



NEWS *from* ICTP



2 WHAT'S NEW
The Art of Science

8 DATELINE
Auctions
Seismology in Iran
Fields Medals

12 MONITOR
Open Day
Boltzmann
G-8

3 COMMENTARY
Abdus Salam

10 ACTIVITIES
July-September 2006

14 PROFILE
Paolo Budinich

4 FEATURES
Science in Islam

Little Lady of Flores

AUTUMN
2006

#118

15 WHAT'S NEXT
Conferences, Schools,
Workshops

The Art of Science

The most beautiful thing we can experience is the mysterious. It is the source of all true art and science."

As indicated in the above quote, for Albert Einstein, science and art were derived from the same source of human imagination.

Perhaps even more remarkably, according to Einstein, both of these fundamental human pursuits were rooted in a world of mystery that existed beyond human understanding.

Think about it. Perhaps the greatest scientist in history—a person whose unparalleled intellect unraveled the mysteries of time and space—viewed scientific discovery as a process driven by unknown forces similar to those driving artistic expression.

Yet, contrary to Einstein, our modern world, which Einstein ironically helped to create, sees science and art as two different cultures—indeed two different worlds. The scientific world and its technological byproducts are believed to be based on a thought process that is both elegant and reproducible.

Once proven, a law of nature remains solidly in place forever, serving as a building block for better understanding the universe.

Art and great art in particular, meanwhile, is thought of as unique and irreproducible. Indeed, isn't that what makes Michelangelo's David such a treasured work?

And while science, in our mind, requires deep commitment to deep thought, in the popular mind, art is inspired not so much by superior intelligence but by flashes of inexplicable insight—to images and sounds, shapes and colours, patterns and perceptions.

When people apply the word 'genius' to a book, painting or musical composition, they often have a different definition of genius in mind than when they describe Einstein as a genius for having discovered the theory of relativity.

Put another way, mention the word 'genius' when discussing Einstein, and the forehead wrinkles and the eyes squint in an effort to understand the intelligence that drove



Giuseppe Furlan

his thought process. Mention the word 'genius' when discussing Michelangelo and the eyelids grow wider and the eyes themselves begin to sparkle in an effort to acknowledge and appreciate the inspiration that led him to shape such beautiful forms from stone and marble.

In today's world, the gap between science and art seems to be larger than ever.

Yet, in one area, science is providing a new set of tools that could radically alter our understanding of art, particularly ancient art.

Science and technology have made available new analytical tools for investigating the structure and properties of materials used in the world of art that are proving instrumental in the conservation and restoration of paintings and cultural artifacts. Synchrotron radiation, laser

technology, accelerator mass spectrometry, and X-ray emissions and fluorescence are turning art into science and science into an art.

And while these tools are essential, the insights they provide must draw on the expertise and wisdom of art historians and archeologists if they are to truly improve not only our understanding, but also our conservation and restoration, of the irreplaceable artifacts that define our humanity.

Such collaboration—an alliance between two worlds that seem worlds apart—has become indispensable for the effective management of the world's cultural heritage.

No country is likely to have a greater stake in this effort than Italy, by some estimates home to more than half of the western world's artistic treasures. Italy also serves as the host country of ICTP, with its long and successful history of offering research and training activities to scientists from the developing world. What better place then for science and art to work together? If Einstein were alive today, such collaboration would indeed bring a smile to his face—not only for the intellectual cross-currents that it fosters but also for the light that it sheds on human genius, both in art and science. □

COMMENTARY

Abdus Salam: The Legacy Lives On

November 21 marked the 10th anniversary of Abdus Salam's death. Like most individuals of great accomplishment, Salam's memory lives on—both in the ideas and institutions that he created and in the hearts and minds of the legions of scientists that he influenced as a scientist and humanitarian. Salam not only won the Nobel Prize in physics (in 1979 for his contributions to the theoretical unification of the weak and electromagnetic forces) but he also served as the primary driver behind the creation of the institution that now bears his name: the Abdus Salam International Centre for Theoretical Physics.

Gordon Fraser, a student of Salam's at Imperial College during the 1960s and subsequently editor-in-chief of CERN Courier, the flagship publication of CERN (the European high-energy particle facility) in Geneva, Switzerland, speaks about Salam and his accomplishments in the following article, asking this intriguing question: What would Salam think today about fundamental unanswered questions in high energy physics and the enduring impact of ICTP?

When Abdus Salam urged physicists to go out and look for something new in the early 1970s, this is what he had in mind: Find the forces driving proton decay and use that knowledge to explain how these forces created equal amounts of matter and antimatter that eventually evolved into the Universe.

But detecting such rare phenomena have strained the ingenuity of even the most insightful and skilled experimental physicist. More than 30 years later, researchers have yet to detect any signs of proton decay.

If Salam were still with us today, what would he be thinking—and saying—about this and other related phenomena? Undoubtedly a great deal. Even in his eighties, there is no doubt that this man of unparalleled intellect would embrace the challenges presented by theories and experiments that seek to shed light on the universe's creation and evolution.

That's why Salam would be eagerly anticipating the findings of gravity-related experiments using satellites traveling deep within the universe or at CERN's Large Hadron Collider (LHC), which is scheduled to become operational next year.

Indeed Salam would have relished the prospects of experimentalists at CERN determining whether his theoretical constructs on gravity could be confirmed, much like Carlo Rubbia confirmed his theory of the unification of weak and electromagnetic forces. A Nobel Prize awaited both eminent scientists for their contributions.

Patience and perseverance ruled Salam's life both as a world-class scientist and a faithful follower of Islam. Indeed in both spheres of his life they constituted nothing less than sublime qualities.

Salam often recalled how Albert Einstein patiently persevered for most of his life trying to uncover a theory that would satisfactorily explain the unification of electromagnetism and gravity. Einstein's quest for this ultimate theory failed. Yet, as we all know, he had already left a deep imprint not only on science but on society in ways that most scientists only dream of. Einstein had the good fortune to have been born in the right place at the right time.

Yet, Salam wondered what may have become of Einstein had he been born in an impoverished Third World country instead of Germany. Salam believed that Einstein likely would

have been isolated in the country of his birth, unable to realize his intellectual potential, not only to his own detriment but also to the detriment of the world.

Salam spent the last 40 years of his career trying to ensure that future Einsteins, born in impoverished circumstances that were no fault of their own, could realize their full intellectual potential. That's what ICTP is all about. Salam, if he were alive today, would not only be proud of his creation but would also continue to work tirelessly to increase the Centre's impact in our rapidly evolving world for the benefit of all of humanity.

Salam never forgot his own brief stay at the Institute for Advanced Study in Princeton, in 1951, where he often saw Einstein strolling along the green-lined walkways that define this sanctuary of intellectual curiosity. Einstein would often be absorbed in deep thought, oblivious to his immediate world but keenly aware of the universe beyond.

Young, inexperienced and self-absorbed in his own narrow field of physics, Salam spoke to few people at Princeton and he never did meet Einstein. One person Salam did meet there was its director, J. Robert Oppenheimer. A decade later, Salam convinced Oppenheimer, despite being weakened by throat cancer and in the twilight of his life, to become a member of ICTP's first Scientific Council, where he played an instrumental role in drafting the Centre's charter.

Throughout his life, Salam never grew weary of pointing out to those living in developed countries that other countries—and other people—are less fortunate. If he were alive today, Salam would undoubtedly complement his scientific studies with his continual quest to help impoverished nations build their scientific and technological capacities.

Understanding the forces driving proton decay and gravity would have continued to capture Salam's intellectual curiosity. But so too would the need to address the social and economic problems that continue to plague too many inhabitants in too many nations. Throughout his life, Salam tirelessly explored the role that science could play in improving our understanding of nature and the conditions in which we live.

Let us continue to commemorate Salam by honouring his glorious legacy as a prophet of science and a champion of the underprivileged. □

FEATURES

Science in Islam: Which Way Forward?

