

Faces & Places

AWARDS

André Lagarrigue Prize 2016

Bernard Degrange, emeritus director of research at CNRS, has been awarded the 2016 André Lagarrigue Prize in acknowledgement of his exemplary career in experimental particle physics. Co-financed by the CNRS, the University Paris Sud, Linear Accelerator Laboratory (LAL), École Polytechnique, CERN and CEA, with the support of the French Physical Society, the prize was created in 2005 in honour of André Lagarrigue. Director of LAL from 1969 to 1975, Lagarrigue played a leading role in the discovery of weak neutral currents in the Gargamelle bubble-chamber experiment at CERN, thus paving the way for electroweak theory.

After completing his thesis in 1969, Degrange joined the Gargamelle

P. Sylvaire/LLR



Bernard Degrange worked on bubble chambers and gamma-ray astronomy.

collaboration where he contributed to the first measurement of the ratio of the neutrino and antineutrino cross-sections on nucleons and studied exclusive channels produced in neutral or charged-current interactions. In the early 1980s he moved into the study of cosmic rays and high-energy gamma-ray astronomy, helping to discover several “blazars” in the Crab Nebula with the CAT experiment. For the simultaneous observation of gamma and X-rays during the major bursts of these extragalactic sources, Degrange was awarded the silver medal of the CNRS in 1997. Anticipating the detection power of stereoscopy associated with fast high-granularity imagery, he made major contributions to the design and the results of the HESS experiment.

CERN communications make the grade

The Czech Republic's Academia Film Olomouc has decided to give its 2017 Award for Contribution to Science Communication to CERN, for its “long-lasting commitment not only to research in the edge of science but also to communication of its results and science in general to broader public”. The committee described CERN as a pioneer in developing new ways to communicate science via social media, film, traditional media and events such as CineGlobe. The award ceremony will take place on 29 April at Palacký University Interactive Science Centre in Olomouc.

M. Brice/CERN



CineGlobe is one of the many ways that CERN communicates its science.

EVENT

Hidden Figures premiered

On 2 March, in collaboration with CERN and 20th Century Fox, the Pathé cinema in Geneva hosted an advance screening of the film *Hidden Figures*, followed by a debate on the position of women in science. The film tells the story of three African-American female scientists who played key roles in the US space conquest, contributing in particular to the preparations for putting astronaut John Glenn into orbit. After the film, Maite Barroso Lopez of CERN's IT department, Stéphanie Beauceron and Anne-Marie Magnan from CMS, and Andry Rakotozafindrabe from ALICE shared their experiences of science careers with the audience in a debate. They answered questions about the alleged rivalry among women, about whether there is a link between CERN and NASA as pictured in the film, and about their mentors.



C. Neill/CERN

The panel recalled awkward moments in their careers that highlighted attitudes to women in science.

CORRECTION

There was an error in the Compiler's Note on the Archive page of the March issue of the *Courier* (p54) concerning the g-2 value of the muon. The discrepancy between Standard Model theory and experimental data was not evident in the CERN

measurements up to 1979. It emerged only after BNL measurements in 2006, being the consequence of much reduced theoretical and experimental uncertainties rather than any significant change in the experimental value.

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CONFERENCES

A wealth of new results at Moriond

The 2017 Rencontres de Moriond conference took place in La Thuile, Italy, from 18 March to 1 April, with around 270 participants attending the two-week-long event. The four main LHC experiments presented many fresh results, ranging from precise measurements of the Standard Model (SM) to searches for new physics, including the first obtained with the full 13 TeV data set collected during 2016. Numerous results from experiments outside CERN were also presented, especially in the neutrino field, and participants heard some of the latest developments in theory.

