



NEWS *from* ICTP



the
abdus salam
international centre for theoretical physics



2 WHAT'S NEW
Plans in the Making

8 DATELINE
Awards and Prizes
Trekkies and Weather

13 PROFILE
Jacob Palis's
Dynamical Career

3 COMMENTARY
Changes in the Works

10 REPORTS
October - December 98

14 MONITOR
Visitors, Friends
and Artists

4 FEATURES
Cuban Connections
Bugged Out

**WINTER
1999
#87**

15 WHAT'S NEXT
Conferences, Schools
and Workshops

Plans in the Making

In today's world, there is an ever-increasing demand for scientific research and training institutions to provide 'tangible' proof of accountability to their public and private sponsors.

That's how the opening sentence of ICTP's draft strategic plan reads. In a sense, this brief statement—less than 30 words—provides a short-hand justification for the 95-page report that follows.

Critics often ask what purpose does a strategic plan serve? So much of science, after all, depends on individual insight and determination. Meanwhile, so many scientific breakthroughs evolve from unexpected outcomes. Serendipity, in short, doesn't lend itself to long-range plans. What's needed, instead, is an intelligent, committed staff and eager, well-trained students who are given the freedom to take advantage of the opportunities that present themselves.

That may be true. However, in an age marked by increasing external oversight, scientists can no longer assume that they can avoid public scrutiny. Indeed an unwillingness or inability to explain the value of their research to the public carries increasing risks as competition for research funds intensifies.

That's one of the reasons why ICTP Director Miguel Virasoro asked both the Centre's scientists and administrative staff to contribute to a strategic plan outlining the changes and expanded activities that they would like to see implemented between now and 2003. Entitled "Toward a Long-Range Plan," the report offers a blueprint for the future based on the Centre's fondest hopes.

The document, spearheaded by physicist Juan Roederer, who has been associated with the Centre for more than three decades, not only provides a road map for the future, but is designed to help ICTP scientific and administrative staff to evaluate the Centre's current priorities.

The plan will be presented to the United Nations Educational, Cultural and Scientific Organization (UNESCO), the International Atomic Energy Agency (IAEA), and the Italian government to help officials better appreciate the Centre's mission and goals. Its debut, in fact, took place during the 1998 meeting of the ICTP Steering Committee, held in November. This spring, ICTP's Scientific Council will have an opportunity to formally examine the plan, as will UNESCO during the organization's biennial evaluation process. In response to these assessments, Centre officials "plan" to revise the "plan" based on the recommendations made by each of these institutions.

And that's a critical point. ICTP's strategic plan is an evolving document intended to help the Centre evaluate its mission and goals in a clearer light. Such internal assessments, combined with external scrutiny, will enable the ICTP to meet the challenges that lie ahead while remaining true to the principles that have made it one of the world's most unique scientific research and training facilities. □



Changes in the Works



ICTP is a dynamic institution worthy of its global reputation. Nevertheless, like all institutions, the Centre must change to meet future challenges. I would like to outline some critical administrative areas that will receive special attention in the months and years ahead.

Budget Matters. On 1 January 1996, the mantle of administrative control of the ICTP passed from the International Atomic Energy Agency (IAEA) to the United Nations Educational, Scientific and Cultural Organization (UNESCO). The transfer marked the end of one era and the beginning of another.

Simply put, the Centre moved from an administrative environment marked by strict central control to one of greater autonomy and independence. Unlike the past, the Centre now shoulders responsibility for its treasury, accounting and budget. It has established its own financial rules. It will soon have its own personnel procedures.

That's why the Centre has embarked on a full-scale effort to computerize its financial system, which will be completed by the end of this year. Computerized accounts will provide immediate information on the flow of funds both in and out of the Centre, giving staff a better handle on its money matters. And, in the years ahead, we plan to computerize and integrate information about other administrative programs, including the Scientific Information Services, Housing and Visa programs.

In addition, ICTP will also establish a line-item operational budget for 1999. Monthly reports will be issued enabling program

leaders to assess their ongoing expenditures. The goal is twofold: to place day-to-day financial responsibility in the hands of ICTP's program leaders and to give our sponsors a clear accounting of how their money is being spent.

Staff Development. On the one hand, ICTP has experienced little staff turnover over the past decade. On the other hand, our employees have had few opportunities for advancement. To build enthusiasm and encourage new ideas, it has become essential for the Centre to emphasize staff training in computing and other skills, especially interpersonal management.

Last November, we took our first steps in meeting this goal by offering a week-long computer training course and introducing a voluntary staff rotation program. Early this year, we will begin offering management and supervisory training courses. The initiatives are based on this premise: Scientific excellence cannot be isolated from administrative excellence.

Facility Improvements. First-class scientific research requires up-to-date facilities. That's why the ICTP began refurbishing the rooms at the Adriatico and Galileo guesthouses last year. And that's why we will continue to improve those facilities in the future. Computer links in each room will be in place by the end of this year. In addition, the remodelling of the cafeteria in the Main Building which began last December, is now complete.

ICTP has also begun to study the feasibility of developing recreational facilities, which could lead to the creation of a "rec" club comprised of administrative staff, in-house scientists and visiting researchers. Such a club would pursue a wide range of activities, helping to promote not just science but life in its broader sense.

For more than three decades, the Centre has been a beehive of activity exerting an extraordinary impact on thousands of lives. The changes outlined here are designed to continue to advance the ICTP's agenda by maintaining an environment that offers both first-class training and research opportunities for scientists and a rewarding work environment for its administrative staff and visitors. □

ICTP High Energy Group recently took its show on the road: destination Cuba. The experience proved rewarding for organizers and participants alike.

FEATURES

Cuban Connections

When staff scientist George Thompson, from the ICTP's High Energy Group, travelled to Havana, Cuba, to lecture at the Introductory School on String Theory this past November, he got more than he bargained for. After completing three hours of lectures and grabbing a quick lunch, he suddenly found himself lending a hand—literally—to efforts by the faculty and staff to refurbish the lecture room for the following week's activities. So with pencil in pocket and brush in hand, "physicist" Thompson turned into "painter" Thompson each afternoon.

