

Faces & Places

APPOINTMENTS

CERN Council elects European-strategy secretary

At the 186th session of CERN Council, which took place at CERN on 25–29 September, experimental particle physicist Halina Abramowicz of Tel Aviv University in Israel was appointed secretary of the European Strategy Group. This marks the official start of the next update of the European Strategy for Particle Physics, which will reach a conclusion in May 2020, with Abramowicz's first task being to develop the timeline and a detailed plan.

Abramowicz works on the ATLAS experiment, specialising in perturbative and non-perturbative QCD, and is also a member of the FCAL collaboration devoted



Experimentalist Halina Abramowicz, secretary of the European Strategy Group.

to forward detectors for future linear colliders. She completed her undergraduate and postgraduate degrees at Warsaw University in Poland in the 1970s, and also worked on the former experiments ZEUS and CDHSW. "The strategy update is a very important task in preparing the future of our field," said CERN Director-General Fabiola Gianotti. "We need everybody's contribution to ensure that we have a strategy that truly reflects the wishes of the field."

AWARDS

Nobel recognition for discovery of gravitational waves

The 2017 Nobel Prize in Physics has been awarded to Rainer Weiss, Barry Barish and Kip Thorne of the LIGO/Virgo collaboration "for decisive contributions to the LIGO detector and the observation of gravitational waves". Weiss, of MIT, shares half the SEK 9 million award, while his Caltech colleagues Barish and Thorne share the other half.

More than 40 years ago, Thorne and Weiss pioneered the idea that gravitational waves could be detected, in particular using large laser interferometers that would measure distortions in space–time induced by a passing gravitational wave. Together with Barish, who led the transformation of LIGO



Rainer Weiss, Barry Barish and Kip Thorne brought to fruition a 40-year long research programme.

from a small R&D project, the trio ensured that the search for gravitational waves would end in success. A fourth key figure in the

LIGO story, Ronald Drever, passed away in March this year. He had already shared, along with Weiss and Thorne, in the 2016 Breakthrough prize, Gruber Cosmology Prize and the Kavli Prize in Astrophysics.

The recognition by the Nobel committee for physics comes less than two years after the LIGO/Virgo collaborations announced the first direct detection of gravitational waves in February 2016, followed by a second event a few months later and a third announced in June this year. A fourth gravitational-wave signal was revealed just last month. These and further events open a brand new view of the universe (*CERN Courier* January/February 2017 p34).

IEEE applied-superconductivity award

The IEEE Award for Continuing and Significant Contributions in the Field of Large Scale Applied Superconductivity was presented to CERN's Luca Bottura during the European Conference on Applied Superconductivity (EUCAS) on 18 September in Geneva, Switzerland. The award recognises outstanding technical contributions and achievements in the field of applied superconductivity and comprises a plaque, an inscribed medallion, and a cash award of US\$5000.

Bottura, who is head of CERN's magnets, superconductors and cryostats group, was



CERN's Luca Bottura receives his award.

selected for developing computer models for the design and analysis of cable-in-conduit superconductors, measuring the field of the LHC's superconducting magnets and developing a parametric field model for the LHC operation, leading the development of advanced superconducting magnets for future accelerator projects, and promoting superconducting technology internationally through technical editorship, scientific networking, and the organisation of scientific events.

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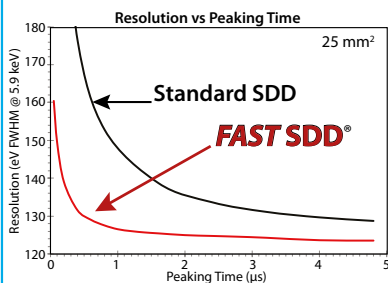
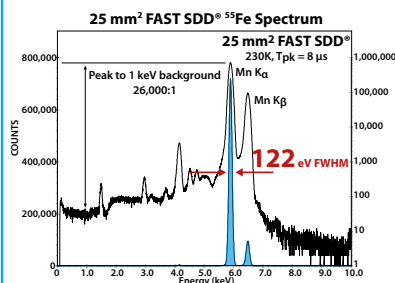
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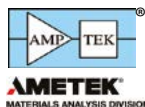


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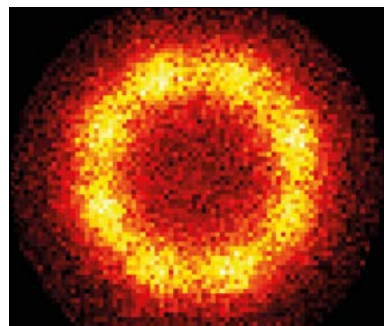
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DOE names top 40 breakthroughs