How much time will pass before the Muslim world fully embraces modernity and science-based development?

A long time—perhaps as long as 50 years. But that doesn't mean that the global scientific community should stand idly by. International collaboration in science and technology could open significant channels for dialogue that would help reduce tensions between the Muslim and Western cultures. These same channels would also help Muslim countries achieve greater prosperity.

But for the dialogue to be both meaningful and productive, scientific communities in both the Muslim and Western worlds must first recognize the vast differences in vocabulary and worldviews that exist between these two cultures. Such differences often lead to misunderstanding and suspicion.

In the Muslim world, for example, people often use the word *elm* when referring to science. Yet, in Arabic, *elm* refers to a deep knowledge of Islam. In Iran, for instance, a religious scholar is given the title *abl e elm*. Similarly, the Iranian word for scientist is *danesbmand*. This word, which has been used for more than 1000 years, refers generally to scholars or philosophers rather than to scientists.

It would be a serious mistake to dismiss this discussion as nothing more than an arcane examination of linguistics—a playful analysis of the meaning of ancient words.

Words, especially in deeply religious and conservative societies like those found in the Muslim world, carry cultural significance that profoundly shape both personal and societal perceptions, understanding and morality. In Iran and all Arab-speaking nations, the lines of distinction between modern science and *elm*—between scientific research and religious scholarship—have been blurred for more than a thousand years. As a result, unlike much of the Western world, no clear distinctions exist between the meaning and purpose of science and the meaning and purpose of religion.

Creating clear distinctions between religion and science—and developing a vocabulary that unambiguously defines each—is one of the most fundamental challenges facing the Muslim world. Much is at stake for Muslims and non-Muslims alike.

Indeed the pathway to modernity and sustained economic growth in Muslim countries may lie with Islamic society's willingness to embrace science not just as a source of economic

progress but as a new way of thinking that is independent of religious thought. Equally important, opening up such pathways of understanding could also help Muslim and Western societies come to some mutual understanding of their shared heritage and common future.

While today's situation reflects a long period of decline and neglect, it is important to remember that a millennium ago the Islamic world was home to the world's finest institutions of higher education and that the region served as the world's primary source of scientific inquiry and discovery. Indeed from the birth of Islam in 622 to approximately 1400, the world's most enlightened centres of learning and research thrived under the patronage of Islam's most enlightened leaders. These institutions pursued curricula that included an amalgam of Islamic theology, the sciences, and philosophy.

By the 15th century, however, institutions of higher education and centres of science throughout the Islamic world chose to shun critical examinations of the natural world, opting instead to attribute natural phenomena solely to the will of Allah and the word of the Prophet Mohamed.

The intellectual shift in higher education in Islam paralleled a fundamental—indeed fundamentalist—shift in religious thought and principles that took place throughout the region. In principle, science continued to be taught at institutions of higher education. In reality, however, these institutions became religion seminaries absent of scientific thought. Education, in large measure, was relegated to religious education and the concept of science was relegated to 'religious science' as defined and practiced by religious scholars.

Science, in fact, was tragically divided into 'useful' and 'harmful' science. This distinction allowed staunchly conservative Muslim scholars to confine scientific curricula to subject areas deemed 'useful' for daily life—for example, knowledge of simple mathematics needed to purchase goods at a souk or an understanding of lunar astrometry necessary to specify the exact times of religious events like Ramadan.

This minimalist approach to science, which remains in place in many parts of the Islamic world to this day, has led to a distorted concept of science found not only in the region's seminaries but, more importantly, in the minds of many Muslims. The rote memorization that dominates the

curricula and characterizes much of what passes for education in Islamic nations is a reflection of the mindset that dominates the region's long-prevailing concept of stilted learning. Even the so-called secular Muslim intelligentsia is strongly influenced by the region's Islamic-based educational paradigm, a pattern of thought, which, needless to say, generates a distorted—indeed withered—concept of science.

For devout Muslims, Islam is embraced as a superior way of thinking that offers unchallengeable precepts for understanding nature and the place of human beings in the universe. For devout Muslims, Islam is superior to all other religions and provides an all-inclusive guide for lifelong behaviour. As a result, large percentages of the population perceive religious scholars to be scientists, while professionally trained scientists are often viewed as outsiders or aliens.

Many Muslims, as a consequence, while embracing *elm*, largely reject modern science and know little either about its practitioners or impact. The impoverished living conditions that characterize much of the Islamic world provide the most visible reflection of the consequences of this rejection. But, as I mentioned above, this rejection is also reflected in a language that has failed to introduce words that truly represent what science is and what scientists do. How can people embrace science if they have yet to find the words to explain what it is?

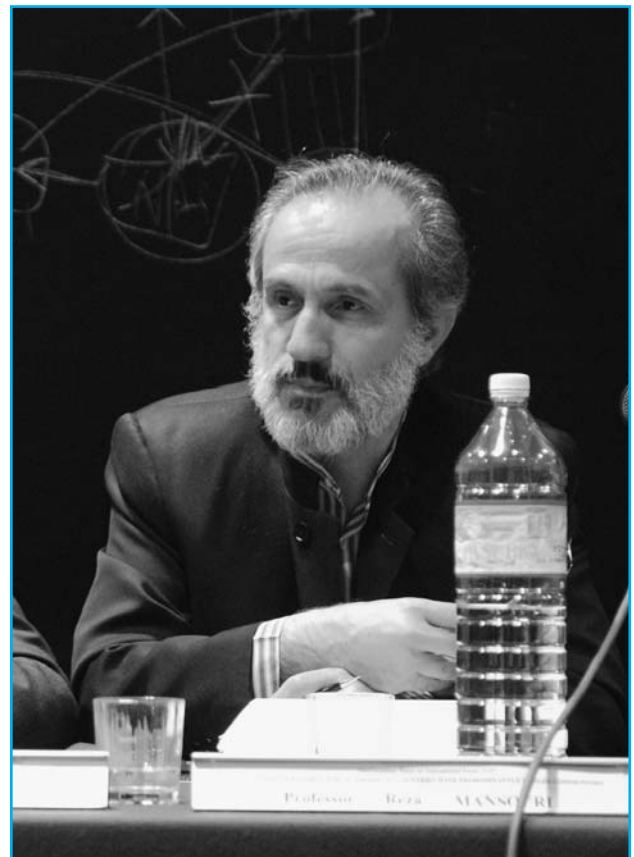
Following centuries of neglect, modern institutions of higher education first began to surface during the mid 19th century. In Iran, for example, the two most important universities in the modern era are Dar-ol-Fonoon, established about 150 years ago, and the University of Tehran, which opened its doors some 70 years ago. But it is interesting to note that scholars or intellectuals created neither university. Indeed Dar-ol-Fonoon was the product of the nation's leading politician, Nasserdedin Shah of Persia, and its primary lecturer in physics was August Kruiser, an Austrian army artillery instructor whose knowledge of physics was largely relegated to the battlefield not the classroom.

Today, there is not a single university in a Muslim country that ranks among the top 200 universities in the world. Most scientists born in the Muslim world are educated elsewhere, largely in the West; indeed most work elsewhere, again largely in the West. The region's scientific academies are largely nominal institutions that have often failed to elect members based on merit and have exerted scant influence on either national or regional policies either for science or science-based development. Scientists are not held in high esteem within their societies and often are not present in sufficient numbers to create a critical mass of thinkers and practitioners so necessary to achieve excellence in research. A recent survey by the Rand Corporation placed only 6 of the 57 Muslim countries in the category of "scientifically developing" countries: Egypt, Indonesia, Iran, Pakistan, Turkey and Uzbekistan. The rest were designated as "scientifically lagging" countries.

So, what can be done to reverse the long, seemingly

irreversible slide that Islamic countries have experienced in science? Some concrete measures would undoubtedly help, most notably increased funding for science, which has taken place in many of the Muslim countries that the Rand Corporation designated as scientifically developing countries. So too would a greater number of scientific exchange and joint research projects both among scientists and scientific institutions within the region and with developing and developed countries outside the region.