Analyses of the Higgs boson presented by CMS included a precise new measurement of the Higgs mass. CMS also showed results from searches for associated Higgs-top production in final states with multiple leptons, which provides direct evidence for the existence of a top-quark Higgs coupling with a measured signal strength consistent with the SM. Both CMS and ATLAS showed new measurements of total and differential cross-sections of the Higgs boson decaying into four leptons or two photons, which agree with the SM. ATLAS also showed preliminary results from searches for the rare Higgs-boson decay to two muons, which are now approaching the sensitivity required to observe a signal.

Concerning other SM particles, ATLAS presented its first measurement of the mass of the W boson with similar precision to the previous best result from a single experiment. The D0 and CDF collaborations at the former Tevatron collider, meanwhile, presented precise measurements of the



Moriond is the traditional winter meeting for particle physicists.

top-quark mass.

Among the highlights of searches for physics beyond the SM were new limits on supersymmetric particles from ATLAS, which now exclude models with particle masses above 2 TeV (see p11). ATLAS also showed searches for new heavy particles decaying to jets of hadron particles, excluding non-elementary quarks with masses as large as 6 TeV. Both ATLAS and CMS are also looking for new heavy resonances decaying to a vector and a Higgs boson: ATLAS sees a 3.3 standard deviation local excess for a $W' \rightarrow WH$ decay at masses around 3 TeV, whereas CMS sees a similar local excess but at a lower mass. Exotic searches from CMS using the full 2016 data sample place new limits on many scenarios including dark matter, new types of quarks, vector bosons and gravitons. No significant deviations from SM predictions have been observed so far by CMS and ATLAS.

Results of searches for bottomonium states at the Belle experiment and charmonium-like states at BESIII were also shown. In particular, the analysis of the $Y(4260)$ appears to be inconsistent with a single peak at more than seven standard deviations. The heavy-flavour field also saw several new results presented by LHCb. Besides an update of the measurement of the rarest decay of a particle containing a b quark ever observed, and the recent observation of a new system of five particles all in a single analysis, LHCb presented the most precise single measurement of the CP-violating phase ϕ_s . The LHCb collaboration is also putting in place new analyses to shed light on two flavour anomalies: $R(D^*)$ and $R(K)$, which remain around three standard deviations away from their SM values. A measurement of the angular coefficient P_5' in the flavour-changing neutral current decay of B mesons was also presented by ATLAS, CMS and Belle, and was found to be compatible with previous LHCb results.

In the dedicated heavy-ion session, ALICE showed recent results from large samples of proton–proton, lead–lead, and proton–lead collisions collected in 2015 and 2016. One of the new results, concerning the azimuthal asymmetry of the production of J/ψ mesons, shows that heavy quarks directly “feel” the shape and size of the asymmetric quark–gluon plasma produced in the interaction region.

With LHC Run 2 about to get under way with a similar integrated-luminosity target as achieved in 2016, the search for new physics is in full swing at CERN and elsewhere.

Madagascar event marks 15 years

The 8th High-Energy Physics (HEP) Madagascar International Conference (HEPMAD 2016) was held in Antananarivo, Madagascar, from 13 to 18 October. It was the event's 15th anniversary and some 50 participants – including 15 invited high-energy physicists from abroad – were present. It is the only conference series in high-energy physics and indeed across all science held in sub-Saharan countries, and aims to be both pedagogical and topical, reviewing the latest experimental and theoretical results in high-energy physics.

Recent results from the LHC, including



HEPMAD is an opportunity for foreign participants to discover the richness of Madagascan science, nature and culture.

precision tests of the Standard Model, Higgs properties and searches for new physics, were presented by ATLAS and CMS. Theory talks, meanwhile, covered topics including the status of the muon anomalous magnetic moment and determinations of the masses and couplings of charmonium and

bottomonium states using QCD spectral sum rule. The high-energy physics talks were complemented by national contributions about climate science and sustainable technologies for energy.

The next HEPMAD event will take place in Antananarivo on 21–27 September 2017.

