

News from

ICTP 138

SPECIAL

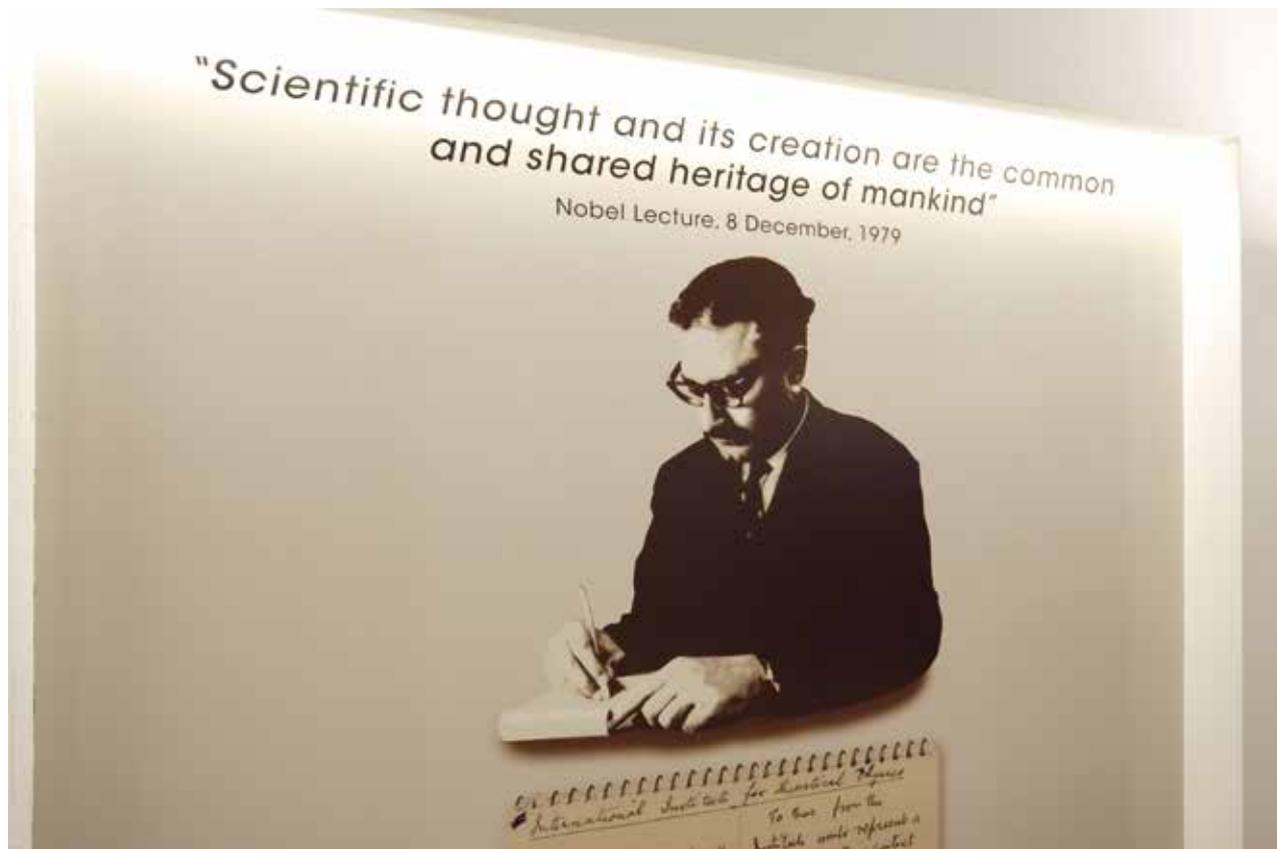
50TH ANNIVERSARY

EDITION



The Spirit of Salam is the Spirit of Science

Fifty years after it opened its doors, ICTP remains as relevant as ever



The Abdus Salam wall in the ICTP lobby

When visitors to ICTP now enter the Centre's renovated main lobby, they are greeted by its founder himself, Pakistani Nobel Laureate Abdus Salam. Recently, a wall in the lobby was transformed into a memorial to the first director, with a portrait of him under his famous quote, "Scientific thought and its creation are the common and shared heritage of mankind".

The mural proved to be a popular attraction during ICTP's recent 50th anniversary celebration, held from 6 to 9 October 2014. Older scientists posed to have their photos taken with Salam, while younger ones captured 'selfies' on their mobile phones and instantly shared these on social media.

The spirit of Abdus Salam pervaded the meeting: the first day's activities devoted an afternoon to his legacy, with moving tributes by C.N.R. Rao, Thomas Kibble, Steven Weinberg and others. This was followed by an emotional presentation of "The Spirit of Abdus Salam Award" to three current and former longtime ICTP staff members—Pierre Agbedjro, Anne Gatti and André Hamende—who have demonstrated a tireless dedication to Abdus Salam's humanitarian passion and vision for the cooperation, promotion and development of science and technology in the developing world.

Salam's spirit was reflected in the more than 270 international participants comprising renowned physicists and mathematicians, policy makers, a president, Nobel Laureates, and United

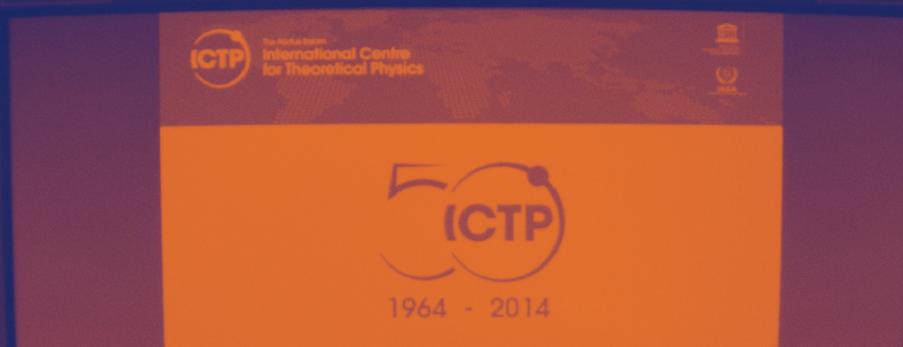
Nations representatives who came to pay their respects to a dream that has become a successful reality with worldwide consequences. His vision could be seen and heard in the more than 100 scientific lectures delivered during the event.