But the truth is that fundamental reform in the relationship between society and science in the Islamic world awaits fundamental reforms within the culture itself—reforms that can lay the intellectual foundation for establishing a clear distinction between science and religion and for clearing a



Reza Mansouri

pathway that enables each to exist independent of the other in a harmonious atmosphere of mutual respect and understanding.

Creating words that reflect this reality would be a good place to start. But nurturing mindsets across Islam that appreciate and honour this distinction would go a long way to defusing the crisis in thought and action that currently grips a society that has suffered too long and need not suffer any longer.

Change is possible but only if people throughout the Muslim world want change to take place. The future is in our hands. More flexible minds will be needed to mould the future in ways that meet our immediate needs without compromising our cultural traditions. □

The discovery of what some believe to be a new human species—*Homo floresiensis*—has captured the public's imagination and sparked a fierce debate among archeologists.

Little Lady: Lost and Found

She's less than a metre tall. She has a tiny brain and displays ape-like proportions marked by long draping arms and short thick legs angled outward at the knees.

But the Little Lady of Flores, as she is affectionately called, is no alien, according to Michael Morwood, professor of archeology at the University of New England in Australia. In fact, Morwood says she's one of us: a member of a new human species—*Homo floresiensis*—that inhabited the remote island of Flores, in what is now eastern Indonesia, thousands of years ago.

Morwood led the team of Australian-Indonesian archeologists who discovered *Homo floresiensis* in 2003. He recently spoke about the work of his team and the intense public and professional scrutiny their findings have received at an ICTP-hosted Workshop on Science for Cultural Heritage held in Trieste from 23-27 October 2006.

The nearly complete skeleton of the Little Lady of Flores, including an intact skull and jaw, is believed to be some 18,000 years old. The same team that discovered her subsequently uncovered the scattered remains of eight other individuals, the bones of a Komodo dragon and an extinct pygmy elephant, as well as stone artifacts that indicate the Little Lady of Flores and other members of her clan knew how to make and use tools.

"The discovery spurred an unprecedented level of academic and public interest," Morwood says. *The Guardian*, *New York Times*, *Le Monde*, *Corriere della Sera* and virtually every major newspaper carried stories about the Little Lady of Flores, as did broadcast and cable television stations worldwide, including BBC, CNN and Sky. If you do a search on Google, you will find more than a quarter of a million entries related to the subject. The fact is that only 20 or so human-like species have ever been found. Discovering a new branch of the human evolutionary tree is indeed a big deal.

"*Homo floresiensis* has drawn widespread interest for two reasons beyond the fact that the discovery of new species is so rare," Morwood says. "First, the remains were found in an unexpected place, well beyond the cradle of human species in Africa. Second, the remains—particularly the size of the skull—display characteristics that fail to fit with many preconceived notions about how and when humans evolved."

"Indonesia lies at the edge of the prehistoric world, far from the home of the first humans in Africa," Morwood explains. Archeologists, as a result, place Indonesia at the periphery of human evolution. In fact, before the discovery of *Homo floresiensis*, a century of archeological research in Indonesia had uncovered only two hominid species: *Homo erectus* and *Homo sapiens*, or modern humans.

"*Homo floresiensis*," Morwood adds, "has a grapefruit-sized brain, measuring just 400 cubic centimetres." That's just

one-third the average size of the brain of modern humans and much smaller than the minimum size of brains that archeologists have associated with the earliest hominids.

"The discovery of *Homo floresiensis*," says Morwood, "not only challenges conventional knowledge about the origin and migration of early humans but it also expands the prevailing definition of what it means to be human. Our team not only found the remains of this species but also nearby stone artifacts that indicate the species' behaviour was as sophisticated as the behaviour of other hominids." Indeed its large frontal lobe development suggests that the small size of the brain did not compromise the intelligence of *Homo floresiensis* or their ability to make and use stone tools.



Homo floresiensis' skull

The discovery of a hominid species with unique characteristics comes as no surprise to Morwood. "We have detected parallel trends in other island-dwelling organisms. In prehistoric times, few animal species reached islands and those that did faced few predators. Consequently, over generations, island-dwelling species often developed new anatomical and behavioural characteristics that ultimately enabled them to evolve into a new species."

"Islands have always served as 'archeological oases' that shed new light on the dispersal and evolution of organisms," Morwood continues. "It's no accident that Charles Darwin based his theory of evolution on field research he conducted on the Galapagos Islands where he discovered a dazzling diversity of animals derived from just a few colonizing species. This same principle applies to humans as well."

Indeed a long-standing principle of archeology, the so-called 'island rule,' states that all species, regardless of their height and weight when they come ashore, tend to evolve into the same size on islands. Species larger than rabbits—for instance, elephants and hoofed animals—often shrink in size and become diminutive because, according to Morwood, "a place without predators" offers no survival advantage "to those with height and heft."

At the time, Morwood notes that smaller organisms, including reptiles and birds, tend to grow in size, not only because they require less food and experience shorter, less risky pregnancies but also because, in the absence of predators, "the ability to hide poses no advantage for survival."

For these reasons, Morwood says, "species that are isolated on islands tend to converge in size. Such a dynamic might have been in play on the island of Flores, helping to explain the Little Lady of Flores' reduced size."

The discovery of *Homo floresiensis* has not gone unchallenged. In fact, some archeologists began to express scepticism immediately after the initial announcement was made. Most recently, in November 2006, a group of researchers led by Robert D. Martin, curator at the Field Museum in Chicago, USA, published an article in the *Anatomical Record*, claiming that the Little Lady of Flores does not belong to a new human species but is a small-bodied modern human species that likely suffered a genetic disorder called microcephaly, which is characterized by a dwarfed brain.

These critics contend that in light of the Little Lady of Flores' uncommonly small brain casing, the remains of other individuals with brain casings of similar size need to be found nearby to confirm the hypothesis of Morwood and his colleagues. That's unlikely to happen given the passage of time and the unique environmental conditions that must exist for the long-term preservation of human remains. In addition, the critics maintain that the nearby stone artifacts are consistent with tools developed and used by *Homo sapiens* 18,000 years ago in other places. Why, then, should we think that the Little Lady of Flores is anything but a *Homo sapiens*?

Morwood remains unperturbed by the criticisms and the doubts expressed by others. He is convinced that the Little Lady of Flores is indeed a new species and that other unique human species will be found on remote islands across the

globe. These findings, he says, will not only challenge our conventional understanding of human evolution and migration but also pose intriguing questions about our diverse ancestry. "In raising these questions," he notes, "we are not just trying to gain a better appreciation of our past but also shedding light on who we are today."

Morwood is indeed at the centre of an intriguing debate about fundamental aspects of who we are and where we came from. And true to the Indiana Jones figure that he projects, he is relishing every moment. □

INVESTIGATIVE PHYSICS

Can physics help solve the debate over whether *Homo floresiensis* is a new species? ICTP in partnership with *Elettra* and the University of Bologna, Italy, plans to turn to such advanced techniques as X-ray microtomography and 3-D scans to compare the brain casing of the Little Lady of Flores to the brain casings of *Homo sapiens* stricken with microcephaly. If the casings match, it's likely that she suffered from the same disease and therefore is not a new species. If the casings don't match, she may well be. This is one of several projects that the Centre will be engaged in, including the co-sponsorship of a workshop in Australia in April 2007, focusing on applications of synchrotron radiation for examining our heritage.