"The enthusiasm and commitment that our hosts brought to the 10-day event were heartening to say the least," says Thompson. "Here were physicists who had very little to work with and virtually no support beyond their own collective sense of purpose. And, yet despite their meager facilities, they were determined to succeed."

The Introductory School on String Theory was the first event ever organized by the High Energy Group outside of Trieste. Its origins lie in a conversation concerning the state of string theory research in Latin America that Hugo Celso Perez Rojas, a physics professor at Cuba's Institute of Cybernetics, Mathematics and Physics in Havana, had with the current Head of the Centre's Office of External Activities during the First Caribbean Workshop on Quantum Mechanics, Particles and Fields, held in Cuba, in spring 1997.

As Seifallah Randjbar-Daemi, Head of the ICTP High Energy Research Group, explains, "Everyone there agreed that there are a small number of excellent string theorists working in universities and research centres throughout the region. But they are too few in number and scattered over too large a geographic area to have a strong presence, and they had never met together in one place to discuss issues of mutual interest. So the conclusion was that it would be a good idea to organize a school where many of the continent's string theorists could meet."

"Deciding to hold the school in Cuba," Randjbar-Daemi adds, "had the added benefit of exposing scientists there, especially young Cuban scientists, to the work of more experienced colleagues. It also gave the host institute, which had never helped organize an event of this size and complexity, a taste of what it took to hold a successful event."

The school, which began 9 November and ended 19 November, attracted approximately 60 students and professors of physics interested in string theory. In addition to the contingent from Cuba, which numbered 14,

participants hailed from six other Latin American countries, including Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela.

"The activity started with a one-week 'preschool' designed largely for students with backgrounds not as strong as the other participants," explains Randjbar-Daemi. "The goal was to help bring the understanding that these students had of string theory to a level as close as possible to those of their more advanced colleagues who would be joining them the following week."



Cuba's Institute of Cybernetics, Mathematics and Physics

"The schedule was intense," says Thompson. "Lectures began at 8:30 in the morning and continued until 17:30 in the evening. The first week focused on the basics of string theory; the second on more advanced subjects, including string dualities and D-branes." In addition to Randjbar-Daemi and Thompson, ICTP staff scientist Kumar Narain also gave several lectures, as did Claus Montonen of the University of Helsinki in Finland, Cesar Gomez of the University of Madrid in Spain, and Elias Kiritsis of the University of Crete in Greece. Several Latin American physicists gave talks as well, including Anamaria Font from Venezuela, Carmen Alicia Nuñez from Argentina, Marti Ruiz-Altaba from Mexico and Jorge Antonio Zanelli from Chile.

"The classroom work, of course, proved invaluable, providing faculty and students alike with a good grounding both in the basic and cutting edge issues in string theory," Randjbar-Daemi notes.

"But what I found equally important," he adds, "were the endless hours of dialogue that took place among faculty and students. Participants lived, worked and ate together from the day they arrived to the day that they left, and they literally talked about string theory morning, noon and night."

Cuba's Institute of Cybernetics, Mathematics and Physics hosted all of the activities, while scientists from the ICTP, Argentina, Chile, Mexico, Spain and Venezuela served as members of the organizing committee.

"The facilities for the school were sparse—two classrooms and dining hall, wooden chairs and benches, many nailed together just the week before, and a makeshift whiteboard," observes Thompson. "But I was truly impressed by the participants' enthusiasm and commitment. At the end of the course, nearly 50 percent of the participants earned more than 50 percent on the final test—a success rate that pleased both the teachers and the students."

Funds for the activity, including the costs for travel, room and board for ICTP staff members, came from several sources, including ICTP's High Energy Group and Office of External Activities (OEA), and the Caribbean

Network, which was launched by OEA in 1997. Cuba's Institute of Cybernetics, Mathematics and Physics, the local host, provided a great deal in the way of in-kind contributions and hospitality.

"It's unlikely that such an event could have taken place without the direct involvement of ICTP," notes Randjbar-Daemi. "The funds and organizational skills necessary to organize the two-week-long

activity simply could not have been replicated. In fact, Patrizia Passarella, conference secretary for the High Energy Group, accompanied us to provide the logistical assistance necessary to ensure that everything went smoothly."

Administrators from Cuba's Institute of Cybernetics, Mathematics and Physics have already requested that ICTP organize another school either in 1999 or 2000, and members of the Centre are currently evaluating the institute's request.

"The activity that took place in Cuba this fall," Randjbar-Daemi observes, "has helped establish a valuable, informal network among Latin America's string theorists that should serve this community of physicists well in the years ahead. At the same time, the initiative has enabled Cuban physicists to become more involved with the research activities of their colleagues while boosting their presence within their academic environment at home. All of this adds up to an excellent return on a modest investment that will continue to pay dividends in the future."

Meanwhile, if ICTP's High Energy Group decides to return to Cuba, Centre staff scientist George Thompson knows this much: he will have to pack a paint brush and drop cloth as well as a pencil and notebook when leaving for his next round of lectures. □



MORE LATIN LINKS

The Introductory School on String Theory, organized by the ICTP this fall in Cuba, is by no means the only link that the Centre has with Latin America. In fact, ICTP has a long and active relationship with the scientific community there.

In 1997, some 180 Latin American scientists participated in Centre research programmes held in Trieste, and an additional 30 Latin American ICTP Associates came to the ICTP to take advantage of our research facilities. In addition, 6 students from Latin America and the Caribbean are class members of ICTP's 1998 Diploma Course, which provides masters-level training for recent university graduates from developing nations. And, over the past two years, the Centre's Office of External Activities has helped to fund more than 40 research activities, including the First Caribbean Workshop on Quantum Mechanics, Particles and Fields, where the preliminary groundwork for the School on String Theory was laid.