Faces & Places

IAS, Nanyang Technological University



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Celebrating 90 years of quantum mechanics

In the digital era, where we are surrounded by ever more technological innovations, it is interesting to reflect on the enormous progress that modern physics has made following the quantum-mechanics revolution 90 years ago. The story began in 1900, with Max Planck's suggestion that light is quantised, which Albert Einstein was the first to fully comprehend and exploit. Then, in the mid 1920s, a revolution in physics took place: quantum mechanics was formulated by Werner Heisenberg, Erwin Schrödinger, Paul Dirac and a handful of other young geniuses under the supervision of Niels Bohr and with Einstein as a critical voice. At the famous Fifth Solvay Conference in 1927, where 17 of the participants either already were or were to be Nobel laureates, much of the basic elements of quantum mechanics were ready and discussed. Never in the history of physics has so much been achieved by so few in such a short time.

To commemorate the beginning of this revolution and its impact on the modern world, a special conference titled 90 Years of Quantum Mechanics was held at the Institute of Advanced Study at Nanyang University in Singapore on 23–26 January. The event gathered leading experts in the foundations of quantum mechanics, quantum cosmology, quantum gravity, quantum field theory, quantum condensed matter, quantum optics, quantum information and technology, and quantum chemistry. Altogether there were 30 talks, with six speakers being Nobel laureates. Some 300 participants attended from all over the world, with a strong emphasis on South East Asia and China.

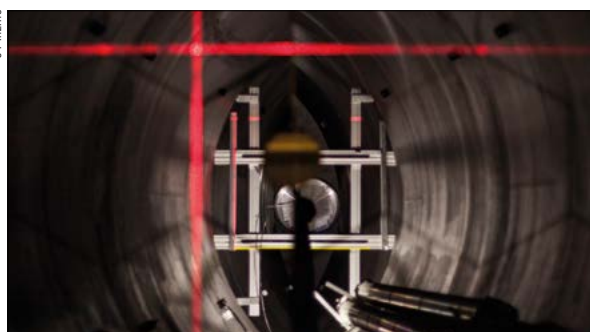
Luminaries of the physics world gathered to mark 90 years of quantum progress.

Physics at the intensity frontier

The Standard Model of particle physics has proved to be a consistent description of nature's fundamental constituents and their interactions, and its predictions have been confirmed by numerous experiments, most recently with the discovery of the Higgs boson at the LHC. However, the model fails to explain several phenomena in particle physics, astrophysics and cosmology, and it is expected that yet unknown particles or interactions are needed to explain these puzzles.

Our inability to observe new particles possibly lies in their extremely feeble interactions. If true, this would imply that experiments are needed not just at the high-energy frontier but also at the "intensity frontier", by increasing the number of collisions to search for rare events. In 2016, CERN created a Physics Beyond Colliders study group with a mandate to explore opportunities offered by the CERN accelerator complex to address outstanding questions in particle physics through projects complementary to high-energy colliders

J. Pinzino



The RICH detector at CERN's NA62 experiment, which searches for extremely rare kaon decays using highly intense beams.

(CERN Courier November 2016 p28).

A two-week-long "theory institute" took place at CERN from 20 February to 3 March to discuss the theory and phenomenology of possible new physics at low energy scales. More than 100 participants from 21 countries discussed the theoretical landscape, predicting new light particles and "dark forces". The potential for the new physics reach of existing and planned

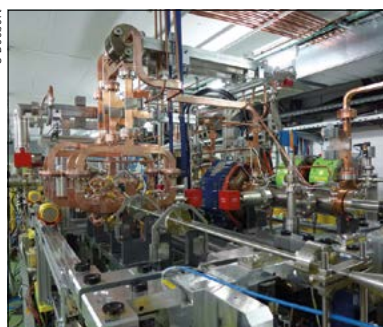
intensity-frontier experiments – SHiP, NA62, DUNE, MATHUSLA and many others – was discussed. These future experiments are at different stages today, ranging from the preparation of a comprehensive design report (SHiP) to a letter of intent (MATHUSLA). The time is therefore ripe to ensure that any necessary changes to the experiment designs can still be made to the physics reach of intensity-frontier experiments.

