NEWS from ICTP

the
abdus salam
international centre for theoretical physics

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Begun just 18 months ago, ICTP's eJournals Delivery Service has expanded to nearly 250 journal titles. Elsevier is the latest publisher to join the effort.

Ready Access

When the Abdus Salam International Centre for Theoretical Physics / Third World Academy of Sciences (ICTP/TWAS) Donation Programme launched the eJournals Delivery Service (eJDS) in autumn 2001, ICTP staff scientist and Donation Programme head, Hilda Cerdeira, hoped that the effort would help overcome a chronic problem faced by scientists who live and work in the developing world: limited access to the most current literature in research fields where new discoveries are often made and announced monthly, if not weekly (see "ICTP's Journals Delivery Service," *News from ICTP*, Autumn 2001, pp. 2-3).

The deceptively simple solution masked the truly breakthrough strategy that was involved. Instead of seeking information directly on the web, eJDS subscribers, who often found themselves short on bandwidth, money, or both, could quickly download files on their email—a solution that was fast, cheap and instantaneous.

Some 18 months later, the project's success is revealed by its numbers. More than 300 scientists from 62 countries now subscribe to the service. As a result, a growing number of scientists from the developing world's most impoverished countries now have the ability to download the most up-to-date scientific literature from a growing list of publishers that includes Academic Press, American Physical Society, Optical Society of America, World Scientific Publishing Co., and, most recently, Elsevier. All told, subscribers can currently tap, via email, the contents of nearly 240 journals, a list that likely includes the most prominent publications in their fields.

Last autumn, e-Journals Delivery Service hosted a roundtable discussion in Trieste to more fully examine the options that are available to provide 'ready' information access to scientists working in isolated areas of the developing world. The meeting, attended by some 50 individuals—representatives of universities, research centres, information providers and publishers—concluded with a list of recommendations outlining the major issues that need to be confronted if the promise of electronic communications is to be realised by all scientists and not just those who are fortunate enough to reside in countries that have the resources to fully partake of these information technologies.

Participants first and foremost concurred that efforts should be made to broaden programmes like eJDS that provide web-to-email access. Such efforts, it was agreed, offer the fastest and cheapest solution to the developing world's information access problems.

Broadening such initiatives, however, will require encouraging additional publishers to join the programme as well as forging strategies for 'literally' spreading the word about the service to scientific communities throughout the developing world, especially scientists in the least developed countries (LDCs).

Participants also agreed that it would be necessary to provide broadbased training to developing world scientists on issues related to communications, networking, and web-enabling technologies. Such training, they added, must take account of local needs and skill levels.

Finally, participants agreed that it was essential to monitor in real-time the rates of connectivity among those working in research and educational institutions in developing countries. Such baseline information is necessary for determining where the bottlenecks exist and ultimately measuring the progress (or lack of progress) that may take place in the future. Efforts to fulfil this goal were put in place last November. To date, 20 developing countries have been surveyed with the help of the PingER project at Stanford Linear Accelerator Center (SLAC) in the United States.

Round Table on Developing Country Access to On-Line Scientific Publishing: Sustainable Alternatives, 4-5 October 2002

New electronic information technologies hold the promise of creating a level playing field for researchers from the North and South. That promise, however, could well be overshadowed by a research landscape marked by sharp peaks and valleys unless scientists from the developing world are able to attain rapid and inexpensive access to the most current literature in their fields.

The recent roundtable discussion in Trieste issued a challenge to scientists and publishers alike not to allow this to happen. The broad framework set out by the participants is designed to ensure that information technologies fulfil their promise by providing universal access to the most current scientific literature to scientists in poor and rich countries alike. It is a challenge that lies at the heart of ICTP itself.□

For additional information about the ICTP/TWAS Donation Programme's eJournals Delivery Service and the full text of the Trieste Recommendations, see http://www.ejds.org and http://www.ictp.trieste.it/ejournals/meeting2002/index.html, or email ejds@ictp.trieste.it.

Lê Dung Tráng
Head, ICTP Mathematics Group

COMMENTARY

Every human being who is capable of learning how to speak a language is also capable of acquiring not just simple but deep mathematical skills, says ICTP's new mathematics group head Lê Dung Tráng.

Culture of Mathematics

Research on brain function and behaviour has highlighted the central role of language in all human activities.

Language is indispensable both for comprehending what is happening around us and for learning new ideas. Put another way, without language it is difficult to understand and to learn.

Research, moreover, also has shown that language is a cornerstone of culture: That the language we speak has a great bearing on who we are—precisely because it serves as a major force driving the socialisation process.

If language is culture-bound, mathematics has long been viewed as a culture-free, universal source of knowledge and understanding.

Yet language at its core evolves around a set of rules and codes that parallel the rules and codes framing mathematics. For this reason, I would contend that language capability is a deep and complex reflection of mathematical capability and that both, in turn, are 'naturally' present in all human beings.