With more than 100,000 scientists from 188 countries trained during its 50 years in operation, ICTP has clearly taken its mission to heart. In the words of UNESCO Director-General Irina Bokova, "ICTP has demonstrated that it is a successful model to respond to the needs of scientists in the developing world and to build scientific capacity."

This issue of *News from ICTP* summarizes the 50th anniversary celebrations; for a more interactive experience, please visit ICTP's anniversary webpage for videos and photos.

Fifty Years of Science for the Future

ICTP's 50th Anniversary in photos



Featuring Nobel laureates, presidents and princes—not to mention world renowned physicists and mathematicians from more than 65 countries—ICTP celebrated its 50th anniversary with style. The four-day event, held from 6 to 9 October 2014, attracted more than 270 distinguished scientists, ministers and others, giving ICTP an opportunity not only to thank its supporters who have helped keep the dream of Abdus Salam alive, but also to look ahead with a new strategy to meet the changing needs of a rapidly developing world.

If you missed the events, here is a timeline of the key activities. All were recorded and are available on the ICTP YouTube channel; we invite you to explore the rich content of this half-century celebration!

Day 01

“Today is a very special day for the ICTP community since we are celebrating 50 years of a unique institution that over the years has become more and more relevant to the needs of our planet and its inhabitants. Science is a key component of our culture and is one of the most effective means of our survival,” said ICTP Director Fernando Quevedo to a crowd of nearly 300 attendees at the official opening of ICTP’s 50th anniversary celebrations



ICTP Director Fernando Quevedo greeting attendees of the 50th anniversary celebration

Director Quevedo is followed by greetings and congratulations from the Government of Italy as well as heads of United Nations organizations—including ICTP’s partners UNESCO and the IAEA—and important local and international dignitaries



Mario Giro, Under Secretary of State, Ministry of Foreign Affairs, Government of Italy



Irina Bokova, Director-General, UNESCO



Yukiya Amano, Director General, IAEA



Michel Jarraud, Secretary General, WMO



Hamadoun Touré, Secretary General, ITU



Rolf-Dieter Heuer, Director-General, CERN

Day 01 continued

The 2013 ICTP Prize is jointly awarded to Yasaman Farzan of the Institute for Research in Fundamental Sciences, Tehran, Iran, and Patchanita Thamyongkit of Chulalongkorn University, Bangkok, Thailand, by UNESCO Director-General Irina Bokova. A video interview with the ICTP Prize winners is available on ICTP's YouTube channel



ICTP Prize recipient Yasaman Farzan (center)



ICTP Prize recipient Patchanita Thamyongkit

ICTP dedicates its Main Lecture Hall to ICTP co-founder Paolo Budinich



IAEA Director General Amano, UNESCO Director-General Bokova and Italy's Under Secretary of State Giro unweil new entrance sign to Budinich Lecture Hall

The celebrations' first keynote lectures are delivered, by Rwandan President Paul Kagame, Prince El Hassan bin Talal of Jordan, and Ansar Parvez, Chairman of the Pakistan Atomic Energy Commission



Rwandan President Paul Kagame



Prince El Hassan bin Talal of Jordan



Ansar Parvez, Chairman of the Pakistan Atomic Energy Commission

ICTP Director Fernando Quevedo presents ICTP's Strategic Plan for the next five years



ICTP Director Fernando Quevedo

Representatives of Abdus Salam's family present the Spirit of Abdus Salam Award to longtime staff members Pierre Agbedjro, Anne Gatti and André-Marie Hamende (see full story, pg. 21)



André-Marie Hamende receives award from family of Abdus Salam

The keynotes continue with two talks by Nobel Laureates David Gross and Carlo Rubbia



David Gross



Carlo Rubbia



C.N.R. Rao



Mohamed H.A. Hassan

Tributes to ICTP founder Abdus Salam begin, with a keynote by C.N.R. Rao, followed by personal testimonials by Salam's friends and collaborators, including Steven Weinberg, Thomas Kibble and Mohamed H.A. Hassan



Guests adjourn to Duino Castle for the anniversary dinner

Day 02

World Meteorological Organisation (WMO) Secretary General Michel Jarraud, and current Intergovernmental Panel on Climate Change (IPCC) Vice-Chair Jean-Pascal van Ypersele open Day 2 activities with a session on Future Earth, about the challenges of climate change and how scientists and policy makers must work together to overcome them



WMO Secretary General Michel Jarraud, ICTP scientist Filippo Giorgi and IPCC representative Jean-Pascal van Ypersele

ICTP's current and future partner institutes promote their activities



Nathan Berkovits, ICTP-SAIFR, Brazil



Silas Lwakabamba, Minister of Education, Government of Rwanda, ICTP-EA, Rwanda



Andrew Briggs, University of Oxford and Templeton Foundation



Adnan A. Shihab-Eldin, Director General, KFAS



Wole Soboyejo



Romain Murenzi

The challenges of funding basic sciences and development are discussed during two sessions moderated by Ian Solomon, Vice President for Global Engagement, The University of Chicago

At a session focussing on Africa, TWAS Executive Director Romain Murenzi and Wole Soboyejo, Immediate Past President, African University of Science and Technology, discuss the challenges and opportunities facing the continent

How do other science institutes collaborate internationally? During a panel discussion on this topic, participants hear from leaders of The Next Einstein Initiative; The Asia Pacific Center for Theoretical Physics; African University of Science and Technology; and SESAME