ISLAND GOATS

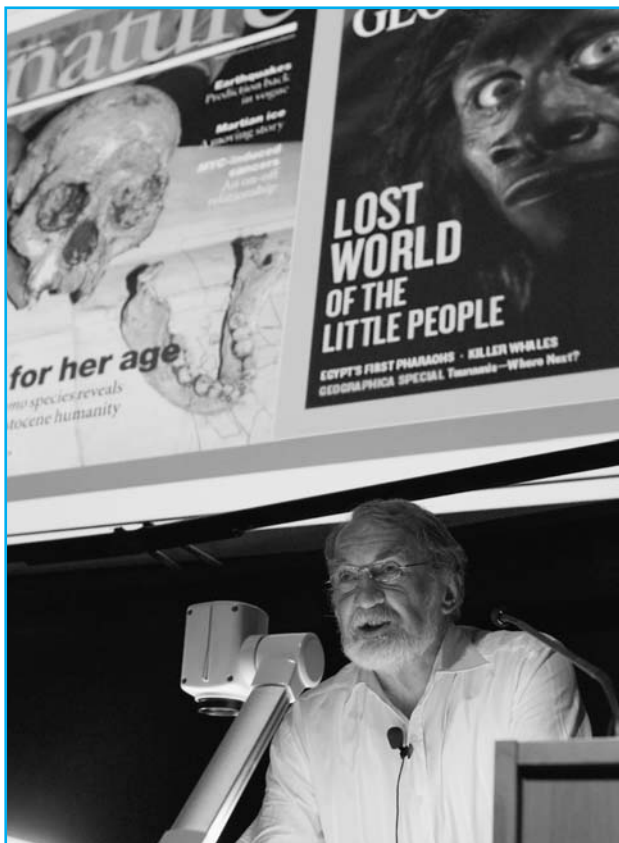
The goat-like animal *Myotragus* may be the best-known example of island-isolated evolution. *Myotragus* lived on the island of Mallorca about some 5 million years ago following the flooding of the Mediterranean basin during the Miocene period. Surviving on tough foods in limited supplies, *Myotragus* lost 60 percent of its body weight. Remarkably, no other animal landed on Mallorca to compete with it for food and no carnivore turned up to eat it. With no need to remain vigilant or to seek shelters while fleeing from enemies, the eyes of *Myotragus* migrated from the sides to the front of its head, creating stereoscopic sight lines much like ours. A 50-percent reduction in brain size ensued, largely occurring in the area of the brain associated with vision. With no need to run swiftly, *Myotragus* also developed short, stout legs to enhance its slow-gait, small-step stability.

Islands abound with such unique species. For example, the five-horned antelope-like *Hoplitomeryx* lived five million years ago on an island that subsequently became part of the Italian peninsula, and the pig-like *Babirusa* with slender deer-like legs lived on the island of Sulawesi in southeast Asia, also five million years ago.

Morwood is convinced that many more of these island species will be discovered as archeological digs continue to expand into remote places. The question is this: Are the Little Lady of Flores' out-on-the-edge 'human' features a consequence of its island evolution? For Morwood, the answer is yes.

OLD HOBBITS DIE HARD

Homo floresiensis' often-used nickname, Hobbit, refers to the one-metre-tall, round-faced human species featured in J.R.R. Tolkien's legendary novel of the same name and, more recently, Peter Jackson's wildly popular *Lord of the Rings* trilogy. This is just another example of the porous borders that often exist between science and popular culture, especially when it comes to unusual scientific discoveries that capture the public's imagination.



Michael Morwood

Gebauer Joins ICTP

Ralph Gebauer has joined the scientific staff of ICTP's Condensed Matter Physics group. Gebauer, who was born and raised in Germany, majored in physics as an undergraduate student at the University of Karlsruhe. He then earned a PhD in physics at *Ecole Normale Supérieure de Lyon* in France. After taking a year off to work as a financial risk manager in a German bank, he returned to academia as a postdoctoral associate at Princeton University, USA, pursuing his studies under the internationally renowned Italian physicist Roberto Car (see "Profile," *News from ICTP*, Autumn 2003). In 2002, he moved to Trieste to assume a tenure track position with ICTP, which he held until his recent appointment as staff researcher. Gebauer's major field of interest is the development and use of computer simulations for the study of electrical currents passing through nanosystems. He also conducts studies examining the behaviour of light in nanosystems, seeking to uncover knowledge that could one day increase the efficiency of solar energy.



Kravtsov Travels to Viet Nam

Vladimir Kravtsov, head of the ICTP Condensed Matter Physics group, recently participated in the sixth *Rencontres du Vietnam*. More than 300 scientists from around the world attended the conference, which was first held in 1992. The event, which focuses on advanced scientific research in astrophysics and condensed matter physics, provides an opportunity for the world's most eminent researchers in these fields to meet and discuss their work. This year's conference focused on fundamental research and applications in the burgeoning field of nanotechnology. Kravtsov was among a select group of participants who met Nguyen Minh Triet, president of Vietnam.



Rencontres du Vietnam, 2006

On Auctions

Four ICTP scientists—**Tobias Galla**, **Matteo Marsili**, **Mauro Sellitto** and **Riccardo Zecchina**—have recently uncovered ways to use statistical mechanics to optimize the outcome of combinatorial auctions. Such auctions have been used to determine landing and takeoff priorities at airports and to distribute licenses for radio spectra. Their findings have been published in the 22 September edition of *Physical Review Letters*.

When there is one item on the auction block, auctioneers have no trouble determining the winning bid: it simply goes to the highest bidder. However, in so-called combinatorial auctions, in which multiple buyers bid 'in combination' on multiple objects, the winning bids are not so easy to determine. Moreover, when there is a large number of bidders and objects, which holds true, for example, in the case of airport takeoff and landing slot allocations, determining the optimal solution can consume unrealistic amounts of time even when the information is being processed by the world's fastest computers.

ICTP scientists turned to the statistical mechanics of disordered systems and, in particular, to the behaviour of granular particles to provide a mathematical approach to such a problem. Their strategy relies on an algorithm previously devised as an analytical tool for spin-glass physics. They hope that their finding may vastly improve existing approaches, helping to more quickly solve the bedeviling winner-determination problem that to date has restricted the use of combinatorial auctions.

Former Diploma Student in *Physical Review*

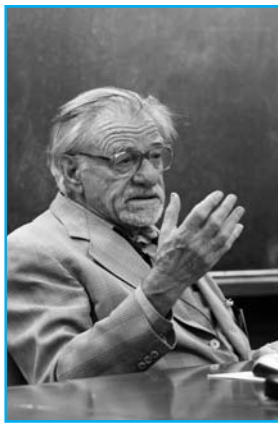
The 28 July edition of *Physical Review Letters* featured an article by **Ignacio Franco**, a former ICTP Diploma student in condensed matter physics. The article, "Laser-Induced Spatial Symmetry Breaking in Quantum and Classical Mechanics," co-authored with his colleague Paul Brumer, was based on a research that they did at the University of Toronto, Canada. Franco, who is from Colombia, graduated from the ICTP Diploma Programme in 2002. He is a PhD student at the University of Toronto.

Seismology Training in Tehran

The first International Training Course on Seismology, Strong Ground Motion and Seismic Waveform Modeling, jointly organized by ICTP and the International Institute of Earthquake Engineering and Seismology (IIEES), was held in Tehran from 20 to 31 August. The faculty came from 10 countries: Algeria, France, Germany, Iran, Italy, Japan, Russia, South Africa, Switzerland and the UK. Students came from 14 countries: Afghanistan, Algeria, Armenia, Belarus, Bulgaria, India, Iran, Iraq, Macedonia, Malta, Morocco, Pakistan, Syria and Turkey.

Nobel Laureate at Centre

Nobel Laureate **Karl-Alex Müller** (Physics 1987) spoke at the opening session of ICTP's International Symposium on the Jahn-Teller Effects: Novel Aspects in Orbital Physics and Vibronic Dynamics of Molecules and Crystals. Müller shared the Nobel Prize with his colleague George Bednorz, while both were working at the IBM Zurich Research Laboratory in Rüschlikon, Switzerland, at that time. They were honoured by the Nobel Committee "for their important breakthrough in the discovery of superconductivity in ceramic materials."



