Swiss Institute of Particle Physics

an Association according to Swiss law

# Annual Report 2020

*Participants at the Roadmap Workshop 2020, Kandersteg.*

A. Benelli. CHIPP

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4 February 2021/AB

This report is to be delivered to SCNAT and is thus structured along the SCNAT guidelines.

## SUMMARY

*Highlights of the Year*

The main highlight of 2020 was the Roadmap Workshop 2020. As last year the summer meeting was held in Kandersteg, a village in the Bernese mountains, in the welcoming Victoria Hotel. The Workshop goal was to gather all physicist members of CHIPP to plan the future directions of the Swiss Particle Physics Research in the light of the decisions that have emerged at the European Strategy Update and to prepare the writing of a new Swiss particle physics Roadmap document. [link to the roadmap document].

During the two-day workshop we scheduled common presentation and parallel sessions where the three pillar communities worked on their interests and priorities. The CHIPP Board meeting was held during the first day of the workshop to start to plan the FLARE (SNSF) requests for the 2020 calls.

A group of young physicists contributed to the Roadmap document presenting the results of questionnaires that they collected among the young CHIPP researchers. A dedicated section in the Roadmap document summarises their inputs.

Later in the year CHIPP organised the CHIPP Plenary meeting online, the formal part of the meeting hosted a session with reports of the activities of the various committees such as the European Committee for Future Accelerators, the International Particle Physics Outreach Group, the Astroparticle Physics European Consortium (APPEC), the Nuclear Physics European Collaboration Committee (NuPECC) and the report of the CERN Council delegate. During this meeting CHIPP held the elections to cover the different roles in the association and to select the Swiss representatives in the international organizations. A special talk was dedicated to Gravitational Waves, the common interests between the CHIPP and CHAPS communities.

At the end of June (1 July 2020) CHIPP participated to the annual meeting of the Swiss Physical Society that due to the COVID emergency was concentrated on one day, online. As part of the SPS award

ceremony, where all winners of the various SPS prizes were honoured, the CHIPP prize for the best 2020 PhD thesis work in particle physics was awarded to Claudia Merlassino from the University of Bern. Claudia received the award for her doctoral thesis work in ATLAS with the laudatio "for her outstanding contribution in the development of new analysis strategies in the search for physics beyond the Standard Model at the LHC experiments, and for having conceived and conducted an innovative study about the radiation damage of the ATLAS detector in view of the high-luminosity phase of the LHC". Claudia presented her work at the CHIPP Plenary meeting.

During 2020, the CHIPP Executive Board and the CHIPP Board were very active in the preparation of the Swiss CHIPP Roadmap. The CHIPP EB kept the FLARE Tables updated with the funding of experiments of the Swiss National Science Foundation (SNSF) to prepare for the FLARE requests at the end of 2020.

The CHIPP outreach activities continued supporting the thematic portal hosted on the SCNAT website, the multi-lingual "particlephysics.ch". Thanks to the SCNAT support, we could continue to keep this a lively page with 10 interviews and a video given by B. Vogel, a professional journalist, and several other news articles and press releases in 2020. Several articles were the output of the Swiss National Media visit to CERN, the 23-24 January 2020, two very successful days.

## SECTORS OF COMPETENCE: NETWORKING AND DEVELOPMENT OF SCIENCE

### Meetings, Workshops and Schools

In 2020 CHIPP continued to work on its networking and educational goals and organized directly or through its members several meetings, schools and workshops.

Below are some online presentations that took place online during the 2020 from young researchers:

- 22 June: virtual seminar at Fermilab, DARWIN solar neutrinos by Shayne Reichard
- 26 June: virtual seminar at "Zooming in on axions in the early Universe", online workshop hosted at CERN, LowER by Michelle Galloway
- 20 July: 12th International Workshop on Boosted Object Phenomenology, Reconstruction and Searches in HEP (BOOST 2020), Directly-invited seminar "Performance of jet reconstruction and tagging in ATLAS" by Steven Schramm
- Sept 10: virtual seminar in Uppsala, on XENON1T results by Adam Brown

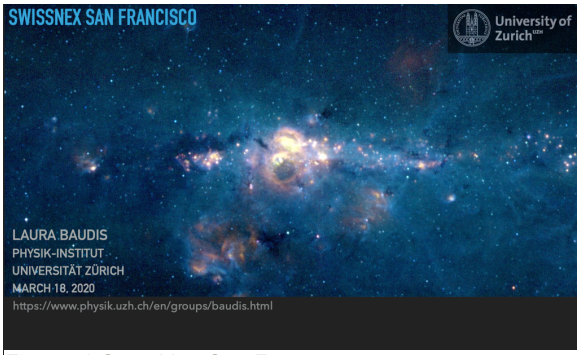

*Figure 1 SwissNex San Francisco*

Laura Baudis (UZH) gave:
- a seminar for SwissNex San Francisco, also the consul was present; March 18 link,
- a lecture at the VHS Zurich, Sept 24, called Rätsel Dunkle Materie
- in Januar 7, she gave a lecture on neutrinos for the Los Club Zurich-Airport Called Die unerträgliche Leichtigkeit der Neutrinos.

More talks are listed in her university webpage, a special mention to her lecture about the state-of-the-art in direct searches for particle dark matter at the Schuster Colloquium at the University of Manchester.

## INTERNATIONAL ACTIVITIES

### Scientific cooperation

Research in particle and astroparticle physics usually involves large infrastructures, which are the result of regional, national and worldwide collaborations. In order to cover the important intellectual and technological challenges, the amounts of human and financial resources required can no longer provided by a single country. The table below shows a snapshot of the current international experimental collaborations involving CHIPP Board members.

