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## Grid Near You

**F**irst the Web. Now the Grid.

CERN, the European particle physics laboratory located near Geneva, Switzerland, bills itself as the place where the "web was born". And for good reason. It was there in 1989 that CERN scientist Tim Berners-Lee invented the Web by melding the technologies of personal computers, computer networking and hypertext into an easy-to-use global information system that has revolutionised the way in which the world communicates.

Now CERN has emerged as a major player in a second revolution in electronic information technologies—a revolution that scientists have dubbed the Grid.

Like the Web, the Grid is being created to meet the growing demand for information sharing among scientists working in research centres and laboratories across the globe.

And like the Web, the Grid may ultimately transform how people worldwide use and share information in a broad variety of human endeavours.

What's the difference between the Web and the Grid? Well, it's equivalent to the difference between your living room bookshelf with one hundred or so novels and travel guides, and the US Library of Congress with nearly 60 million manuscripts and 30 million books.

Both store information and both provide access to it. But one stores a lot more information and provides much broader access than the other, although usually under a vast array of administrative frameworks that determine who can get in and who can't. After all, information may want to be free but it is expensive to produce, and those who produce it usually want to be rewarded for their efforts. Think publishers. Think broadcasters. Think Google. Think Grid.

It's for this reason that the Grid may hold a great deal more information than the Web and yet be far less accessible. You will likely need a key—an authorised computer and password—to see any of the information it contains.

In the world of science, the Grid is designed to link a large number of networked computers across the world, offering scientists the potential to seamlessly share huge computational resources, including huge databases. Indeed one of the primary reasons that CERN is leading the development of the Grid is to create the necessary computing infrastructure for the Large Hadron Collider (LHC), the world's largest scientific instrument, which will begin its exploration

into the fundamental properties of subatomic particles and forces next year. Officials anticipate that LHC experiments will generate some 15 million gigabytes of data each year. Some 6000 scientists and 50,000 computers are expected to be 'gridded' through the project.

Exponential increases in the quantity of data that can be automatically stored, retrieved and analysed worldwide will likely lead to qualitative changes in the way that scientists conduct research. It will certainly allow for more (and more complex) questions to be reasonably analysed, and will speed up the time in which solutions to problems can be formulated.

Like the Web, which began as a tool used exclusively by physicists, the use of the Grid will likely spread rapidly from the physics community to other scientific fields, including climate modelling, earthquake risk assessment, protein folding, and even the behaviour of financial markets.

Indeed the behaviour of financial markets was the theme of a workshop, appropriately titled "Grid in Finance in 2006," held in Palermo, Italy, in early February. ICTP, which coorganised the event with the University of Palermo, was represented by Alvise Nobile, a Centre staff scientist, and Stefano Cozzini, a Centre consultant. Sponsoring organisations included Avande Italy, IBM Italia and *Fondazione Banco di Sicilia*.

The meeting was the first of its kind. And while the uses of the Grid in finance are still in their infancy, the enthusiasm displayed by those in attendance—representatives from universities, research centres, financial institutions, software companies and governmental agencies, including the European Commission—reflected the growing interest in this emerging information technology. Will the Grid allow financial analysts to better understand investor behaviour? Will it enable experts to better anticipate changes in the financial markets? Will it allow experts to more precisely forecast both subtle and abrupt changes in national and global financial systems?

The use of the Grid at CERN may well unlock the secrets of the early universe. The use of the Grid to better understand financial behaviour, as discussed at the ICTP-cosponsored conference in Palermo, may well shed equally revealing light on more mundane pocketbook issues. Either way, the Grid will likely be coming your way soon. But you'll need a key to get in. □

## COMMENTARY



**W**hen Erney Camargo, President of Brazil's National Council for Scientific and Technological Development (CNPq) met with ICTP director K.R. Sreenivasan during the Centre's 40th anniversary conference, Legacy for the Future, in October 2004, he came to convey more than his congratulations. The day after the conference, Camargo and Sreenivasan signed a memorandum of cooperation to establish a partnership between CNPq and ICTP for jointly promoting "the development of schools and workshops in mathematics and physics in Latin America."

The good intentions conveyed in the memorandum were recently transformed into reality when the two institutions held a joint Workshop on Dynamical Systems at the *Instituto de Matemática Pura e Aplicada* (IMPA) in Rio de Janeiro in January. The workshop, attended by 170 participants from 21 countries in Latin America, covered such diverse topics as homoclinic bifurcations, strange attractors and stochastic stability and hyperbolicity.

The Rio workshop was quickly followed by a School on Soft Matter Physics, taking place at the *Universidade de São Paulo* in February. The school, which attracted some 100 participants, examined such issues as liquid crystals, polymers, granular matter and non-equilibrium statistical physics.

"These research and training events," says Jacob Palis, former director of IMPA who recently stepped down as chair of the ICTP Scientific Council, "will seek to strengthen the capacity of local and regional research, particularly in cutting-edge fields. They are designed to attract advanced graduate students and young post-doctoral researchers across the region as part of a larger effort to improve their understanding of their major fields of study and to put them in contact with others who share their interests."

"The world has changed a great deal since ICTP was created more than 40 years ago," says ICTP director K.R. Sreenivasan. "Today, countries such as Brazil have the scientific capacity to conduct research and training activities that meet the needs of researchers not just in their own countries but throughout the region. Holding ICTP-sponsored workshops and schools abroad is not only cost-effective but also helps to build both confidence and camaraderie among participants." If the workshop had been held in

Trieste instead of Rio, Sreenivasan estimates that the same budget would have accommodated just 50 and not 170 participants.

"Brazil," notes Palis, "covers a substantial portion of the cost of these events. As a result, we don't just benefit from these activities but also shoulder financial and logistical responsibility for organising them. ICTP also contributes to the budget but much less than it would if the events were held on its campus. The Centre," Palis adds, "also receives more visibility in the developing world than it would if the activities took place in Italy. For example, the Brazilian workshop and school, largely because of the unique partnership they represented between the developed and developing world, garnered press coverage in both Rio de Janeiro and São Paulo."

Future plans call for holding similar joint events at institutions not just in Brazil but in other countries in Latin America. In 2007, there will be a Latin American School in String Theory, tentatively scheduled to take place in Buenos Aires, Argentina; a Workshop on Probability Theory and



School on Soft Matter Physics, Universidade de São Paulo, February 2006

Application, scheduled for Brazil (but outside of Rio and São Paulo); and a Workshop on the Geometry and Topology of Singularities, which will likely take place in Cuernavaca, Mexico.