Here's a sampling of the Centre's recent outreach efforts to Latin America's research community and those scheduled to take place in the near future:

Spring 1997

ICTP Microprocessor Laboratory's Second Latin American Course on Data Acquisition and Data Filtering, held in the University of San Luis in San Luis, Argentina.

Winter 1998

ICTP Microprocessor Laboratory's Second Regional Course on Advanced VLSI Design Techniques, held at the San Sebastian Convention Centre in Medellin, Colombia.

Fall 1998

ICTP Experimental Workshop on High Temperature Superconductors and Related Activities, held at the Bariloche Atomic Center in Bariloche, Argentina.

Winter 1999

ICTP/International Centre for Genetic Engineering and Biotechnology (ICGEB)'s Ibero-American School on Astrobiology, to be held at Simon Bolivar University's Institute of Advanced Studies in Caracas, Venezuela.

As we cross into the next millennium, many of the world's computers may confuse the year 2000 with the year 1900, causing untold problems for our networked world. The Centre will likely avoid the anguish that this electronic bug may create for others. Here's why.

Bugged Out ... But not at the ICTP

There will be no millennium bug at the ICTP. Through a combination of good luck and wise investments, the Centre's computer systems and databases should be able to welcome the new millennium without experiencing any debilitating ailments.

Other computer-dependent institutions may not be so fortunate. Many likely will spend hundreds of thousands—even millions—of dollars to avoid problems ranging from malfunctioning automatic bank tellers to failed missile systems.

"The roots of the millennium bug," notes Alvis Nobile, Head of ICTP's Scientific Computer Section, "date back to the mid 1950s, the dawn of the computer age."

"At the time, computer memory was very expensive, and early programmers continually searched for ways to avoid consuming it. That's why they designated two digits instead of four to electronically record each year. Although memory became much cheaper in the 1970s, by then two-digit dating had become an industry convention, which both manufacturers and programmers continued to follow."

When the computer industry finally realized that much of the hardware and software it had created would fail to recognize the year 2000, confusing it with the year 1900, it was too late: millions of chips and billions of codes had already been embedded with this potentially troublesome flaw.

For computer-dependent private companies and public institutions alike, the millennium bug creates more than a mild headache. It could, in fact, strike damaging body blows to their core responsibilities and, as a consequence, generate colossal social disruptions. Computerized street lights, for example, may fail to turn on. Life insurance policies may be cancelled. Student grades and graduation records erased. Yearly pensions invalidated. Computerized defense systems may even be disabled.

Imagine if you woke up one day and thought it was 1900 instead of 2000, and then behaved as if you had stepped 100 years back in time. In effect, a lifetime of memories would vanish. That's exactly what could happen to many of the world's individual computers and inter-networked computer systems. No wonder experts are so alarmed.

Yet, how is it that the Centre has been able to inoculate itself from the millennium bug? As Nobile explains, "Computerized information about the Centre's visitors—for

example, how many times they have come to Trieste and how long they have stayed—will have to be reprogrammed to account for the new millennium. Otherwise, this important data may be lost. Beyond that, however, the millennium bug poses minimal risks to our computer and data systems."

"The Centre's good fortune," says Nobile, "has a lot to do with the kind of research that is conducted here. Because much of our work in theoretical physics and mathematics deals with timeless truths and immutable physical laws, Centre researchers have had little need to systematically date their data as an integral part of their studies."

The one exception is ICTP's Physics of Weather and Climate Group, where baseline information is essential to determine, for instance, the buildup of carbon dioxide in the atmosphere or potential shifts in precipitation patterns due to alternations in cloud formations and wind currents.

Nevertheless, as Nobile notes, "The Weather and Climate Group is a relatively new group at the Centre and receives most of its data from other places like the National Center for Environmental Predictions and the Center for Ocean Land Atmosphere Studies in the United States. As a result, the millennium bug is not as much a threat to this group as it might have been under other circumstances."

The truth is that, across the board, coded dates have not been an integral part of the Centre's research software programs, and since they aren't embedded into the databases, the millennium bug has nothing to attack.

Another factor that has helped the Centre ward off the millennium bug is that the ICTP did not hitch on to the computer bandwagon until relatively late in the game. Abdus Salam, who founded the Centre and then served as its director for the first 30 years of its existence, initially doubted that computers would become an essential tool for theoretical physicists and mathematicians, especially those in Third World countries. In fact, the Centre's earliest machines were computer hand-me-downs shipped to Trieste in the late 1970s by ICTP's main administrative body, the International Atomic Energy Agency (IAEA) in Vienna, Austria, or by the European Laboratory for Particle Physics (CERN) in Geneva, Switzerland.

"Virtually all of the Centre's current equipment," Nobile notes, "was purchased after the computer industry acknowledged the millennium bug problem and had replaced two-digit calendar chips with four-digit chips."