Sessions on the challenges that women scientists face in pursuing careers in a male-dominated field stimulate discussions on personal and professional experiences of panel members from around the world



Rohini Godbole, co-moderator, Women in Science session



Patchanita Thamyongkit, panelist, Women in Science session

Carlo Rubbia delivers a public talk at Trieste's Politeama Rossetti on the future of energy



Carlo Rubbia

Days 03 & 04

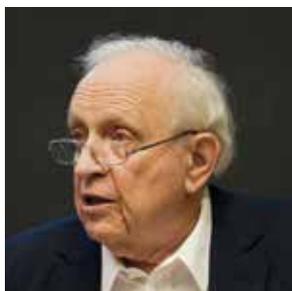
ICTP's anniversary offerings now take a turn toward a more scientific flavour, with sessions devoted to ongoing and new research areas delivered by world experts. These include:



Extreme Events and Natural Disasters:
Tim Palmer,
University of Oxford



Renewable Energies:
Serdar Saricifci,
University of Linz



Optics:
Roy J. Glauber,
Harvard University



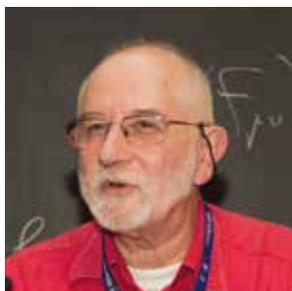
Optics:
Alain Aspect,
Laboratoire Charles Fabry



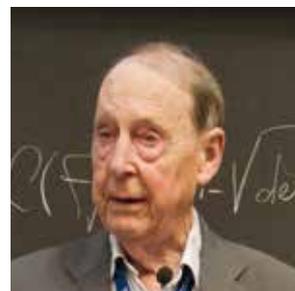
Quantitative Life Sciences:
Mauro Giacca,
ICGEB



Theoretical Physics:
Michael Green,
University of Cambridge



Theoretical Physics:
Michael Berry,
University of Bristol



Theoretical Physics:
Thomas W.B. Kibble,
Imperial College London

Day four begins with a keynote lecture by Ingrid Daubechies, President of the International Mathematical Union. After her talk, she presents the 2014 Ramanujan Prize to Miguel Walsh

The scientific lectures continue, with sessions on mathematics and theoretical physics including Cédric Villani's animated presentation on "The importance of mathematics" and Nima Arkani-Hamed's talk on "The geometry of scattering amplitudes"



Ingrid Daubechies



Miguel Walsh



Cédric Villani



Nima Arkani-Hamed



ICTP Dirac Medallists Gabriele Veneziano, Ashoke Sen, and Andrew Strominger

ICTP awards its 2014 Dirac Medal to Ashoke Sen (India), Andrew Strominger (USA) and Gabriele Veneziano (Italy), three physicists who have made crucial contributions to the origin, development and further understanding of string theory

ICTP officially closes its 50th anniversary celebrations. Reflecting on the events, ICTP Director Fernando Quevedo says, “The fact that we attracted an outstanding group of visitors from highest level government officials, directors-general and secretaries general of international scientific organisations, as well as high level researchers, illustrates the uniqueness of ICTP. It is difficult to find another scientific institution worldwide with this convening power, and we look forward to carrying on our important work.”

50th Anniversary Celebration Highlights



Pre-dinner speech by Luciano Bertocchi, former Deputy Director of ICTP, at Duino Castle



Celebrating ICTP, dinner at the Trieste Prefettura, ICTP Director Fernando Quevedo looks on



Silas Lwakabamba, Rwandan Minister of Education, greeted by students of United World College at Duino Castle



The Salam family pose by the Abdus Salam Wall at ICTP



Raise a toast, David Gross at the Trieste Prefettura dinner



Spirit of Abdus Salam Award recipients Anne Gatti and Pierre Agbedjro at the staff party after the 50th Anniversary celebrations



ICTP staff on the campus after 50th Anniversary celebrations

Glimpses from ICTP's 50th Anniversary



ICTP Scientific Council Chairman Luciano Maiani reads out a statement of congratulations sent by Italian President Giorgio Napolitano



Martin Rees, ICTP Director Fernando Quevedo and Rwandan President Paul Kagame



ICTP Director Fernando Quevedo introduces CERN Director-General Rolf-Dieter Heuer to Prince El Hassan bin Talal of Jordan and his wife, Princess Sarvath



Rwandan President Paul Kagame speaking during the 50th anniversary opening ceremony



Daniele Amati of SISSA chaired the session for the Spirit of Abdus Salam Award



Fernando Ferroni, President, Istituto Nazionale di Fisica, chaired the keynote lecture by Carlo Rubbia



Aldo Malavasi, Deputy Director General of the IAEA Department of Nuclear Sciences and Applications, chaired the keynote lectures during the opening ceremony



Peter Goddard, Institute for Advanced Study, chaired a session on "Friends and Collaborators of Abdus Salam"

Nobel Laureate Steven Weinberg (left), who shared the 1979 Nobel Prize in Physics with Salam and Sheldon Lee Glashow, and Federico Mayor, former UNESCO Director-General, provided video testimonies about Salam's legacy that were shown during the session on "Friends and Collaborators of Abdus Salam"



(Clockwise from left): Robert Delbourgo, University of Tasmania; Michael Duff, Imperial College London; Adnan Badran, former Prime Minister of Jordan and current President of Petra University; and Rexhep Meidani, former President of Albania, sharing their memories of Abdus Salam during the session on "Friends and Collaborators of Abdus Salam"



Glimpses from ICTP's 50th Anniversary



Trieste Mayor Roberto Cosolini and Prefect of Trieste Francesca Garufi at the opening ceremony of ICTP's anniversary



Other local authorities attending the opening included Maria Teresa Bassa Poropat, President of the Province, and Debora Serracchiani, President of the Region