"We are off to a good start," says Sreenivasan. "We are hoping that this joint venture in Latin America will not only expand in the years ahead in Latin America but will serve as a model that can be adopted by other regions in ways that transform ICTP's relationship with institutions across the developing world and help us all advance the lofty goals that we share." □

## Today's UNESCO

Last autumn, UNESCO's General Assembly elected Koïchiro Matsuura to a second term, extending his tenure as Director General to 2009. Matsuura, who was educated in Japan and the United States, has held numerous diplomatic posts with the Japanese Ministry of Foreign Affairs, including stints in Africa, Asia, Europe and the United States. He is also an accomplished author having written a wide range of books and articles on economic development and cooperation and diplomacy. Before assuming his leadership post at UNESCO, Matsuura served as the Japanese Ambassador to France and concurrently to Andorra and Djibouti. Earlier this spring, the Director General agreed to respond to a series of email questions in which he discussed his accomplishments during his first term and his plans and hopes for his second term. Excerpts follow.

*What do you consider to be your most significant accomplishments during your first term? What do you hope will be the primary accomplishments of your second term?*

There is a range of accomplishments that I believe can be attributed to the reform agenda upon which I was first elected Director General. These cover all dimensions of UNESCO's operations, from management to programmes. Perhaps one of the achievements to which I personally attach the greatest importance—although it was far from easy—is to have succeeded in putting UNESCO back on the map as a credible international partner with unique, or at least valued, expertise in certain priority areas: education for all; water resources management; cultural diversity; information and knowledge for all; and the ethics of science and technology.

As for the second term, I would like to consolidate many of the reforms I have already introduced, some of which will necessarily take time to fully implement. Specifically, I would like to concentrate on two things: converting staff policy reforms into an everyday reality for the benefit of what is the organisation's greatest asset—its staff; and mobilising the huge and multifarious network of UNESCO constituents, friends and supporters—far beyond official government and civil society circles. Ultimately, I hope to advance what must still be our ultimate goal when all is said and done: promoting peace through better understanding among people.

*What are the strengths of UNESCO's broad mandate? The weaknesses?*

One of UNESCO's greatest riches is precisely the fact that it covers a range of important fields of inquiry. What makes us unique is that these issues are not just in juxtaposition, but interact with one another. The attendant weakness is the constant temptation to do too much with too little. I have had to be very watchful about this and quite tough sometimes.

*Most people would agree that culture and education are more closely related than culture and science. How has science fitted into UNESCO's overall mandate? Considering that scientific development is an integral part of sustainable*

*development, how do you propose to use the offices of UNESCO to improve scientific development in developing countries?*

I am not sure I can entirely agree with the proposition. Of course a country should always address its educational needs in a culturally sensitive manner, which puts culture and education into constant interaction. But I know of few people today who would deny the links between science and culture, if only in the broad and complex field of sustainable development. The 'S' in UNESCO has been a major part of the organisation's programme since its inception. During the Cold War, UNESCO was a meeting place for scientists from the East and West; many scientific initiatives



Koïchiro Matsuura

born within the scientific community—for example, the idea for CERN, the European particle physics laboratory—have been created and have taken shape thanks largely to the governmental links that UNESCO provided. UNESCO has also helped increase awareness among developed nations of the importance of building scientific capacity in the developing world as a driver for economic growth and independence; it has promoted ethical conduct and more widely enhanced understanding of the place of science within society; and much more. We are currently engaged in a review of the Natural Sciences Sector and the Social and Human Sciences Sector of the secretariat that I know will produce interesting proposals for the future place of science in UNESCO. That place is more important than ever, for science is knowledge, and knowledge is freedom, empowerment and dignity.

*Ten years ago, UNESCO assumed lead administrative responsibility for ICTP from the International Atomic Energy Agency (IAEA). How would you describe ICTP's relationship with UNESCO? In what ways would you like to strengthen the UNESCO-ICTP relationship in the future?*

To be honest, the relationship in the past was, by all accounts, tenuous, partly because Abdus Salam was an independent and strong-minded personality, but partly because UNESCO, from an institutional perspective, had not sufficiently come to grips with the role of its major institutes within its overall programme objectives. Much has been achieved over the past four to five years. I think we all have a much clearer idea of why the institutes—including ICTP—are there, what their potential is, and why it is most important that they continue to function with a degree of autonomy that guarantees the flexibility they need to succeed. ICTP can certainly play a greater role in its capacity-building dimension by partnering with other parts of UNESCO—including other institutes and field offices, foremost among which should be the office in Venice. This is one of the reasons why ICTP has been asked to be involved in the development of the new International Basic Sciences Programme (IBSP). But its research function should remain central, as should its role as an echo chamber for the needs and aspirations of scientists from the developing world.

*You played an instrumental role in helping ICTP secure a grant for the Mori Fellowship programme, which provides funding for young scientists and mathematicians from sub-Saharan Africa to continue their education. What are your hopes for this programme? How does such an initiative fit into UNESCO's overall mandate and strategies?*

As I have just said, ICTP has an important role in capacity building. This was part of Abdus Salam's vision. The Mori Fellowships cannot do everything alone and need to be integrated into a broader drive for support. I am glad, though, that the name of the former Prime Minister of Japan is associated with these important goals. □

## WHEN UNECO BECAME UNESCO

Culture and education were destined to be part of UNESCO's mandate from the earliest discussions leading to the creation of the organisation. But science was another matter. Indeed it was not until the Preparatory Commission met in 1945 that science became part of UNESCO's primary responsibilities thanks largely to a campaign led by British biologists Joseph Needham and Julian Huxley. Without this campaign, there is a good chance that the organisation's acronym would be UNECO, not UNESCO.

## INSTITUTES AND CENTRES

ICTP is one of twelve institutes and centres that operate under UNESCO's umbrella. These include: the UNESCO European Centre for Higher Education in Bucharest, Romania; UNESCO-IHE Institute for Water in Delft, The Netherlands; UNESCO International Institute for Capacity-Building in Africa in Addis Ababa, Ethiopia; UNESCO Institute for Education in Hamburg, Germany; UNESCO International Institute for Educational Planning in Paris, France, and Buenos Aires, Argentina; UNESCO International Institute for Higher Education in Latin America and the Caribbean in Caracas, Venezuela; UNESCO International Bureau of Education in Geneva, Switzerland; UNESCO Institute for Information Technologies in Education in Moscow, Russia; UNESCO International Centre for Technical and Vocational Education and Training in Bonn, Germany; and the UNESCO Institute for Statistics in Montreal, Canada.

