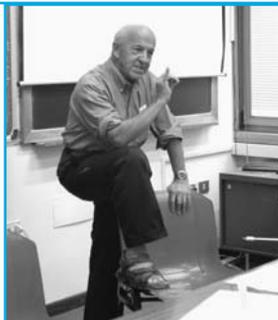
GENES, GENOMICS AND THE DEVELOPMENT OF BEHAVIOUR: THE DEVELOPMENT OF FUNCTION IN THE NERVOUS SYSTEM

14 July - 1 August

Cosponsor: National Centre for Biological Sciences, NCBS, Tata Institute of Fundamental Research (Bangalore, India).

Directors: M. Bate (University of Cambridge, UK), V. Rodrigues (TIFR, Mumbai, India) and K. Vijayraghavan (NCBS/TIFR, Bangalore, India).

John Nicholls



Michael Bate



SUMMER SCHOOL AND CONFERENCE ON REAL ALGEBRAIC GEOMETRY AND ITS APPLICATIONS

4 - 22 August

Directors: F. Brogna (University of Pisa, Italy), K. Kurdyka (*Université de Savoie*, Le Bourget-du-Lac, France), M.-F. Roy (*Université de Rennes I*, France) and C. Traverso (University of Pisa, Italy).



First Meeting of the African Network of Algebra and Geometry Applied to Development, 8-10 August

THIRD STIG LUNDQVIST CONFERENCE ON ADVANCING FRONTIERS OF CONDENSED MATTER PHYSICS: FUNDAMENTAL INTERACTIONS AND EXCITATIONS IN CONFINED SYSTEMS

11 - 15 August

Directors: A. Pinczuk (Columbia University, New York, NY, USA) and G. Scoles (Princeton University, NJ, USA).

Local Organiser: V. Kravtsov (ICTP).

EUROCONFERENCE ON AB-INITIO MANY-BODY THEORY FOR CORRELATED ELECTRON SYSTEMS

25 - 29 August

Cosponsor: Psi-k Network.

Directors: A. Georges (*Ecole Normale Supérieure*, Paris, France) and W. Temmerman (Daresbury Laboratory, Warrington, UK).

Local Organiser: V. Kravtsov (ICTP).

TENTH HOPPING AND RELATED PHENOMENA CONFERENCE (HRP 10)

1 - 4 September

Cosponsor: *Deutsche Forschungsgemeinschaft*.

Director: H. Böttger (*Otto-von-Güricke Universität*, Magdeburg, Germany).

WORKSHOP ON RECEPTOR BINDING ASSAY (RBA) FOR ALGAL TOXINS

1 - 5 September

Cosponsor: International Atomic Energy Agency (IAEA, Vienna, Austria).

Directors: F. Boisson (IAEA Monaco Laboratory) and K.I. Burns (IAEA Laboratories, Seibersdorf, Austria).

ICTP-INFM SUMMER SCHOOL ON TRANSPORT, REACTION AND PROPAGATION IN FLUIDS

followed by

CONFERENCE ON KOLMOGOROV'S LEGACY IN PHYSICS: ONE CENTURY OF CHAOS, TURBULENCE AND COMPLEXITY

8 - 17 September

Directors: F. Benatti (University of Trieste), G. Boffetta (University of Turin, Italy), G. Falkovich (Weizmann Institute of Science, Rehovot, Israel), R. Livi (University of Florence, Italy), M. Vergassola (*Institut Pasteur*, Paris, France), A. Vulpiani (University of Rome *La Sapienza*, Italy) and R. Zecchina (ICTP).

Local Organiser: R. Zecchina.

SEVENTH TRIESTE CONFERENCE ON CHEMICAL EVOLUTION AND THE ORIGIN OF LIFE: LIFE IN THE UNIVERSE: FROM THE MILLER EXPERIMENT TO THE SEARCH FOR LIFE ON OTHER WORLDS

15 - 19 September

Cosponsors: International School for Advanced Studies (SISSA,



Frances Westall

Trieste, Italy), National Research Council (CNR, Rome, Italy), European Space Agency (ESA, Paris, France), National Aeronautics and Space Administration (NASA, Washington, DC, USA), *Université Paris 12* (France), The NASA Astrobiology Institute (NAI, Moffett Field, CA, USA), Astronomic Observatory (OAT, Trieste), National Astrophysics Institute (Rome, Italy) and *Laboratorio dell'Immaginario Scientifico* (IS, Trieste).

Directors: J. Chela-Flores (ICTP and *Instituto de Estudios Avanzados*, IDEA, Caracas, Venezuela), T. Owen (Institute for Astronomy, Honolulu, Hawaii, USA) and F. Raulin (*Université Paris 12* and *Paris 7*, France).