A 2010 paper from the ALPHA experiment at CERN's Antiproton Decelerator, which describes the successful trapping of 38 antihydrogen atoms, is one of 40 landmark papers selected by the US Department of Energy (DOE) to celebrate its 40th anniversary. The discovery of the Higgs boson by the LHC's ATLAS and CMS experiments was also selected. Other particle-physics results listed include: Fermilab's discoveries of the top and bottom quarks; the measurement of $\sin 2\beta$ with B^0 mesons at SLAC; the observation at Brookhaven Lab that free quarks and gluons make a perfect liquid; and the discovery of neutrino oscillations at SNO and elsewhere.



Untrapped antihydrogen atoms annihilating on the inner surface of the ALPHA trap.

EVENT

First users at European XFEL

Inaugurated on 1 September, the world's most powerful X-ray laser – the European XFEL in Hamburg, Germany – has now welcomed its first users. The culmination of a worldwide effort, the facility will eventually fire up to 27,000 pulses of intense X-rays per second to image electronic, chemical and biological processes in unprecedented detail. The first batch of users aimed to get a better understanding of the shape and function of biomolecules, using techniques such as femtosecond crystallography. In this first round of beamtime a total of 14 groups with up to 80 users each will conduct experiments until March 2018.



DESY's Anton Barty (left) and Henry Chapman (right) were involved in the first user experiments.

ANNIVERSARY

Sibling celebrations at the LHC

In early October, the ATLAS and CMS collaborations celebrated their 25th birthdays. On 1 October 1992, the nascent collaborations each submitted a letter of intent for the construction of a detector to be installed at the proposed LHC, containing detailed specifications that were close to what exist in the final designs. The letters of intent for ALICE and LHCb, the LHC's two other large experiments, followed a few months later. Earlier in 1992, some 600 physicists and engineers from 250 institutes worldwide had met in Évian-les-Bains to discuss the physics and detectors of the LHC. Construction of the LHC was approved in December 1994.



A joint ATLAS and CMS cake.



On 19 September, CERN Director-General Fabiola Gianotti delivered a public lecture at the University of Geneva titled “The Higgs boson in our lives”, during which she described the Higgs boson discovery and how research into fundamental particles has implications beyond the laboratory. The lecture was part of a rich programme of outreach events associated with the 2017 European Conference on Applied Superconductivity (EUCAS) held in Geneva from 17 to 21 September and co-organised by CERN in collaboration with the University of Geneva and EPFL-SPC (CERN Courier September 2017 p17).

J. Jordan/CERN

MEETINGS

CERN School of Computing marks 40th edition

The CERN School of Computing (CSC) aims to promote advanced learning and knowledge exchange in scientific computing among young scientists and engineers involved in particle physics or other sciences. The CSC, along with the CERN Schools of Physics and the CERN Accelerator School, are the three schools that CERN has set up to help train the next generation of researchers across the laboratory’s main scientific and technical domains.

Since the first CSC in Italy in 1970, the school has visited 21 countries and been attended by more than 2600 students from five continents and 80 nationalities. Participants are young, come from many different backgrounds and all have a passion for computing and science. They work together for two weeks, not only to widen their skills but also to establish lifelong links that will be useful throughout their careers.

The 2017 CSC, which took place in Madrid from 27 August to 9 September, marked its 40th edition. Organised together with the Universidad Politécnica de Madrid (UPM), it welcomed 63 students from 37 different universities and institutes. Representing

A. Pace/CERN



Since 1970, the CERN School of Computing has trained more than 2600 participants from 80 nationalities in scientific computing.

26 nationalities, students were selected from a record number of 110 applicants. This year, the usual intensive academic programme (52 hours of lectures and exercises covering base technologies, physics computing and data technologies) was complemented by a rich social programme that included scientific visits to UPM’s wind tunnel and

biotechnology lab. At the end of the school, 59 students passed the optional exam – 14 of them with distinctions.