## BACK TO BASICS

UNESCO has launched an International Basic Sciences Programme (IBSP) that is designed to strengthen "national capacities in the basic sciences and science education." Specifically, IBSP will seek to build member-state capacities for basic research, training, science education and the popularisation of science, and to transfer and share scientific information and excellence in science through North-South and South-South cooperation. Representatives from ICTP and The Academy of Sciences for the Developing World (TWAS) served on IBSP's ad-hoc committee of experts, which helped to design the programme. The two institutions will also play a key role in the implementation of IBSP as it moves forward. For additional information, see [www.unesco.org](http://www.unesco.org).

## FEATURES

# Centre of Energy

**N**early everything that is worth saying—and much that is not—has already been said about sources of energy and the rising thirst for it. Yet, for all the clutter of conversation, a few pragmatic points may be worth some consideration.

And, within ICTP, it is worth considering what contributions the Centre can make to a more secure energy future for both the South and North.

It is useful to keep in mind a time horizon; the end of the 21st century may be a useful target. I would like to separate the century into its two halves because we can be fairly certain about the first 50 years—and what happens in the next 50 years will depend on how we deal with the first 50.

The world's energy needs will be growing much more steeply in this century than at any time since the beginning of the industrial revolution. Two factors will contribute to this trend. The percentage of people who use little energy today is likely to use more tomorrow. At present, about 4.5 billion people use less than the world's average and 1.6 billion of them don't have access to electricity. If they all catch up to the present average, the new average use of energy will rise by 60 percent. And if the world's population increases—as it certainly will—by some 50 percent, say, by 2050, we will be using twice the energy we do now. Moreover, additional energy needs are likely to emerge—for example, in seeking to meet future water needs via, say, desalination.

Better energy conservation practices will no doubt play some role. The improvement in energy efficiency achieved over the last 50 years is impressive, and it will be possible to push it further. However, no one thinks that conservation will be the answer to the world's increasing energy needs.

What then are the options?

Oil wells will dry up. The recent doubling of oil prices has already damaged the economy of developing countries (and the economy of industrialised countries too, but the fundamentals of their economies are in better shape). Yet, it is only a harbinger of tougher times to come—both economically and politically. The world economy is so strongly conditioned on oil that it cannot switch rapidly to anything else. As long as the last well remains in operation, oil will be the preferred source of energy. Thus it will have to remain in the mix of our energy portfolio in the foreseeable future.

Complete reversion to coal (leaving aside the issue of its abundance) will not be possible because of greenhouse effects. Carbon sequestration may be a solution, but it is a long way on the horizon and its consequences are unclear.

As for fusion, a commercial power plant is at least 50

years away, even if everything with ITER, the international fusion project headquartered in Cadarache, France, works according to plan and additional up-scaling occurs as expected. ITER will take 20 or so years to work fully and at least one intermediate generation of fusion plants will be needed before commercial success becomes a reality. Fusion will play no role in the next 50 years—though it may play an important role in the subsequent 50. Thus fusion research should be supported.

Some people think that hydrogen is the future, while others do not. According to experts, there are basic problems with hydrogen as an energy source at the thermodynamic, conceptual and practical levels. One should not forget the principal point that hydrogen, though an excellent carrier of energy, is not an energy source. Hydrogen may play some role, but not the dominant one that fossil fuels now do.

Nuclear fission today supplies about 16 percent of the world's energy needs (but the distribution is geographically lopsided). To bring it to 80 percent or so—roughly as in France now—one will have to increase the number of reactors five-fold. Let's forget for the moment about the lack of technological know-how in many countries (despite valiant efforts by the International Atomic Energy Agency, IAEA), the limited sources of uranium, and difficult reprocessing and storage issues associated with spent fuel. Just consider, instead, what it would be like to dot the world's landscape with five times as many reactors as now. This step will likely increase the risk of accidents, magnify security issues many fold, and exacerbate the concern for proliferation of nuclear weapons. Yet, nuclear fission will have to play a moderately stronger role than now. Lately, its acceptability has increased because of the absence of greenhouse effects.

In summary, looking towards the horizon for the first 50 years, oil will become less available, the use of coal cannot increase dramatically without doing interminable damage to the environment, fusion will play no role, hydrogen will remain a marginal energy source, and nuclear fission can be expected to increase slightly. We have no choice but to add a significant fraction of renewable energies to the mix of oil and nuclear. Perhaps a roughly equal mix of the three is a viable scenario for the future.

But renewable energies face several formidable obstacles—the principal technical one being that it is too much in the form of a 'retail' commodity. Some energy consumption is indeed retail, and there is no reason why, especially in much of Asia, Australia, Africa, and the Mediterranean, some household energy cannot come from the sun, or why wind

energy cannot be harnessed more effectively in countries like Morocco. Equally importantly, one needs to work, with the same level of seriousness as with fusion, on large-scale solar power plants. This is a high-tech and non-trivial challenge.

To repeat, it would seem that a reasonable goal for 2050 is a three-way mix of fossil fuels, renewable energy and nuclear fission, roughly in equal proportions, with others joining as minor partners. By 2050, we will surely know more about such things as fusion, hydrogen and the technology of renewable energy (in which category solar energy will figure dominantly), and we will have to readapt ourselves to a new equilibrium point for 2100.

Continual evaluation and adaptation are the keys to a more secure energy future. If today's developing countries follow the same technological path as industrialised countries followed during their ascension, there will not be adequate resources to meet the energy needs of the world. Developing countries, some of which have the 'luxury' of taking a fresh look at the energy crunch, should look for alternative approaches. This requires clear awareness of the issues involved, deep understanding of potential technologies and, as a precondition, much research and knowledge of science. I cannot argue in favour of science any more strongly than by stating that it is a matter of survival: an increasing number of problems will depend on science for their solutions.

ICTP was created under the umbrella of IAEA and has been concerned with energy from the very beginning. The Centre's first long-term programme in 1964, in fact, focussed on fusion energy. Since then, ICTP has had a sustained interest in renewable energies. In total, the Centre has organised some 30 courses on this topic, many of them in cooperation with IAEA. Some 2000 scientists worldwide have taken part and are now involved directly in renewable energy projects in their own countries. Furthermore, through our Training and Research in Italian Laboratories (TRIL) programme, we have supported some 400 postdoctoral

scientists to come to Italy and work on projects of renewable energy. This represents a substantial investment on ICTP's part, and strongly indicates that we recognise the seriousness of the scientific issues involved, and that we are committed to addressing them.