CLIC looks to the future

The annual Compact Linear Collider (CLIC) workshop took place at CERN on 6–10 March, attracting 220 collaborators from 26 countries to discuss the latest status of the CLIC accelerator and detector studies. CLIC is a future multi-TeV electron–positron linear collider at CERN envisaged for the era beyond the High-Luminosity LHC (HL-LHC). First beams in CLIC could be foreseen in 2035 and be the starting point of a 20–25 year-long physics programme.

During the workshop particular focus was placed on the recently published updated staging scenario for the CLIC accelerator, where construction and operation are pursued in three stages with collision energies of 0.38, 1.5 and 3 TeV, respectively (CERN Courier November 2016 p20). At its initial energy, CLIC is optimised for Higgs and top measurements and enables a scan at the top-quark pair-production threshold, while the higher-energy stages provide the best sensitivity to new physics through direct and indirect searches. High-energy operation also provides access to rare processes such as double Higgs production, which is sensitive to the important Higgs self-coupling.

S. Doebert



Acceleration in the two-beam module at the CTF3 facility was thoroughly tested in 2015–2016, verifying power production and energy gain while operating at the nominal CLIC gradient of around 100 MV/m.

CLIC week 2017 hosted a variety of sessions with 150 speakers, covering the activities of both the accelerator and detector-and-physics studies. The workshop also included meetings among the CLIC accelerator institutes and the detector-and-physics institutes. In both meetings the focus was on the steps necessary to submit a project-implementation plan in time for the European Strategy update in 2019–2020. Particular priority is given to the studies where cost and power can be reduced, presenting the initial CLIC project and further upgrades as

a realistic option that is compatible with the level of resources available at CERN.

Another highlight was the summary of the successful demonstration of key CLIC concepts obtained by the recently completed CTF3 test programme at CERN. Part of the CTF3 facility has now been approved for conversion into an electron accelerator facility called CLEAR (CERN Linear Electron Accelerator for Research), providing an open user facility for accelerator R&D, irradiation and training. The future CLEAR programme will include CLIC high-gradient and instrumentation studies.

The successful operation of high-gradient accelerating structures and experience with advanced beam-dynamics techniques, developed for the small dimensions of these structures, have inspired a growing number of applications outside of particle physics. Applications of high-gradient and X-band technology include compact linacs and advanced diagnostics for photon sources, as well as medical applications. Many of the technologies under study for the CLIC detector are also of interest to the HL-LHC, where the high granularity and time-resolution needed for CLIC are equally crucial. Other communities also benefit: for example, software reconstruction techniques developed for particle flow at linear colliders have been applied to current and next-generation neutrino experiments.

Faces & Places



RuPAC16 had a strong international theme.

RuPAC16 demonstrates international outlook

For many years the biennial Russian conference on accelerator physics and technology, RuPAC, was viewed by the international accelerator community as an internal event for representatives of the Soviet accelerator school. Although representatives of the latter have actively been working in accelerator centres around the world since the beginning of perestroika in the late 1980s, it is indeed rare to see a foreign specialist invited to a prominent position in Russia. But that situation is changing, and RuPAC16 held at St Petersburg State University (SPbSU) in November last year saw the world's largest accelerator projects represented and more than 60 reports by participants from outside Russia. For the first time, the event also provided simultaneous translation from Russian to English.

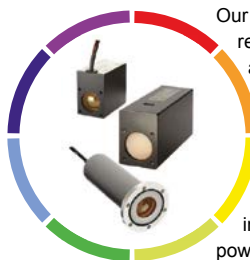
Today, RuPAC has become an excellent platform for information exchange between researchers working in accelerator science and technology and related issues. More than 40 reports from SPbSU students were presented at RuPAC16, and the geographical reach of the event extended to 260 participants from 67 institutions in 13 countries. In addition to traditional participants Ukraine, Belarus and Armenia, the event was attended by experts from China, South Africa, UK, Germany, Italy, Canada, US, Japan, Poland, Sweden and Switzerland.