Since 2002, the school has offered a CSC diploma upon successful completion of an optional exam. In addition, since 2008, the university hosting the CSC audits its academic programme and incorporates the CSC into its official teaching programme. As a result, a formal certificate of five or six ECTS (European Credit Transfer System) credit points are awarded by the hosting university and recognised across Europe for any doctoral and masters programme. Since 2005, CSC management has also organised an “inverted” CSC (iCSC) and, since 2013, a “thematic” CSC (tCSC). The idea behind the inverted school is to invite CSC alumni to become teachers themselves at a short school organised at CERN in the winter. The tCSC, on the other hand, is a one-week school that goes into more depth about a particular topic – this year’s was efficient parallel processing of future scientific data.

Applications for CSC and tCSC 2018 will be open early next year. For more information, visit csc.web.cern.ch/.

Strong discussions in Montpellier

The 20th High-Energy Physics International Conference in Quantum Chromodynamics (QCD 17) took place in Montpellier, France, on 3–7 July, involving around 50 participants with a large number of young experimental and theoretical physicists present. The conference is unique in its coverage of all aspects of QCD,

from the formal field-theory approach to confinement to its phenomenological facets, in addition to searches for physics beyond the Standard Model.

This year’s event was divided into four main sessions. The first concerned the production of jets, photons, dibosons, top quarks and B and D mesons from various experiments

– ATLAS, CMS and ALICE at the LHC, HERA and COMPASS – during which improved measurements of the QCD coupling constant, studies of fragmentation and parton distribution functions were presented. In the second session, the BESIII group presented experimental results for heavy molecules and four-quark states, in addition to

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properties of light hadrons. These results were complemented by theoretical talks on QCD spectral sum rules, potential models, holographic QCD and glueball searches.

The third session was dedicated to the more formal non-perturbative aspects of QCD, such as confinement, finite temperature and hydrodynamics, while the fourth session concerned low-energy precision tests of the electroweak Standard Model. The latter included recent measurements of lepton anomalous magnetic moments, where consistent results on the measurements of the cross-sections for $e^+e^- \rightarrow$ hadrons were presented by BABAR, BESIII and CMD-3 and compared to different theoretical contributions (there is now good agreement among different experiments confirming a 3.6 σ discrepancy with respect to theoretical predictions).

The conference ended with different precision measurements of the W, Z and Higgs boson masses and couplings, and with experimental searches for physics beyond the Standard Model by LHCb, ATLAS and



Participants at the 20th edition of the QCD conference, held in Montpellier in July.

CMS. Theoretical talks on current LHCb anomalies and on the discreteness origin of particle masses were presented, and the future performance of the ATLAS and CMS detectors was discussed.

With almost equal numbers of theorists and experimentalists present, the conference

series is an opportunity for participants to interact in a relaxed atmosphere.

New results presented in this conference also have the advantage of appearing just before the larger EPS and ICHEP international conferences. QCD18 is expected to take place from 2 to 6 July 2018.

Baikal school stays vibrant

Cold waters and hot scientific discussions were the main ingredients of the 17th international Baikal Summer School on high-energy physics and astrophysics, which was held from 13 to 20 July in the small Russian village of Bolshie Koty on the shore of Lake Baikal. More than 50 undergraduate and PhD students from Russia, Germany, Poland, Italy, India and Romania gathered at this remote and scenic location for a full week of Siberian-style scientific immersion, with an intense lecture programme set in magnificent wilderness.

The Baikal Summer School is organised annually by the Joint Institute for Nuclear Research (JINR), Dubna, and Irkutsk State University (ISU). Emerging in the early 2000s as a summer event for local physics students, it evolved into a dynamic, fully international scientific school, and one of the major annual particle-physics events in Siberia. This year, in addition to funding from JINR and ISU, the school received substantial financial support from the Russian Foundation for Basic Research and Russian energy firm En+ group, while the Traektoriya foundation provided books for student prizes.

The lecture programme maintains a good balance between theory, experiment and astroparticle topics, covering the Standard

A. Poluektov, University of Warwick



Summer-school students enjoying the view over Lake Baikal.

Model, the basics of QCD and B physics, statistical methods and other topics. A selection of results by the ATLAS, CMS and LHCb collaborations were also given, covering Higgs physics, top-quark properties, supersymmetry and exotics searches, heavy hadron spectroscopy and B-meson decays. Students also enjoyed overviews of the vast field of experimental neutrino physics and neutrino-mass model building. The latter

were so favoured by the students that the lecturer received an unexpected appreciation prize at the closing ceremony.