Zoller Wins Dirac Medal

Peter Zoller, professor of physics at the University of Innsbruck and scientific director of the Institute for Quantum Optics and Quantum Information at the Austrian Academy of Sciences, has won the Dirac Medal 2006. Zoller is being honoured for his innovative and prolific accomplishments in atomic physics, including his seminal work in proposing methods to use trapped ions for quantum computing and describing how to realize the Bose-Hubbard model and associated phase transitions in ultracold gases. The announcement was made on 8 August, birthday of Nobel Prize winner Paul A.M. Dirac (Physics 1933), one of the greatest physicists of the 20th century and an ardent friend and supporter of ICTP. The awards ceremony will be held at a later date.

Honours

Charles Chidume, a member of ICTP's Mathematics section, has been elected a member of the Nigerian Academy of Sciences. Chidume is being honoured for his innovative contributions to functional analysis and nonlinear operator theory. He is also widely recognized for his efforts to train young African mathematicians. Chidume has been a coordinator of the ICTP Diploma Course in mathematics since 1992.

Alexei Smirnov, a scientist with ICTP's High Energy Physics section, has won the 2005 Bruno Pontecorvo Prize. Smirnov is being honoured "for his prediction and study of the influence of matter on neutrino oscillations, now known as the MSW (Mikheyev-Smirnov-Wolfenstein) effect."



Erio Tosatti, former acting director of ICTP and currently professor of condensed matter physics at the International School for Advanced Studies (SISSA), has been elected a corresponding member of *Accademia dei Lincei*. Founded in 1603 and with Galileo among its first members, *Lincei* is one of the world's oldest and most prestigious science academies.

Jacob Palis, former chair of the ICTP Scientific Council, is one of four eminent scientists from the developing world to win the Trieste Science Prize 2006. Palis, director emeritus of the Institute of Pure and Applied Mathematics in Rio de Janeiro, and a frequent visitor to the Centre, shared the Trieste Science Prize in mathematics with C.S. Seshadri, founding director, Chennai Mathematical Institute in India. The Trieste Science Prize winners in the medical sciences are Chen Ding-Shinn, dean of the National Taiwan University College of Medicine, and Rao Zihé, professor at Tsinghua University, China. The Trieste Science Prize, a joint venture of the Academy of Sciences for the Developing World (TWAS) and Illycaffè, is designed to honour and recognize the developing world's most eminent scientists. A US\$100,000 cash award will be divided among the four winners. For additional information, see www.twas.org.

Perelman Declines Fields Medal

Grigori Perelman is among the four winners of the 2006 Fields Medal. The iconoclast mathematician, however, has declined the honour. The announcement was made in Madrid on 22 August, during the opening ceremony of the International Congress of Mathematicians. Perelman's proof, which verifies Poincaré's Conjecture, solves one of mathematics' most perplexing problems, first presented by the great French mathematician and physicist in 1904. Last June, participants in ICTP's Summer School and Conference on Geometry and Topology of 3-Manifolds became one of the first groups to reaffirm Perelman's proof. (See "Shapes, Spaces and Spheres," *News from ICTP*, Summer 2005, for a detailed description of their efforts.) Other 2006 Fields Medallists are Andrei Okounkov, University of California at Berkeley; Terence Tao, University of California at Los Angeles; and Wendelin Werner, *Université de Paris Sud*, Orsay, France. Werner spoke at ICTP's School and Conference on Probability Theory in 2002.

2006 ICTP Prize

Rajesh Gopakumar, Harish-Chandra Research Institute, Allahabad, India, has been awarded the 2006 ICTP Prize. Gopakumar is a highly accomplished string theorist whose important contributions to the field include papers on large N gauge theories, solitons in noncommutative field theories and topological string theory. His work on the latter topic, conducted with Cumrun Vafa, inspired the theory of Gopakumar-Vafa invariants in mathematics. The 2006 ICTP Prize is being given in honour of Gian-Carlo Wick (1909-1992), a student of Enrico Fermi, who is well-known among theoretical physicists for "Wick's theorem" and "Wick rotation". Wick visited ICTP in 1973 to participate the Topical Meeting on Weak Interactions. The official awards ceremony will be held at a later date.



Gian-Carlo Wick and Abdus Salam at ICTP, 1973

NEWS FROM ASSOCIATES

P.R. Parthasarathy, Department of Mathematics, Indian Institute of Technology, Chennai, and a former (2000-2005) senior associate of ICTP, has been awarded the Jacob Wolfowitz Prize. Parthasarathy will share the prize with R.B. Lenin, Dhirubhai Ambani Institute of Information and Communication Technology, Gujarat, India, for their birth and death process (BDP) models that have proven to have applications in a number of fields, including biology, chemistry and information and communication technologies. The Jacob Wolfowitz Prize is given by the *American Journal of Mathematical and Management Sciences*.

ACTIVITIES

FOURTH STIG LUNDQVIST CONFERENCE ON ADVANCING FRONTIERS OF CONDENSED MATTER PHYSICS

3 - 7 July

Organizers: A. Pinczuk (Columbia University, NY, USA), S. Scandolo (ICTP) and G. Scoles (Princeton University, NJ, USA, and International School for Advanced Studies, SISSA, Trieste, Italy).

Local Organizer: E. Tosatti (SISSA and ICTP).

COLLEGE ON PHYSICS OF NANO-DEVICES

10 - 21 July

Co-sponsors: I2CAM - International Institute for Complex Adaptive Matter (c/o University of California at Davis, USA) and NEC Research Institute Inc. (Princeton, NJ, USA).

Organizers: B.L. Altshuler (NEC Research Institute Inc.), V.I. Falko (University of Lancaster, UK), P.B. Littlewood (University of Cambridge, UK) and C.M. Marcus (Harvard University, Cambridge, MA, USA).

Local Organizer: V. Kravtsov (ICTP).

SUMMER SCHOOL AND WORKSHOP ON ELECTRONIC STRUCTURE METHODS AND THEIR APPLICATIONS, Bangalore, India

10 - 22 July

Cosponsors: Democritos National Simulation Center (Trieste, Italy) of the National Institute for the Physics of Matter (INFM) and the National Research Council (CNR), International Center for Materials Research (ICMR, Santa Barbara, CA, USA) and Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR, Bangalore, India).

Organizers: S. de Gironcoli (International School for Advanced Studies, SISSA, Trieste, Italy), S. Narasimhan (JNCASR), S. Scandolo (ICTP) and D. Vanderbilt (Rutgers, Piscataway, NJ, USA).

Local Organizer: U. Waghmare (JNCASR).



SUMMER SCHOOL IN COSMOLOGY AND ASTROPARTICLE PHYSICS AND WORKSHOP ON NONGAUSSIANITY IN COSMOLOGY

10 - 28 July

Organizer: U. Seljak (ICTP, Trieste, Italy, and Princeton University, NJ, USA).

Local Organizers of Workshop: C. Baccigalupi (International School for Advanced Studies, SISSA, Trieste, Italy), N. Bartolo (ICTP), L. Boubekur (ICTP) and P. Creminelli (ICTP).

SCHOOL AND CONFERENCE ON MODELLING ELASTIC MANIFOLDS: FROM SOFT CONDENSED MATTER TO BIOMOLECULES

24 - 29 July

Organizers: L. Cugliandolo (*Ecole Normale Supérieure*, Paris, France), S. Franz (ICTP), M. Marsili (ICTP), C. Micheletti (International School for Advanced Studies, SISSA, Trieste, Italy) and R. Zecchina (ICTP).



SCHOOL AND CONFERENCE ON COMPLEX SYSTEMS AND NONEXTENSIVE STATISTICAL MECHANICS

31 July - 8 August

Organizers: U. Tirnakli (Ege University, Turkey) and C. Tsallis (*Centro Brasileiro de Pesquisas Físicas*, CBPF, Rio de Janeiro, Brazil, and Santa Fe Institute, Santa Fe, NM, USA).