CERN's High-Luminosity LHC and Future Circular Collider projects were presented, and several other reports were devoted to mutual research between Russian and European scientists. A particular focus was the FAIR-NICA collaboration concerning production and testing of superconducting accelerator magnets. Two new facilities have been commissioned at the Joint Institute for Nuclear Research (JINR) in Dubna for the international FAIR and NICA projects in Germany and Russia, respectively. The first is a high-tech assembly and testing hall for superconducting magnets, while the second is a heavy-ion linear accelerator that accelerates ions up to Au^{31+} to an energy of 3.2 MeV per nucleon.

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Status reports from all accelerator facilities of JINR were presented, as were activities at other major accelerator centres. The National Research Centre Kurchatov Institute carries out a broad range of activities, among them the development of a synchrotron radiation source and operation of the U-70 facility, Russia's largest accelerator complex, with its new facility for carbon-beam medical applications and plans to attain high-power neutron fluxes. Important work also continues at the Institute for Nuclear Research of the Russian Academy of Sciences and the Budker Institute of Nuclear Physics (BINP). The latter facility has established itself as a manufacturer and supplier of high-tech accelerator facilities to the

international market, such as electronic cooling systems, electron accelerators for industrial applications, components and synchrotron systems, magnetic systems and power systems, for example for the European X-FEL. BINP is also actively involved in the construction of FAIR and NICA, while continuing to develop domestic projects including a free electron laser, two electron-positron colliders (VEPP 2000 and VEPP4M) and facilities for radioisotope analysis.

The conference concluded with a satellite meeting devoted to NICA, for which most Russian accelerator centres are already involved in manufacturing elements. Backed by the Russian government since 2016, NICA is a major factor driving current

trends in the country's accelerator science and technology. The success of this project will influence government support of other accelerator projects, such as the super C-tau factory project at BINP.

Although Russia has a highly developed scientific infrastructure and potential to design complex accelerator facilities, the corresponding market is underestimated. Applied research projects such as medical beams for Russia's first proton-therapy facility, along with the Russian "mega-science" projects, are thus a vital factor for accelerating Russian industry. As is clear, such projects are reinforcing the international outlook of Russian accelerator science and technology. The next RuPAC event will be held in autumn 2018.

VISITS

J Jordan/CERN



Marianne Thyssen, MEP and European commissioner for employment, social affairs, skills and labour mobility, toured CERN on 10 March, during which she visited CMS, ISOLDE and the new MEDICIS facility. She is pictured signing the guestbook with CERN Director-General Fabiola Gianotti.

S Bennett/CERN



Enrique Cabrero Mandoza, director-general of CONACYT in Mexico, visited CERN on 23 March, immediately following the 9th CERN–Latin American School held in San Juan del Río. He visited the ALICE experiment and the LHC tunnel before signing the guestbook with CERN's head of relations with associate members and non-Member States, Emmanuel Tsesmelis, and director of international relations Charlotte Warakaulle.

Image credits: S Bennett/CERN



UK minister of state for universities, science, research and innovation **Jo Johnson** (top) came to CERN on 29 March, during which he visited the underground area at CMS. Two days later, chief scientific adviser to the UK government **Mark Walport** (bottom) also visited CERN, taking in the computing centre, ATLAS and the Antiproton Decelerator.

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OBITUARIES

Ludwig Faddeev 1934–2017

Ludwig Dmitrievich Faddeev was an outstanding scientist who made exceptional contributions to modern theoretical and mathematical physics. He was born in 1934 in what is now St Petersburg, Russia, and attended Leningrad University. His name is well known in theoretical physics in connection with the quantum three-body system, and he made decisive contributions to the quantisation of the Yang–Mills theory and gravitational fields. The Faddeev–Popov covariant prescription for quantisation of non-Abelian gauge theories (“Faddeev–Popov ghosts”, discovered in 1966–1967) laid some of the foundations for the Standard Model of strong, weak and electromagnetic interactions.