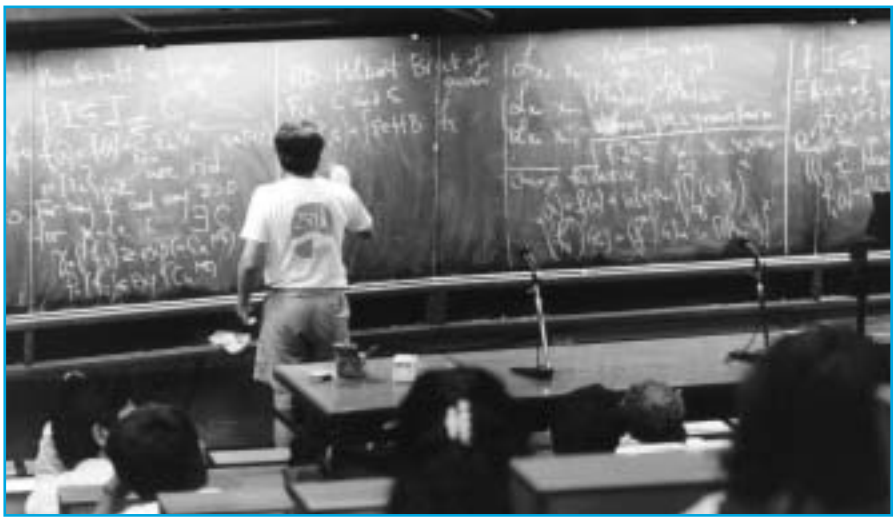
I use the word 'naturally' in a broad sense and not as a concept that language stems only from genetic predisposition. Because of the close ties between language and mathematics, I have concluded that every human being who is capable of learning how to speak a language (that means virtually everyone) is also capable of acquiring not just simple but deep mathematical skills. After all, the logic and abstract understanding embodied in language—translating sounds, images, ideas and facts—into a common base of understanding represents the very principles of mathematics as well. Language skills, however, do not translate easily into mathematical skills. As many math-challenged people will readily admit, mastering mathematics is not easy.

If these common strains between language and mathematics are true, then they raise serious questions about our abiding beliefs in the culture-free universality of mathematics, particularly the creation of mathematics. Perhaps it is not by chance that the Greeks invented geometry or that the Arabs invented algebra.

Instead of concluding that mathematics—and, by implication, science—progresses on the shoulders of individual geniuses, we should consider the fact that progress is driven, in part, by differences in cultures that enable gifted individuals within these cultures to explore and shed light on unanswered mathematical problems from different perspectives.

These differences may be comparable to those we find in musical expression among various cultures. Everyone follows the same scales and notes but the sound of the music—and the pleasure we derive from such sounds—varies enormously. And so do the compositions of a culture's most gifted musicians.

Today we continue to find differences in mathematical interest depending on the culture involved. French-born mathematicians, for example, have a preference for large systems, particularly those related to algebra and geometry. US-born mathematicians lean towards topology, most notably low dimensional topology. Italian mathematicians often concentrate on geometry, especially algebraic geometry, while Japanese mathematicians have displayed keen interest in mathematical formulae and combinatorial mathematics.



What are we to make of these diverse preferences for the study of mathematics? We still do not know enough about the relationship between genetics and nurturing to determine whether these differences are simply intriguing facts without explanation or a reflection of something deeply revealing about the essence of mathematics and culture.

No one would claim that language is disconnected from culture. It may now be time to consider that the same is true of mathematics.□

ICTP has recently joined the race for fast computers. It's a decision likely to help keep researchers throughout the Centre on track.

Fast Computers, Real Phenomena

No group is more amazed by the simplicity and beauty of the fundamental laws of physics than theoretical physicists themselves, particularly when their own fields of study shed unexpected, yet revealing, light on the variety and complexity of the laws' manifestation in nature.

Sandro Scandolo

How can Schrödinger's equation, a tidy example of mathematical synthesis, describe the messy arrangement of atoms that compose the paper that this article is written on? And how can the three Navier-Stokes equations, which can easily fit on the back of an envelope, reveal a great deal about the aerodynamics of flight?

Equally interestingly, what is it about the laws of physics that enable scientists to predict such physical phenomena as climate dynamics and the creation of such materials as superhard solids from the bottom up (or perhaps more accurately from the top down)—that is, from the basic laws of classical and quantum mechanics.

Using computers to solve the fundamental laws of physics and provide answers to such complex questions has a long history, which began in the 1940s with the pioneering and visionary work of John von Neumann at Los Alamos National Laboratory in the USA.

Luckily, human endeavour in this field has been paralleled by breathtaking increases in the speed and memory of computers. As a result, such simple problems as a computer synchronising the rinse-and-spin cycle on a washing machine, which could only be solved on rudimentary punch-card machines 30 years ago, now require just a tiny portion of a computer chip for their calculation.

Even more startling to consider is the fact that new computer processors for desktop PCs experience a doubling of capacity every 18 months, according to Moore's celebrated law, named after Gordon Moore, the famed co-founder of Intel, who first presented this insight in 1965.

"Simulating the behaviour of matter at the atomistic scale by solving Schrödinger's equation is one activity among many in the very active and prolific field of computational physics, which has received a tremendous boost over the past 20 years due to a rapid increase of computer capabilities," says Sandro Scandolo, one of the newest members of the ICTP condensed matter physics group. "We can now determine with a high degree of accuracy the electronic and mechanical properties of solids and in some cases find interesting surprises."