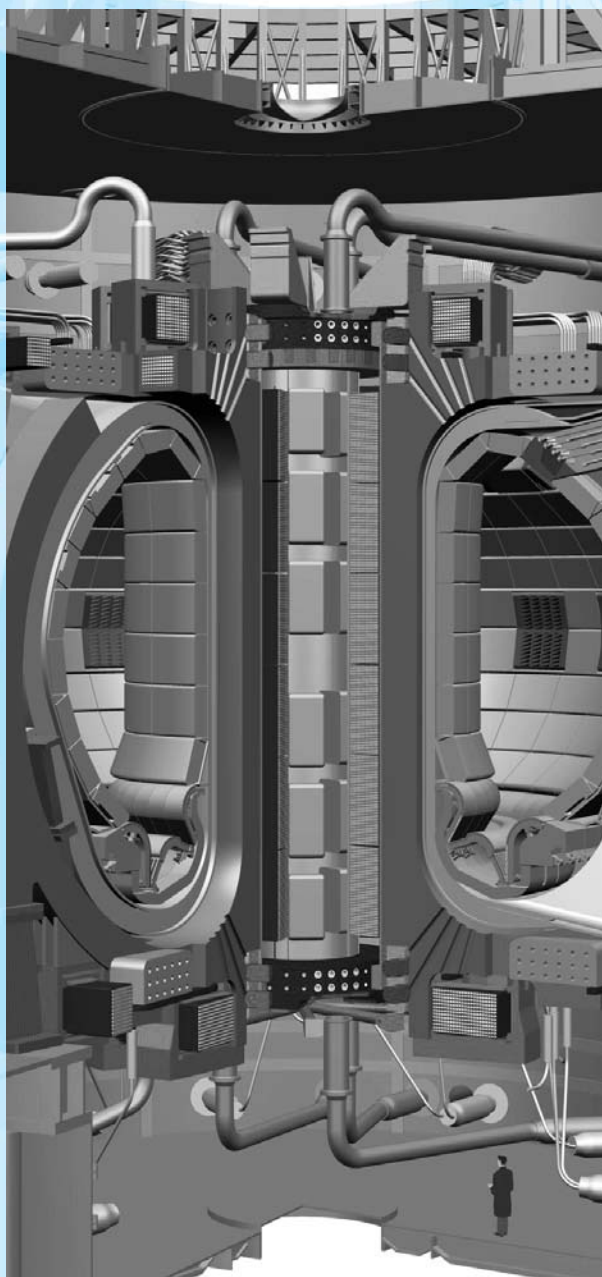
The ITER programme soon to be set up in Cadarache, France, is a one-of-its-kind effort, not to be replicated anytime soon anywhere in the world. If our goal is to provide a viable source of fusion energy to the world at large, it is important that people from needy countries be involved in the enterprise from the beginning. It is unrealistic to think that the fusion programme will be perfected by a few chosen countries, while others stay away until the technology is ready to be transferred, somehow, to those in need. Only a few countries can be principal partners, but some minimal access must be available, right from the start, to capable scientists from developing countries. We have to start building appropriate groups that can act, when needed, as the nuclei for fostering this new technology.

There is no better institution than ICTP to lead this effort. Because scientists from a large number of countries visit ICTP, they can in principle make connections to ITER through ICTP.

As one measure, ICTP could run, in cooperation with ITER and IAEA, courses on fusion-related issues in which scientists from developing countries participate. As a second measure, ICTP could develop a remote access and control facility for the ITER experiment, through which scientists from developing countries could participate in the enterprise without physically being at Cadarache. One can similarly imagine developing, through ICTP, a

network of scientists to work on the analysis of data coming from ITER.

The world, I would think, would welcome such an initiative because if we do not face our energy challenges together, the prospects of meeting them successfully at all will dim considerably. □



Artistic rendering of ITER device

## Mathematics in Pakistan

The National Centre for Physics (NCP) organised the 12th Regional Conference in Mathematical Physics, in cooperation with the Higher Education Commission (HEC) and ICTP. The Conference took place from 27 March to 1 April at Quaid-i-Azam University, Islamabad, Pakistan. Regional conferences on mathematical physics have been held for the past 20 years on a rotating basis in Iran, Pakistan and Turkey. The fields covered in this year's conference included superstring theory, particle physics, relativity, astrophysics, cosmology, plasma physics and mathematical physics. About 40 foreigners and 20 Pakistanis made presentations.

## King Faisal Award to Narasimhan

**M.S. Narasimhan**, long-time head of ICTP's mathematics group who retired in January 1999, was named the co-winner of the King Faisal International Prize for 2006. Narasimhan, who shared the prize with Britain's Simon Kirwan Donaldson, President of the Institute of Mathematical Sciences and professor of mathematics at Imperial College, London, was honoured for his path-breaking research in strengthening the links between mathematics and physics. The prize, named after King Faisal of Saudi Arabia (1906-1975), carries a US\$200,000 cash award. The ceremony took place in February in Riyadh, Saudi Arabia.

## Wireless in Print

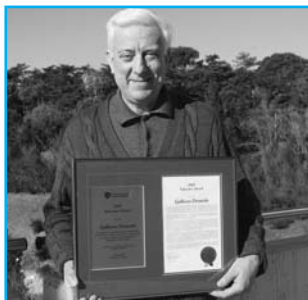
*Wireless Networking in the Developing World*, co-authored by ICTP's **Carlo Fonda** and **Marco Zennaro**, Aeronomy and Radiopropagation Laboratory (ARPL) and Science Dissemination Unit (SDU), is a how-to guide for building, deploying and maintaining wireless information networks in rural areas of the developing world. The book can be downloaded under a Creative Commons license. It is also available in a print-on-demand format. See [www.wndw.net](http://www.wndw.net).

## 2006 ICO/ICTP Award

**Hector Manuel Moya-Cessa**, *Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE)*, Puebla, Mexico, has won the 2006 ICO (International Commission for Optics)/ICTP Award. The ceremony took place in the ICTP Main Lecture Hall during the Winter College on Quantum and Classical Aspects of Information Optics, held from 30 January to 10 February. Ari Friberg, president of ICO, presided. Moya-Cessa is being honoured for his research on the foundation of quantum optics and his involvement in organising research and training activities in this field in Latin America. On the same occasion, ICTP scientist **Gallieno Denardo** received the SPIE Educator Award (see "Dateline", *News from ICTP*, Autumn 2005, p. 8).