Faddeev is one of the creators of modern mathematical physics, and he believed that mathematical beauty is the most important guiding principle in physics. As predecessors of this point of view, he cited Dirac, Weyl and Fock – the latter having been one of his teachers at Leningrad. In the 1970s, Faddeev was one of the first to recognise the importance of the newly discovered solutions of nonlinear partial differential equations – solitons, and he believed that they would reduce the number of fields in Lagrangians.



Mathematical physicist Ludwig Faddeev.

His work stimulated the widespread application of solitons in relativistic quantum field theory.

Work by Faddeev and his group on the so-called quantum method of inverse scattering is now the basis of a flourishing branch of mathematics and mathematical physics involving quantum groups and their representations. In 1980, Faddeev also clarified the group-theoretical origin of anomalies in the context of “cocycles”, after which he continued his work on multidimensional solitons and Yang–Mills theory in the 1990s until his retirement.

Faddeev created a very special atmosphere at the Leningrad Steklov Mathematics Institute in the 1970s and 1980s, during

which he supervised several currently world-renowned mathematicians and theoretical physicists. He visited the theory department at CERN for the first time in 1973 and made several further visits.

The importance of Faddeev’s work has been recognised with awards for both physics and mathematics, including the 1975 Dannie Heineman Prize for Mathematical Physics of the American Physical Society; the 1990 ICTP Dirac Medal; the 2002 Pomeranchuk Prize; the 1996 Max Planck Medal; the 1995 and 2004 Russian Federation State Prizes; the 2006 Henri Poincaré Prize; and the 2008 Shaw Prize. Faddeev was a member of the Russian Academy of Sciences from 1976, as well as a number of foreign academies including the US National Academy of Sciences and the French Academy of Sciences. From 1976 to 2000 he was deputy director of the Steklov Mathematical Institute and was the founding director of the Euler International Mathematical Institute, which he led until his death.

Ludwig Faddeev was a man of great honesty who was always ready to discuss new ideas. We will miss him very much.

● *Irina Aref’eva and Andrey Slavnov, Steklov Mathematics Institute.*

Victor Kryshkin 1939–2017

Victor Kryshkin of the Institute for High Energy Physics (IHEP) in Protvino passed away on 16 January after a long illness. He was a long-standing member of the CMS collaboration and made several important contributions to the CMS detector.

After graduation from Voronezh University, Kryshkin started work as an experimental physicist in Tomsk Institute for Nuclear Physics. There he carried out his first experiment: measuring the lifetime of the neutral π meson, which was included in the *Review of Particle Physics*. Since 1973 he worked at IHEP in Protvino, and was one of the key people who proposed and then established the two-arm magnetic spectrometer, with the main aim to study hadron production with high-momentum transfer in proton–proton and proton–nuclear interactions. Many important scientific results revealing the structure of elementary particles were obtained using



Victor Kryshkin was a member of the CMS collaboration.

this apparatus. The most important result of these studies was the observation of a kink in the dependence of the cross-section for the production of meson pairs on the sum of transverse momenta in proton–proton interactions at an energy of 70 GeV.

In 1991 Kryshkin became professor of physics at IHEP, and since 1992 he was an

active participant in the CMS experiment at CERN’s Large Hadron Collider. He was a technical co-ordinator of the CMS hadron-endcap calorimeter and made major contributions to the design of the detector. Under his leadership, the Protvino group assembled all of the active elements of the hadron-endcap calorimeters. More recently, Kryshkin performed several original studies on gas-discharge detectors, which he was planning to use in calorimetry. The novelty of his research has been confirmed by 21 registered patents.