Three years ago, for example, a group of scientists at the International School for Advanced Studies (SISSA) that included Scandolo and Erio Tosatti, currently ICTP's acting deputy director, discovered that simulations of the compression of carbon dioxide to one million atmospheres transformed this inert and innocent gas into superhard solid material. Their findings immediately prompted a global experimental search for this new material, which was synthesized the same year following the same route—extreme compression—by scientists at Lawrence Livermore National Laboratory, USA.

Climate prediction is another field where computer simulations are extremely helpful.

"Numerical models of the climate system, including the atmosphere, oceans and ice caps, have developed to a stage that allows us to understand the interactions between 'natural' climate variability and the climatic impacts of human activities," says Franco Molteni, staff member in the Physics of Weather and Climate group. "Indeed, simulations developed by the Intergovernmental Panel on Climate Change (IPCC) projecting future climate scenarios have been based

Franco Molteni

on numerical models created by some of the most powerful supercomputers in the world."

But computer simulations are not just an indispensable tool for high-level scientific research. They have also become a valuable teaching instrument in universities and research centres in both the North and the South.

"Computer literacy in most developing countries is growing at an extremely rapid rate, possibly faster than literacy in the basic sciences," says Scandolo, "thanks to the internet and the increasing availability of PCs with high performance and low cost. We need to take advantage of this global market trend and turn it into an opportunity to foster education in physics and other basic sciences in developing countries."

In fact, the improvements in hardware performance are so rapid that the performance of a $10,000 top-of-the-line processor today can be replicated in two-years' time by a $1,000 processor in a desktop PC.

Two years are an extremely brief period on the time-scale of scientific progress. This means that high-quality scientific achievements in computationally oriented disciplines can be obtained with financial investments that are affordable for institutions in less developed countries. Put another way, money and, consequently, time are not the obstacles they used to be for scientists who draw on computer-driven calculations for their research.

Equally encouraging, the rapid narrowing of the performance/cost ratio for PCs has brought a welcome paradigm shift in the design of high-performance machines for scientific computing.

In the past, high-performance computers had to be tailored to the needs of the scientific community. The fastest computers in the 1970s were constructed explicitly for scientific applications. Nowadays, parallel computers based on dozens of standard PC processors, assembled and interconnected with a fast network, provide computational power that exceeds by orders of magnitude that of the fastest machines available in the 1970s, satisfying the needs of banks, insurance companies and scientific institutions alike.

ICTP has taken advantage of this 'building block' approach by recently acquiring a cluster of 80 PC processors. This cluster will dramatically boost in-house computational research capabilities—a turn of events especially welcomed by staff and visiting scientists in the fields of condensed matter physics and physics of weather and climate.

"We are excited by this opportunity," says Molteni, "which will give us the ability to test climate simulations on a time scale of up to 100 years. Also, by running several simulations based on a variety of conditions, we can distinguish the effects of the chaotic nature of climate dynamics from the 'greenhouse' gas and aerosol effects caused by human activities."

"On another research front, a parallel computer with such a large number of processors will finally allow us to test whether water becomes metallic at the extreme conditions found in the interiors of Uranus and Neptune, a speculation that we put forward a few years ago, but that is still awaiting confirmation from simulations on a larger scale," Scandolo adds.

Ralph Gebauer, also with the Condensed Matter Physics group, has a different but equally enticing vision of future accomplishment: "I'd like to understand the physical mechanisms that control transport and dissipation in molecular junctions, the building blocks of the future generations of processors." In other words, Gebauer would like to tap the capabilities of today's computers to lay the theoretical groundwork for even faster computers in the future.

Scientific research is often like a marathon—with the winners usually those who are intellectually fit enough to stay the course. But progress in this marathon requires the ability to win sprints as well, and increasingly fast computers provide the 'data track' you need to stay in the day-by-day competition.

Now, with the recent arrival of in-house fast computers, ICTP scientists have found themselves in the enviable position of being able to compete in both the short- and long-distance runs that increasingly characterise the nature of competition in their fields. Such an environment has positive implications not just for global science but for our global community as well.□

ICTP computer bank

The ICTP College on Soil Physics celebrated its 20th anniversary this year. The activity has proved a valuable source of training for hundreds of scientists worldwide.

Soil Physics: Twenty Years On

In 1980, while attending the ICTP Autumn Course on the Physics of Flow in the Oceans, Atmosphere and Deserts, Donald Gabriels casually sat down for lunch in the Centre's Main Building cafeteria. As he turned to his side, he was surprised to see the Centre's director, Abdus Salam, sitting next to him.

"Our conversation was what you would expect—seemingly nothing more than casual cafeteria chatter," Gabriels, a professor of agricultural engineering, University of Ghent, Belgium, recently recalled. "Salam asked me which activity I was participating in and what was my major field of research."

"Soil physics, I told him."

"You should prepare a course outline on the subject, Salam quickly replied, and send it to me. Perhaps we can organise a workshop here."

"Delighted by his invitation, several weeks after returning to my university, I sent Salam a detailed course outline and a brief description of the workshop's objectives. He responded in short order, saying the Centre had tentatively scheduled to hold a training activity on the subject. It was one of the most extraordinary turns of events in my career."