The astroparticle aspect of the Baikal school was equally intense, with introductions to dark matter and its various candidate particles. IceCube's results on high-energy astrophysical neutrinos were presented, as was the status of high-energy cosmic-ray programmes by the Auger and TAIGA collaborations. TAIGA, located in the Tunka valley near Lake Baikal, and the Baikal-GVD neutrino detector working inside the lake are the two flagship astroparticle experiments in Russia, and many students working in or planning to join these collaborations participated in the school. The astroparticle lecture programme closed with lectures on LIGO's recent discovery of gravitational waves.

In addition to lectures, the students presented their own work and participated in regular discussion sessions in small groups. The school offered ample opportunities for students to talk to lecturers outside of normal office hours, and staff from Irkutsk Planetarium organised stargazing sessions under the spectacular Siberian skies.

Preparations for the 2018 school, which will be organised jointly with the European network of doctorate schools in astroparticle physics (ISAPP), are already proceeding at full speed. The ISAPP-Baikal Summer school 2018 will strengthen ties between Europe, JINR and the astroparticle experiments conducted at Baikal.

● astronu.jinr.ru/school/current.

VISITS



Teruo Kishi, science and technology adviser to the minister for foreign affairs, Japan, came to CERN on 14 September. During his trip, Kishi, who is professor emeritus at the University of Tokyo, visited the ATLAS visitor centre and signed the guestbook with CERN director for international relations Charlotte Warakaulle and Director-General Fabiola Gianotti.

Deepak Dhital, ambassador of Nepal to the United Nations office in Geneva, came to CERN on 19 September, during which he signed an International Co-operation Agreement between the government of Nepal and CERN concerning scientific and technical co-operation in high-energy physics and related areas.



Māris Kučinskis, prime minister of the Republic of Latvia (furthest left), came to CERN on 20 September. Owing to a short machine stop, he was able to take a quick look at the LHC tunnel and CMS underground area. He also visited the Microcosm, S'Cool LAB and the CERN computer centre.

Image credits: (left) J. Bergerie-Pagadoy & M. Aitor; (middle and right) S. Benetti/CERN

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OBITUARIES

Dmitry Bardin 1945–2017

Our colleague Dmitry (Dima) Yurievich Bardin, an academic at Dzhelepov Laboratory of Nuclear Problems of the Joint Institute for Nuclear Research (JINR), Dubna, Russia, left us on 30 June.

Dima graduated with honours from Moscow State University and started research work at JINR in 1968. He defended his PhD thesis under the guidance of Samoil Bilenky in 1974 based on studies of elastic pion–electron scattering and rare decays of pions and kaons. Since then, Dima's scientific work was devoted to the calculation of complete electroweak and QCD radiative corrections in the Standard Model. He had close interactions with many experimental collaborations at LEP, SPS, the LHC (CERN) and HERA (DESY).

From 1978 to 1986 Dima derived, with various collaborators, electroweak corrections to deep inelastic scattering and developed a pioneering approach to renormalisation in the unitary gauge. These two projects were the basis of many now-classical applications of radiative corrections in the Standard Model, performed in close co-operation with experiments at CERN and other research centres.

With the advent of LEP, Dima's scientific activity focused on precise calculation of the properties of the Z boson, in particular by developing the ZFITTER project. In 1989 he



contributed substantially to the now-famous workshop Z Physics at LEP1, and in 1995 he was a convener of the working group for event generators for Standard Model processes at LEP2. During 1994–1995 he was a co-ordinator of the precision calculations working group at CERN. The CERN report *Precision Calculations for the Z Resonance* was the basis for the well-known “blue-band plot” of the LEP electroweak working group. ZFITTER was one of the main codes used for LEP1 and LEP2 data analyses, and was a central theoretical tool for predicting the masses of the top quark and the Higgs boson prior to their discoveries.

Dima Bardin developed ZFITTER and many other software projects.

Further software packages in which Dima was directly involved are: *muELA* for polarised mu-e scattering, *GENTLE* for LEP2 data analysis and *HECTOR* for radiative corrections to ep scattering. Since 2000 Dima also led the software system *SANC* for calculations of radiative corrections for LHC processes, and together with Giampiero Passarino he authored the significant monograph *The Standard Model in the Making*.

Dima Bardin exemplified faithful and selfless service to fundamental science. It is impossible to overestimate his role in creating an atmosphere of high standards in scientific research. With broad knowledge, extensive experience and diligence, he was a true professional in his field. A severe, debilitating and prolonged illness brought a great deal of suffering and pain, but despite this he continued working until his last day.