Antonino Zichichi, President, World Laboratory, speaking at a special dinner for ICTP's anniversary hosted by the Trieste Prefettura



Wole Soboyejo, Immediate Past President of the African University of Science and Technology, speaking during the "Focus on Africa" session



ICTP Director Fernando Quevedo opened the session on "Funding Basic Sciences and Development". Panelists included (top, right) Alejandro Ceccatto, Argentina Ministry of Science, Technology and Innovation; Adnan A. Shihab-Eldin, Director General, Kuwait Foundation for the Advancement of Sciences (below, left); Zahid Hamid, Minister for Science and Technology, Pakistan (below, centre); and Faris Hasan Al Sheikh, OPEC Fund for International Development (below, right)



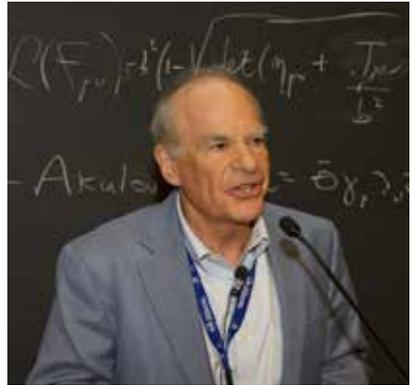
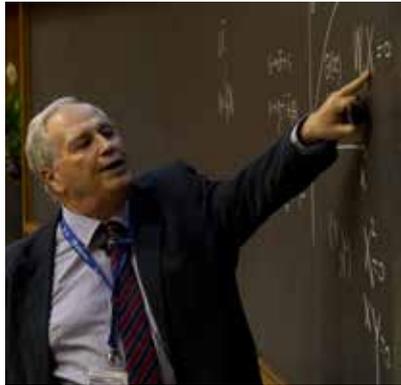


The anniversary event included two panel discussions on "Women in Science"; at left, Zohra ben Lakhdar of the University of Tunis – winner of the L'Oreal-UNESCO Award for Women in Science and an ICTP Senior Associate – shares her experiences, while in photo at right, Martin Rees offers a male perspective during one of the panel sessions



Chris Llewellyn Smith, President of the Council of SESAME, speaking during the session on "International Collaborations with Other Centres". With him are Wole Soboyejo, Immediate Past President of the African University of Science and Technology, and Seunghwan Kim, President of the Asia Pacific Center for Theoretical Physics

Roger Bilham, University of Boulder, Colorado, talks about the seismic future of cities during the session on "Extreme Events and Natural Disasters"



Giorgio Parisi, Università la Sapienza, Rome, at the session on "Quantitative Life Sciences"

Sergio Ferrara of CERN (left) and John Schwarz of CALTECH (right) speaking during the session on "Theoretical Physics"



(left photo) At the podium, John Dudley, President of the European Physical Society and Chair of the International Year of Light steering committee, gives a presentation during the roundtable on "Optics and the Next 50 Years"; panelists included Eugene Arthurs, International Society for Optics and Photonics (SPIE); Alain Aspect, Laboratoire Charles Fabry; Peter Zoller, University of Innsbruck; and Nobel Laureate Roy J. Glauber, Harvard University

At right, Christopher Stringer of the UK Natural History Museum lectures on "Our African Origins"

Glimpses from ICTP's 50th Anniversary



Edward Witten of the Institute for Advanced Study gave a lecture on "Knots and Quantum Theory"



Duncan Haldane, Princeton University, spoke about "Topology and Geometry in Condensed Matter"



Subir Sachdev's lecture focussed on "Quantum Matter without Quasiparticles"



Sessions on Mathematics featured talks by (from left) Marcelo Viana, Don Zagier and Fernando Codá Marques



Edouard Brézin of the École Normale Supérieure lectured on "Gaussian Integrals"



Andrew Strominger (left), Harvard University, receives the 2014 Dirac Medal from Edward Witten, ICTP's first Dirac Medallist



ICTP's Postgraduate Diploma students were on hand to introduce the many renowned scientists who lectured during the anniversary celebrations. From left: Asma Kehal and Rodrigo De Leon Ardon; Mahumm Ghaffar introducing Jogesh Pati; and at far right (clockwise from top), Sarah Jaye Oliva, Mariam Khachatryan, Prosper Delanyo Akrobotu, Angela Tabiri, and Ismail Abdulrashid



Carlos Alberto Aragão de Carvalho Filho, Universidade Federal do Rio de Janeiro, chaired a session on ICTP's partner institutes



M.S. Narasimhan, Tata Institute of Fundamental Research and Indian Institute of Science, chaired sessions on mathematics



Spenta Wadia, International Centre for Theoretical Sciences, chaired a session on international collaboration amongst science centres



Erio Tosatti, former Acting Director of ICTP, chaired the public talk by Carlo Rubbia



Alfonso Franciosi, Elettra Sincrotrone Trieste, chaired the session on renewable energies



Former ICTP Director Miguel Virasoro chaired sessions on theoretical physics



Luis Álvarez-Gaumé, CERN, chaired a session on theoretical physics



Massimo Inguscio, President of the Istituto Nazionale di Ricerca Metrologica, chaired a session on optics



Jagadish Shukla, Centre for Ocean-Land-Atmosphere Studies, chaired a session on extreme events and natural disasters



Guido Martinelli, Director of the International School for Advanced Studies, chaired a session on theoretical physics

The Next Five Years: ICTP's Strategic Plan

50th Anniversary celebrations a chance to plan for the future

As part of ICTP's 50th Anniversary celebrations, Director Fernando Quevedo unveiled his strategic plan for the Centre's next five years. Among the goals are undergraduate and teacher training, setting up a programme of ICTP ambassadors, and increasing the number of scientific staff. Two more goals received special attention during the anniversary conference: striving towards gender balance and setting up regional centres of excellence.