And, as Gabriels would subsequently learn, an unusual example of the sometimes positive power of miscommunication. You see, at their lunchtime encounter, Salam thought that Gabriels had said his major field of interest was *solar*—not *soil*—physics.

"Salam was expecting a course outline dealing with subjects close to the Centre's core fields of study in theoretical physics—perhaps an exploration of issues related to subatomical behaviour dealing with sunspots, solar magnetism and hydrogen bounding. What he received, instead, was a course outline with such headings as soil erosion, compaction and siltation."

"But rather than dismissing what I had given him, Salam was intrigued enough to let the proposal move forward. Only several years later, after our biennial colleges on soil physics had become a regular feature on the ICTP calendar, did Salam let me know that the activity was based on a mutual misunderstanding of what we had talked about at lunch."

The chance encounter—and misunderstanding—between Salam and Gabriels, which took place more than two decades ago, unwittingly laid the groundwork for one of ICTP's most unusual activities: the College on Soil Physics. Over time, some 500 scientists—80 percent of whom are from developing countries—have participated in the programme, which this March celebrated its 20th anniversary.

What is soil physics? In the simplest terms, it is the study of the physical characteristics of soil. Put another way, which emphasizes the dynamic processes that drive soil formation, use and evolution (and not just the medium itself in a static state), soil physics is the study of the physical laws of nature governing the behaviour of soil.

"While the definition of soil physics may appear simple," adds long-time College organiser Edward Skidmore, "the reality is that soil physics is a subject of infinite complexity.

Edward Skidmore, Donald Gabriels, GianCarlo Ghirardi, Ildefonso Pla Sentis and Donald Nielsen

The study—and, equally important, the potential applications—of soil physics involve an understanding not only of physics but of biology, chemistry, hydrology, engineering and even land-use management." Skidmore, a research leader at the US Department of Agriculture, Agricultural Research Service, Manhattan, Kansas, has also served as one of the principal architects of the activity since its inception.

The reason soil physics is so complicated lies in the fact that the health and behaviour of the soil depends on a complex interplay of factors: the physical and chemical composition of the soil; the diversity of flora and fauna living within the ecosystem in which a particular type of soil is present; the number and variety of soil microbes; the altitude and slope of the landmass; the rate and intensity of rainfall; and the density of human population and patterns of land development.

"Those who study soil physics," adds Donald Nielsen, a former dean at the University of California, Davis, USA, and the third 'founding' organiser of the event, "must process large amounts of data and information in order to build

models that help us understand and, at times, anticipate soil behaviour under ever-evolving conditions—some of which are induced by nature, others by human activities.'' In developing such models, soil physicists must continually excavate a complex academic terrain that resides at the unspecified boundaries of mathematics, physics, chemistry, biology and agricultural science.

But, as Nielsen is quick to add, "soil physics is not just an academic exercise. It carries important implications for understanding and responding to some of the most critical issues of our time: food security, access to safe drinking water, air and water pollution, and the prospects for such natural disasters as flooding and landslides." To shed light on these critical phenomena, soil physicists need to examine such complex environmental forces as erosion, water flow, runoff, soil transport, and carbon and oxygen diffusion.

The wide ranging critical issues that draw on information and insights provided by soil physics were on full display at this year's College, which took place from 3 to 21 March. Researchers came from a variety of fields that included not only physics but agricultural science, biology, chemistry, engineering, forestry and land-use management. Their places of work ranged from academic research centres to governmental agencies to universities to burgeoning private-sector consulting firms. Fifty-five out of 57 participants came from developing countries or countries with economies in transition.

The participants' scholarly research and on-the-ground work-related projects ranged from the construction of an irrigation system in the drought-prone Indian province of Guwahati; to the study of soil composition in Ghana, where food shortages remain a threat to public health and the physical well-being of the citizens; to the development of soil-related instruments in Brazil that help to measure the soil's water-retention capabilities, which is a critical parameter in determining the soil's potential health and long-term viability for food production.

The personal commitment and enthusiasm that participants at the College had for their work was clearly conveyed in how they chose to describe what they did.

"Don't call it dirt. It's not dirty. In fact, it's one of cleanest, most pristine materials that you would ever want to handle," says Daniel Okae-Anti, an agricultural scientist at the University of Cape Coast in Ghana, who was attending the College for the third time.

Okae-Anti's good natured but heartfelt description reflects his deeply rooted personal commitment to the study of soil genesis, which involves analysing the parent materials—the rock, sand, water, chemicals and microbes—that interact with one another under ever-changing climatic and weather conditions to create a particular category of soil. Okae-Anti notes that scientists have identified more than 200 orders or classes of soil worldwide and that each one of these orders may be divided into subcategories based on virtually endless local and regional ecological factors and processes.

Other participants at the College, including Gautam Barua, a professor of civil engineering at the Indian Institute of Technology, in Guwahati, India, and Carlos Vaz, an agricultural researcher at EMBRAPA's (*Empresa Brasileira de Pesquisa Agropecuária*) Agricultural Instrumentation Institute, in São Paulo, Brazil, share Okae-Anti's sense of commitment to the study of soil. All agree that what they do represents more than a job to them.