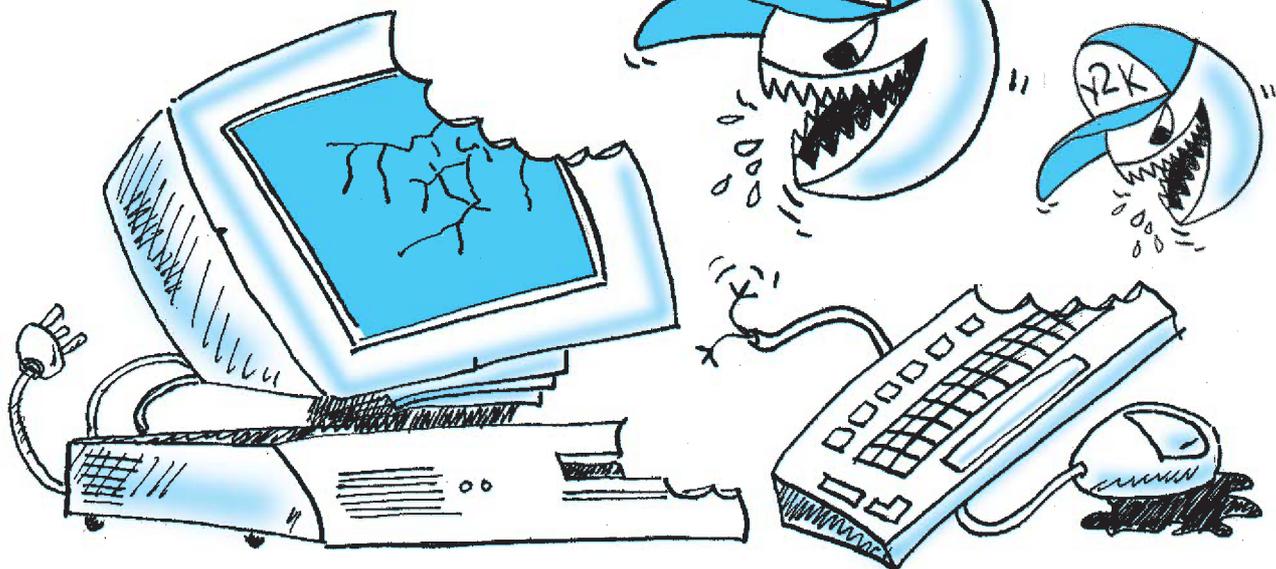
In an ironic twist, the Centre's experience with the rapidly changing world of computers carries lessons comparable to those drawn from the fabled race between the turtle and the hare. Starting slow but remaining steadily on course once it embraced the computer age has allowed the ICTP to approach the year-2000 finish line—or should we say, precipice—in relatively good shape.

Nobile, however, urges the ICTP not to rest on its good fortune. "The Centre's servers linking each of our computers to other computers and networks both on-campus and throughout the world," he observes, "operate on the UNIX system. The experts who developed the UNIX may have avoided the two-digit dating problems that now threaten many of the world's computers and networks. But they did not eliminate all of the bugs."

"For example, as a matter of convention, most UNIX systems begin counting time as of 1 January 1970. An internal software program then translates the UNIX 1970 false counting system into real-time. The problem is that the system can count only 2 billion seconds and no more. As a result, with UNIX's world beginning on 1 January 1970 and clicking away ever since, the system's capacity will be reached sometime before 2030. When the computerized counter sweeps past that moment—much like the problems caused by the millennium bug—the system will fail unless its capacity is expanded or the counters are modified."

Nobile urges UNIX users not to worry. "Thirty years in computer time is like a millennium in real time. Just like it would have been useless to try to improve stagecoach transportation at the turn of the nineteenth century (why improve the efficiency of horse-drawn carriages when combustion-engine automobiles loomed on the horizon), it's likely that the UNIX system will be relegated to the dustbin of history well before the system's counting problem will have to be confronted."

And, so for now, Centre scientists and staff can rest easy. The turn-of-the-century millennium bug won't be inflicting much damage here. □



Awards, Awards and Awards

Arun Jayannavar, who won the 1996 ICTP Prize, recently received the Shanti Swaroop Bhatnagar Award, which is the highest honor the Indian government gives to young scientists working mainly in India. Oxford University professor **Sir Robert May**, a three time lecturer at ICTP courses in mathematical ecology, is one of the recipients of the 1998 Balzan Foundation Prize. The prize, which is sponsored by the Italian and Swiss Balzan Foundation, is given to individuals or institutions for their efforts to promote peace. **Francis K. Allotey**, a member of the ICTP Scientific Council since 1995,

is a recipient of the first World Bank-International Monetary Fund Africa Club award, granted to distinguished African-born scientists. **Zhou Guangzhao**, President of the Chinese Academy of Sciences and member of the ICTP Scientific Council since 1993, was the winner of the 1998 Wick Medal, which he received for his outstanding contributions to increasing our knowledge of subnuclear forces. ICTP Director, **Miguel A. Virasoro**, has been elected to the American Academy of Arts and Sciences. He is one of 147 new fellows and 22 honorary foreign members chosen in the field of physical sciences.

Laureates and Medalist

Four of the five 1998 Nobel Prize winners in Physics and Chemistry are no strangers to the ICTP. US-born **Robert N. Laughlin** of Stanford University has visited the ICTP four times, including last year at the Third Trieste Conference on Statistical Field Theory. German-born **Horst L. Störmer**, on the faculty of Columbia University in New York and staff of Lucent Technologies (formerly Bell Laboratories) in New Jersey, has spoken at three ICTP symposia, including the Centre's 25th Anniversary Conference on Frontiers in Physics, High Technology and Mathematics. He will return to the ICTP this July for the First Stig Lundqvist Research Conference on Advancing Frontiers in Condensed Matter Physics. And Chinese-born **Daniel C. Tsui**, who teaches at Princeton University, tutored at the Symposium on Frontiers in Condensed Matter Physics in 1990. Meanwhile, Austrian-born **Walter Kohn**, who shared the 1998 Nobel Prize in Chemistry with UK-born John A. Pople of Northwestern University, was a frequent visitor to the ICTP between 1985 and 1993. Kohn is a professor emeritus at the University of California at Santa Barbara.

In still another demonstration of the ICTP's reach, one of the four recipients of the 1998 Fields Medal was **Maxim Kontsevich**, who spoke at the ICTP Trieste Conference on S-Duality and Mirror Symmetry in 1995. The Fields Medal, given once every four years, is the highest honor bestowed in mathematics.



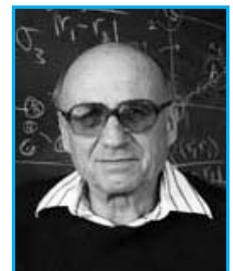
Robert N. Laughlin



Horst L. Störmer



Daniel C. Tsui



Walter Kohn



Nitin Nitsure

ICTP Prize

Nitin Nitsure, a reader in the School of Mathematics of the Tata Institute of Fundamental Research in Mumbai, India, is the winner of the 1997 ICTP Prize. Nitsure was awarded the prize for his internationally recognized work in algebraic geometry. Marking a trend that has become increasingly common, Nitsure received his undergraduate and advanced degrees in his home country of India, at the University of Poona and the University of Mumbai. The official award ceremony took place last October.