Local Organizer: M. Marsili (ICTP).

TARGETED TRAINING ACTIVITY: SEASONAL PREDICTABILITY IN TROPICAL REGIONS: RESEARCH AND APPLICATIONS

7 - 18 August

Organizers: I.-S. Kang (Seoul National University, Republic of Korea), J. Pal (ICTP), J. Shukla (Center for Ocean-Land-Atmosphere Studies of the Institute of Global Environment and Society, COLA/IGES, Calverton, MD, and George Mason University, Fairfax, VA, USA) and Jin Ho Yoo (ICTP).

MINIWORKSHOP ON NEW STATES OF STABLE AND UNSTABLE QUANTUM MATTER

14 - 25 August

Organizers: A. Chubukov (University of Wisconsin, Madison, USA), P. Coleman (Rutgers, Piscataway, NJ, USA), A. Schofield (University of Birmingham, UK), H. Takagi (University of Tokyo, Japan) and Yu Lu (Interdisciplinary Center of Theoretical Studies, ICTS, Beijing, P.R. China).

Local Organizer: E. Tosatti (International School for Advanced Studies, SISSA, and ICTP, Trieste, Italy).

ICTP-NCNST-ICTS ASIAN/PACIFIC REGIONAL COLLEGE ON SCIENCE AT THE NANOSCALE, Beijing, People's Republic of China

14 - 25 August

Cosponsors: National Natural Science Foundation of China (NSFC), National Center of Nanoscience and Nanotechnology of China (NCNNC) and Interdisciplinary Center of Theoretical Studies (ICTS, Beijing, P.R. China).

Organizers: R. Gebauer (ICTP), G. Scoles (Princeton University, NJ, USA, and International School for Advanced Studies, SISSA, Trieste, Italy), Xie Sishen (NCNNC) and Yu Lu (ICTS).

Local Organizer: Lu Zhong-yi (Institute of Theoretical Physics of the Chinese Academy of Sciences, ITP, Beijing, P.R. China).



JOINT IIEES-ICTP INTERNATIONAL TRAINING COURSE ON: SEISMOLOGY, STRONG GROUND MOTION AND SEISMIC WAVEFORM MODELING, Tehran, Iran

20 - 31 August

Organizers: M. Ghafoory-Ashtiany (International Institute of Earthquake Engineering and Seismology, IIEES, Tehran, Iran), I. Kuznetsov (International Institute of Earthquake Prediction, IIEP, Moscow, Russian Federation), G.F. Panza (University of Trieste and ICTP) and M. Zare (IIEES).

INTERNATIONAL WORKSHOP ON FRONTIERS OF PLASMA SCIENCE

21 August - 1 September

Organizers: R. Bingham (Rutherford Appleton Laboratory, Didcot, UK), S.M. Mahajan (University of Texas at Austin, USA), P.K. Shukla (*Ruhr Universität Bochum*, Germany), L. Stenflo (Umeå University, Sweden) and Z. Yoshida (University of Tokyo, Japan).

Local organizer: C. Tuniz (ICTP).

INTERNATIONAL SYMPOSIUM ON THE JAHN-TELLER EFFECTS: NOVEL ASPECTS IN ORBITAL PHYSICS AND VIBRONIC DYNAMICS OF MOLECULES AND CRYSTALS

28 - 31 August

Co-sponsors: University of Milan (Italy), International School for Advanced Studies (SISSA, Trieste, Italy), *Núcleo Científico Milenio - Física de la Materia Condensada* (Chile).

Organizers: I. Bersuker (University of Texas at Austin, USA), N. Manini (University of Milan, and National Institute for the Physics of Matter, INFN, Italy) and E.E. Vogel (*Universidad de la Frontera*, Temuco, Chile).

Local Organizer: E. Tosatti (SISSA and ICTP).



ATOMIC AND MOLECULAR DATA FOR FUSION ENERGY RESEARCH

28 August - 8 September

Organizers: R.E.H. Clark (International Atomic Energy Agency, IAEA, Vienna, Austria).

Local Organizer: C. Tuniz (ICTP).

CONFERENCE AND EUROMECH COLLOQUIUM #480 ON HIGH RAYLEIGH NUMBER CONVECTION

4 - 8 September

Organizers: D. Lohse (University of Twente, The Netherlands) and R. Verzicco (*Politecnico di Bari*, Italy).

Local Organizer: J. Niemela (ICTP).

COLLEGE ON MEDICAL PHYSICS

4 - 29 September

Organizers: A. Benini (University Hospital, Copenhagen, Denmark), F. Milano (University of Florence, Italy), P. Sprawls (Emory University, Atlanta, GA, USA) and S. Tabakov (Kings College, London, UK).

Local Organizer: L. Bertocchi (ICTP).

SCHOOL ON PHYSICS AT LHC: "EXPECTING LHC"

11 - 16 September

Organizers: B. Acharya (ICTP), R. Barbieri (*Scuola Normale Superiore*, Pisa, Italy), J. Ellis (CERN, Geneva, Switzerland), A. Smirnov (ICTP) and G. Weiglein (University of Durham, UK).

Scientific Secretary: M. Maltoni (ICTP).

SCHOOL AND CONFERENCE ON STATISTICAL PHYSICS AND INTERDISCIPLINARY APPLICATIONS, Beijing, People's Republic of China

11 - 22 September

Cosponsors: Interdisciplinary Center of Theoretical Studies (ICTS, Beijing, P.R. China), and National Natural Science Foundation of China (NSFC).

Organizers: S. Franz (ICTP), C. Godreche (*Commissariat à l'Énergie Atomique*, CEA, Saclay, France), M. Marsili (ICTP), R. Zecchina (ICTP) and H. Zhou (Institute of Theoretical Physics, ITP, Beijing, P.R. China).

ANNUAL TECHNICAL MEETING ON MANAGING NUCLEAR KNOWLEDGE

18 - 22 September

Cosponsors: International Atomic Energy Agency (IAEA, Vienna, Austria) and World Nuclear University (WNU, London, UK).

Organizers: A. Kossilov (International Atomic Energy Agency, IAEA, Vienna, Austria) and Y. Yanev (IAEA).

Local Organizer: C. Tuniz (ICTP).

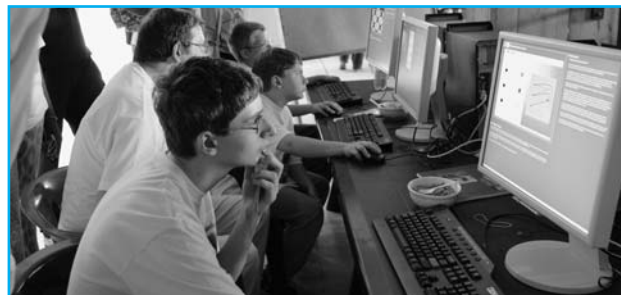
8TH WORKSHOP ON THREE-DIMENSIONAL MODELLING OF SEISMIC WAVES GENERATION, PROPAGATION AND THEIR INVERSION

25 September - 7 October

Organizers: B. Bukchin (International Institute of Earthquake Prediction Theory and Mathematical Geophysics, IIEPT, Russian Academy of Sciences, Moscow, Russian Federation) and G. Panza (University of Trieste and ICTP).

Open Day

Open Day at Miramare Science Campus took place on Saturday 16 September. Guest speakers included Italian astronaut **Umberto Guidoni** who spoke about his experience on the Space Shuttle and international space station, and Italy's world champion skier and Olympic gold medal winner, **Manuela Di Centa**, who discussed her travels in the Himalayas and her successful ascent of Mount Everest. There was a roundtable discussion by local scientists illustrating research efforts in climate and weather, seismology, black holes and dark matter. Additional talks throughout the afternoon involved the role of science in criminal investigations, medicine and sport. Some 35 scientific stands showcased research activities taking place at scientific institutions on the Miramare Science Campus. Guided tours of ICTP, SISSA (the International School for Advanced Studies), *Immaginario Scientifico*, Miramare Castle Park, and WWF Miramare Marine Reserve were held throughout the day.