ADVANCED SCHOOL AND CONFERENCE ON SOURCES OF GRAVITATIONAL WAVES

15 - 26 September

Cosponsor: European Commission's Research Training Network for the Study of the Sources of Gravitational Waves.

Directors: J. Miller (International School for Advanced Studies, SISSA, Trieste, Italy), L. Rezzolla (SISSA) and V. Ferrari (University of Rome *La Sapienza*, Italy).

SEMINAR ON DEVELOPMENT AND APPLICATION OF ISOTOPE TRACER DIAGNOSTICS IN REGIONAL CLIMATE MODELS

22 - 26 September

Cosponsor: International Atomic Energy Agency (IAEA, Vienna, Austria).

Directors: P. Aggarwal (IAEA) and F. Giorgi (ICTP).

SEVENTH WORKSHOP ON NON-LINEAR DYNAMICS AND EARTHQUAKE PREDICTION

29 September - 11 October

Cosponsors: European Commission (Brussels, Belgium), Department of Earth Sciences of the University of Trieste, and Commission on Earthquake Hazard, Risk and Strong Motion of the International Association for Seismology and Physics of the Earth Interior (IASPEI, Boulder, CO, USA).

Directors: V.I. Keilis-Borok (International Institute of Earthquake Prediction Theory and Mathematical Geophysics, Russian Academy of Sciences, Moscow, Russian Federation) and G.F. Panza (University of Trieste and ICTP).

FIRST INTERNATIONAL WORKSHOP ON INTEGRATED CLIMATE MODELS: AN INTERDISCIPLINARY ASSESSMENT OF CLIMATE IMPACTS AND POLICIES

30 September - 3 October

Cosponsors: Beijer International Institute of Ecological Economics (Stockholm, Sweden) and *Fondazione ENI Enrico Mattei* (FEEM, Milan, Italy).

Director: C. Carraro (FEEM and University of Venice, Italy).

Local Organisers: M. Eberle (FEEM) and M. Marsili (ICTP).



*Standing: Mauro Calligaris and Aida Foco
Sitting: Nina Dabrowski and Nora Opecca*

Passport and Visa Office

The Centre's Passport and Visa Information Office is the gateway to ICTP.

Each year, the four-person visa office processes more than 3500 visa applications.

Some visas are for our staff scientists who are planning extended stays in Italy, often lasting several years, even decades. Some are for individual visiting scientists who come to Trieste to participate in ICTP research and training activities. Some are for their accompanying family members—husbands, wives and children—who are here because their spouse or parents are here. And some are for travel from, not to, Italy for attendance at workshops and conferences abroad.

These 'comings' and 'goings' put the ICTP visa office in direct contact with consulates and embassies from more than 100 countries.

Despite similarities in the process, each consulate and each embassy have their own set of rules and their own style of doing business.

As ICTP's visiting scientists know, regardless of where they come from or where they are going to, governments have become much stricter in the issuance of visas over the past two years following the terrorist attacks of 11 September 2001. New procedures require more detailed information and often a personal visit to the consulate or embassy before an individual and his or her family are allowed to come or go. A fast and simple 'ok' has become the exception, not the rule.

As a result, it now takes much longer to process a visa. Indeed, in some cases, visitors have been forced to cancel their visits as a result of delays in reviewing their applications.

The new world of travel in which we all live requires both vigilance and patience. ICTP understands governments' concerns for security and works cooperatively with them to ensure that all regulations are followed and fulfilled. At the same time, its close relationship with officials both here in Italy and in many countries abroad helps to ensure that our concerns are heard by those who are responsible for facilitating the visa process and ensuring the safety of their citizenry.

The process is bounded by reams of rules and regulations, yet it is often personal at its core, both for those who are seeking to obtain visas and those helping them to receive permission to travel.

To effectively serve the Centre's scientists, staff members of the ICTP visa office must operate in both the world of written rules and the world of personal contacts. It is these twin challenges that make the visa office, ICTP's gateway, an interesting and rewarding place in which to work.

