



# NEWS

*from*

# ICTP

the  
abdus salam  
international centre for theoretical physics



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## Special Delivery

The information revolution has not only brought scientists closer together on a global scale; in the minds of some critics, it has created a 'digital divide'—a gnawing gap between scientists in the North, who enjoy full e-connectivity, and their colleagues in the South, who do not.

ICTP's "www4mail" project, which Centre staffer Clement Onime and I launched in 1998, has sought to close this troublesome divide by providing researchers in developing countries with access to databases, online journals, and scientific preprint repositories via e-mail.

Simply put, www4mail gives browsers in the South the means to navigate the internet off-line and free-of-charge through low-cost technologies that are available in their home countries. As a result, www4mail offers an instructive example of a technological solution to disparities in 'information access' between the North and South. It also aims to help fulfil ICTP's mandate for transferring knowledge to developing countries.

An important lesson learned from www4mail is that high-bandwidth access to the internet is not essential for bridging the digital divide. Indeed the service—and the software that drives it—offers web information to internet users in countries where full connectivity is not widespread. As an added bonus, www4mail's support for non-Western character sets enables internet users from these countries to interact with web-based information in their own languages.

Since its launch more than two years ago, the software has evolved rapidly thanks largely to extensive user feedback that has led to enhancements and new features. www4mail was designed to overcome many of the obstacles—such as JavaScript, cookies and frames—that have sometimes impeded the use of other free software. At the same time, it has tried to replicate, as closely as possible, the experience of browsing the web via full internet connection, including searches of online databases.

Most importantly, the software is easy to use and extremely reliable. So much so that the www4mail project was named

a finalist in the Stockholm Challenge Award 2000, a 'cyberspace competition' that included more than 600 projects from 84 countries (see *News from ICTP*, Summer 2000, p. 14).

An evolving goal of the project is to disseminate the service more widely and to use it as a catalyst to build capacity in developing countries for setting up and hosting local www4mail services. Until now, five main public www4mail servers—one each in Germany, Italy and the United States and two in Canada—have been established to deliver web pages via e-mail to users around the world. Each server can supply more than 5,000 pages of information daily. We hope to have additional servers in place in the near future.

www4mail's value is reflected largely in its rising number of users. But like the dynamic environment in which it operates, the project's prospects for success in the future (and the not-so-distant future at that) lie in its ability to meet the demands of an ever-more sophisticated and complex operating environment. That, in turn, means finding ways to provide easy access to more dynamic content, multimedia elements, and specialised software.

To keep pace, the www4mail project must continually draw on state-of-the-art knowledge and technologies. For this reason, observations and insights from www4mail users are always welcome. It's the only way we can ensure that we stay abreast of advances in the field in ways that allow us to serve the needs of scientists working in remote areas. By taking one small step at a time, projects like www4mail will help determine whether, over time, the digital divide narrows into a sliver of separation ultimately bridged by creative applications of today's technology. □

*Questions concerning www4mail may be addressed to [canessae@ictp.trieste.it](mailto:canessae@ictp.trieste.it). For a first-hand look at the project, see <http://www.ictp.trieste.it/~www4mail>.*

John Schwarz  
ICTP Dirac Medallist  
California Institute of Technology,  
Pasadena, California, USA

## COMMENTARY

The study of string theory has helped to advance the frontiers of mathematics and theoretical physics. One of its most distinguished proponents examines the 'unifying' road ahead.

# Strings Strung

We think of particle physics addressing the microscopic extreme and cosmology addressing the macroscopic extreme. However, string theory, through its explorations of the behaviour of gravity in both scales, allows us to consider particle physics and cosmology together. In fact, string theory offers deep connections between the two.

Proponents of string theory have contended that the theory requires extra spatial dimensions, which have generally been assumed to form a compact space of six or seven dimensions. Recent investigations, however, suggest that the extra dimensions in which the strings exist could be much larger than previously envisioned—perhaps large enough to be experimentally observable.

I find the idea of large extra dimensions to be implausible because it sacrifices some of the successes of supersymmetric

grand unification, such as the unification of the couplings and suppression of proton decay. Nevertheless, I agree that it is worthwhile to explore these ideas. Who knows what might turn up?

I do not expect string theory to be completely understood by pure thought alone. The more traditional back and forth between theory and experiment surely will be important in this quest. The most immediate experimental question is whether supersymmetry particles will be discovered this decade. Such a discovery would have profound theoretical and experimental consequences, helping to set the agenda for experimental particle physics for several decades to come.

The discovery of supersymmetry would make it clear that the abstract mathematical musings of the past 30 years can be connected to experimental science. Experimental findings about supersymmetry at the electroweak scale, in turn, would provide crucial guidance in the quest to understand how to connect the underlying theory to the real world.

Through the study of string theory, the last third of the 20th century witnessed the construction of an amazing mathematical edifice that we are still struggling to understand. I am convinced that the theory is unique, and I am optimistic that a deeper formulation will be found. The theory could well lay the intellectual foundation for uncovering solutions accounting for the observations both of particle physics and cosmology.

The subject of string theory has involved a host of new and bizarre concepts, much as quantum mechanics did in the first half of the 20th century. To get it right we will need help from both our mathematical and experimental friends. But that should come as no surprise. In fact, it is only fitting that a theory that seeks to unify particles and forces at extreme micro- and macro-scales may wind up unifying disciplines as well. □



John Schwarz

Jean-Pierre Ezin, who has been associated with ICTP for more than two decades, describes how he hopes his *Institut de Mathématiques et de Sciences Physiques* will become a major regional math and physics centre in West Africa.

## Into Africa

When the first parcel of earth was turned last spring to begin construction of a regional math centre just outside Benin's capital city Porto-Novo, it marked the end of a 25-year campaign for the construction of a regional research and training facility in this small poor country on the west coast of Africa. Jean-Pierre Ezin, a long-time visitor to ICTP and head of the University of Benin's *Institut de Mathématiques et de Sciences Physiques* (IMSP), has witnessed—indeed directly participated in—the entire saga. In his own words, "the ground breaking ceremony was a proud moment; now the real work begins."