Hats Off

News from ICTP has won Best of Newsletters and was named a finalist for Best of Show in the MerComm's Mercury Award Competition. The newsletter was chosen among more than total 1,000 entries. Previous winners of MerComm awards have included Boeing Aerospace, the Discovery Channel, Turner Broadcasting and the Electric Power Research Institute. The awards ceremony took place at the Plaza Hotel in New York City in late January.

Physics for Trekkies

By day, **Lawrence M. Krauss** is an internationally renowned particle physicist and cosmologist, who chairs the Physics Department at Case Western Reserve University in Cleveland, Ohio. That's why Krauss was invited to lecture at ICTP's Workshop on the Physics of Relic Neutrinos, held last fall in Trieste. At the workshop, he analyzed the preliminary results of the Super-Kamiokande experiment in Japan, which showed for the first time that neutrinos, the world's most elusive subatomic particles, oscillate and, therefore, have mass (see *News from ICTP*, Summer 1998).

By night, however, Krauss is an internationally renowned author widely known for his bestseller, *The Physics of Star Trek*, inspired by the famous television and movie saga. Using *Star Trek* as a hook to entice readers, young and old, Krauss explains such exotic concepts—and perhaps fantasies—such as warp drives, antimatter and teleportation.

"In my opinion," Krauss noted in an interview with the editors of *News from ICTP*, "the world of *Star Trek* is a

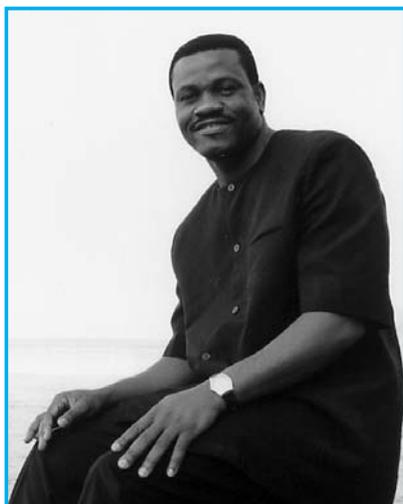
marvellous laboratory in which you can explore the physics of the entire universe. Many high school science teachers and college professors," he adds, "have used my book to lure their students into wonders of science."

Krauss's most recent book, *Beyond Star Trek*, offers a scientific analysis of such recent cult movies as *Independence Day* and *The X-Files*. He hopes that too will be another bestseller. In the meantime, he has no intention of leaving his day job. So, we can expect to see him back at the ICTP in the near future.



Lawrence Krauss

Nigeria's Weather Guy



Ernest Afiesimama

What will tomorrow's weather be like in Lagos, Ibadan and Abuja? That's a question that some 40 million Nigerians ask each evening when they tune into Nigeria's national television network at 7 and 9 p.m. The answer is often provided by **Ernest A. Afiesimama**, one of three weather "presenters" who work for Nigeria's Central Forecast Office. Within the past six months, Afiesimama has visited the ICTP twice, first to attend the Conference on Warm Climates in the Tropics, held last summer, and then to participate in the Course on Mediterranean Sea(s) Circulation and Ecosystem Functioning, held last fall.

"My experience at the ICTP," Afiesimama explains, "has not only helped to sharpen my weather forecasting skills but has put me in touch with weather and climate experts from around the world." Nigeria, he goes on to say, "has a number of well-trained meteorologists, but we often find it difficult to keep current in a field that is being rapidly transformed by advances in computer modelling."

That's why Afiesimama hopes to stay in close contact with the ICTP's new Physics of Weather and Climate Group. "We think that the Group has a great deal to offer us, especially when it comes to gaining access and training in the use of regional models." By providing a clearer look at weather patterns over small areas—say 25 square kilometres—such models could dramatically improve weather forecasting in

Nigeria and other developing countries.

As for his "nightly gig" as a weather presenter with one of the largest audiences in the world, Afiesimama notes that the job has its ups and downs. "It's fun to be recognised by so many people except, of course, when you predict sunny skies and it pours—or, as sometimes happens in Nigeria, when you predict heavy rains and the sun keeps bearing down. I just have to keep telling people I don't make the weather, I just report it—based on the best information available."

From Lagos to Los Angeles, inaccurate forecasts are apparently an occupational hazard faced by all weather forecasters.

Life Beyond

Searching for Life on Mars, Jupiter and Saturn. That was the topic of **Tobias Owen's** public lecture, organized by the ICTP, which took place at the Interpreters' School of Trieste University last fall. Owen is a well-known astrophysicist from the University of Hawaii, who has served as part of the research team for several interplanetary space programs sponsored by the U.S. National Aeronautics and Space Administration (NASA), including the Viking, Voyager, Galileo and Cassini missions. Owen highlighted the compelling progress that scientists have made in two areas of research. The first is laboratory replication of the possible first steps in molecular evolution, marked by the creation of nucleic acids, proteins and sugars. The second is the search for biological evidence of primitive forms of life on other celestial bodies, including planets, meteorites and comets. Some 150 people from Trieste and the surrounding region attended Owen's lecture.



Tobias Owen

WORKSHOP ON FUSION RELATED PHYSICS AND ENGINEERING IN SMALL DEVICES

7 - 9 October

Directors: A. Wootton (University of Texas at Austin, USA) and Y. Wan (Academia Sinica, Institute of Plasma Physics, Hefei, P.R. China).
Local Organizer: A. Vespignani (ICTP).
The workshop's main objectives were to review and discuss both plasma and fusion physics research and engineering in small devices; promote cooperation among developed and developing countries in plasma and fusion research; and examine possible directions for future work. Presentations focused on the following topics: physics of turbulence and transport; tokamak disruptions; diagnostic and data analyses; and engineering.