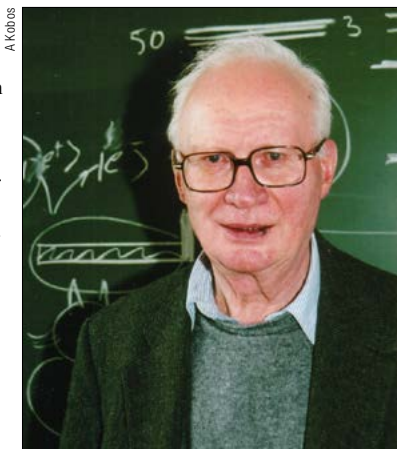
Dima was not only an outstanding scientist but also a reliable friend and colleague, and a wonderful family man. We feel a great loss, not only personally but also as a scientific community.

● Andrej Arbuzov, Wolfgang Hollik, Lida Kalinovskaya and Tord Riemann, on behalf of his colleagues and friends.

Wiesław Czyż 1927–2017

Outstanding theoretical physicist and former editor-in-chief of the journal *Acta Physica Polonica B*, Wiesław Czyż passed away on 8 April after a long illness. Wiesław was born on 2 May 1927 in Lublin, eastern Poland. His education was interrupted by the Second World War, during which he was active in the Polish resistance (the Home Army). After the war, he completed his master's degree in mathematics at the Maria Curie-Skłodowska University in Lublin.

His career in physics began in 1948, when he moved to Cracow to work at Jagiellonian University. He received his PhD in 1955 for a dissertation on spin interactions in nuclear matter. Soon after the establishment of the Institute of Nuclear Physics in Cracow, he created its theory department, which he headed for 34 years.



Wiesław Czyż made pioneering contributions to high-energy nuclear physics.

During his long research career, Wiesław was associated with many institutions. He spent two years (1957–1959) at the Niels Bohr Institute in Copenhagen, where he developed an interest in theoretical high-energy physics, his lifelong scientific passion. Then, in the early 1960s, he visited the Stanford Linear Accelerator Centre for one year, where he made significant contributions to our understanding of nuclear structure and composite-particle scattering.

In Poland, he kept in touch with the group of theoretical physicists at the Jagiellonian University, especially with Andrzej Białas, with whom he published many papers,

including their most famous one, on the wounded nucleon model, completed in 1976.

Throughout his career Wiesław developed close relations with the community of theoretical physicists in the US, visiting different institutions in the late 1960s and early 1970s. He spent six months at Stanford University, the National Bureau of Standards, Stony Brook University and the University of Virginia in Charlottesville, and one year at the University of Illinois, Urbana-Champaign. He also visited for shorter periods the University of Washington in Seattle, CERN, Utrecht and Munich, and the University of Tel Aviv many times. In 1988, Wiesław returned to Jagiellonian University and produced a stream of work on high-energy scattering of nuclei, resulting in a number

of pioneering contributions to the study of quark–gluon plasma, which was a mere hypothesis at the time.

In addition to being a great scientist, Wiesław was also an outstanding lecturer and teacher. He was involved in the organisation of the Cracow School of Theoretical Physics since its inception in 1961. Together with Andrzej Białas and their wives, Maria Czyż and Elżbieta Białas, he helped create a unique institution, which has attracted young scientists and senior lecturers for 57 years.

From 1972 to 1994, Wiesław was editor-in-chief of the leading Polish physics journal *Acta Physica Polonica B*, with Maria Czyż acting as the managing editor. It is impossible to talk about Wiesław without mentioning Maria, who was a true guardian

angel for a large group of theoretical physicists at Jagiellonian University.

Wiesław was a member of the Polish Academy of Sciences and of the Polish Academy of Arts and Sciences. He was awarded the highest Polish distinctions, including the Commander Cross of the Order of Polonia Restituta.

His death is a great loss to his friends, colleagues and students, both in Cracow and around the world. We will all miss this extraordinary scientist and human being, who shared with us the fruits of his talent with exceptional modesty – his most characteristic virtue. We will miss his inimitable sense of humour and simple kindness, so much needed in today's world.

● Michał Przaszłowicz, Jagiellonian University.

Alper Garren 1925–2017

Alper Abdy Garren was born on 30 April 1925 in Oakland, California, and died peacefully on 25 June in the same place.