Victor Kryshkin was not only a prominent scientist, he was also a very interesting companion, possessing an encyclopedic knowledge in many fields. His main hobby was studying astrophysics and space science and he was also interested in history and art. He read a lot, particularly Russian and English literature, and liked to tell jokes and anecdotes. Living in

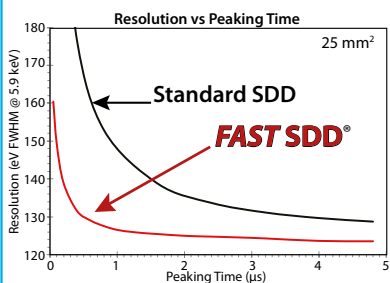
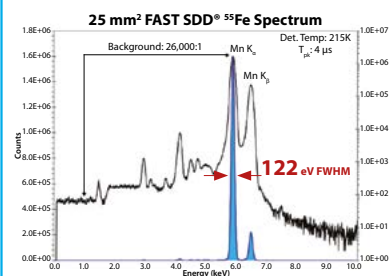
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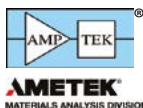


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Leningrad after the Second World War, Kryshkin learnt how to paint, and never missed an opportunity to visit an art gallery or museum. He could not imagine his life without music, especially jazz. He loved his family very much and leaves

behind his wife Galina, a son and three granddaughters.

On behalf of the CMS collaboration, we offer our condolences to his family and colleagues.

• *His friends and colleagues.*

Heinrich Leutz 1928–2017

Heinrich Leutz, who joined CERN in 1966 as leader of the BEBC physics aspects group, passed away on 26 February, aged 89, following several years of serious health problems. During his long and active career in experimental physics he took part in three main research fields: nuclear spectroscopy; high-energy physics with bubble chambers; and detector technologies for hadron colliders. In each of these areas, Leutz was responsible for original inventions that led to improved physics results.

During his first active research period in the 1950s and 1960s, based at the University of Heidelberg, Leutz led a research group studying colour centres in crystals, nuclear beta decay, electron capture, polarisation and photon spectroscopy. One of his remarkable contributions during this period concerned the idea to grow scintillation crystals doped with radioactive isotopes, which allowed precise spectroscopy to be performed while avoiding source-thickness and scattering-correction effects. Important publications from this period demonstrate excellent research results in nuclear physics during the 1950s and 1960s.

His move to high-energy physics started in the 1970s when he joined the French–German–CERN programme to design and construct the Big European Bubble Chamber (BEBC) at CERN as the SPS started up. Responsible for the physics aspect of the BEBC project, Leutz soon became well known in the bubble-chamber community around the world. His team developed a track-sensitive liquid-hydrogen-filled, optically transparent target box to observe primary particle interactions, surrounded by a heavy-liquid neon-hydrogen mixture to provide improved photon conversion. His bold proposal was no less than to operate a “bubble chamber inside a bubble chamber” by finding a temperature and pressure regime such that the pressure cycle was transmitted from the heavy liquid to the hydrogen volume for primary interactions, allowing interactions and tracks in both media to be visualised on the same photo. A further step was the construction of a high-resolution fast-cycling bubble