"I was a young post doctorate student at ICTP in the mid 1980s," explains Ezin, "when Abdus Salam asked me if I would be interested in having ICTP support two or three students when I returned to the University of Benin's math department to resume my teaching responsibilities after a two-year hiatus in Trieste."

"I was honoured by Salam's offer but I responded that the creation of an independent centre, with its own research and training responsibilities separate from the university's, might have a greater long-term impact on the growth of mathematics in Benin. To my surprise, Salam quickly concurred and assigned US\$25,000 in the ICTP's budget to launch the effort. Salam also helped convince the government of Benin to match ICTP's contribution." The result was the creation of IMSP.

"The initiative, while modest, did fulfil some of the goals both Salam and I had hoped for," says Ezin. "The first US\$25,000 grant from ICTP, given in 1989, turned into an annual contribution that has continued to this day. Over the past decade, the money has enabled us to enrol five students every other year to participate in our advanced degree programmes in math and physics."

Additional periodic funding—for example, from Belgium, France and Germany—has allowed the institute to raise its enrolment at times to as many as 10 or 15 students. But it's ICTP's consistent year-to-year funding, derived from the Centre's Office of External Activities, that has given the Benin institute a firm foundation from which it has developed into one of the most respected institutions of its kind in Africa.

The institute was the first ICTP Affiliated Centre, an initiative that has since become the centrepiece of ICTP efforts to work jointly with universities and research centres in developing countries to establish reputable in-country training and research facilities serving local and regional scientific

communities in a wide range of disciplines. These centres, based on agreements between ICTP and the host institutions, are found throughout the developing world.

Today, there are six ICTP Affiliated Centres in Africa: IMSP in Benin; a centre on semiconductors, solar cells and quantum physics in Ethiopia; laser centres in Ghana and Sudan; and atomic physics centres in Senegal and Cameroon. Each receives an annual grant of about US\$25,000 from ICTP.



Jean-Pierre Ezin

The first class of five students at IMSP in Benin, all of whom began in March 1989, attained their doctorates by 1994. All have since gone on to successful academic careers. Isso Ramadhani, who is from the Democratic Republic of the Congo, now teaches at the University of Kinshasa, and Bernard Kamte, who is from Cameroon, teaches at the University of Toronto. Meanwhile, the institute's first three students from Benin have remained in their home country—Jean Bio Orou Chabi and Joël Tossa are employed at their alma mater and Taofick Adeleke at the *Institut National d'Economie*. The 25 plus students who have followed in their footsteps have achieved similar levels of success.

"We are not only pleased by our graduation rates, which have been exceptionally high," explains Ezin, "but we are proud that many of our graduates have continued to work in Africa—often in their native countries—after attaining their degrees."



Ezin attributes this encouraging trend, which runs counter to the 'brain-drain' effect that has sapped the strength of many other like-minded initiatives, to the way in which his programme has been structured.

"Our doctorate programme," he explains, "has always followed the so-called 'sandwich' model: Students spend their first year or two at IMSP, then move on to a university in the North for a year or two, only to return to the University of Benin to complete their course work and thesis. This way, students never lose touch with IMSP. As a result, they are less likely to wind up as professors or researchers in institutions in the developed world."

IMSP works closely with a number of Northern universities and research centres to ensure that the goals of its 'sandwich' programme are met: for instance, in Belgium, the *Université Libre de Bruxelles*; in Canada, the University of Toronto; in France, the *Université de Paris Sud* in Orsay; in Germany, the Max Planck Institute for Mathematics; and in the United States, Florida State University. "All told," Ezin notes, "the institute's sandwich programme involves more than a dozen institutions in the developed world."

Overall, IMSP's track record of success has meant a great deal to the math and physics community in Africa, where advanced training and research facilities are in short supply and where many universities do not even have a single math teacher with a doctorate degree (see "Africa's Future Discounted by Math Crisis," *News from ICTP*, Summer 1998, p. 6-7).

Ezin and others who have been involved in the field for many years have always realised that the number of doctorates that institutes like his have been able to produce—some five Ph.D.s every other year—are no match for the magnitude of the math and physics crisis faced by Benin and other nations in Africa. "I don't want to minimise our contribution," says Ezin, "but the truth is our efforts have largely prevented a very bad situation from getting much worse. We've never had sufficient resources to make a great deal of progress. The best we've been able to do is to prevent additional backsliding."

That may change, however, now that the government of Benin has agreed to invest US\$1 million for the expansion of IMSP. The new support represents such a large increase—the institute's current annual budget is just US\$50,000—that, in effect, the allocation sets the stage for the creation of a new institute different not only in size but in scope from the facility that has preceded it.

"This substantial infusion of funding," Ezin notes, "should allow us to provide instruction for some 100 students each year, not five every other year, which is the current situation." To achieve this goal, Ezin anticipates that the number of faculty will eventually increase from seven to 20.

"As our resources and size grow, so will the breadth and depth of our curriculum," explains Ezin. "The institute plans to offer courses in differential geometry, statistical physics, functional analysis, control and game theory, and computer science. We also plan to eventually build exchange programmes with other math and physics institutions both in Africa and on other continents. In fact, I have had preliminary conversations with colleagues in Latin America that we hope will soon lead to some joint training and research activities."

It's all part of an ambitious agenda that includes new classrooms, a library, cafeteria, and guesthouse. "The goal is to build a mini-ICTP-like facility designed primarily to serve the needs of young mathematicians and physicists in West Africa," says Ezin, who views what is happening "as an extension of Salam's vision, which could never be completely realised until governments in developing countries begin to invest in scientific research and training effectively and sustainably."

So, after decades of coaxing and cajoling by Salam, Ezin and dozens of others dedicated to the development of science in the South, the *Institut de Mathématiques et de Sciences Physiques* in Benin may soon emerge as an enduring symbol of their hard work and dedication—and, more importantly, as an institution that helps build a strong foundation in basic science that lifts the economic and social well-being of the entire region. □



IMSP construction site

Council members of the Edward Bouchet/Abdus Salam Institute (EBASI) recently met at ICTP to discuss how their alliance of African and Afro-American scientists could be strengthened.