"My work in India will help continue my country's efforts to increase the nation's food supply," says Barua. "We now recognise that increasing the level of food production in the short term cannot take place at the expense of the long-term health of the soil, which could suffer from rising levels of salinisation if our irrigation systems deplete groundwater levels faster than they can be replenished. The models that I helped to devise have enabled us to create engineering blueprints that serve both our short- and long-term needs for healthy and productive soil."

"The tensiometers that I designed," notes Vaz, "have allowed field workers to record valuable information on the level of water in the soil and the ability of the soil to retain water during periods of low rainfall. Such data is critical for determining the soil's potential productivity as well as its responsiveness to crop-rotation or irrigation strategies that might be implemented. In a sense, agriculture throughout much of the world has become an information-intensive industry and what I do helps increase the level of scientific data that both farmers and agricultural policy makers need to succeed."

"Just like beauty," Barua adds, "details are in the eyes of the beholder. And our ability to better understand the intricate nature of soil—in all of its elegant complexity—holds the key to addressing some of the world's most critical concerns."

"Some people may call it dirt, but on closer inspection, the soil is indeed one of nature's most elegant media and, more importantly, the basis of one of earth's most fundamental life-giving elements: our food supply."

For the past two decades, the ICTP College on Soil Physics has helped train hundreds of scientists to better apply their skills and talents to such a vital concern. This year—the 20th anniversary of the College—offered an opportunity for participants to extend their thanks to those who have made the activity possible, most notably directors Donald Gabriels, Edward Skidmore, Donald Nielsen and, more recently, Ildefonso Pla Sentis, coordinator of *Escuela Latinoamericana de Física de Suelos* (ELAFIS), as well as GianCarlo Ghirardi, professor of theoretical physics at the University of Trieste and long-time ICTP consultant, who has been the College's local organiser since the beginning.

If the enthusiasm displayed by the participants of this most recent College is any indication of things to come, the 20th year anniversary will likely be followed by many more Colleges in the years ahead.□

DATELINE

Ecological Economics

The Ecological and Environmental Economics programme, an activity that ICTP will host through 2004, held its official launch on 10 February. **Robert Solow**, Nobel Laureate in economics (1987), participated in the official launch in ICTP's Kastler Lecture Hall. The

event was part of the First School on Ecological Economics that began on 27 January with a series of 'teaching workshops.' The initiative is promoted under an agreement with the Beijer International Institute of Ecological Economics, Sweden, and *Fondazione ENI Enrico Mattei*, Italy. For additional information, please contact eee@ictp.trieste.it.

IUPAP in Trieste

The International Union of Pure and Applied Physics (IUPAP) executive council and commission chairpersons met at ICTP on 24-25 January to plan IUPAP's activities for the next three years. A key topic on the agenda was potential strategies for helping developing

countries improve their education and research programmes. Special attention was paid to the role that ICTP and the Third World Academy of Sciences (TWAS) could play in these efforts. Other topics discussed included professional ethics, the state of physics in Italy, and planning for the World Year of Physics, which will be celebrated in 2005.

Chaudhari to Head Brookhaven

Praveen Chaudhari, chairperson of the ICTP Scientific Council, has been appointed director of Brookhaven National Laboratory, which is part of a network of national laboratories operated by the US Department of Energy. Chaudhari was employed at IBM for more than 30 years as a scientist and senior manager of research, rising to the position of vice president for science. An expert in condensed matter physics, he has published more than 150 research articles and has received 22 patents. Chaudhari has served as chairperson of the ICTP Scientific Council since 1998.

L'Oréal Prize to Weissmann

Mariana Weissmann receiving the L'Oréal-UNESCO Prize from Koïchiro Matsuura, Director General of UNESCO

Former ICTP Senior Associate (1985-1994) **Mariana Weissmann**, senior researcher at *Comisión Nacional de Energía Atómica* in Buenos Aires, Argentina, who has visited ICTP on numerous occasions over the past two decades, has been awarded the L'Oréal-UNESCO Prize for Women in Science. The prize, given each year to five women scientists (one from each of the five continents), carries a cash award of US$100,000. This year's competition focussed on material science. Launched in 1999, L'Oréal-UNESCO Prize for Women in Science has become one of the world's most prestigious prizes for women scientists. For additional information, see www.forwomeninscience.com.

EU to Trieste

Christian Patermann, Director of Environment, Marine Ecosystems and Biodiversity at the European Commission (EC), visited Trieste's international scientific institutions on 19-20 February to discuss potential areas of participation under the European Union's (EU) 6th Framework Programme for scientific research and technological development. He spoke of EU's keen interest in working in partnership with scientific institutions in the developing world and expressed hope that the institutions that make up the Trieste System—most notably, ICTP, the Third World Academy of Sciences (TWAS), the International Centre for Genetic Engineering and Biotechnology (ICGEB), and the International Centre for Science and High Technology (ICS)—could serve as an important conduit between the North and South.

ICTP Director "Abdus Salam Professor"

In addition to his position as director, **Katepalli R. Sreenivasan** has been named the Abdus Salam Honorary Professor of the International Centre for Theoretical Physics. The professorship, named after ICTP's founding director, is designed to recognise Sreenivasan's outstanding qualifications as a high-level scientist in the fields of statistical and nonlinear mechanics, turbulence, and the physics of fluids, as well as his intention to continue his own active research programme while serving as director.