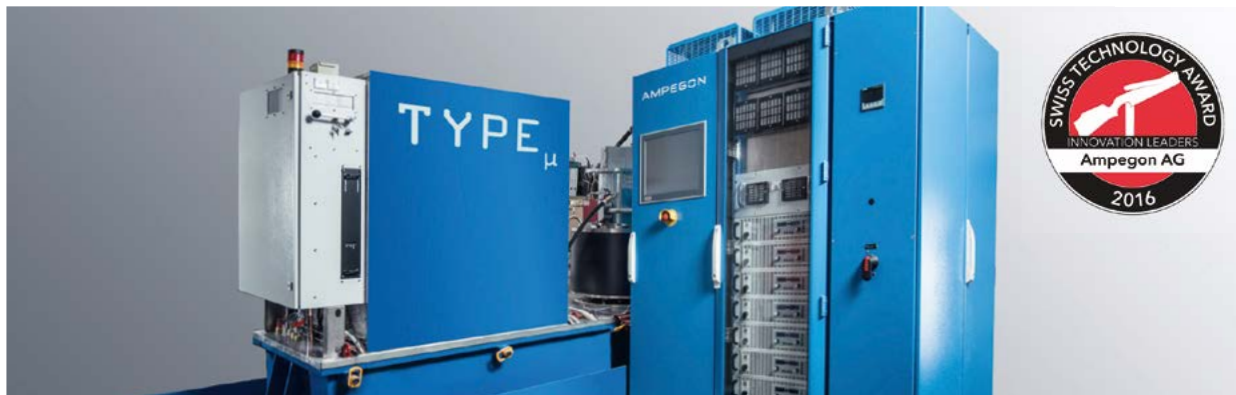
Leutz was an active member of CERN's “LAA” programme.

chamber (LEBC activity) that was used for charm physics and allowed one of the first definitive studies of charm production at a proton facility.

After the closure of bubble chambers around 1984, Leutz concentrated on promoting detector technologies for high-energy colliders within the CERN LAA (Lepton Asymmetry Analyser) programme. In particular, he dedicated his efforts to the development of plastic scintillating fibres and new photodetectors called hybrid photon detectors for particle tracking in LHC-like environments and for non-high-energy physics applications. In this last phase of his professional career, he particularly enjoyed being surrounded by motivated and motivating young people: a new generation that he endeavoured to shape and which had the great opportunity to be mentored by him. Books and publications testify to his outstanding contributions to experimental physics, even beyond his retirement from CERN in 1993.

Throughout his professional life, Leutz developed his exceptional talents to promote original ideas, establish collaborations with physics teams worldwide, motivate high-level technical support in his own team and – last but not least – make friends to whom he always offered great hospitality at his home, together with his wife Ingrid. Whenever they meet at CERN, friends and former colleagues recall the great times they spent with Heinrich Leutz.

• *His friends and colleagues.*



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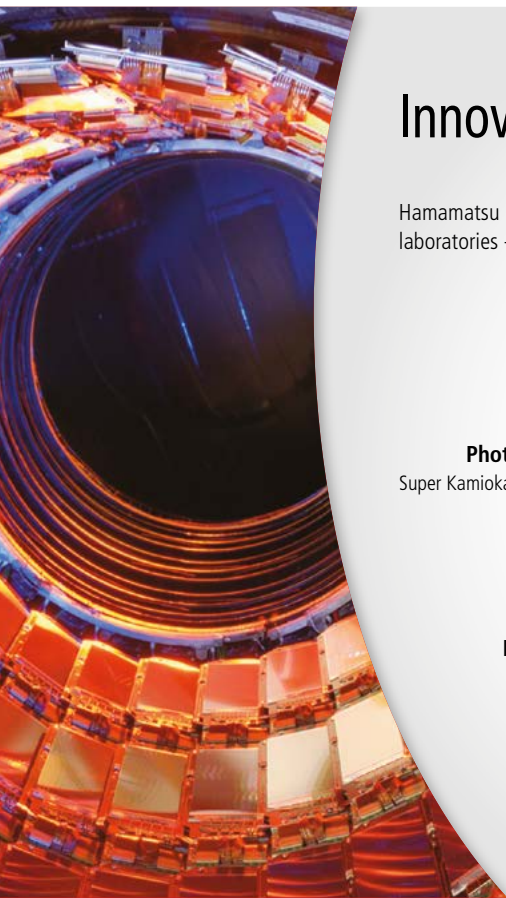
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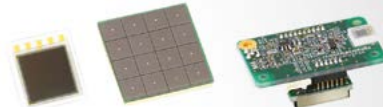
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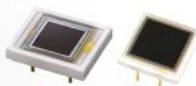
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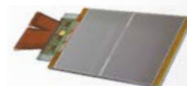
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