Boltzmann Remembered

The ICTP-sponsored Boltzmann Memorial Meeting took place on 4 September at Duino Castle, near Trieste. Introductory remarks



Leo Kadanoff

by ICTP director **K.R. Sreenivasan** were followed by three lectures given by **Leo Kadanoff**, president-elect, American Physical Society; **Peter Lagner**, managing director, Institute of Biophysics and Nanosystems Research of the Austrian Academy of Sciences, Graz; and **Giuseppe Mussardo**, professor of physics, SISSA. Following the talks, participants gathered at the nearby former Hotel Ples, which now hosts the United World College of the Adriatic, to attend a ceremony

unveiling a plaque honouring Boltzmann. **Giorgio Ret**, mayor of Duino, and **Marc Abrioux**, head of school of the United World College of the Adriatic, spoke at the ceremony. Austrian-born Ludwig Boltzmann, father of statistical mechanics, is widely considered one of the greatest physicists of the late 19th and early 20th centuries. He took his life on 5 September 1906 while on vacation with his wife and daughter in Duino.

Diploma Awarding Ceremony

Twenty-six students have successfully completed their year-long Diploma Course studies. The 'graduation' ceremony was held on 28 August. Fourteen students were present to receive their diplomas. ICTP director **K.R. Sreenivasan** presided. ICTP's Diploma Programme enables promising university students from the world's least developed countries (LDCs) to pursue studies in high energy physics, condensed matter physics and mathematics.



Director at G-8

ICTP director **K.R. Sreenivasan** participated in a Group of 8 (G-8) Symposium on Innovation for Business and University Leaders. The event took place on 11 July in St. Petersburg, Russia, just prior to the G-8 Summit. A major theme of this year's G-8 Summit was education for innovation in the 21st century. The G-8 consists of Canada, France, Germany, Italy, Japan, Russia, the United Kingdom, and the United States, which together generate about 65 percent of the world's gross domestic product. Presidents of these nations meet annually to discuss major economic and political issues.

Bookshelf

Luciano Fonda: His Life and Scientific Achievements (Società Italiana di Fisica, Bologna, 2006), edited by Fonda's closest scientific collaborator, **GianCarlo Ghirardi**, offers a warm and detailed homage to a leading theoretical physicist who died in 1998. **Luciano Fonda**, who played a key role in the development of the *Elettra* Synchrotron Light Laboratory in Trieste, was a long-time professor of physics at the University of Trieste and an ICTP consultant. The first two chapters of the book contain recollections by friends, colleagues and collaborators; subsequent chapters consist of many of Fonda's most important papers in the fields of elementary particles, resonance reactions, symmetries and synchrotron radiation.

Quantum Mechanics – Are There Quantum Jumps? (American Institute of Physics, 2006), edited by Angelo Bassi, Detlef Dürr, Tullio Weber and Angelo Zanghi, is a collection of talks and discussions given in September 2005 on the occasion of **GianCarlo Ghirardi's** 70th birthday. A pair of meetings were organized in his honour: one at ICTP (Are There Quantum Jumps?) and another in Losinj, Croatia (On the Present Status of Quantum Mechanics). GianCarlo Ghirardi, professor of quantum mechanics at the University of Trieste and head of ICTP's Associate and Federation Scheme, is an internationally renowned scientist. His main field of interest is the conceptual foundations of quantum mechanics.

Chinese Delegation

On 1 August, a five-person delegation from China met with ICTP staff, including **Claudio Tuniz**, assistant director, **Dag Johannessen**, director of administration, and **George Thompson**, head, Office of External Activities. The purpose of the visit was to learn more about the Centre's activities to promote scientific capacity building in the developing world. **Zhang Xinsheng**, China's deputy minister of education, led the delegation. Zhang also chairs the Chinese National Commission at the United Nations Educational, Scientific and Cultural Organization (UNESCO) and is president of the executive council at UNESCO. **Philippe Pypaert**, programme specialist, UNESCO's Regional Bureau for Science in Europe, accompanied the delegation.



G-77

D.S. Kumalo, South Africa's Ambassador to the United Nations and current chair of the Group of 77 (G-77), visited ICTP on 6-7 June to discuss future avenues of cooperation between the G-77 and Trieste's international scientific institutions. Kumalo agreed to have the G-77 explore possibilities for transforming the Trieste-based Third World Network of Scientific Organizations (TWNISO), an affiliated organization of the Academy of Sciences for the Developing World (Twas), into the G-77 Consortium on Science and Technology. A formal endorsement of this measure took place at the TWAS General Meeting in Brazil during the first week in September (see "Profile" on next page). The foreign ministers of G-77 member states subsequently endorsed the proposal at their annual meeting held at the UN headquarters in New York City in conjunction with the UN General Assembly. With 132 members, the G-77 is the largest coalition of developing countries in the United Nations.

Retirements

Susan Bencich, long-time member of ICTP's administrative staff, has retired. Sue began her career at the Centre in 1973 as a clerk/typist in the deputy director's office. She subsequently assumed the position of secretary to the deputy director. In 1984, she left ICTP to work with the Food and Agriculture Organization of the United Nations (FAO) in Rome. She returned to the Centre six months later, and after a brief stint with the Office of External Activities (OEA), she was appointed secretary of the High Energy Physics group in 1988, where she would remain until her retirement. In 1999, she was given additional responsibilities as supervisor of the Centre's conference support services. Colleagues and friends wish her well.



IN MEMORIAM

Valerie Shaw died on 20 August after a lengthy battle with cancer. She was 51. Valerie, who was born in Ireland, began working at ICTP in 1990 as a scientific conference clerk. She is survived by her son. Colleagues and friends will fondly remember Valerie for her warmth, energy and good cheer. She will be missed.

ICTP Visitors 1995-2005 from Latin America and the Caribbean

including associates, TRIL fellows, course participants and researchers



| Countries | Visitors 1995-2005 |
|---|--------------------|
| Argentina | 984 |
| Bolivia | 24 |
| Brazil | 1094 |
| Chile | 183 |
| Colombia | 276 |
| Costa Rica | 29 |
| Cuba | 538 |
| Dominica | 54 |
| Ecuador | 29 |
| Mexico | 509 |
| Peru | 125 |
| Uruguay | 57 |
| Venezuela | 246 |
| Belize, Guatemala, Guyana, Haiti, Honduras, Jamaica, Montserrat, Panama, Puerto Rico, Trinidad and Tobago | 60 |
| Total Visitors | 4208 |



PROFILE

Paolo Budinich celebrates his 90th birthday, not by reminiscing about his past but by embracing the future.

Budinich Looks Forward at 90

The list is long—and impressive. The Abdus Salam International Centre for Theoretical Physics (ICTP), the International School for Advanced Studies (SISSA), *Fondazione internazionale Trieste per il progresso e la libertà delle scienze*, the *Immaginario Scientifico*.

Paolo Budinich, who celebrated his 90th birthday on 28 August, has spent a lifetime building an intricate network of scientific institutions in Trieste, Italy, where he has lived and worked for more than a half century. He has pursued this quest largely with two goals in mind: to advance the scientific capacity of developing countries and to transform Trieste, which once served as the primary port of the Austrian-Hungarian empire, into an international city of science.

Yet, what may be the most amazing aspect of Budinich's career is not his impressive list of accomplishments but the fact that he still going strong—still charting strategies on how to expand scientific knowledge and know-how in the developing world; still envisioning an even greater future for Trieste within the global scientific community; and still summoning the energy and determination to turn his lofty visions into reality.