Tosatti Deputy Director

Erio Tosatti, ICTP's acting director from June 2002 to March 2003, will continue to serve the Centre as acting deputy director until June this year, when he will return full-time to the International School for Advanced Studies (SISSA). Tosatti's presence will help ensure a smooth transition for ICTP's new director, K.R. Sreenivasan, who began his tenure in March.

Science in Muslim Countries

The InterAcademy Panel on International Issues (IAP) and the Third World Academy of Sciences (TWAS), whose secretariats are located on ICTP's campus, hosted a workshop on capacity building for science academies in countries with predominantly Muslim communities on 5-7 March. The workshop concluded with a one-day symposium examining science, religion and values. The list of attendees included Atta-ur-Rahman, chair, Higher Education Commission, Pakistan; Bruce Alberts, president, US National Academy of Sciences; and Abdulaziz O. Altwaijri, director general, Islamic Educational, Scientific and Cultural Organization (ISESCO). For additional information, contact iap@twas.org.

Jagla New CM Staff Member

Argentinean-born **Eduardo Alberto Jagla** is the newest member of the ICTP condensed matter physics group. He joined the group earlier this year. Jagla received his Ph.D. from the University of Bariloche concentrating his studies on vortex dynamics in superconductors (the subject of his thesis) and strongly correlated systems. Since then, his research has focussed on the theoretical underpinnings of phase transitions. His studies in this field have contributed to our understanding of anomalous behaviour in such substances as water and silica. A frequent visitor to ICTP over the past decade, Jagla most recently served as researcher of *Consejo Nacional de Investigaciones Científicas y Técnicas* (CONYCET) at *Instituto Balseiro*, Bariloche, Argentina.

Bhattacharya TIFR Director

Condensed matter experimentalist **Sabyasachi (Shobo) Bhattacharya**, who attended a number of ICTP training activities during the 1990s, has been appointed director of the Tata Institute of Fundamental Research (TIFR) in Mumbai, India. TIFR, with 400 scientific staff, is one of India's premier research institutions.

Salam Prize to Farhan Saif

Farhan Saif, assistant professor at the Department of Electronics of Quaid-i-Azam University, Islamabad, Pakistan, has been awarded the Salam Prize in the field of physics. Farhan Saif has participated in several ICTP conferences and schools in condensed matter physics since 1997. The Salam Prize is given on a rotating basis in the fields of physics, chemistry, mathematics and biology. Begun in 1981, it is awarded to Pakistani scientists, younger than 35 years of age, who live and work in their native country. Founder and long-time ICTP director Abdus Salam, who won the Nobel Prize in physics in 1979, used a portion of his prize money to launch the award. Comparable Salam prizes are given to scientists in Egypt, Morocco, Palestine and Syria.

ACTIVITIES

ELEVENTH INTERNATIONAL WORKSHOP ON COMPUTATIONAL PHYSICS AND MATERIAL SCIENCE: TOTAL ENERGY AND FORCE METHODS

16 - 18 January

Co-sponsors: DEMOCRITOS (DEmocritos MOdeling Centre for Research In aTOmistic Simulation) National Simulation Center of the Italian National Institute for the Physics of Matter (INFM, Trieste, Italy), International School for Advanced Studies (SISSA, Trieste, Italy) and European Commission (Brussels, Belgium).

Directors: R. Martin (University of Illinois, Urbana, USA), M. Finnis (Queen's University, Belfast, UK) and S. Baroni (SISSA and DEMOCRITOS-INFM).

WINTER COLLEGE ON NUMERICAL METHODS IN ELECTRONIC STRUCTURE THEORY

16 January - 4 February

Co-sponsor: DEMOCRITOS (DEmocritos MOdeling Centre for Research In aTOmistic Simulation) National Simulation Center of the Italian National Institute for the Physics of Matter (INFM, Trieste, Italy).

Directors: S. Baroni (International School for Advanced Studies, SISSA, and DEMOCRITOS-INFM, Trieste, Italy), A. Dal Corso (SISSA and DEMOCRITOS-INFM), S. de Gironcoli (SISSA and DEMOCRITOS-INFM) and P. Giannozzi (*Scuola Normale Superiore*, and National Enterprise for nanoScience and nanoTechnology, NEST-INFM, Pisa, Italy).

Stefano Baroni

Sir Partha Dasgupta

SCHOOL ON ECOLOGICAL ECONOMICS and CONFERENCE ON THEORETICAL TOPICS IN ECOLOGICAL ECONOMICS

27 January - 28 February

Co-sponsors: Beijer Institute of Ecological Economics (Stockholm, Sweden) and *Fondazione ENI Enrico Mattei* (Milan, Italy).

Directors: P. Dasgupta (Cambridge University, UK) and K.-G. Mäler (Beijer Institute).

Local Organiser: M. Marsili (ICTP).

SCHOOL ON RADIO USE FOR INFORMATION AND COMMUNICATION TECHNOLOGY

3 - 21 February

Co-sponsors: International Union of Radio Science (URSI, Ghent, Belgium) and Telecommunication Development Bureau of the International Telecommunication Union (ITU/BDT, Geneva, Switzerland).

Directors: S.M. Radicella (ICTP) and R.G. Struzak (ITU).