THIRD SCHOOL ON NONLINEAR FUNCTIONAL ANALYSIS AND APPLICATIONS TO DIFFERENTIAL EQUATIONS

12 - 30 October

Co-sponsor: European Commission (Brussels, Belgium).
Directors: A. Ambrosetti (Scuola Normale Superiore, Pisa, Italy), K.-C. Chang (Peking University, Beijing, P.R. China) and I. Ekeland (Université de Paris IX, France).
Local Organizer: G. Vidossich (Scuola internazionale superiore di studi avanzati, SISSA, Trieste, and ICTP).
Nonlinear functional analysis is a rapidly growing research field. Most universities, however, do not offer courses in this area. The goal of this activity was to give students the skills they need to pursue this subject. The first two weeks of the school consisted of lectures on the following topics: harmonic and wave maps; critical point theory; Morse theory and problems in absence of Palais-Smale condition; elliptic problems; Hamiltonian systems; nonlinear Schrödinger equations; and applications to mathematical physics. The school's final week featured seminars on current research problems.

FIFTH COLLEGE ON MICROPROCESSOR-BASED REAL-TIME SYSTEMS IN PHYSICS

12 October - 6 November

Co-sponsor: United Nations University (UNU, Tokyo, Japan).
Director: A.S. Induruwa (University of Moratuwa, Sri Lanka, presently at University of Kent, Canterbury, UK).
Local Organizer: C. Verkerk (ICTP, formerly CERN, Geneva, Switzerland).
The college examined how to make use of real-time operating systems when designing and implementing computer-controlled experiments. The programming language was C, and Linux was the underlying operating system. Lectures focused on real-time operating systems and design methods; development of embedded systems using a real-time kernel; writing a device driver for special equipment; and developing a graphical user interface. Laboratory sessions concentrated on gaining experience with threaded programs; writing software for embedded systems; and developing a graphical user interface to control external equipment.



Catharinus Verkerk and students

EXPERIMENTAL WORKSHOP ON HIGH TEMPERATURE SUPERCONDUCTORS AND RELATED MATERIALS, Bariloche, Argentina

19 October - 6 November

Co-sponsors: Comisión Nacional de Energía Atómica (CNEA, Argentina) and Universidad de Cuyo, in cooperation with Centro Atómico Bariloche (CAB, Bariloche, Argentina).
Directors: F. de la Cruz (CAB) and F.C. Matocotta (Consiglio nazionale delle ricerche - Istituto di spettroscopia molecolare, CNR-ISM, Bologna, Italy).

The workshop, the second held at the Centro Atómico Bariloche, outlined research that has taken place since high-temperature superconductivity captured public attention more than a decade ago. It also offered speakers the opportunity to present their views on new research areas. Topics included: the nature of the normal and superconducting state of copper oxides; thermodynamics and transport properties of the vortex structure in liquid and solid state; normal and superconducting properties of artificial low dimensional systems; new superconducting and related materials; optical properties of high-temperature superconductors; non-conventional superconductors; and trends in applications of high-temperature superconducting materials.

COURSE ON MEDITERRANEAN SEA(S) CIRCULATION AND ECOSYSTEM FUNCTIONING

2 - 20 November

Co-sponsors: MEDIAS-CNES (Regional Research Network on Global Environment Change in the Mediterranean Basin and Subtropical Africa—MEDIAS—of the French Space Agency—CNES—Toulouse, France) and Osservatorio Geofisico Sperimentale (OGS, Trieste, Italy).

Directors: J.-L. Fellous (MEDIAS-CNES), T. Legovic (R. Boskovic Institute, Zagreb, Croatia), M. Gacic (OGS) and R. Mosetti (OGS).

Local Organizer: G. Furlan (University of Trieste and ICTP). *The course, the third in a series focusing on oceanography, offered researchers the opportunity to strengthen their theoretical understanding of the physical mechanisms affecting water circulation and pollution on the continental shelf. Topics included the dynamics of the mediterranean and regional seas; air-sea heat exchange and thermobaline forcing; dense water formation and deep circulation; wind forcing; occurrences of hyperoxia and hypoxia; functioning of pelagic versus benthic subsystems; outbreaks of rare species; interactions between marine ecosystems in the Atlantic and Mediterranean; effects of global warming on mediterranean seas; and regional case-studies and modelling.*



Steve Brenner

ICTP-UNU-MICROPROCESSOR LABORATORY FIFTH COURSE ON BASIC VLSI DESIGN TECHNIQUES

9 November - 4 December

Co-sponsors: Kuwait Foundation for the Advancement of Sciences (KFAS) and United Nations University (UNU, Tokyo, Japan).

Director and Local Organizer: A. Colavita (ICTP). *The course is part of a continuous training activity whose goal is to introduce scientists and engineers to the latest VLSI (Very Large Scale Integration) design techniques. Topics included: an introduction to LINUX; top-down digital design; VLSI design using Alliance; introduction to analogue design; and hands-on laboratory work. The activity was essentially experimental in nature: About 75 percent of the allocated time (approximately 70 hours) was devoted to design work.*

WORKSHOP ON REACTOR SIMULATION TRAINING AND UTILIZATION

16 - 20 November

Co-sponsor: International Atomic Energy Agency (IAEA, Vienna, Austria).

Directors: R.B. Lyon (IAEA) and G. Bereznai (Chulalongkorn University, Bangkok, Thailand). *Participants were offered instruction and practice in simulation computer codes designed for commercial nuclear reactors. Topics included operating principles of pressurized water, boiling water, and pressurized heavy water reactors—the three principal reactor systems; examinations of reactor coolant, protection, emergency core and containment systems; instruction and practice in the installation and use of codes; and exercises in diagnosing malfunctions, performing simulations and analysing the results.*

WIZARD INTERNATIONAL COLLABORATION MEETING

30 November - 4 December

Co-sponsor and Organizer: Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Trieste. *WIZARD is an experimental program for the search of antimatter in cosmic rays as part of a larger effort to verify some implications of the Big Bang. The project has led to the construction of a silicon detector telescope that has been flown into space. Data collected from this effort has led to a new project called PAMELA. Under PAMELA, an object, similar to the one created under WIZARD, will be placed into orbit to collect data on antimatter in cosmic rays over a 3-year period. Researchers from several universities and INFN, including scientists from Sweden, Germany, the United States and Russia, have followed the project. INFN's Trieste section, whose researchers built the WIZARD's core, organized this meeting for 40 researchers now working on PAMELA.*

6th ELETTRA USERS' MEETING

29 November - 1 December

Organizer: Sincrotrone Trieste.