## African-American Ties

Council members of the Edward Bouchet/Abdus Salam Institute (EBASI) met at the Centre between 6 and 9 November 2000 to lay out a broad agenda for the organisation's future.

The meeting took place as a follow-up to a series of events, including EBASI's 3rd International Conference on Physics and High Technology in Botswana in August 1998 and a forum on the state of mathematics in Africa in October 1999 in Trieste, that examined potential new avenues for collaboration among black scientists in sub-Saharan Africa and the United States (see "Math Across the Oceans," *News from ICTP*, Winter 2000, p. 6-7).

Launched in 1988 by ICTP's founding director and Nobel Laureate Abdus Salam, EBASI is named in honour of Edward Bouchet, a late 19th century graduate of Yale University, who was the first person of African descent to receive a Ph.D. in physics in the United States.

"During its brief history, the institute has pursued a number of worthwhile activities—most notably, a series of meetings in Africa that initiated and then sustained close relationships between African and African-American scientists," says Gallieno Denardo, ICTP representative to EBASI and former head of ICTP's Office of External Activities, who has been closely involved with EBASI since its inception. "These efforts have helped participants to learn more about each other's institutions and laid the foundation for researchers from Africa and the United States to collaborate on a variety of research activities."

"Yet, until now," explains Denardo, "the institute has acted largely as an informal association. Over the past few years, many of those involved began to think that it may be time to build a more formal institutional framework. That was our overarching goal in calling for the council meeting."

"The most important outcome of the meeting," says Charles S. Brown, the council's chairperson and chief science officer at Luxcore in Decatur, Georgia, USA, "was the drafting of statutes detailing the institute's structure and collaborative goals. These included the designation of specific responsibilities for its current 15 council members (seven African-Americans, seven Africans, and two ICTP liaisons) and the opening of the institute to general membership. The first member under this new arrangement is Aakhut E. Bak, Department of Physics, Morehouse College, Atlanta, USA."

Another outcome of the meeting was the drafting of plans to expand the institute's reach of activities to generate a broader and more lasting impact not just on physics in Africa, but mathematics and high technology as well. These steps

will give the institute a broader foundation for action than it had in the past.

"The effort," notes Denardo, "is part of ICTP's director Miguel Virasoro's long-range goal to more closely link researchers from developed and developing nations, especially researchers who have some affinity to one another—as is the case with African and African-American physicists and mathematicians."

"Despite centuries of separation," adds council member Ahmadou Wagué, "deep cultural ties exist between black scientists in the United States and Africa that could help



*Council Meeting of the Edward Bouchet/Abdus Salam Institute*

nurture a spirit of closer collaboration. EBASI hopes to tap both the personal and professional interests that researchers in each of these scientific communities have for one another." Wagué is the coordinator of the African Network on Laser, Atomic and Molecular Physics (LAMP). The network's headquarters are located at University Cheik Anta Diop—an ICTP Affiliated Centre—in Dakar, Senegal.

One of the several activities that the institute plans to pursue is a programme in theoretical and experimental hydrodynamics that will enable young African scientists to pursue their studies at ICTP in Trieste under the supervision of council member Joseph A. Johnson, professor of physics at Florida A&M University in Tallahassee, USA. While students will be able to avail themselves of the Centre's facilities, funding for the effort will come in part from sources in the United States.

"It's the kind of initiative that conforms to Salam's vision," Johnson notes. "The Centre will be at the hub of a multifaceted effort to improve physics and mathematics training in Africa with assistance from African-Americans in the United States."

Johnson will spend the next several months seeking funds from agencies and foundations in America. He hopes to have two to three students participating in the overall programme next year, including African participants whose research activities are based in Florida.

Other potential EBASI projects include an initiative to secure a project focussed on external support for ICTP Affiliated Centres like LAMP. The project will be designed to strengthen LAMP's role as a regional laser facility for the training of scientists and technicians in West Africa.

To bolster such efforts, the council has asked ICTP to remain closely associated with EBASI. Such ties, members maintain, are necessary to enhance the institute's visibility and prestige, especially among potential funders.

"Every institute needs to step back and seek new directions as it matures, and EBASI is no exception," observes Denardo. "The decisions made at the council meeting were intended to provide new directions and stronger purpose to the organisation. We will assess our progress as we move ahead, but we are optimistic that the institute will now be able to nurture even closer links between physicists and mathematicians in Africa and the United States in ways that are beneficial to both communities." □

*For additional information about the Edward Bouchet/Abdus Salam Institute (EBASI), please contact Eleonora Crotta, ICTP Office of External Activities, Strada Costiera 11, 34014 Trieste, Italy, phone 39 040 2240 323, fax 39 040 2240 443, oea@ictp.trieste.it, or Charles Brown, Chief Science Officer, Luxcore, P.O. Box 370349, Decatur, GA 30037-0349, USA, profcsb@bellsouth.net.*

## Edward Bouchet/Abdus Salam Institute Executive Board

### CHAIR

Charles S. Brown  
Chief Science Officer  
Luxcore  
Decatur, GA, USA  
profcsb@bellsouth.net

### DIRECTOR OF AFRICA OFFICE

F.K.A. Allotey  
Ghana Atomic Energy Commission  
Legon-Accra, Ghana  
fka@ghana.com

### ADMINISTRATIVE OFFICER

Aakhut E. Bak  
Department of Physics  
Morehouse College  
Atlanta, GA, USA  
abak@morehouse.edu

### ABDUS SALAM ICTP REPRESENTATIVES

Gallieno Denardo  
The Abdus Salam ICTP  
Trieste, Italy  
hussainf@ictp.trieste.it

Faheem Hussain  
The Abdus Salam ICTP  
Trieste, Italy  
hussainf@ictp.trieste.it