Gender and Science: Panels explore women's experiences



Shirley Malcom, American Association for the Advancement of Science, speaks during the women in science panel

In its new strategic plan for 2015 to 2019, ICTP has committed to increase the number of women at ICTP in all roles. A double-panel session on women in science during the anniversary celebrations provided an important first step in developing a blueprint for reaching the Centre's gender goals. The panelists, comprising eminent and predominantly female scientists, shared their experiences and their suggestions for future improvements.

The first panel provided a variety of perspectives of scientists from Italy, Argentina, Brazil, the United Kingdom, and the United States, who presented institutional barriers in education, culture, and attitudes and suggested ways they might be fixed. "It is important that your voice be heard," said physicist Shirley Malcom of the American Association for the Advancement of Science.

While some of the speakers expressed optimism about the opportunities for women in science in upcoming years, others stressed the work yet to be done. "We still have a long way to go," said Ingrid Daubechies, the current (and first female) president of the International Mathematical Union. Marcia Barbosa, from the Universidade Federal do Rio Grande do Sul, urged the attendees to serve as mentors to young women in their fields, and Martin Rees of the University of Cambridge suggested a role for ICTP to play: "It's rather embarrassing that of the 40 winners of the Dirac Prize, there's only been one woman."

The second panel addressed the challenges facing women scientists in the developing world. In her opening remarks, moderator Shobhana Narasimhan of the Jawaharlal Nehru Centre for Advanced Scientific Research suggested that in many cases, it is easier for women to be scientists in developing countries. Belita Koiller of the Brazilian Physical Society agreed. It was the lack of infrastructure, rather than her gender, that was a burden for her career.

Ayşe Erzan, a panelist from Turkey, a country with many female physicists, credited the role of the government in creating an academic environment with many professorships that were open for women. But Sujatha Ramdorai, who completed her PhD in her home nation of India, urged her country's leaders "to go beyond tokenism" and improve the support structure for women.

2013 ICTP Prize winner Patchanita Thamyongkit said that cultural attitudes about women and the young were also changing in her country, Thailand. During her undergraduate years, there were very few female professors but "now, the opportunity is not bad in terms of gender," Thamyongkit said. But cultural traditions remain strong, and administrators continue to be overwhelmingly male. She said she was grateful to receive the ICTP Prize, and concluded the discussion by urging the older generation of physicists in the audience to give young women opportunities. "If you just make it available, women will step out and do it."

ICTP Around the World: Partner Institutes Report Progress

Directors and scientific and governmental officials representing ICTP's regional centres in Brazil, Turkey, China, Mexico, and Rwanda presented the histories, administrative details, and scientific successes of their respective institutes at a session on the second morning of the 50th anniversary celebrations of ICTP. The progress reports from ICTP's partner institutes, which together represent the entire globe, suggested that Director Quevedo's goal to "consolidate achievements in the regional centres" is already well on its way to completion.

Nathan Berkovits, the director of the ICTP- South American Institute for Fundamental Research (ICTP-SAIFR) in Sao Paulo, Brazil, told the history of the collaboration between the Instituto de Física Teórica of the Sao Paulo State University (IFT-UNESP) and ICTP, which officially began with a memorandum of understanding signed at the ICTP "After 45" celebrations in 2010. ICTP-SAIFR opened less than two years later, in February 2012. Since then, ICTP-SAIFR has hosted international schools, workshops, and minicourses for 900 scientists a year from across South America. In addition to this ambitious programme, next year ICTP-SAIFR will begin to help organise schools in Peru and Mexico.

Tuğrul Senger presented the Eurasian Centre for Advanced Research (ECAR), hosted by Iztech in Izmir, Turkey. ICTP-ECAR, which was inaugurated in May 2014, serves Eastern Europe, the Balkans, the Black Sea, Near Asia, the Middle East, and North Africa. “In most countries in this region, scientific culture and institutions are not well established,” Senger explained. “A need for such a centre, even though it is close to ICTP, can be important.” In its brief five-month existence, ICTP-ECAR has already hosted a summer school on quantum structures for 35 students from Turkey, Algeria, Iran, and elsewhere in the region, and an advanced workshop on quantum control in condensed matter physics with 27 prominent invited speakers.

Next, Yue-Liang Wu of the Chinese Academy of Sciences spoke about the creation of an ICTP institute in the Asia-Pacific region. The idea for an ICTP branch in China was first suggested by Director Quevedo at an October 2011 string theory and cosmology conference in China, and this year the Director met with the leaders of the Chinese Academy of Sciences and the National Science Foundation of China to discuss the plans further. “ICTP-AP, together with the International College of the University of the Chinese Academy of Sciences, will serve as an international platform for integrating advanced research and education with a focus on the developing world in the Asia-Pacific,” Wu said.

Arnulfo Zepeda, Director of ICTP-MAIS (Mesoamerican Institute of Sciences), presented his institute based at the University of Chiapas in Mexico. ICTP-MAIS began as a memorandum of understanding in December 2011 that established the Mesoamerican Centre for Theoretical Physics (MCTP). The mission of MCTP, officially opened in June 2013, is to contribute to the development of basic and applied science in physics, mathematics, energy, and the environment, and to support researchers from Mesoamerica, the Caribbean, and Mexico. Educational activities at ICTP-MAIS include introductory courses in physics, to be expanded to mathematics next year, while workshop and symposium topics so far have included entrepreneurship, radiation physics, disaster response, and microemulsions.

Last, but not least, the Minister of Education of Rwanda, Silas Lwakabamba, presented the initiative of ICTP-East Africa (EA), to be hosted in his country. Minister Lwakabamba outlined how ICTP-EA fits with Rwanda’s Vision 2020, which incorporates a strong emphasis on science, technology, research, and education. Together with ICTP, the partner institute in Rwanda will offer the country’s first master’s programme in physics. Lwakabamba discusses opportunities and challenges for scientific education in Rwanda in an exclusive video interview available on ICTP’s YouTube channel.