January 1999 marks the birth of a new scientific research group at ICTP: the Synchrotron Radiation Theory Group. Massimo Altarelli, who heads the group, also assumes the post of general manager and scientific director of the synchrotron laboratory "Elettra," in Trieste's Area Science Park. With Altarelli's arrival, ICTP will forge an even closer partnership with "Elettra." Centre research will provide a strong foundation in theoretical physics for projects that also entail an experimental dimension. The partnership will also offer training opportunities for Third World scientists in such advanced fields as electronic materials and magnetic properties, surface structures and the crystallography of macromolecules.

"My main task will be to strengthen Elettra's role in the international arena, highlighting its excellence and updating its technology," said Altarelli during a presentation of Elettra's future activities at the 6th Users' Meeting. In 1998, about 600 scientists worked on 220 experiments using Elettra's 11 beamlines. That number will likely more than double over the next few years. Most users are Europeans, coming from such countries as Germany and the United Kingdom, which have national synchrotron facilities. Their presence serves as one of the best indicators of the high-level work taking place here. Beyond research on the structure and properties of materials, Elettra researchers hope to concentrate on at least two other promising fields: (1) drug design for pharmaceutical firms, including the study of an inhibitor that halts the replication of the HIV virus within infected cells, and (2) use of synchrotron light in nanotechnology for construction of electronic and mechanical devices one-thousandth-of-millimetre long.



6th Elettra Users' Meeting



Nobel Laureates Carlo Rubbia, Werner Arber, Robert Huber

TWAS 10th GENERAL MEETING

9 - 11 December

The 10th General Meeting of the Third World Academy of Sciences (TWAS) was attended by more than 100 scientists from some 40 countries. On the first day, participants were treated to lectures by three Nobel Laureates: Carlo Rubbia (Physics 1984); Robert Huber (Chemistry 1988) and Werner Arber (Medicine and Physiology 1978). The meeting also was highlighted by an important announcement from the Italian government. Gianfranco Facco Bonetti, head of the scientific and cultural division of Italy's foreign ministry, told participants that over the next three years his government intended to increase its contribution to the Academy from 1.9 billion lire (US\$1.1 million) to 3 billion lire (US\$1.75). Equally important, Facco Bonetti said that Italy would begin taking the necessary steps to write the "TWAS agreement" between the Italian government and the United

Nations Educational, Scientific and Cultural Organization (UNESCO) into Italian law. The signing of such an agreement would place TWAS's future operational budget on solid financial ground. José Vargas, President of the TWAS, welcomed the announcement by noting that this decision puts the Academy "within sight of the vision presented by Abdus Salam at our first meeting in Trieste in 1985."



PROFILE

Lebanese by heritage, Brazilian by birth, Jacob Palis has become president of the world's largest society for professional mathematicians. What's it like to lead a life filled with figures and formulas?

Palis's Dynamical Career

Jacob Palis, a member of the ICTP Scientific Council since 1989, reached the pinnacle of his career this summer when he delivered his first address as president-elect of the International Mathematical Union (IMU), the world's largest organization for professional mathematicians.

Palis, a relaxed yet expressive man who often displays an understated self-assurance that is both appealing and persuasive, is currently professor and director of the Institute of Pure and Applied Mathematics in Rio de Janeiro, Brazil. For more than a decade, he has also been the lead organizer of ICTP's Schools and Workshops on Dynamical Systems, which have become among the most respected activities held at the Centre.

"Last year's workshop," Palis proudly notes, "received rave reviews from both lecturers and participants. In terms of quality, it could easily match the workshops at the very best universities and institutes in the world. We have certainly come a long way from where we started in the early 1980s, when the number of participants often depended on our ability to work the phones. Today, we readily turn down people that we would have gladly accepted just a few years ago."

Like the ICTP workshops he organizes, Palis's career in mathematics has also come a long way. Born to Lebanese parents who had moved to remote Uberaba, Brazil, to find a better life, Palis displayed an interest in math at a young age. When he entered the University of Brazil, which now bears the name of the Federal University of Rio de Janeiro, his talent for figures and formulas initially found expression in the university's engineering department. In fact, Palis graduated with a degree in engineering in 1964.

"My family wanted me to pursue a career in engineering because they thought it would be more lucrative," Palis adds that "There were hardly any mathematicians working in Brazil in the late 1950s and early 1960s. So it was hard to know what such people did. There just weren't enough role models around to help young, interested students like me draw a clear picture of the profession."

"I knew this much, however," says Palis. "That I was more interested in understanding the principles behind

engineering than the 'how to' aspects of the profession."

Driven by his personal interest, Palis spent the next five years at the University of California at Berkeley—four as graduate student and one as post-doc after earning his Ph.D.

"My field of concentration is dynamical systems, a sector of mathematics that tries to understand how multi-variable complex systems behave over the long run. Abstract formulas and complex models dominate the research agenda but our efforts involve more than trying to solve mind-bending puzzles. Our findings, for example, help enhance our understanding of population growth patterns, global climate change and even stock market fluctuations."



Jacob Palis

In 1968, Palis returned to Brazil, where he has lived and worked ever since. "When I went back home," he observes, "our universities and research institutes still did not have a system in place for turning out an adequate number of mathematicians with advanced degrees. One or two doctorate students were produced here or there but for the most part Brazil's mathematicians were educated and worked abroad."

"That's no longer the case. Since the mid 1970s, Brazil's universities and research institutes have granted advanced degrees to more than 1,000 students. Many now remain in Brazil, where they enjoy productive and rewarding careers."

Palis notes that "For the first time in Brazil's history a critical mass of mathematicians—and an even larger number of students with advanced math degrees—are now in place to ensure a bright future for the profession."