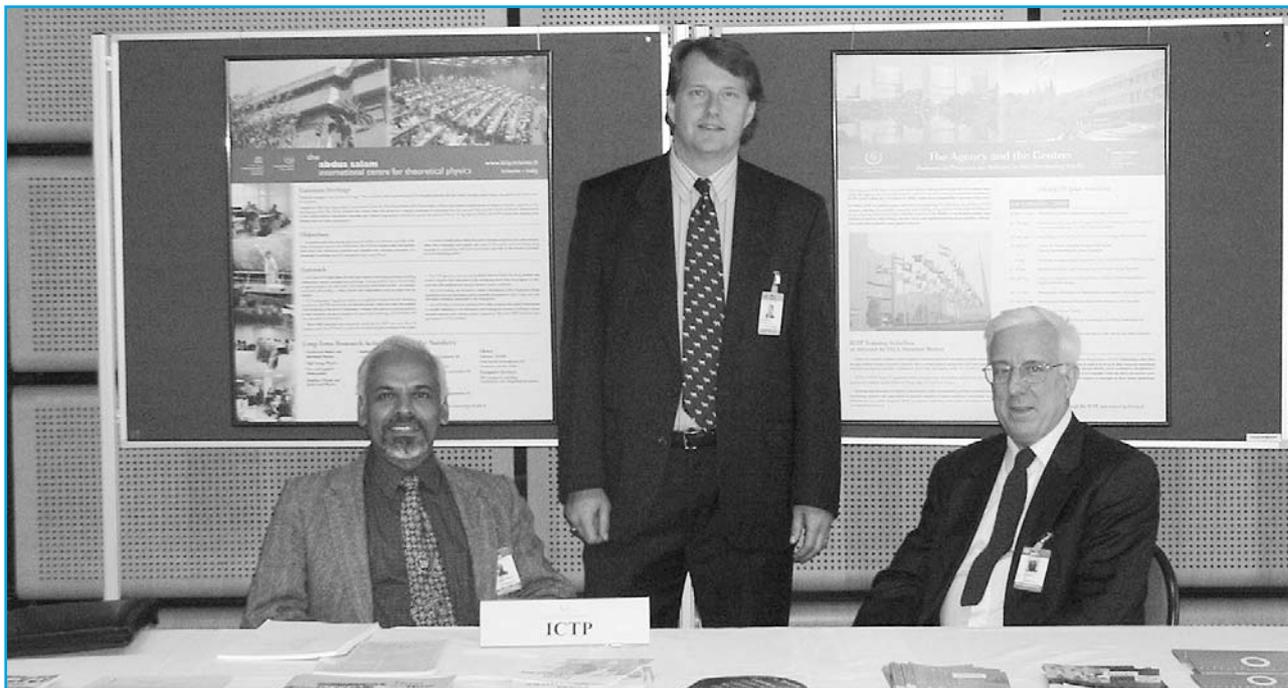
IN MEMORIAM



Armand Borel, a key figure in the development of late 20th century mathematics and one of the founders of the theory of algebraic groups, died on 11 August in Princeton, New Jersey, USA. He was 80 years old. Born in a French-speaking canton of Switzerland, Borel was a member of the Bourbaki Group, a group of young mathematicians studying in France whose collective explorations of new avenues of mathematical research began in the 1930s and 1940s and continue to this day. Borel's most important contributions included his insightful studies of the mathematical symmetries known as Lie groups, a central element in the study of mathematics today. Borel visited ICTP in the summer of 1996.

IAEA General Conference

The International Atomic Energy Agency's (IAEA) 47th General Conference was held at the Agency's headquarters in Vienna on 15-19 September. This marked the first IAEA Conference attended by ICTP director Katepalli R. Sreenivasan (left). He was accompanied by Gallieno Denardo (right), acting director of administration, and Brian Stewart (centre), on secondment to ICTP from the US Department of Energy. ICTP also displayed two posters describing the long history and broad range of current research and training activities shared by the Agency and the Centre.



RadioNet in LA

Carlo Fonda, a member of ICTP-RadioNet (Programme of Training and System Development on Networking and



Radiocommunications) at ICTP's Aeronomy and Radiopropagation Laboratory, recently spoke about the rapid dissemination of Linux software among computer users in Africa. His talk took place at a conference on technology in Africa, held in Los Angeles, on 12-14 September. The conference was part of the Los Angeles Black Business Expo and Trade Show. ICTP has been assisting African institutions' efforts to utilise this free open-source language since 1995 (see *News from ICTP*, Summer 1999, p. 4-5.)

US Returns to UNESCO

The United States has returned to the United Nations Educational, Scientific and Cultural Organization (UNESCO) after a 19-year absence. The official announcement marking the US return took place at the opening session of UNESCO's 32nd General Assembly, held at the organisation's headquarters in Paris on 29 September. The number of member states that now belong to UNESCO stands at 190.



Nearly 20 years ago, two Trieste-based scientists provided the scientific underpinning for computer simulation, setting the stage for the modelling revolution that followed.

Models of Behaviour

In the modern BC (before the computer) world of science, all of science, but particularly physics, could be neatly divided into two categories: theoretical and experimental.

Over the past two decades, however, computer simulation and modelling—a hybrid of theory and experiment or, more precisely, an intricate blend of theory and experiment in which it is difficult to separate one from the other—has emerged as one of the primary ingredients of modern scientific inquiry. Indeed some researchers now contend that computer simulation and modelling represents a third way of doing science.