Rwanda already has a regional centre of excellence in internet and communication technologies through a partnership with Carnegie Mellon University and the African Development Bank, and has begun research initiatives in many other fields such as climate change, energy, conservation, and fibre optics. Rwanda’s easy accessibility for many scientists from the region, in addition to its research initiatives, led Director Quevedo to visit in July

2013 to assess the feasibility of establishing a centre. The East Africa Institute for Fundamental Research has already hosted two international schools this year, one on Space Science and one on Geophysics, each of which attracted scientists from at least 13 African countries, the US, and Europe. “Partnership with ICTP is a very important component in Rwanda’s ambitions to build science, technology, and research,” Lwakabamba summarised.

“Our goal is to bring ICTP’s unique blend of high-quality physics and mathematics education and high-level science meetings closer to scientists in Africa, to help strengthen the continent’s research capacity,” added ICTP Director Fernando Quevedo.

“ICTP’s commitment to establish its East African regional centre in Rwanda is of great practical and symbolic importance to us as a nation,” remarked Rwandan President Paul Kagame during the inauguration of ICTP’s festivities. “We look forward to working together with the rest of the region and ICTP to make this venture a success. You can count on our strong support,” Kagame said.



(l-r) Yue-Liang Wu (Chinese Academy of Sciences), ICTP Director Fernando Quevedo, Nathan Berkovits, (ICTP-SAIFR, Brazil), Tuğrul Senger (ICTP-ECAR, Turkey), Arnulfo Zepeda (ICTP-MAIS Mexico)

Outreach During the 50th Festivities

Carlo Rubbia and Cédric Villani give public lectures in Trieste

ICTP's 50th anniversary celebrations were not limited to the ICTP campus. Two key speakers at the event, Nobel laureate Carlo Rubbia and Fields Medallist Cédric Villani, director of Institut Henri Poincaré, presented talks geared to the general public.

Rubbia's talk, titled "Quale futuro per l'energia?" ("What is the Future of Energy?"), was held at Politeama Rossetti in Trieste on 7 October. Villani spoke to high school students about the beauty of mathematics on 9 October.

The Road Ahead for Energy



Carlo Rubbia at Politeama Rossetti

Speaking to the Trieste daily newspaper *Il Piccolo*, Rubbia said, "In the 80 years since I was born, the world's population has tripled: the primary energy consumed by each of us today is 11.7 times more." He added, "In terms of energy policy, there is much to be done." He spoke against dependence on nuclear energy, and said that problems related to nuclear waste disposal and the possibility of a nuclear incident are serious issues that cannot be ignored.

In his talk, Rubbia pointed out that one of the best solutions to meet the rising energy demands would be to develop unconventional gas resources, which include coal-bed methane, shale gas, and methane hydrates. He stressed that the global community needs to keep in mind the environmental aspects while tapping into these resources using cost-effective methods.

Rubbia, a long-time friend of ICTP, was awarded the Nobel Prize in Physics in 1984, and learned of his prize while on a visit to the Centre. Among his many contributions to physics, Rubbia's work in developing sustainable energy approaches has been crucial. He was the president of ENEA, the Italian National Agency for New Technologies, Energy and the Environment, from 1999 to 2005, and during his tenure there he developed a novel method for concentrating solar power at high temperatures for energy production, known as the Archimedes Project, which is presently being developed by industry for commercial use.

Rubbia is the current scientific director at Institute for Advanced Sustainability Studies, Potsdam, Germany. His complete talk can be viewed on ICTP's YouTube channel (in Italian).

Underlining the Underlying Math



Cédric Villani talks about the importance of mathematics at ICTP

From the technology that fuels cell phones to understanding the mechanics behind the flight of a bat, mathematics is deeply embedded in our world, but we often fail to see it. Mathematician and 2010 Fields Medallist Cédric Villani spoke during the mathematics session at ICTP's 50th Anniversary and later at a local high school in Trieste to put the spotlight on mathematics and the fascinating ways in which it forms the basis of scientific and logical methods.

There is much to learn even from the triangle, one of the basic shapes in geometry, he pointed out. "The study of triangles teaches you to think and organise and make proofs," said Villani. "Sometimes in the geometry of triangles you have miracles like four points on a single line, or three lines that come together, and you say, 'Wow! That's amazing!', but then you learn you can explain these, and that's the whole approach of science, you see things which are like miracles, and then you learn that there is something behind the scene, and the explanation is never less beautiful than the miracle itself," he said.

To underline why knowledge of mathematics is an extremely powerful tool, Villani cited the example of a competition organised by CERN. The Higgs Boson Machine Learning Challenge required participants to find a mathematical method to objectively analyse signals in order to recognise the signature of the Higgs Boson. Knowledge of mathematics, said Villani, allowed a team of computer science specialists who knew nothing about theoretical physics to attack the problem and perform better than any other team.

At the high school talk, Villani presented the students with the mathematics behind the flight of bats. "Sometimes you can start with an element, which is natural, which is familiar, and see how much mathematics there is," says Villani. "If you want to understand how the bat flies, how the bat can find the prey, and so on, there is so much nice mathematics involved."

"In a way, mathematics can be considered the most personal of all sciences," said Villani, "it teaches you how to find the solution yourself, not just blindly follow your teacher." At the same time, Villani pointed out that it is also a very social activity. "You have to talk and discuss and be immersed in the environment. You have to go and meet people. It's a human thing, getting into science."

Villani's talk at ICTP and his interview are available on the ICTP YouTube Channel.

Strings Untangled

The 2014 Dirac Medallists discuss string theory and how it has grown over the years



(l-r) Gabriele Veneziano, Ashoke Sen, Andrew Strominger

How many string theorists does it take to have a fascinating roundtable discussion about the past, present and future of the field? In a recent case at ICTP: four.