Hector Manuel Moya-Cessa



Gallieno Denardo with SPIE Educator Award

## In the Trib

The *International Herald Tribune* recently published an article describing the efforts of ICTP's Aeronomy and Radiopropagation Laboratory (ARPL) to provide developing countries with low-cost, effective electronic communications through the use of tin can antennas. To read the article, see the 28 February 2006 edition of the *Tribune* or contact [sci\\_info@ictp.it](mailto:sci_info@ictp.it).

## Dirac Medallists Honoured

ICTP Dirac Medallists **Sergio Ferrara**, European Organization for Nuclear Research (CERN), Geneva, Switzerland, **Daniel Freedman**, Massachusetts Institute of Technology (MIT), and **Peter van Nieuwenhuizen**, State University of New York (SUNY), Stony Brook, have been awarded the Dannie Heineman Prize for Mathematical Physics. They are being honoured for their successful efforts in "constructing supergravity, the first supersymmetric extension of Einstein's theory of general relativity." The Dannie Heineman Prize is awarded jointly by the American Physical Society (APS) and the American Institute of Physics (AIP). Eighteen ICTP Dirac Medallists, including this year's winners, have now received this prestigious award.

## NEWS FROM ASSOCIATES



### Raphael Mukaro,

ICTP Junior Associate 2002-2007 and head of the Physics Department at Bindura University of Science in Bindura, Zimbabwe, has been awarded the 2005 TWAS (The Academy of Sciences for the Developing World) Young Scientist of the Year Award in Zimbabwe. The award was cosponsored by the Research Council of Zimbabwe. Mukaro is being honoured for his role in developing powerful but inexpensive sensors, control systems and computer software used for research and teaching.



## March Meeting

ICTP Director **K.R. Sreenivasan** participated in the March Meeting of the American Physical Society in Baltimore, Maryland, USA, where, on 13 March, he chaired and spoke at the session, "Scientists from Developing Countries: Is There an Effective Way to Support Meaningful Research?" ICTP Associate Zohra Ben Lakhdar (see "Profile", *News from ICTP*, Winter 2005-2006, p. 14) also spoke at the session. On the following day, Sreenivasan participated in the ACIPA (American Chapter of the Indian Physics Association) meeting. Other participants were Shobo Bhattacharya, Director, Tata Institute of Fundamental Research (TIFR), India, and Michael Cheetham, Study Director, Smithsonian Institution, USA.



Speakers at FIP session in Baltimore: K.R. Sreenivasan, Bernard M'Passi Mabiala, Gary Steigman, Zohra Ben Lakhdar and Carlos Henrique de Brito Cruz

## Scoles Awarded Franklin Medal

**Giacinto Scoles**, Donner Professor of Science at Princeton University, and Professor at the Departments of Biophysics and Condensed Matter Physics at the International School for Advanced Studies (SISSA), Trieste, has been awarded the 2006 Benjamin Franklin Medal in Physics. He shares the Medal with J. Peter Toennies, Associate Professor, Department of Physics, University of Göttingen, Germany, and former Director of the *Max-Planck-Institut für Dynamik und Selbstorganisation*, Göttingen, Germany. The award is being given to Scoles and Toennies for their development of new techniques for studying molecules that involve embedding them in ultra-cold helium droplets. Scoles has lectured at ICTP on numerous occasions and has served as a course director of the Stig Lundqvist Conferences. The medal is awarded by the Franklin Institute, Philadelphia, Pennsylvania, USA. The ceremony took place at the Franklin Institute on 27 April.



Giacinto Scoles

## Earthquake Prediction Centre in Pakistan

The government of Pakistan has approved a plan to establish a centre for earthquake risk assessment and management. The centre, which will cater to the needs of South and Central Asia and the Middle East, will be located at the National Center for Physics, Quaid-i-Azam University, Islamabad. ICTP is among the international organisations that the new centre will work with. Other partnering organisations include the International Institute of Earthquake Prediction Theory and Mathematical Geophysics, Moscow, the University of California at Los Angeles and the Russian Academy of Sciences. **Vladimir Keilis-Borok** and **Inessa Vorobieva**, two well-known seismologists who have collaborated with ICTP's Structure and Non-Linear Dynamics of the Earth (SAND) group for more than 20 years, were part of a select group serving as consultants for the creation of the new centre.



Walter Kutschera (right)

## Public Lectures Redux

**Walter Kutschera**, Institute of Isotope Research and Nuclear Physics, University of Vienna, Austria, launched ICTP's 2006 public lecture series on 17 March with a presentation titled "Synchronizing Cultures in the Past: How to Combine Natural Sciences and Humanities." On 22 March, **Fabio Toscano**, an Italian physicist, spoke about his fellow countryman Gregorio Ricci Curbastro in a lecture titled "The Italian who Saved Einstein". The lecture, which was held at the University of Trieste, was organised in cooperation with the University's Department of Mathematics.

## Duff Appointed

**Michael Duff**, a doctoral student of Abdus Salam, ICTP's founding director, has been appointed Principal of the Faculty of Physical Sciences at Imperial College, London, UK. Duff earned his doctorate from Imperial College in 1972. Before returning to his alma mater, Duff was the Oskar Klein Professor of Physics at the University of Michigan and the first Director of the Michigan Center for Theoretical Physics. He has also been a professor of physics at Texas A&M University and a senior physicist at CERN, the European particle physics laboratory located in Geneva, Switzerland.



Michael Duff at the Salamfest, ICTP, 1993



## ACTIVITIES

### ADVANCED SCHOOL AND CONFERENCE ON REPRESENTATION THEORY AND RELATED TOPICS

9 - 27 January

**Organisers:** J.A. de la Peña (*Universidad Nacional Autónoma de México*, UNAM, Mexico City, Mexico), B. Keller (*Université Denis Diderot – Paris 7*, Paris, France), H. Lenzing (*Universität Gesamthochschule Paderborn*, Paderborn, Germany) and A. Skowronski (*Nicholas Copernicus University*, Torun, Poland).