### AFRICAN COUNCIL MEMBERS

Aba B. Andam  
Department of Physics  
Kwame Nkrumah University of Science  
& Technology  
Kumasi, Ghana  
ustlib@libr.ug.edu.gh

James O.C. Ezeilo  
Department of Mathematics  
University of Swaziland  
Kwaluseni, Swaziland  
ezeilo@science.uniswa.sz

Jean-Pierre Ezin  
Institut de Mathématiques et de Sciences  
Physiques  
Porto-Novo, Benin  
jpezin@syfed.bj.refer.org

Mohamed H.A. Hassan  
Third World Academy of Sciences  
Trieste, Italy  
twas@ictp.trieste.it

Leonard Kanangwe Shayo  
University of Dar-es-Salaam  
Dar-es-Salaam, Tanzania  
shayolk@cs.udsm.ac.tz

Ahmadou Wagué  
Departement de Physiques  
Université Cheikh Anta Diop  
Dakar, Senegal  
wague@ucad.refer.sn

### U.S. COUNCIL MEMBERS

Anthony M. Johnson  
Department of Physics  
New Jersey Institute of Technology  
Newark, NJ, USA  
johnsona@adm.njit.edu

Joseph A. Johnson III  
Center for Nonlinear and  
Nonequilibrium Aeroscience  
Florida A&M University  
Tallahassee, FL, USA  
johnsonj@cennas.nhmfl.gov

Ronald E. Mickens  
Department of Physics  
Clark Atlanta University  
Atlanta, GA, USA  
rohrrs@math.gatech.edu

Sekazi K. Mtingwa  
Department of Physics  
North Carolina A&T State University  
Greensboro, NC, USA  
mtingwas@ncat.edu

Kennedy Reed  
Lawrence Livermore National Lab  
Livermore, CA, USA  
reed5@llnl.gov

Milton D. Slaughter  
Department of Physics  
University of New Orleans  
New Orleans, LA, USA  
mslaught@uno.edu



## DATELINE

### Media Attention

Former ICTP Diploma student, Saw Wai Hla, now with the Free University of Berlin, Germany, has received widespread media attention following the publication of his article (co-authored with L. Bartels, G. Meyer and K.H. Rieder), "Inducing All Steps of a Chemical Reaction with the Scanning Tunnelling Microscope Tip: Towards Single Molecule Engineering," *Physical Review Letters* 85 (25 September 2000). The research, which *Chemical and Engineering News* 78 (2 October 2000) selected as one of its top news stories for that week, is based on innovative 'tweezer' applications of scanning tunnelling microscopes to construct what may be the first 'hand-made molecule.' The finding could significantly expand a chemist's tool kit for molecular synthesis.

Claudio Castellano, University of Essen, Germany; Matteo Marsili, INFN Trieste - SISSA Unit; and Alessandro Vespignani, ICTP, published "Nonequilibrium Phase Transition

in a Model for Social Influence," *Physical Review Letters* 85 (16 October 2000). The article, which uses mathematical formulas to help explain how cultural norms are transmitted and sustained, was discussed at length by Philip Ball in "Physics: Culture Cultures," *Nature - Science Update* (11 October 2000).

ICTP post doc Herman Julio Mosquera Cuesta spoke on the German national radio network about his research on the relationship between neutrino oscillations and supernova collapse. Cuesta's findings were published in *The Astrophysical Journal* 544 (20 November 2000).

Hilda Cerdeira, staff scientist with the ICTP Condensed Matter Group and head of the ICTP/TWAS Donation Programme, has been elected to the editorial board of the *International Journal on Bifurcation and Chaos*. The journal's editorial offices are housed at the University of California, Berkeley.

### Climate Grants

ICTP's Physics of Weather and Climate Group (PWC) recently received two research grants from Italian funding institutions. The Rome-based Italian National Research Council (CNR) has awarded the PWC 30 million lire (US\$15,000) to examine issues related to climate predictability, with a special focus on regions bordering with the Atlantic Ocean. The three-year grant will be administered under CNR's SINAPSI (Seasonal, interannual, and decadal variability of the atmosphere, ocean and marine ecosystems) project. Meanwhile, the Milan-based CESI (*Centro Elettrotecnico Sperimentale Italiano Giacinto Motta*), a government-sponsored applied research group devoted to examining and improving the management of the national electric system, has awarded the PWC a 120-million-lire (US\$60,000) grant to participate in the development and validation of a seasonal forecasting system based on sequences of numerical models. Specifically, the one-year project will examine how to devise seasonal forecasts based on interrelated models that simulate ocean-atmosphere circulation and atmospheric circulation at high resolution on global and regional scales. ICTP researchers will focus on the high-resolution regional components of the forecasting system.

## NEWS FROM ASSOCIATES

Vinod Chandra Tewari, senior scientist at the Wadia Institute of Himalayan Geology, Dehradun, India, was honoured by the International Biographical Centre, Cambridge, UK, as an International Man of the Year for 1999-2000, for his outstanding research work on precambrian life of the Earth (Himalaya), and more specifically his studies on its early evolution and genetic significance in the transition from unicellular to multicellular microbes in the sediments in the Dehradun district. V.C. Tewari is a Regular Associate of ICTP (1998-2003).

Titilayo Adelaja Kuku, ICTP Regular Associate 1992-2003 and Fellow of the Training and Research in Italian Laboratories (TRIL) Programme, has been appointed Head of the Department of Electronic and Electrical Engineering of Obafemi Awolowo University in Ile-Ife, Nigeria (see News from ICTP, Spring 1998, p. 12-13). He assumed the post from Adebayo Gabriel Adegboyega, former ICTP Regular Associate 1984-1998, who is now Dean of the Faculty.



## Nobel And Not

The annual Ig Nobel Prize, although not quite on par with the announcement of the real Nobel Prize, is nevertheless an announcement that captures a great deal of attention in scientific publications and the popular press.



Sir Michael Berry

What's the Ig Nobel Prize, you ask? A sort of alternative (or anti-) Nobel Prize that honours scientists whose achievements "cannot or should not be reproduced." That translates into unusual, eccentric or sometimes just plain goofy research.