In September, Budinich traveled to Brazil to witness his latest creation: the Consortium on Science and Technology and Innovation for the South (COSTIS)—a joint initiative between the Group of 77 and China, the most recognized and authoritative voice for developing world issues in the United Nations, and Trieste's international scientific institutions. COSTIS will seek to raise the profile of science and technology throughout the developing world, especially the role of science and technology in economic development efforts (see "G-77," p. 13).

"COSTIS," Budinich says, "will draw on many of the concepts for scientific capacity building first developed by Trieste's international scientific institutions, most notably ICTP and TWAS—the Academy of Science for the Developing World." The consortium, which is expected to be fully operational in January 2007, will succeed the Third World Network of Scientific Organizations (TWNISO), another Trieste-based creation that has sought to promote both science-based development and scientific cooperation among developing nations.

Budinich was born in 1916 in the Dalmatian village of Veli Losinj off the coast of what is now Croatia. In 1938, he graduated with a doctorate degree in physics from the *Scuola Normale Superiore* in Pisa. His plans to pursue an academic career were soon thwarted by war. Budinich not only served in the Italian navy but was also held as a prisoner of war for two years after being captured by the British in 1943.

Like many other Italians, he struggled in the post war period. His career, in fact, did not get back on track until 1953 when he was appointed a professor of theoretical physics and head of the physics department at the University of Trieste.

"What fascinated me about Trieste," he says, "besides the fact that the city was just a few hundreds kilometres from my birthplace, was its strategic location. The city," he says, "may have been at the corner of Italy but it was in the centre of Europe."

Throughout the next decade, Budinich sought to integrate Trieste's small, largely isolated, physics community into Europe's larger scientific network. "Science has no borders," he observed in a recent interview. "My hope was that I could use science—and, more specifically, scientific exchange programmes—to enrich both Trieste's scientific community and the city as a whole. The tactics I used—nurturing contacts among European scientists—foreshadowed my later efforts to promote scientific exchange on a global scale."

Those efforts took a giant leap forward in 1960 when he organized Trieste's first international conference on physics at the *Castelletto* in Miramare park just outside of Trieste. Attending the conference was Pakistani-born Abdus Salam, a 34-year-old internationally renowned physicist who was first beginning to explore the idea of creating an UN-endorsed international centre devoted to helping physicists from the developing world. "I knew nothing about developing countries," says Budinich. "But I did know that international exchange programmes had helped Trieste, and I earnestly believed that such programmes could help others as well."

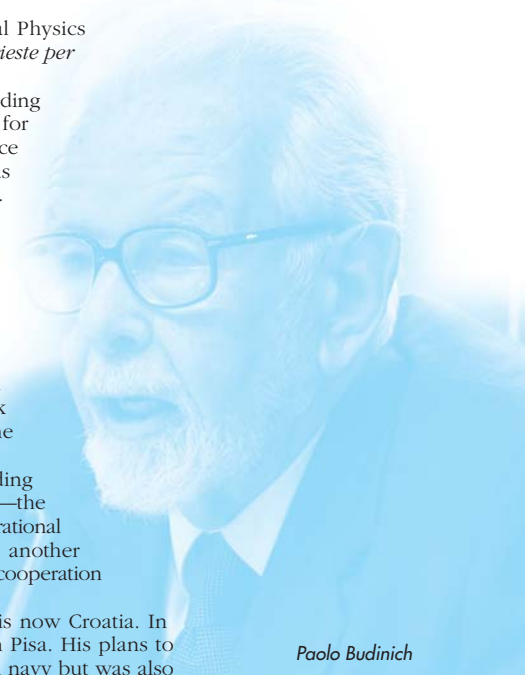
Just days after the conference, Budinich sent a letter to Salam saying that Trieste would be an excellent location to host Salam's proposed physics centre. Four years later, with the help of the Italian government and community leaders in Trieste, ICTP was born. In 1968, the Centre moved to the Miramare campus within sight of the initial meeting between Budinich and Salam. It has remained there ever since, and has since become recognized as one of the world's foremost institutions for global scientific exchange, especially between developed and developing countries.

But Budinich was far from finished. Indeed he was just beginning. In 1978, he spearheaded the drive for the creation of the International School for Advanced Studies (SISSA), Italy's preeminent graduate-degree-granting institution in physics and mathematics; in 1980, he was one of the architects of the *Fondazione internazionale Trieste per il progresso e la libertà delle scienze*, an 'enabling' institution that facilitates Trieste's ongoing efforts to attract and maintain international scientific institutions; and in the late 1980s and early 1990s, he was the driving force behind the creation of the *Immaginario Scientifico*, an interactive science centre that has become one of Trieste's most popular attractions not only for school-age children but children of all ages.

Along the way, he has lent a hand to the development of the International Centre for Genetic Engineering and Biotechnology (ICGEB), TWAS, the International Centre for Science and High Technology (ICS), the *Elettra* synchrotron radiation facility, the InterAcademy Panel on International Issues (IAP), and now COSTIS.

For Budinich, clearly the focus is never on 'what has been done' but always on 'what's next'. And that's where he prefers the focus to remain even in his nineties.

"I have always wanted to spend my time conducting research into the most fundamental aspects of theoretical physics," he explains. "And in that sense, my life has largely been a failure." To which legions of admirers inevitably respond, "may we all fail so gloriously." □



Paolo Budinich

9 - 20 October
International School and Workshop on Polynomial Automorphisms and Related Topics,
Hanoi, Viet Nam

9 - 20 October
Workshop on Optimization Technologies for Low-Bandwidth Networks

9 - 27 October
School on Nonlinear Differential Equations

16 - 17 October
Climate Change Mitigation Measures in the Agro-Forestry Sector and Biodiversity Futures

18 - 20 October
EU-India Grid Kick-Off Meeting

23 - 28 October
International Workshop on Science for Cultural Heritage

30 October - 24 November
Fourth Workshop on Distributed Laboratory Instrumentation Systems

19 - 23 November
International Conference on Micro and Nanotechnologies ICMNT2006,
Tizi-Ouzou, Algeria

20 - 24 November
Topical Consultancy on the Effects of Climate Change on the Occurrence, Frequency and Intensity of Extreme Meteorological and Hydrological Events

20 - 24 November
Workshop on Role of Partitioning and Transmutation in the Mitigation of the Potential Environmental Impacts of Nuclear Fuel Cycle

27 November - 1 December
Economic Development for Physicists from Developing Countries

27 November - 22 December
ICTP-INFN Advanced Training Course on FPGA Design and VHDL for Hardware Simulation and Synthesis

4 - 8 December
Seismic Hazard in Asia

4 - 15 December
Workshop on the Future of Ionospheric Research for Satellite Navigation and Positioning: Its Relevance for Developing Countries

12 - 14 December
Short Workshop on Porting Applications on Computational Grids, Colombo, Sri Lanka



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

ON THE WORLD WIDE WEB (WWW)

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

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

ON E-MAIL

(1) For Scientific Calendar of Activities

Create a new e-mail message and type

To: smr@ictp.it

Subject: get calendar 2007

Leave the body of the message blank. Send it.

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

(2) For Information on a Specific ICTP Activity

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

To: smr####@ictp.it

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Subject: get index

Leave the body of the message blank and send it.

You will receive automatic reply messages containing all documentation available on that particular activity.

(3) For Information on All ICTP Activities

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

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Leave the subject line empty.

In the body of the message type

subscribe

and your e-mail address. Send the message.

Any comments or suggestions on this service are most welcome. Please address them to pub_off@ictp.it.

NEWS from ICTP

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

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

Editor-in-Chief

Daniel Schaffer

Staff Writer/Direttore responsabile

Fabio Pagan

Managing Editor

Anna Triolo

Copy Editor

Katrina Danforth

Statistician

Giuliana Gamboz

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Massimo Silvano

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Public Information Office



The Abdus Salam
**International Centre
for Theoretical Physics**

Strada Costiera, 11
34014 Trieste
Italy
sci_info@ictp.it
fax: (+39) 0402240565
www.ictp.it