One of the most noteworthy advancements in this field took place in Trieste during the 1980s when two Italian physicists, Roberto Car and Michele Parrinello, conducted research at the International School for Advanced Studies (SISSA), next door to ICTP, and at ICTP, on the *ab-initio* molecular dynamics method, an analytical method that has since assumed the names of its discoverers: the Car-Parrinello method.

The article that they coauthored, "Unified Approach for Molecular Dynamics and Density-Functional Theory," published in *Physical Review Letters* (22-25 November 1985), remains the fifth most cited article of the publication—with a total of 3,000 citations and counting. For their work, Car and Parrinello shared the 1990 Europhysics Prize of the European Physical Society.

Born in Trieste and educated at *Politecnico di Milano*, Italy, Roberto Car is currently professor in the Chemistry Department at Princeton University, New Jersey, USA. Michele Parrinello, who was born in Messina, Sicily, is now professor of computational science at the Laboratory of Physical Chemistry of the *Eidgenössische Technische Hochschule Zürich* (ETH, Swiss Federal Institute of Technology) in Lugano, Switzerland.

The Car-Parrinello method helped to launch a new era of understanding in the esoteric field of electronic structure calculations for solids, liquids and molecules. While the concept may be difficult to understand, it has had an enormous impact in the creation of molecular simulations that have had useful applications in all the basic sciences.

Car and Parrinello, then both in their early 40s, first met in Trieste in 1984 through their affiliation with SISSA and ICTP, which have always promoted inter-institutional interaction between their staff and visiting scientists.

"We hit it off immediately and soon talked about the possibility of working together," says Parrinello. "Roberto was deeply involved in studies on how to improve the electronic structure of crystals, while I had a strong background in statistical mechanics and molecular biology. We thought it could be interesting to combine our expertise."

"At the time, the challenges posed by silicon, particularly liquid silicon, were among the hottest topics in the field of condensed matter physics. Researchers knew, from experimentation, that silicon changes from a semiconductor to a metallic phase when you melt it. But no one could satisfactorily explain how this transition took place. It was an unanswered challenge that we thought we could make a contribution to, through our varied and complementary skills."

The twosome, often working at night when computer capacity was most available, conducted their research and wrote their paper over several months in the winter of 1984. The article, after a series of minor revisions, was published in *Physical Review Letters* several months later.

"It was an extraordinary time," Parrinello recalls. "I think that, regardless of your profession, it is always important to be in the right place at the right time—and that certainly was the case for Roberto and me in Trieste in the mid 1980s. We later went our separate ways, but we both look back on those years with fondness, especially when meeting on occasions in Trieste."

In recent years, Car has used his expertise to pursue such research topics as modelling electronic current in nanostructures. "But I still benefit from the collaboration with Michele. The way we approached the problem—through what was then the new field of computer simulation—has given me both a practical tool and lofty inspiration for my subsequent research."

The Car-Parrinello model is now a standard analytical concept not only in condensed matter physics, but in other disciplines as well. Parrinello, for example, is currently interested in the behaviour of water, whose study involves biophysics, biochemistry and, yes, sophisticated computer simulation.

"Even today," Parrinello says, "many of my colleagues insist that computing simulation fails to represent the real world and, as a result, real problems cannot be addressed by such a methodology."

"I agree that computing is no substitute for thinking. But computer simulation has proven useful in so many studies that the verdict should no longer be in dispute: There is overwhelming evidence in favour of using such an approach for both broadening and deepening our scientific understanding of an increasing number of problems. Simulation is here to stay." □



Roberto Car and Michele Parrinello

1 - 4 October

Conference on Hierarchy Problems in Four and More Dimensions

13 October - 7 November

Autumn College on Plasma Physics: Long-Lived Structures and Self Organization in Plasmas

15 - 18 October

Workshop on Modelling of Prefrontal Function

20 October - 14 November

Second Workshop on Distributed Laboratory Instrumentation Systems

23 - 24 October

Round Table on Developing Countries Access to Scientific Knowledge: Quantifying the Digital Divide

27 October - 7 November

Regional School in High Performance Computing on Linux Clusters, to be held in Mérida, Venezuela

10 - 15 November

Workshop on Plasma Physics

10 - 28 November

College on Evaluation of Energy Technologies and Policies for Implementation of Agenda-21

24 November - 12 December

Microprocessor Laboratory African Regional Course on Advanced VLSI Design Techniques, to be held in Kumasi, Ghana

1 - 12 December

2nd Advanced Course on Computable General Equilibrium Modelling (CGE) and the Environment

1 - 19 December

Third Latin American School in String Theory, to be held in São Paulo, Brazil



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 2004

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 automatic replies containing all documentation available on that particular activity.

(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. K.R. Sreenivasan 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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