The Igs, which are awarded by the science humour magazine *Annals of Improbable Research*, are co-sponsored

by the Harvard Computer Society. Winners are selected by a committee that includes genuine Nobel Laureates—Sheldon Glashow, for instance, who received the Nobel Prize for physics in 1979 with Abdus Salam and Steven Weinberg.

Last October, the 2000 Ig Nobel Prize for physics was shared by Andrey Geim of the University of Nijmegen, The Netherlands, and Sir Michael Berry of Bristol University, United Kingdom. Sir Michael, a highly respected physicist and member of the Royal Society, won the ICTP Dirac Medal in 1995 for his discovery of the non-integrable phase that arises in adiabatic processes in quantum theory. He received the Ig Nobel Prize for another, more profane, contribution to the world of science: "Using magnets to levitate a frog and a sumo wrestler," according to the citation that accompanied the prize. Simply stated, Geim and Berry conducted research on a device that levitates plants, animals and inanimate objects through the force of an intense magnetic field (see *News from ICTP*, Winter 2000, p. 9).

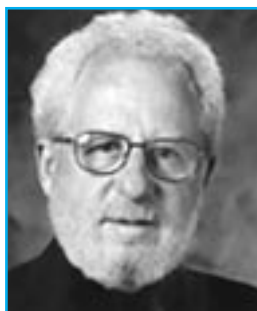
In the 'Ig Nobel' words of the two physicists, their work creates a sort of "levitation without meditation." The paper that prompted the award, "Of Flying Frogs and Levitrons," appeared in the *European Journal of Physics* (18, July 1997, p. 307-313). The phenomenon they describe and have put into practice is based on diamagnetism, the magnetic force created by the internal motion of atoms, which can be used both for conducting experimental research and teaching magnetism in schools. In one of the more memorable Dirac Medal award ceremonies, Berry gave a practical demonstration of diamagnetism at ICTP during his lecture. The audience agreed it was an 'uplifting' experiment.

## Nobel Prize in Chemistry 2000

The most recent Nobel Prize winners, announced in October 2000, include Alan J. Heeger, University of California, Santa Barbara, USA; Alan G. MacDiarmid, University of Pennsylvania, Philadelphia, USA; and Hideki Shirakawa, University of Tsukuba, Ibaraki, Japan, who were awarded the prize in chemistry "for the discovery and development of conductive polymers." All three Laureates lectured

at ICTP at the Adriatico Research Conference on "One-Dimensional Organic Conductors: Chemistry, Physics and Applications." Heeger also lectured

at the Adriatico Research Conference on "High Temperature Superconductors." Both conferences took place at the Centre in July 1987.



Alan J. Heeger



Alan G. MacDiarmid



Hideki Shirakawa

5th WORKSHOP ON THREE-DIMENSIONAL MODELLING OF SEISMIC WAVES GENERATION, PROPAGATION AND THEIR INVERSION

25 September - 6 October

Co-sponsor: European Commission (Brussels, Belgium).

Directors: B.G. Bukchin (International Institute of Earthquake Prediction Theory and Mathematical Geophysics, Moscow, Russian Federation), F. Cornet (Institut de Physique du Globe, Paris, France) and G.F. Panza (University of Trieste, Italy, and ICTP). Local Organiser: G.F. Panza.

*The Workshop offered training in advanced research and development methodologies for fundamental studies of the Earth's evolution and dynamics and for such applied problems as prospecting for mineral resources and evaluation of seismic hazards, especially in megacities. Lectures concentrated on the theory of seismic wave propagation and modelling, seismic sources, and seismic hazards. Computer exercises focussed on frequency-time analyses of seismic records, modelling of seismic response of layered media, determination of seismic source characteristics through analyses of seismic waves records, 2D and 3D seismic tomography, and monitoring of the Earth's seismicity.*

EARTH SYSTEMS SCIENCES COURSE IN WATERSHEDS AND COASTAL ZONE SIMULATION

2 - 13 October

Co-sponsor: Kuwait Foundation for the Advancement of Sciences (KFAS).

Directors: T.S. Hopkins (North Carolina State University, Raleigh, USA) and R. Pagnotta (Italian National Research Council, Rome, Italy).

*The Course introduced students to scientific methodologies for the management of anthropogenically impacted natural systems. As a result of the deteriorating capacity of natural systems to provide goods and services (natural capital) to ever-increasing human populations, there is an urgent need for quantitative assessments of these systems to guide sustainable socio-economic decision-making. That is the goal of the emerging academic/research field of Earth Systems Science (ESS). ESS is inexpensive and transportable, which makes it a highly desirable tool for lesser developed countries struggling to preserve the sustainability of their natural systems. Computer-based simulation models, backed by targeted validation and input-data observations, represent a powerful assessment tool likely to prove beneficial to both the science and policy sectors.*

QED 2000 - 2nd WORKSHOP ON FRONTIER TESTS OF QUANTUM ELECTRODYNAMICS AND PHYSICS OF THE VACUUM

6 - 10 October

Directors: D. Amati (International School for Advanced Studies, SISSA, Trieste, Italy) and E. Zavattini (University of Trieste, Italy). Organising Committee: G. Cantatore (University of Trieste), D. Bakalov (Institute of Nuclear Research and Nuclear Energy, Sofia, Bulgaria), F. Della Valle (University of Trieste) and C. Rizzo (Université Paul

*Sabatier and Centre National de la Recherche Scientifique, CNRS, Toulouse, France). As a follow-up to the first workshop in the series, held in Sandanski, Bulgaria, in 1998, QED 2000 was designed to bring together experimental and theoretical physicists in related fields to explore innovative ideas and new theoretical challenges for conducting experimental tests of QED and 'vacuum' physics. Main topics included photon-photon interactions, bound systems, heavy ions interactions, vacuum structure, dark matter, and fundamental constants.*

ICTP - LATIN AMERICAN SCHOOL ON STRINGS 2000 (ICTP-LASS 2000), Mexico City, Mexico