Al attended the US Naval Reserve Midshipmen's School at the University of Notre Dame in 1945 and served as a commissioned lieutenant in the US Naval Reserve through 1947. By 1950 he had received undergraduate and masters degrees from the University of California, Berkeley, and in 1955 he completed his PhD at the Carnegie Institute of Technology.

A career particle physicist at Berkeley Lab, located on the hill above the UC Berkeley campus, Al wrote his first paper for what was then the Radiation Laboratory in 1949. He wrote his final paper in 1991 at what had become the Lawrence Berkeley National Laboratory (LBL).

Al was a brilliant scientist who designed the accelerator lattice for the Superconducting Super Collider (SSC), in particular inventing the “diamond bypass” to allow two beams to be injected and aborted from just one straight section. His career also included work on the Tevatron, the asymmetric B-Factor at

Berkeley Lab



Alper Garren designed the lattice for the SSC.

SLAC's PEP-II accelerator and SYNCH – a computational tool used extensively at particle-physics labs around the world and for which he held a patent. He contributed to the design and orbit theory of the following

machines: the Bevatron, Magnetic Mirror Fusion Reactors, 88-inch Cyclotron, Advanced Light Source (ALS), Fermilab Proton Synchrotron, the Large Proton–Proton Storage Rings LSR (CERN), ISABELLE (BNL), and the High Energy Heavy Ion Facility SUMATRAN (Japan).

Al was a sweet, kind, generous man who made friends easily and kept them for life. He loved to travel and was especially drawn to the culture and people of Asia. He loved the performing arts and was a patron of the San Francisco Opera, the San Francisco Symphony and the Philharmonia Baroque Orchestra. He was a dedicated philanthropist, supporting some 200 environmental, human-rights and performing-arts organisations in his later years.

Physicist, teacher, mentor, world traveller, sailor, philanthropist and above all a dear friend, Al enriched many lives during his 92 years.

● Based on text published in the San Francisco Chronicle by Jon Eisenberg and Marilee Bailey.

Maryam Mirzakhani 1977–2017

Maryam Mirzakhani, mathematics professor at Stanford University and Fields Medalist in 2014, passed away on 14 July aged just 40. She was the first woman and first Iranian citizen to win a Fields Medal.

Born in Teheran, at high-school age

Maryam participated in two International Mathematics Olympiads, winning gold medals both times – once with a perfect score. After undergraduate studies at Sharif University, she moved to the US to enroll in a PhD course at Harvard University, under

the supervision of Fields Medalist Curtis McMullen. Before joining Stanford in 2008 she was a fellow of the Clay Mathematics Institute in Cambridge (MA) and a professor at Princeton University.

Since her early career as a



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mathematician, Maryam obtained fundamental results on moduli spaces of Riemann surfaces and inhomogeneous space dynamics – topics at the intersections between mathematics and physics. One of her first major results was a counting theorem on closed geodesics that unexpectedly led to a new proof of Witten's conjecture, related to the partition function of two-dimensional quantum gravity.

As Harvard string theorist Cumrun Vafa recalled in his speech at a memorial event held in August, results of Maryam's work and the techniques she applied in her proofs might be applied to solve problems in string theory. Riemann surfaces are natural ingredients in string theory, where they appear both as 2D world-sheets of strings dynamically evolving in space–time, as well as 2D internal manifolds on which the theory is compactified to reduce its original 10 or 11 dimensions to a more familiar 4D scenario.

Both applications of Riemann surfaces are of great interest to theoretical physicists. Ongoing research in CERN's theory department directly investigates string world-sheet and scattering amplitudes,

Stanford News Service



Mirzakhani, who was the first woman to be awarded a Fields Medal, worked at the intersection between mathematics and physics.

as well as supersymmetric field theories, which are constructed through geometric engineering of branes wrapping Riemann surfaces. Maryam's approach to moduli spaces provided powerful tools that, in the future, could lead to major advances in theoretical physics.

The premature departure of Maryam Mirzakhani represents a huge loss for the scientific community, not just for her scientific excellence. Winning a Fields Medal not only highlights the academic achievement of the recipient but, as Terrence

Tao (Fields Medalist, UCLA) wrote in a note about Maryam Mirzakhani, it also promotes the recipient to a role model. In the case of Maryam Mirzakhani this was definitely true: as a female mathematician and the first woman to win a Fields Medal, she will remain a reference figure for future generations of female scientists.

In addition to an extraordinary scientific career, particularly noticeable were her generosity and humble personality.

● *Alessandra Gnecci and colleagues from the CERN theory department.*



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