Local Organiser: S.M. Radicella (ICTP).

Setting a long-distance link across the Gulf of Trieste

WINTER COLLEGE ON BIOPHOTONICS: OPTICAL IMAGING AND MANIPULATION OF MOLECULES AND CELLS

10 - 21 February

Co-sponsors: International Commission for Optics (ICO, Orsay, France), Optical Society of America (OSA, Washington, D.C., USA), International Society for Optical Engineering (SPIE, Bellingham, Washington, USA) and International Society on Optics Within Life Sciences (OWLS, c/o *Universität Münster*, Germany).
Directors: G. von Bally (*Universität Münster*, Germany), P. French (Imperial College, London, UK) and S. Pavone (European Laboratory for Non-linear Spectroscopy, LENS, and University of Florence, Italy).
Local Organiser: G. Denardo (ICTP and University of Trieste).

COLLEGE ON SOIL PHYSICS

3 - 21 March

Directors: D. Gabriels (Ghent University, Belgium), D. Nielsen (University of California at Davis, USA) and I. Pla Sentis (*Universidad Central de Venezuela*, Maracay, Venezuela, and *Universitat de Lleida*, Spain).
Local Organiser: GC. Ghirardi (University of Trieste and ICTP).

College on Soil Physics

CONFERENCE ON MONSOON ENVIRONMENTS: AGRICULTURAL AND HYDROLOGICAL IMPACTS OF SEASONAL VARIABILITY AND CLIMATE CHANGE

24 - 28 March

Co-sponsors: PROMISE Project of the European Commission, World Climate Research Programme (WCRP, Geneva, Switzerland), and Climate Prediction and Agriculture (CLIMAG) Project of START (global change SysTem for Analysis, Research and Training, Washington, D.C., USA).
Directors: E. Black (Centre for Global Atmospheric Modelling, CGAM, Reading University, UK), F. Molteni (ICTP) and J. Slingo (CGAM).

SPRING SCHOOL ON SUPERSTRING THEORY AND RELATED TOPICS

31 March - 8 April

Directors: E. Gava (Italian National Institute for Nuclear Physics, INFN, Trieste, Italy), K.S. Narain (ICTP), H. Ooguri (California Institute of Technology, Pasadena, USA), S. Randjbar-Daemi (ICTP) and A. Sen (Harish-Chandra Research Institute, HRI, Allahabad, India).

Sandip Trivedi

Prize for Optics

The official ceremony honouring the 2002 and 2003 recipients of the ICO (International Commission for Optics)/ICTP Award took place on Thursday 20 February in the Main Lecture Hall. **Alphan Sennaroglu**, associate professor of physics and electrical engineering, Department of Physics, Koç University, Istanbul, Turkey, won the 2002 award for his contributions to our understanding of ultrashort pulse generation related to the development of solid-state lasers and his theoretical studies of power optimisation.

Robert Szipöcs, head of the laboratory at the Research Institute for Solid State Physics and Optics, Budapest, Hungary, won the 2003 award for his contributions to our understanding of 'chirped' multilayer mirrors related to ultrafast optics. The ceremony, which featured lectures by each of the prize winners, took place during the ICTP Winter College on Biophotonics, held from 10-21 February. The ICO/ICTP Award, launched in 2000, recognizes the work of researchers from developing countries or countries with economies in transition, who are less than 40 years old and have made significant contributions to the field of optics. For additional information about the award, see www.ictp.trieste.it/~sci_info/awards/ICO/ICO.html.

Abdus Salam Street

Toronto, Canada, has honoured Abdus Salam, the founding director of ICTP, by naming a street after him. He is one of many Muslim scholars, including Sir Zafrullah Khan, Hakeem Noor Uddin, and Mirza Nasir Ahmad, whom Canada's largest city is recognising for their contributions to humanity.

Library Renovation

Renovations on the 'old' Library wing, housing the Centre's book collection, have been completed. Firewalls, smoke detectors and an emergency exit have been installed to bring the wing up to current safety and security standards. New lighting and carpeting will provide a more research-friendly environment for Centre visitors.

Centre and City

The ICTP Cultural Committee hosted an exhibition featuring photographs by ICTP's chief photographer **Massimo Silvano** (left). "The Centre and the City" featured images of Trieste's coastline conveying the enduring role the sea and now science have played in the city's development.

IN MEMORIAM

Attia Abdel-Kader El-Sayed, an ICTP Associate since 2000, died on 11 February. He was 39. El-Sayed, a native of Egypt, last visited the Centre in summer 2002 and was scheduled to return to Trieste this year as a Fellow of ICTP's Training and Research in Italian Laboratories (TRIL) programme. El-Sayed, who received his doctorate from Uppsala University in Sweden, worked as a professor of seismology at Mansoura University in Egypt, where he pursued a broad research agenda in geophysics. At the time of his death, El-Sayed was serving as coordinator of a seismology network in North Africa supported by ICTP's Office of External Activities.