The 2014 Dirac Medallists Gabriele Veneziano, Andrew Strominger and Ashoke Sen, and new ICTP research scientist Atish Dabholkar sat down for a relaxed discussion about string theory, its origins, and the impact it has had on physics after the Dirac Medal ceremony held during ICTP's 50th Anniversary celebrations. Their discussion, which was captured on video, gives insights into successes and setbacks of string theory and the medallists tackle some tough questions that Dabholkar puts forth. "I know these are very hard problems," Dabholkar says at one point during the discussion, "but since you are Dirac Medallists I can ask you these questions."

Veneziano, who is considered a pioneer of string theory, began laying the foundations for the field back in the 1960s when he discovered the Veneziano Amplitude. "[It was] not an accidental discovery, this description of string theory. We started from a bottom-up approach," he says. "Now the field has grown, it's like your baby that you don't recognise anymore, it has grown up so much."

Strominger and Sen are two string theorists who have nurtured the field and contributed to its growth. "It's so interesting to listen to Gabriele's personal recollection," says Strominger. "When he discovered the Veneziano formula, it was a little bit disappointing that it didn't describe hadrons. Of course, what it did describe, I think, is more wonderful than anything you can

imagine. The truth about the laws of physics is more wonderful and more interesting than our imagination."

Strominger's co-discovery of Calabi-Yau compactifications allowed string theory to emerge as one of the candidates for the unified theory of nature. "If somebody in 1985 had predicted what was to come [in string theory], they would have been dismissed as optimistic fools," he says.

String theory, today, provides tools and a framework that can be used to solve problems posed by other fields including condensed matter physics, hydrodynamics, and the study of black holes. Ashoke Sen, who has contributed significantly to string theory, especially in studies related to duality and black holes, says, "The fact that string theory can explain so many different properties of black holes is unthinkable for any rival theory." Sen was one of the first recipients of the Fundamental Physics Prize "for opening the path to the realisation that all string theories are different limits of the same underlying theory." "My experience is that in this field you cannot really plan your research because to do something you may need some more information, which you don't have at that time," says Sen. "So, you basically explore the theory in all possible ways. And then, when the time is right, you'll make a breakthrough in one particular front."

The complete discussion—"The Dirac Roundtable"—can be viewed on ICTP's YouTube channel. Scientific talks presented by the medallists during the ceremony are also available. The 2014 Dirac Medal was awarded to the three physicists for their crucial contributions to the origin, development and further understanding of string theory.

Putting Science on the Development Agenda

Flavia Schlegel, UNESCO's new ADG for Natural Sciences, talks about ICTP's role in sustainable science



Flavia Schlegel (far right) poses with dignitaries at ICTP's 50th anniversary event. From left, CERN Director-General Rolf-Dieter Heuer, Elisa Quevedo, ICTP Director Fernando Quevedo, Rwanda President Paul Kagame, UNESCO Director-General Irina Bokova, Prince El Hassan bin Talal of Jordan and his wife, Princess Sarvath, IAEA Director General Yukiya Amano, TWAS Executive Director Romain Murenzi

Barely a week after taking up her new post as Assistant Director-General (ADG) for Natural Sciences at UNESCO, Flavia Schlegel visited Trieste, accompanying UNESCO Director-General Irina Bokova to ICTP's 50th anniversary events. Her appointment comes at a time when UNESCO is gearing up for its input into the Post-2015 Development Agenda, a follow-on to the Millennium Development Goals formulated in 2000. For the post-2015 agenda, UNESCO is keen to highlight the importance of science, technology and innovation (STI) in accelerating sustainable development, a point that was largely ignored in the 2000 agenda.

"I am deeply convinced that science will play a major role in the success of these goals," said Schlegel during a break in the 50th anniversary activities. Schlegel holds a medical doctorate degree and a master's degree in organizational development, and took up her appointment at UNESCO on 1 October 2014.

According to UNESCO, challenges to scientific capacity building remain significant, including insufficient government commitment and resource base for STI, low rates of female participation in most fields of science, a lack of equitable access to adequate infrastructure, and a disconnect between policy makers, technical experts and citizens in generating, sharing and utilizing scientific knowledge.

To this last point, Schlegel believes that ICTP, with its vast, international network of scientists, could help. "Institutions like ICTP can spread the message to people from all over the world that it

is very important to be literate about science and to be a good scientist. But you also have to be able to explain your science to politicians, business people or to the farmer in the field, so that they know it is important to support and sustain science in order to create solutions needed for accomplishing the post-2015 development agenda," she explained.

Yet at the heart of ICTP's work is basic science, and this, too, feeds into the humanitarian vision the development agenda strives toward, Schlegel noted. "Basic science is at the very beginning of every applied technology, and can help the world handle resources in a sustainable and equitable way."

The ultimate aim of the UN development goals is to build a better world, and Schlegel sees another important aspect of ICTP—bringing together scientists from around the world—as vital to the success of the post-2015 agenda. "By educating people from developing and emerging countries, ICTP is a good example of how people can cooperate coming from different cultures, background and social situations in order to bring knowledge to the world. This will help us to sustain peace," she said.

News Highlights

Spirit of Abdus Salam Award

Recognition of dedication to Abdus Salam's passion and vision

After a moving tribute to ICTP founder Abdus Salam by his friends and collaborators during ICTP's 50th anniversary event, it was only fitting that ICTP honour the long-time staff members who are recipients of the Spirit of Abdus Salam Award. The award, instituted by the family of Abdus Salam, recognises scientists and non-scientists alike who have demonstrated a tireless dedication to Abdus Salam's humanitarian passion and vision for the cooperation, promotion and development of science and technology in the developing world.