9 - 27 October

International Organising Committee: G. Aldazábal (Centro Atómico Bariloche, San Carlos de Bariloche, Argentina), N. Berkovits (Universidade Estadual Paulista, São Paulo, Brazil), M. Blau (ICTP), A. Cabo (Institute of Cybernetics, Mathematics and Physics, ICIMAF, Havana, Cuba), A.M. Font (Universidad Central de Venezuela, Caracas, Venezuela), F. Quevedo (University of Cambridge, UK), M. Ruiz-Altaba (Universidad Nacional Autónoma de México, UNAM, Mexico City, Mexico), S. Randjbar-Daemi (ICTP), N. Vanegas

*(Universidad de Antioquia, Medellín, Colombia) and J. Zanelli (Centro de Estudios Científicos de Santiago, Chile).*

*The School, designed both for graduate students of theoretical high energy physics and researchers in other fields of mathematics and physics, offered an introduction to modern string theory (week 1), a discussion of non-perturbative string theory dualities (week 2), and an examination of other recent developments (week 3). Hosted by the Mexican Academy of Sciences El Colegio Nacional, the School was open only to Latin-American students. In attendance were 83 participants from the following countries: Argentina, Brazil, Colombia, Chile, Cuba, Ecuador, Guatemala, Mexico, Peru and Venezuela.*



Gerardo Aldazábal, Fernando Quevedo (in profile) and Marti Ruiz-Altaba with students and conference secretary Veronica Riquer

6th COLLEGE ON MICROPROCESSOR-BASED REAL-TIME SYSTEMS IN PHYSICS

9 October - 3 November

Directors: A.S. Induruwa (University of Kent, Canterbury, UK) and C. Verkerk (ICTP).

*The College was designed for physicists and engineers seeking to devise computer-based, real-time operating systems for the control of their*

*experimental equipment. After a brief review of C programming language, lecture topics focussed on real-time operating systems and design methods, development of embedded systems using a suitable real-time kernel, writing of device drivers for special equipment, development of a graphical user interface for use with external equipment, and examinations of the practical aspects of networks.*

## WORKSHOP ON PLASMA DIAGNOSTICS AND INDUSTRIAL APPLICATIONS OF PLASMAS

12 - 13 October

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

Directors: R. Amrollahi (K.N. Toosi University of

Technology, Tehran, Iran), V. Gribkov (Lebedev Physical Institute, Moscow, Russia) and A. Wootton (Lawrence Livermore National Laboratory, Livermore, USA).

*Through the exchange of information and ideas, the Workshop promoted co-operation among larger and smaller plasma diagnostic and application*

*programmes. Topics included plasma diagnostic techniques, development of plasma diagnostic instruments, and industrial applications of plasmas and plasma diagnostics tailored for small plasma research and development programmes, especially in developing countries.*

## WORKSHOP ON THE APPLICATION AND DEVELOPMENT OF NUCLEAR REACTOR SIMULATORS FOR EDUCATIONAL PURPOSES

16 - 27 October

Co-sponsor: International Atomic Energy Agency

(IAEA, Vienna, Austria).

Directors: G. Bereznai (Chulalongkorn University, Bangkok, Thailand), W.K. Lam (CTI Simulation International Corporation, Toronto, Canada) and R.B. Lyon (IAEA).

*The Workshop included both lectures and computer exercises for advanced software packages that operate on personal computers and that are*

*designed to simulate responses of water-cooled reactors during normal and abnormal operations. The simulations were designed to provide insight and understanding of the overall design and operational characteristics of various power reactor systems. Models were used to demonstrate reactor behaviour in sub-critical, critical and supercritical states.*

## 15th ANNIVERSARY MEETING OF DIRAC MEDALLISTS

4 - 5 November

Local Organiser: K.S. Narain (ICTP).

*The year 2000 marked the 15th anniversary of the Dirac Medal of the Abdus Salam International Centre for Theoretical Physics.*

*The Medal has become one of the most prestigious awards in physics. The list of winners includes many of the world's leading theoreticians. Medallists were invited to Trieste to discuss their past and present research interests and to examine ways in which they could help maintain the international status that the award has achieved.*

## Statement of Support from Dirac Medallists

*On the occasion celebrating the 15th anniversary of the Dirac Medal, a support group of Dirac Medallists was constituted to sustain ICTP's mission to promote basic sciences in the developing countries and North-South collaboration.*

*Group members agreed to:*

- *Provide advice when requested to ICTP to help increase the visibility of Centre activities, act as good will ambassadors and make a special effort to participate in programmes such as the Visiting Scholar programme.*
- *Propose nominations for the Dirac Medal Award reinforcing the well-established tradition of high scientific excellence and innovative impact in physics and mathematics.*



Tullio Regge



Peter van Nieuwenhuizen



Bryce DeWitt



Ludwig D. Faddeev



Sergio Ferrara



Daniel Z. Freedman



15th Anniversary Meeting of Dirac Medallists



## SCHOOL ON SYNCHROTRON RADIATION

6 November - 8 December

Co-sponsors: *Sincrotrone Trieste S.p.A.*, *Società Italiana di Luce di Sincrotrone (SILS, Italy)* and Italian Ministry of Foreign Affairs, in connection with the SESAME project.

Directors: M. Altarelli (ICTP and *Sincrotrone Trieste*), A. Craievich (*Universidade de São Paulo, Brazil*), C.S. Fadley (Lawrence Berkeley Laboratory, Berkeley, USA) and H. Wiedemann (Stanford Synchrotron Radiation Laboratory, Stanford, USA). *The School covered all aspects of synchrotron radiation from machine physics, insertion devices and beamline design to actual applications. Emphasis was placed on practical training in vacuum technology and instrumentation and use*

*of common experimental techniques. Industrial and environmental applications were also discussed. Visits to the Trieste synchrotron radiation laboratory, Elettra, were part of the event. Due to recent progress in the proposed effort to transfer a synchrotron radiation source to the Middle East (SESAME Project), the first week of the School included introductory lectures for Middle East participants. The School consisted of lectures in the morning followed by exercises and data handling sessions on personal computers in the afternoon. Lecture topics included accelerator physics and synchrotron radiation sources, beamline and monochromator design, and applications of synchrotron radiation to physics, chemistry, materials science, surface science and engineering, geophysics, biophysics and the environment.*



Chuck Fadley

## WORKSHOP ON PHYSICS OF MESOSPHERE-STRATOSPHERE-TROPOSPHERE INTERACTIONS WITH SPECIAL EMPHASIS ON MST RADAR TECHNIQUES

13 - 24 November

Directors: S.M. Radicella (ICTP) and D. Narayana Rao (Sri Venkateswara University, Tirupati, India).