Pierluigi Romita (right), a well-known Italian politician, died on 22 March in Milan. Born in Turin in 1924, during World War II he participated in the resistance against the German occupation. Romita was subsequently elected to the Italian parliament in 1958 as a member of the Social Democratic Party. In 1972, he was appointed minister for science. In this capacity, Romita visited ICTP the following year, meeting Abdus Salam (left). Holding a number of government posts over the next two decades, he visited the Centre on several occasions helping to strengthen the ties between ICTP and the Italian scientific community. In 1989 he was elected to the European Parliament in Strasbourg, France, where he served until 1994.

PROFILE

Former ICTP Diploma Course student, Tino Shawish Nyawelo from Sudan, recently visited ICTP. His journey has come full circle beginning as a student and now returning as a lecturer.

Life's Symmetries

As Tino Shawish Nyawelo stepped up to the podium to deliver the seminar "Singular Metrics in Supersymmetric Sigma-Models" this past January, he could see a number of faces in the audience with expressions that seemed to match his own just five years ago: "Yes, it's been a difficult six months," some of the students seemed to say, "but we think we're finally on our way."

It was in September 1997 that Nyawelo arrived in Italy from his native country of Sudan to begin an intensive year of study in the ICTP Diploma Course programme.

"The first six months," Nyawelo recalls, "were tough. By November, I had become so frustrated that I almost quit. But both my friends and the Centre's professors—notably, Goran Senjanovic, my advisor, and Faheem Hussain, then co-ordinator of the Diploma Course programme in high energy physics—encouraged me to stay. Heeding their advice and concerned about how I would explain to my family and colleagues why I had come home empty handed, I decided to stay."

Nyawelo took his first set of exams in January—and passed. "That was the turning point. Things became easier for me after that."

Language had something to do with Nyawelo's slow, frustrating start. "Although both my parents speak English and I am fluent in the language, my studies at the Sudan University of Science and Technology in Khartoum were in Arabic. We had no textbooks. Consequently, my knowledge of physics and mathematics was based entirely on the lecture and classroom notes that I had taken. The fact is that I didn't know the terminology when I arrived at ICTP. Even the simplest concepts carried names that were foreign to me."

Once he overcame the 'language' problem, Nyawelo faced another serious obstacle. Upon learning how to understand and speak in the classroom, he soon realised that he did not know as much as many of the other students. "Diploma students begin their studies here in Trieste with vastly different levels of knowledge and skills. My knowledge and skills were not very high. So I had to study especially hard to catch up."

And catch up he did. Nyawelo received his graduation certificate from the Diploma Course programme in September 1998. He was then appointed a visiting scientist at the National Institute for Nuclear and High Energy Physics (NIKHEF) in The Netherlands. He entered the doctorate programme at NIKHEF in 2000 and expects to receive his degree sometime early next year.

"My research—from the time of my Diploma Course thesis at ICTP to my doctoral thesis at NIKHEF—has always focussed on the geometric and algebraic aspects of supersymmetry. More specifically, I construct mathematical models related to the fundamental interactions of subatomic particles."

Nyawelo's efforts not only mark a personal triumph but also hold significant promise for his native country of Sudan.

"My doctorate degree in high energy physics, with a special focus on supersymmetry, will make me the only person in Sudan with a Ph.D. in this field. In fact, there are only 10 to 15 Sudanese-born professors with Ph.D.s in any field of physics in the entire country."

Their efforts are supplemented by contract professors from Iraq, Syria and several other nations. In addition, institutes like Leiden University and the University of Amsterdam have visiting professorship programmes with universities in Sudan that enable physics professors from The Netherlands to spend a couple of weeks there each year.

"Given the circumstances," Nyawelo notes, "one person with a doctorate can make an enormous difference." In fact, Nyawelo's value to his home country is already being felt. "I am on the faculty of the Sudan University of Science and Technology's physics department and returned there in 2000 and 2001 to interact with teachers and students. It's an arrangement that I hope to continue while spending several years as a postdoctorate in Europe or the United States."

In the meantime, Nyawelo will continue to work on research problems related, for example, to 'singular metrics in supersymmetric sigma-models,' 'holomorphic killing vectors,' and 'the particle spectrum in the unitary gauge.'

As Nyawelo's facility both with these words and concepts clearly convey, the terminology that physicists and mathematicians use to communicate no longer poses an obstacle to his success. Indeed they have become the 'mastered' tools of his trade.□

22 April - 9 May
Workshop and Conference on Recent Trends in Nonlinear Variational Problems

5 - 16 May
International Workshop on Proteomics: Protein Structure, Function and Interactions

12 - 16 May
Fourth International Conference on Perspectives in Hadronic Physics

12 - 23 May
Workshop on the Use of the Simpacts Model for Estimating Human Health and Environmental Damages from Electricity Generation

19 - 28 May
ICTP-INFM Spring School on Magnetic Properties of Condensed Matter Investigated by Neutron Scattering and Synchrotron Radiation

19 - 30 May
Workshop on Nuclear Data for Science and Technology: Materials Analysis

26 May - 6 June
ICTP Workshop on the Theory and Use of Regional Climate Models

1 - 18 June
Summer College and Conference on the Physics and Chemistry of Rare-Earth Manganites

2 - 13 June
School on Mathematics in String and Field Theory

16 - 27 June
Course on Climate Variability Studies in the Ocean "Tracing and Modelling the Ocean Variability"

16 June - 4 July
Summer School on Particle Physics

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 2003`
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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