Three long-time ICTP staff members André-Marie Hamende, Anne Gatti and Pierre Agbedjro were recipients of the inaugural award. Dr. Hamende, a nuclear engineer from Belgium, was present at the very inception of ICTP and served as the Centre's Senior Administrative and Scientific Information Officer from 1964 to 1990. Gatti, often described as "a pillar of ICTP", began working at ICTP in 1983 as administrative assistant to Abdus Salam and has provided crucial support to every director since then. Agbedjro has been ICTP's official driver since 1985, and has been providing efficient and faithful service to the Centre's thousands of visitors.

"The three recipients of this inaugural award have each in their own way demonstrated an enduring commitment to do what they could to support Abdus Salam and his noble aims," said Ahmad Salam, the Nobel Laureate's son, at the award ceremony that was held during the first day of ICTP's anniversary celebrations. "We, the Salam family, are delighted and honoured to recognize André, Anne and Pierre as truly worthy of the Spirit of Abdus Salam prize. I know how much my father loved and valued each of them; without them ICTP would not be what it is today," said Salam.

Abdus Salam is primarily remembered for his scientific work, but his family wishes him to also be remembered for his humility of spirit and humanitarian passion and zeal which ultimately led to the creation of ICTP and TWAS.



Pierre Agbedjro (right) with Ahmad Salam, son of ICTP founder Abdus Salam



Anne Gatti (left) with Abdus Salam's daughter Aziza Rahman



André-Marie Hamende

News Highlights

ICTP Conferred Honorary Citizenship of Trieste

Recognition marks the 50th anniversary of the Centre



ICTP Director Fernando Quevedo and Mayor of Trieste Roberto Cosolini

ICTP has been conferred honorary citizenship of Trieste in recognition of the Centre's continuing efforts in advancing scientific expertise, especially in the developing world.

In a ceremony held at Trieste's city hall, the Mayor of Trieste, Roberto Cosolini, highlighted the importance of ICTP and said that it is thanks to the Centre and the foresight and tenacity of Abdus Salam and Paolo Budinich that the Trieste System of scientific institutions took shape, and ICTP has become "a source of pride for the whole city."

Founded in 1964 by the late Nobel Laureate Abdus Salam, ICTP continues to offer exceptional opportunities in research and training to researchers and students coming from countries that often do not have access to cutting-edge research and education. Every year, the Centre welcomes nearly 6000 scientific visitors and organizes important and relevant conferences, workshops and schools in the fields of mathematics and physics.

Over the past decades, the Centre has also been a model for the development of other scientific institutions in Trieste that have made the city a real "City of Science".

"This recognition by Trieste is an honour," said ICTP Director Fernando Quevedo, adding, "The city has given us not only infrastructure and institutional support, but also hospitality and friendship for the past fifty years. For this, ICTP is very grateful."

Shedding Light

ICTP 50th Anniversary anticipates International Year of Light 2015



Eugene Arthurs of SPIE

In appropriate commemoration of the International Year of Light 2015, for which ICTP will serve as the Global Secretariat, ICTP's 50th anniversary celebrations included a roundtable on the history and future of optics.

Many physicists hope to keep optics in the limelight with 2015's International Year of Light. Eugene Arthurs of SPIE, the International Society for Optics and Photonics, began his presentation with a brief video introducing IYL2015 and encouraged ICTP to continue its work in optics: "We are proud to support optics and education programmes at ICTP, and look forward to continued scientific and moral leadership from this wonderful centre."

ICTP scientist Joe Niemela, who will lead the Centre's coordination efforts for the International Year of Light, said, "Together with many partner societies in the fields of physics and optics, ICTP has been a major driver of the International Year of Light initiative since its launch in 2010. Our experience and our networks will allow us to identify new important partnerships and opportunities for education in light science, and the promotion of photonic technologies where they are needed, especially in developing countries."

With UNESCO as lead agency, the IYL Global Secretariat at ICTP will play a central role in coordinating the actions of the international scientific community and stakeholders with the UNESCO International Basic Sciences Programme at UNESCO headquarters in Paris.

Video interviews with John Dudley, President of the European Physical Society and the Chair of the IYL2015 Steering Committee, on the goals of the International Year of Light, its relation to ICTP, and the two light-related 2014 Nobel Prizes are available on ICTP's YouTube channel.

Climatic Synergies

ICTP and WMO sign a memorandum of understanding



ICTP Director Fernando Quevedo and WMO Secretary General Michel Jarraud sign the MoU

ICTP is partnering with the World Meteorological Organization (WMO), the main international body dealing with weather and climate research and applications, to address some of the most challenging problems related to weather and climate. Researchers from ICTP's Earth System Physics (ESP) section work on understanding different facets of weather and climate physics, with a special focus on developing countries. The memorandum of understanding (MoU), which was signed by ICTP Director Fernando Quevedo and WMO secretary General Michel Jarraud on 7 October during ICTP's 50th anniversary celebrations, will allow the two organizations to build better co-operation, knowledge exchange and dissemination strategies.

An International Mathematician for ICTP

Don Zagier joins Centre as Distinguished Staff Associate



Don Zagier presents "Arithmetic, Quantum Theory and knots"

Just in time for ICTP's 50th anniversary, the Mathematics section is pleased to welcome Don Zagier, one of the directors of the Max Planck Institute for Mathematics in Bonn, Germany, as an ICTP Distinguished Staff Associate.

Zagier, who first visited ICTP five years ago for a conference which he helped to organize, is thrilled to be affiliated with an institute he has come to like more and more over the years. "It's a very wonderful place to do work, but above all the kind of special mission here, the idea that it's not an institute like all others, is attractive," Zagier said, adding that he loved the idea of encouraging science in the developing world. "Mathematically, this is a very interesting place. Mathematics here is becoming very strong, physics has been strong for decades, and there's beginning to be more and more interaction. That does not happen everywhere. Here, it's automatic because we're all in the same place."

ICTP on the web: www.ictp.it

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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.

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