**Local Organiser:** Lê Dung Tráng (ICTP).

### 3rd INTERNATIONAL WORKSHOP ON INTEGRATED CLIMATE MODELS: AN INTERDISCIPLINARY ASSESSMENT OF CLIMATE IMPACTS AND POLICIES

12 - 13 January

**Organiser:** C. Carraro (*Fondazione ENI Enrico Mattei*, FEEM, and University of Venice, Italy).

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

### ADVANCED WORKSHOP ON RECENT DEVELOPMENTS IN INORGANIC MATERIALS

16 - 20 January

**Cosponsors:** International Center for Materials Research (ICMR) of the University of California at Santa Barbara, The Academy of Sciences for the Developing World (TWAS, Trieste, Italy) and the International Center for Young Scientists (Tsukuba, Japan).

**Organisers:** A.K. Cheetham (University of California at Santa Barbara, USA), C.N.R. Rao (Jawaharlal Nehru Centre for Advanced Scientific Research, JNCASR, Bangalore, India) and M. Rühle (*Max-Planck-Institut für Metallforschung*, MPI, Stuttgart, Germany).

**Local Organiser:** R. Gebauer (ICTP).

### FIRST ICTP WEST AFRICAN WORKSHOP ON REGIONAL CLIMATE AND IMPACTS, Accra, Ghana

16 - 20 January

**Organisers:** F. Allotey (Institute of Mathematical Science, IMS, Legon, Ghana), F. Giorgi (ICTP), J. Intsiful (*Zentrum für Entwicklungsforschung der Universität Bonn*, ZEF, Bonn, Germany) and J. Pal (ICTP).

### SCHOOL ON MATHEMATICAL METHODS FOR OPTICS

23 - 27 January

**Organisers:** V. Lakshminarayanan (University of Missouri at St. Louis, USA), M.A. Alonso (University of Rochester, New York State, USA) and T. Visser (*Vrije Universiteit*, Amsterdam, The Netherlands).

**Local Organiser:** G. Denardo (ICTP).

### WINTER COLLEGE ON QUANTUM AND CLASSICAL ASPECTS OF INFORMATION OPTICS

30 January - 10 February

**Organisers:** M. Calvo (*Universidad Complutense*, Madrid, Spain), P. Knight (Imperial College, London, UK) and P. Tombesi (University of Camerino, Italy).

**Local Organiser:** G. Denardo (ICTP).

### ICTP/INFM-DEMOCRITOS WORKSHOP ON PORTING SCIENTIFIC APPLICATIONS ON COMPUTATIONAL GRIDS

6 - 17 February

**Cosponsor:** INFN-Democritos (Italian National Institute for the Physics of Matter).

**Organisers:** R. Barbera (Italian National Institute for Nuclear Physics, INFN, Catania, Italy) and S. Cozzini (National Research Council, CNR-INFN-Democritos, Italy).

### ICTP-ITU-URSI SCHOOL ON WIRELESS NETWORKING FOR DEVELOPMENT

6 - 24 February

**Cosponsors:** International Telecommunication Union (ITU) Telecommunication Development Bureau, International Union of Radio Science (URSI), EsLaRed (*Universidad de Los Andes*, ULA, Venezuela).

**Organisers:** R. Struzak (URSI Commission on Developing Countries) and S. Radicella (ICTP).



Didier Nkurikiyimfura Kagabire



Siruvanoor Narayanawamy Ragu Kumar

## WORKSHOP ON NUCLEAR STRUCTURE AND DECAY DATA: THEORY AND EVALUATION

20 February - 3 March

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

**Organisers:** A.L. Nichols (IAEA), J.K. Tuli (Brookhaven National Laboratory, BNL, Upton, New York State, USA) and A. Ventura (*Ente per le Nuove Tecnologie, l'Energia e l'Ambiente*, ENEA, Bologna, Italy).

**Local Organiser:** C. Tuniz (ICTP).



## TECHNICAL MEETING ON ANALYTICAL METHODS FOR CHARACTERIZATION OF HOT PARTICLES AND THEIR IMPACT ON ENVIRONMENT

6 - 10 March

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

**Organisers:** S. Fesenko (IAEA) and D. Wegrzynek (IAEA).

**Local Organiser:** C. Tuniz (ICTP).



## ICTP/DEMOCRITOS JOINT WORKSHOP ON TOOLS FOR COMPUTATIONAL PHYSICS

6 - 11 March

**Cosponsor:** INFN-Democritos (Italian National Institute for the Physics of Matter).

**Organisers:** S. Cozzini (National Research Council, CNR-INFN-Democritos, Italy), A. Kohlmeyer (*Ruhr-Universität-Bochum*, Germany) and R. Rousseau (International School for Advanced Studies, SISSA, Trieste, Italy).

## WORKSHOP ON THE ORGANIZATION AND MAINTENANCE OF TROPICAL CONVECTION AND THE MADDEN JULIAN OSCILLATION

13 - 17 March

**Cosponsors:** Thorpex (the Observing System Research and Predictability Experiment) and WCRP (World Climate Research Programme).

**Organisers:** J. Slingo (University of Reading, UK), F. Molteni (ICTP), M. Moncrieff (National Center for Atmospheric Research, NCAR, Boulder, Colorado, USA) and M. Shapiro (NCAR).

## SCHOOL ON ION BEAM ANALYSIS AND ACCELERATOR APPLICATIONS

13 - 24 March

**Organisers:** G. Battistig (Research Institute for Solid State Physics and Optics Budapest, Hungary), N. Dytlewski (International Atomic Energy Agency (IAEA, Vienna, Austria) and C. Tuniz (ICTP).



## SPRING SCHOOL ON SUPERSTRING THEORY AND RELATED TOPICS

27 March - 4 April

**Cosponsors:** International School for Advanced Studies (SISSA, Trieste, Italy) and Italian National Institute for Nuclear Physics (INFN).

**Organisers:** E. Gava (INFN), K.S. Narain (ICTP), H. Ooguri (California Institute of Technology, Pasadena, USA), S. Randjbar-Daemi (ICTP) and A. Sen (Harish-Chandra Research Institute, Allahabad, India).

for additional information see [www.ictp.it](http://www.ictp.it)

## TRIL at ENEA

A meeting on "Scientific Cooperation Between Italy and Emerging Countries", sponsored by the Italian Ministry of Foreign Affairs and the Italian National Agency for New Technologies, Energy and the Environment (ENEA), took place in Rome on 14 March. The objective of the *Giornate della Cooperazione* was to examine the impact of ICTP's TRIL (Training and Research in Italian Laboratories) programme and to discuss strategies for making TRIL even more effective in the future. Since its inception in 1983, more than 1000 scientists from 75 developing countries have participated in TRIL, conducting high level research in physics institutes across Italy. For additional information about TRIL, see [www.ictp.it](http://www.ictp.it).