That's why Palis is so enthusiastic about his 4-year term as president of the IMU, which began in January 1999. "One of

my goals is to improve the state of mathematics throughout the developing world. With Brazil as a model—Argentina, China, India and Korea are others—we now have enough experience to know what works and what doesn't."

"I plan to make sharing this information a key aspect of my presidency," Palis says. "Such exchanges would not only help improve the state of mathematics within individual countries but ultimately would expand the profession's frontiers by opening it to a larger pool of talented students." □

TRIBUTES

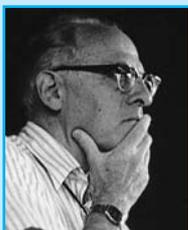
Over the past six months, the ICTP has lost three of its oldest and most internationally acclaimed friends. Like the rest of the global scientific community, we are saddened by their deaths.



Sidney Walter Fox, professor emeritus at the University of South Alabama, was an active participant at the ICTP's Trieste Conferences on Chemical Evolution, where he lectured on three different occasions

in the 1990s. A pioneer researcher in the origins of life, his main field of interest was proteins, which he considered forerunners of living cells. He was a key consultant to the U.S. National Aeronautics and Space Administration (NASA) on projects related to the search for biological molecules in meteorites, as well as on the Moon and Mars. Fox was 86.

Boris B. Kadomtsev, Director of the Institute of Nuclear Fusion at the Russian Research Centre Kurchatov Institute and member of the Russian Academy of Sciences, was on the ICTP Scientific Council in the early 1970s. Kadomtsev was a world-class theoretical plasma physicist, who enjoyed a long association with the International Atomic Energy Agency (IAEA). He was 70.



Frederick Reines, who shared the Nobel Prize in Physics in 1995 for his discovery of the ghost particle neutrino, had visited ICTP during the Trieste Conference on Particle Physics in 1984 and the 25th

Anniversary Conference on Frontiers in Physics, High Technology and Mathematics in 1989. He was professor emeritus at the University of California at Irvine. His death occurred just a few weeks after scientists at the Super-Kamiokande laboratory in Japan had announced they had uncovered evidence of neutrino mass. Reines was 80.

Ministers' Visits

Wu Minglian, China's Ambassador to Italy, visited the ICTP on 2 November to express his thanks for the assistance that the Centre has rendered to Chinese scientists over the years. **Ana Maria Deustua**, Ambassador of Peru to Italy, paid a brief visit to the ICTP on 4 December while in Trieste to attend the opening of the new Honorary Consulate of Peru. **Mostafa Moin**, Iran's Minister of Science, arrived at the Centre on 8 December to participate in the TWAS 10th General Meeting and meet with ICTP Director Miguel Virasoro. The Minister discussed potential opportunities for wider cooperation between the Centre and the government of Tehran.

Czech Students

Six high school students from the Czech Republic visited the ICTP to learn more about Centre facilities and activities. They stopped at ICTP on their way to touring other important science facilities in Italy. The students, who hailed from Prague, were winners of the 10th Young Physicists tournament, launched by Moscow University in 1979. The competition now includes 18 teams from 16 countries on 4 tournaments.



Farewell and Fare Well

Deisa Buranello retired last October after more than 30 years of service to the Centre. Deisa, who was born in Muggia, just outside of Trieste, emigrated to Australia when she was 11. She returned to Italy with her family in 1964 and came to the ICTP in April 1965, six months after the Centre's creation. Her initial job at ICTP was to provide secretarial help for the Centre's first high energy seminar. In the mid 1980s, she was appointed Head of the Scientific Programme Office, where she remained for the balance of her career, supervising a staff of about 10 people. Centre colleagues and friends alike wish Deisa a pleasant retirement for a job well done.



Caressed Engravings

The Centre's Art Gallery, located on Lower Level 1 of the Adriatico Guesthouse, celebrated its first anniversary with an exhibition entitled "Caressed Engravings." The show, which took place from 12 December 1998 to 15 January 1999, contained the work of some 20 contemporary graphic artists from Italy, Croatia and Chile. This was the fifth exhibition of the Centre's Art Gallery. The 1999 season will begin this spring.



14 - 16 January

Ninth International Workshop on Computational Materials Science: Electronic Structure Theory and Simulations

1 - 19 February

Second ICTP-URSI-ITU/BDT School on the Use of Radio for Digital Communications in Developing Countries

8 - 26 February

Winter College on Spectroscopy and Applications

1 - 5 March

III Adriatico Research Conference on Quantum Interferometry

8 - 26 March

Third Workshop on Thin Film Physics and Technology, including:

24 - 26 March

Topical Conference on Microstructure and Surface Morphology Evolution in Thin Films

22 - 30 March

Spring Workshop on Superstrings and Related Matters



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

ON THE WORLD WIDE WEB (WWW)

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

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

ON E-MAIL

(1) For Yearly Calendar of Scientific Activities

Create a new e-mail message and type

To: smr@ictp.trieste.it

Subject: get calendar 1999

Leave the body of the message blank. Send it.

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

(2) For Information on a Specific ICTP Activity

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

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

Under the e-mail's subject, type

Subject: get index

Leave the body of the message blank and send it.

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

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

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

Subject: get announcement application_form

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

NEWS from ICTP

The ICTP is administered by two United Nations Agencies—the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Atomic Energy Agency (IAEA)—under an agreement with the Government of Italy. Miguel Virasoro serves as the Centre's Director. On 21 November 1997, the ICTP changed its name to The Abdus Salam International Centre for Theoretical Physics to honour its founder.

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

Editor

Daniel Schaffer

Staff Writer

Fabio Pagan

Managing Editor

Anna Triolo

Statistician

Giuliana Gamboz

Photos

Giovanni Montenero

Ludovico Scrobogna

Massimo Silvano

ICTP archives

Layout

Associazione Progettisti Grafici

Printed by

Tipografia Moderna



public information office

the
abdus salam
international centre for theoretical physics

strada costiera, 11
34014 trieste
italy
sci_info@ictp.trieste.it
fax: (+39) 0402240565
www.ictp.trieste.it