Local Organiser: S.M. Radicella. *An increasing number of developing countries now actively study the lower and middle atmosphere to improve weather forecasting. The Workshop helped participants to better understand the structure of the lower and middle atmosphere as well as interactions among the atmosphere's three components: mesosphere, stratosphere and troposphere. The activity consisted of tutorial lectures*

*and laboratory work. During the latter, participants analysed data received from applications of different radar techniques. The Workshop covered the following topics: stable atmosphere, gravity waves and turbulence, tropical meteorology, mesospheric dynamics, lower ionosphere structure, scattering mechanisms, principles of ST/MST radar, wind profilers, boundary layer radar, radio acoustic sounding system, and meteor radar.*

## MICROPROCESSOR LABORATORY THIRD REGIONAL COURSE ON ADVANCED VLSI DESIGN TECHNIQUES, Lima, Peru

13 November - 1 December

Directors: A.A. Colavita (ICTP). A. Cicuttin (ICTP)

was Head of laboratory exercises. Local Organiser: J. Tisza (*Universidad Nacional de Ingeniería, Lima, Peru*). *This training Course introduced scientists and engineers from Latin America to the latest VLSI (Very Large Scale Integration) design techniques.*

*The activity included both the study of theory (introduction to LINUX, VLSI design using Alliance, CMOS technology, design for testability, introduction to analogue IC design, and FPGAs design fundamentals) and laboratory exercises, including 70 hours of VLSI design using Alliance.*



Microprocessor Laboratory Third Regional Course on Advanced VLSI Design Techniques





## PROFILE

ICTP Associate Bandara Karunaratne has spent much of his career putting physics to work to help boost the economy of his native country Sri Lanka.

# Moulding the Future

**S**ri Lanka is a small island-nation that lies like a tear-drop off the southern coast of India. Rich in cultural traditions and blessed with an abundance of natural resources, the tranquility of this island-nation has been shattered by violent ethnic upheavals in the northern province of Tamil, which have left thousands of people dead and a once-pleasing landscape scarred and battered.

ICTP Regular Associate (1997-2002) Bandara Karunaratne, a Sri Lankan materials physicist, is determined to help put his native land, which the world has often associated with tea, coconuts and rubber, back on track by improving its capacity for scientific training and research. He has been particularly interested in investigating potential commercial applications of native materials.

"I received my undergraduate degree in physics in 1971 from the University of Peradeniya, Sri Lanka, and earned my doctorate in materials physics from the University of Warwick in the United Kingdom in 1980," explains Karunaratne. "Immediately following my graduation, I worked for a local timber firm, where I examined the physical properties of the harvested lumber to assess its durability after it was treated with borax, a preservative."

As a graduate student, Karunaratne broadened his materials research at the University of Warwick to encompass silicon nitride ceramics. "I wanted to investigate the microstructure and fracture properties of these materials when subjected to extremely high temperatures and pressures," he notes. "The ways in which the materials respond to these conditions tell us a lot about their durability. That, in turn, could have important implications for their use in motor engines or cutting tools."

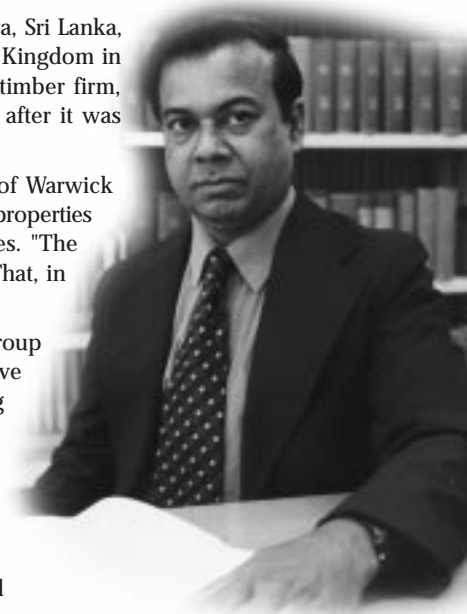
While completing his doctorate, Karunaratne, in collaboration with the Lucas Research Group in the United Kingdom, conducted research helping to illustrate that silicon nitride could serve as a more efficient and longer lasting machine-cutting material than carbon- and steel-cutting materials then in use. The research eventually bore fruit in commercial applications under the trademark *syalon*, which has found widespread use in the cutting tool industry.

Karunaratne returned to Sri Lanka in 1980, assuming a teaching position in the department of physics at the University of Peradeniya. While attending to his teaching responsibilities, Karunaratne also developed an active research agenda. Drawing on his knowledge and previous training in materials physics, he devoted a great deal of time examining the structural integrity and durability of local ceramics—porcelains, bricks and tiles.

"My goal," Karunaratne notes, "has been to enhance the applicability of these ceramics in the manufacture of materials ranging from dinner plates to turbine blades." Most recently, he has investigated the potential for ceramic rotary seals to replace alumina seals in water pumps. "Since clay is much cheaper than alumina and since our testing suggests that the ceramic seals would be more durable, the research holds much promise for possible commercial applications."

A key to Karunaratne's success is explained by the ties he has established with other institutions. The International Programme in Physical Sciences (IPPS) at the University of Uppsala in Sweden offers both laboratory equipment and student fellowships, and the University of Warwick sends materials used in experiments and provides valuable lines of communication with former teachers and colleagues. Meanwhile, his status as ICTP Associate has enabled him to spend seven weeks last fall in Trieste, where he has taken advantage of the Centre's library, internet facilities and proximity to other well-respected scientific institutions to "stock up on information that will undoubtedly prove invaluable to my research and development activities when I return home."