## UN Under-Secretary General Visits ICTP

**Adama Dieng**, UN Under-Secretary General, met ICTP Director **K.R. Sreenivasan** on 2 February to discuss a wide range of issues related to the role of science in the UN System. Following the meeting, Dieng and Sreenivasan participated in a conference on human rights organised by the University of Trieste.



## Minister from South Africa

**Mosibudi Mangena**, Minister of Science and Technology in South Africa, met ICTP Director **K.R. Sreenivasan** on 24 March to discuss future avenues of cooperation. The Minister also met other representatives of Trieste's international scientific community during his brief visit.



## Science, Art and Music

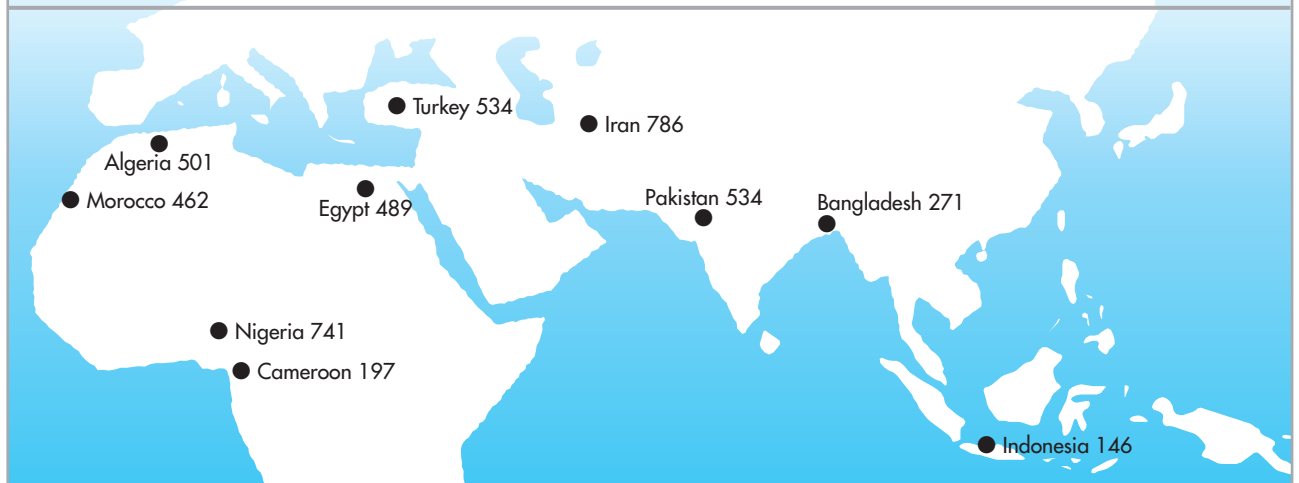
The ICTP Cultural Committee, in cooperation with the University of Rome "*La Sapienza*", organised a public event at the Adriatico Guesthouse on 22 February titled "Science and Art — MOVEMENT = Thinking of the Present". Writers **Giuseppe O. Longo**, **Marina Silvestri**, and **Annio Stasi** took part in a discussion on art, music and science. An exhibition of paintings by **Mery Tortolini**, an artist who teaches at "*La Sapienza*" University, was inaugurated. The Trieste-based North Winds Band, which includes ICTP staff members Suzie Radosic and Joe Niemela, provided a musical interlude.



## ICTP and the Top 10 OIC Countries

- ICTP visitors 1995-2005  
(including Associates, TRIL Fellows, Course Participants and Researchers)

Over the past decade, more than 6000 scientists from OIC (The Organization of The Islamic Conference) countries have visited ICTP. Here are the top 10 OIC countries.

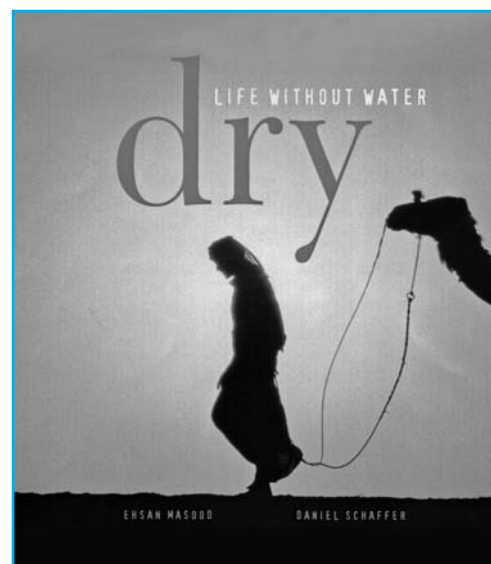


## ▣ Dry Life

ICTP/TWAS Public Information Officer Daniel Schaffer is the co-editor of *Dry: Life Without Water*, published by Harvard University Press. The book, which includes more than 80 illustrations, describes how people living in arid environments across the developing world have learned to cope—indeed thrive—in water-sparse environments. For additional information, see <http://www.hup.harvard.edu/catalog/MASDRY.html>.

## ▣ Book Donations

World Scientific Publishing Co. (WSPC), one of the world's leading scientific publishers, has donated 21,000 textbooks to ICTP for distribution to libraries in the developing world. The 1200 titles range broadly in subject matters from physics to economics and from mathematics to medicine. The ICTP Library, which is responsible for the project, has distributed nearly 13,000 volumes to 58 countries since WSPC's first shipment in September 2005. All of the books will be distributed by this summer.



## ▣ Shenoy Returns to India

**Subodh Shenoy**, a member of the ICTP scientific staff and coordinator of the Centre's Diploma Course in condensed matter physics since 1994, has returned to his native India,



where he will serve as a professor of physics at the University of Hyderabad. Shenoy received a bachelor of science degree from Queen Mary College at the University of London, UK, in the late 1960s and master's and doctorate degrees in physics from Yale University, USA, in the early 1970s. After his Ph.D, he worked at the University of South Florida, USA, Tata Institute, Bombay, the Institute of Physics, Bhubaneswar, and the University of Hyderabad, Hyderabad. Shenoy first visited Trieste in the mid 1980s when, as a professor of physics at the University of Hyderabad, he was appointed an ICTP Associate. He returned to Trieste on numerous occasions over the next decade to attend Centre research and training activities and to conduct his own

research before receiving a staff position with the Condensed Matter Physics group. Shenoy's decade-long stay at ICTP was marked by a continual flow of research publications in such scientific journals as *Physics Review Letters*, *Europhysics Letters* and *Physical Review*. It was also marked by the emergence of the ICTP Diploma Course as a critical Centre research and training activity for students from the least developed countries. Friends and colleagues wish Shenoy the best of luck in his newest professional endeavours and hope that he will return often to ICTP where his keen intelligence, warmth, generosity and kindly manners will be missed.