The Centre's close relationship with the University of Trieste has allowed Karunaratne to develop ties with Italian researchers as well as to take advantage of the university's electronmicroscopic facilities to conduct experiments that would be impossible to do back home. Trieste's scientific facilities have also opened a new world to Uthpala Dahanayake, a youthful Sri Lankan researcher who has accompanied Karunaratne as an 'ICTP young collaborator.' "Sergio Meriani and Valter Sergo, professors at the Materials Engineering Department of the University of Trieste, have been particularly helpful in strengthening the links between ICTP, their university and my institution. It's all part of a growing network of scientific interaction that would be impossible to build without the Centre's long-standing reputation both in Italy and abroad." □



Bandara Karunaratne

## T R I B U T E S



Antonio Ruberti, 1927-2000

*Antonio Ruberti, a well-known scientist, engineer and statesman, died in Rome on 4 September. As Italian Minister for Scientific Research from 1987 to 1992, and European Commissioner from 1992 to 1994, he strongly supported ICTP, SISSA (International School for Advanced Studies), and the Elettra synchrotron facility. He also led the effort to establish the Italian and European Scientific Culture Weeks, now held yearly, and lent his authority to the development of the Trieste-based Laboratorio dell'Immaginario Scientifico. He visited ICTP in October 1987.*



Jean Heidmann, 1923-2000

*French-born astronomer Jean Heidmann, an enthusiastic supporter of the search for extraterrestrial intelligence (SETI), died on 3 July. He began his career at Cornell University, USA, conducting research on cosmic rays. He then moved to the Paris Observatory, Meudon, France, to pursue his interests in radioastronomy. In recent years he advocated the design and ultimate construction of a lunar SETI radiotelescope fully shielded from terrestrial interference. Author of many popular books on astronomy and cosmology, Heidmann lectured at the ICTP Conference on Chemical Evolution in 1992, 1995 and 1997.*

director-general of the NSFC bureau of international cooperation, and included the deputy director of the department of mathematics and physical sciences and the programme manager of the bureau of international cooperation. The Viet Nam delegation was headed by Tran Manh Tuan, deputy director-general of the Viet Nam National Centre for Natural Science and Technology (NCST), and included the director of the institute of materials science and the director of the department of international cooperation. More than 150 Chinese scientists visit ICTP each year, some under a cooperative agreement with the Centre in which China pays the airfare while ICTP covers the cost of hospitality. Meanwhile, Viet Nam sends some 60 scientists to the Centre each year, placing it near the top of country-participation on a per-capita basis.



Cuban nuclear physicist Fidel Castro Diaz-Balart, eldest son of Fidel Castro, toured ICTP and the Third World Academy of Sciences (TWAS) on 2-3 November. Fidel 'junior' studied at the Lomonosov University in Moscow and received his Ph.D. in fusion physics at the Kurchatov Institute. From 1979 to 1992, Castro served as head of Cuba's Atomic Energy Commission. Today he is engaged in programmes to modernise the scientific, technological and industrial management of Cuba. This was Castro's second visit to the Centre. The first took place in 1989.



Prosper Mpawenayo, Minister of National Education and Scientific Research in Burundi in Central Africa, visited ICTP in mid November to discuss potential areas of cooperation with ICTP for boosting training and research opportunities among scientists in his home country. Mpawenayo was a Regular ICTP Associate between 1993 and 1999 and was a Fellow in the ICTP Programme for Training and Research in Italian Laboratories (TRIL) between 1985 and 1988. During the latter period, he earned a doctorate in physics. TRIL grants enabled Mpawenayo to visit the *Politecnico di Torino* on several occasions during the 1990s. His major fields of research are semiconductor physics and solar energy.



### VIPs Visits

Ishfaq Ahmad, Chairman of the Pakistan Atomic Energy Commission, visited ICTP from 12-14 September. The Chairman and ICTP staff discussed ways to strengthen the relationship between Pakistan and the Centre by expanding the number of visits of Pakistani scientists to ICTP research activities and by increasing the number of Pakistani scientists participating in ICTP external training programmes. ICTP and Pakistan enjoy a long and fruitful relationship dating back to the Centre's earliest days.



Science officials from China and Viet Nam visited ICTP in October. The Chinese delegation from the National Natural Science Foundation of China (NSFC) was headed by Bai Ge, the deputy



A delegation from European embassies in Rome, including scientific counsellors and attachés from Belgium, France, Germany, Spain and the United Kingdom, visited the Centre on 28 November, to learn more about ICTP's training and research activities.



## WHAT'S NEXT

11 - 13 January  
Tenth International Workshop on Computational Condensed Matter Physics: Total Energy and Force Methods

24 - 27 January  
Trieste Meeting of European Project COST 271

12 February - 2 March  
School on Digital and Multimedia Communications Using Terrestrial and Satellite Radio Links

19 February - 2 March  
Winter School on Laser Spectroscopy and Applications

5 - 10 March  
International School on Crystal Growth of Materials for Energy Production and Energy-Saving Applications

12 - 16 March  
Advanced Course: Climate Change in the Mediterranean Region - Part I: Physical Aspects

12 - 30 March  
College on Soil Physics

2 - 6 April  
Workshop on Soil Systems in the Context of Climate Change



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](mailto:smr@ictp.trieste.it)

**Subject:** get calendar 2001

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](mailto: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](mailto:smr####@ictp.trieste.it)

**Subject:** get announcement application\_form

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

##### (3) For Information on All ICTP Activities

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

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## NEWS from ICTP

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

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

Editor  
Daniel Schaffer

Staff Writer  
Fabio Pagan

Managing Editor  
Anna Triolo

Copy Editor  
Katrina Danforth

Statistician  
Giuliana Gamboz

Photos  
Massimo Silvano,  
ICTP Photo Archives

Layout  
Associazione Progettisti Grafici

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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