## IN MEMORIAM

**Mizanur Rahman**, former ICTP Associate, died on 30 January. He was 72 years old. Mizanur Rahman was professor of mathematics at the University of Rajshahi in Bangladesh. He visited ICTP on many occasions to attend Centre training and research activities, especially in his primary field of interest, theoretical nuclear physics.



## PROFILE

**Ryszard Struzak, long-time staff member of the International Telecommunication Union (ITU), has launched a second career in electronic communications at ICTP.**

# Forever Young

**A**t first glance, his collar-length silvery hair seems to belie his youthful exuberance.

But since 1989, Ryszard Struzak, now 73, has been one of ICTP's most frequent and enthusiastic visitors—first serving as teacher for the Centre's radiocommunication courses and later as co-director of the ICTP schools on digital radio and wireless computer networking. While at the Centre, Struzak has worked closely with Sandro Maria Radicella, head of the Aeronomy and Radiopropagation Laboratory (ARPL).

ICTP's most recent wireless networking school took place in February. Some 26 participants from 15 developing countries attended.

In Africa and in many regions of Asia and Latin America, low-cost radiocommunication technologies are the most cost-effective means to connect remote villages, universities and hospitals to the internet. For example, a simple antenna attached to a tin can—a cantenna, if you will—has helped bring the internet to universities across sub-Saharan Africa. Thanks to Struzak and Radicella, ICTP has been one of the world's leading organisations in making wireless-communication science and technology available to developing countries. The work of the Centre recently received worldwide attention when it was profiled in the 28 February edition of the *International Herald Tribune* (see p. 8).

The Centre's activities in the field are strongly supported by the International Telecommunication Union (ITU), a UN agency where Struzak worked for more than two decades until his retirement in 2003. Born in Janow, a small city near Lublin in Poland, Struzak studied at universities in Lodz, Wroclaw and Warsaw, where he received doctorate degrees in both electronics and telecommunications. His education set the stage for a long and rewarding career as a university professor and international civil servant.

"My collaboration with ICTP," Struzak says, "began in January 1989, when the Centre organised its first Course on Basic Telecommunication Science, but I had previously met Radicella at ITU headquarters in Geneva. From our first conversations I understood the spirit of the Centre."

With Struzak's help, ICTP organised radiocommunication courses every other year until 1995, when more formal links were developed with ITU. From then on, courses became annual events with topics changing from one year to the next to keep pace with the rapid advances in the field. Hundreds of young physicists and engineers have attended the Centre's radiocommunication courses, colleges, workshops and schools—mostly from African countries.

Why the emphasis on Africa? "Because it is a continent that must become connected to the rest of the world if it hopes to achieve sustainable economic progress," Struzak says. "For me and Radicella it's rewarding to see how researchers attending the courses learn new things that they subsequently use in their home countries. Their level of preparation today is much better than it was 15 years ago. This too can be seen as a sign of hope for Africa."

In the near future ICTP plans to help forge partnerships between India and several African countries. Struzak notes that South-South cooperation in science is just "one more sign of the progress that is taking place across the developing world—thanks in large measure to advances in electronic communications driven not only by satellites and optical fibres but also by tin cans and aluminium antennae." □



Ryszard Struzak with Sandro M. Radicella

**18 - 28 April**  
Workshop on Driven States in Soft and Biological Matter

**2 - 19 May**  
ICTP-COST-USNSWP-CAWSES-INAF-INFN International Advanced School on Space Weather

**8 - 12 May**  
Topical Consultancy on Tsunami Hazards, in Particular, and Coastal Flooding, in General, for Nuclear Facility Sites

**8 - 26 May**  
ICTP School on Synchrotron Radiation and Applications – in Memory of J.C. Fuggle and L. Fonda

**15 - 19 May**  
The Conduct of Seismic Hazard Analyses for Critical Facilities

**20 - 22 May**  
International Workshop on X-Ray Spectromicroscopy and Imaging for Improving Life Conditions and Human Health

**22 - 26 May**  
Fifth International Conference on Perspectives in Hadronic Physics – Particle-Nucleus and Nucleus-Nucleus Scattering at Relativistic Energies

**22 - 26 May**  
Consultancy on Options for Post-Kyoto Regimes and Their Implications for Sustainable Energy Development

**29 May - 3 June**  
Workshop on String Vacua and the Landscape

**29 May - 9 June**  
Third ICTP Workshop on the Theory and Use of Regional Climate Models

**5 - 9 June**  
Conference on Drug Development for the Third World

**5 - 17 June**  
Introductory School on String Theory, Beijing, People's Republic of China

**12 - 23 June**  
School and Workshop on Theory and Technology in Quantum Information, Communication, Computation and Cryptography

**12 - 30 June**  
Summer School on Resolution of Singularities

**26 June - 1 July**  
Workshop on Ion Beam Studies of Nanomaterials: Synthesis, Modification and Characterization



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.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 Scientific Calendar of Activities

Create a new e-mail message and type

**To:** [smr@ictp.it](mailto:smr@ictp.it)

**Subject:** get calendar 2006

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 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:

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You will receive automatic reply messages 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:

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Any comments or suggestions on this service are most welcome. Please address them to [pub\\_off@ictp.it](mailto:pub_off@ictp.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. Katepalli 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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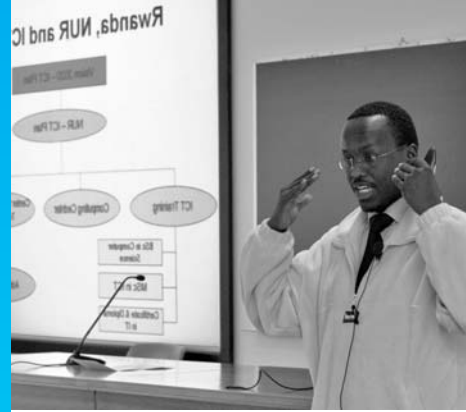
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