Furthermore, smaller cooperation projects exist; many of them occur spontaneously – between groups working in the same field or requiring the same type of infrastructure – or in a coordinated way by CHIPP.

| Project | Swiss institutes | CHIPP Board Members | Institutes worldwide |
|---|---|---|---|
| High-Energy particle physics | | | |
| ATLAS | Bern, Geneva | Beck, Ereditato, Golling, Iacobucci, Mermod, Nessi, Sfyrla, Weber, Wu | 218 |
| CMS | ETHZ, PSI, Zurich | Canelli, Dissertori, Grab, Kotlinski, Kilminster, Wallny | 198 |
| LHCb | EPFL, Zurich | Bay, Nakada, Schneider, Serra, Shchutska | 81 |
| LHC Tier-2 | ETHZ, CSCS | Grab | > 200 |
| HL-LHC | EPFL, PSI | Rivkin | 55 |
| CLIC | ETHZ, PSI | Rivkin | 70 |
| FCC | Bern, EPFL, ETHZ, Geneva, PSI | Blondel, Rivkin, Dissertori, Laine | 134 |
| Na64 | ETHZ | Rubbia | 8 |
| FASER | Bern, Geneva | Iacobucci, Sfyrla, Scampoli | 18 |
| Astroparticle physics | | | |
| AMS | Geneva | Wu | 63 |
| ArDM | ETHZ | Rubbia | 7 |
| CTA | ETHZ, Geneva, Zurich | Biland, Montaruli, Canelli | 210 |
| DAMIC | Zurich | Kilminster | 10 |
| DARWIN | Bern, Zurich | Baudis | 24 |
| IceCube | Geneva | Montaruli | 50 |
| MAGIC+FACT | ETHZ | Biland | 24-4 |

| | | | |
|---|---|---|---|
| XENON | Bern, Zurich | Baudis | 27 |
| Neutrino physics | | | |
| GERDA | Zurich | Baudis | 18 |
| MICE | Geneva | Blondel | 28 |
| NA61 / T2K / HyperK | Bern, ETHZ, Geneva | Blondel, Ereditato, Sanchez, Rubbia | 33-63-75 |
| SBN (MicroBooNE) | Bern | Ereditato, Weber | 34 |
| SHiP | EPFL, Geneva, Zurich | Bay, Blondel, Kilminster, Mermod, Serra, Shaposhnikov | 53 |
| WA105 + DUNE | Bern, ETHZ, Geneva | Blondel, Rubbia, Weber | 21-175 |
| High-precision and muon physics | | | |
| CREMA | ETHZ, PSI | Hildebrandt, Kirch | 9 |
| GBAR | ETHZ | Rubbia | 18 |
| MEG II | PSI | Hildebrandt, Ritt | 15 |
| Mu3e | ETHZ, Geneva, PSI, Zurich | Blondel, Dissertori, Grab, Hildebrandt, Kotlinski, Ritt, Wallny, Serra | 8 |
| nEDM/n2EDM | ETHZ, PSI, Bern | Kirch, Lauss, Piegsa | 15 |
| PANDA | Basel | Krusche | 64 |

In parallel to these experimental collaborations and projects, Swiss theorists are involved in numerous international collaborations. The prominent ones, in which Swiss theory institutes are key players is

- The LHC Higgs cross-section working group (LHCHXSWG) created in 2010 to produce agreements on cross sections, branching ratios and pseudo-observables relevant to the Higgs boson: M. Spira (PSI) was involved in the LHC Higgs cross-section working group responsible for the HDecay Manual.

At the University of Bern the work on the review of lattice results continues. It is related to pion, kaon, D- and B-meson physics with the aim of making them easily accessible to the particle physics community.

Prof. O. Schneider (EPFL) is convener of a sub-group of the Heavy Flavour Averaging Group (HFLAV). HFLAV is responsible for calculating world averages of measurements of beauty-hadron, charm-hadron and tau-lepton properties from current and past experiments and provides a comprehensive resource for the field in terms of web pages and full documentation of results.
One particular example of scientific collaboration and help at the service of the new arrivals in the LHCb experiment has been provided by the EPFL team that has built the LHCb starterkit project where the lessons from the dedicated Workshops and online tutorials are stored. This year the EPFL researchers Andy Morris, Biljana Mitreska, David Friday, Lakshan Ram (LHCb) organized an LHCb Starterkit 2020 virtual workshop where Surapat Ek-In and Violaine Bellée volunteered for teaching and demonstrating.

Institutional collaboration (in alphabetical order):

Several CHIPP members are acting as official delegates to international organizations in 2019:

- *Hans Peter Beck* (U. Bern) has been the co-Chair of the International Particle Physics Outreach Group (IPPOG) since 2013, and he has been elected President of the Swiss Physical Society on the 22nd August 2017 for a period of two years. He represents Switzerland in the European Physical Society Council. He is the Swiss representative in IUPAP as of 1 January 2019.
- *Angela Benelli* (CHIPP) has been the Swiss member of the European Particle Physics Communication Network (EPPCN) since June 2017.
- *Laura Baudis* (UZH) is member of the Dark Matter advisory committee. She is the APPEC Scientific Advisory Committee chair. From February 10 to April 10 she was a visiting Miller Professor at the UC Berkeley and LBL.
- *Florencia Canelli* (UZH) has been a member of commission C11 of the International Union of Pure and Applied Physics (IUPAP) on particles and fields since Nov. 2014. She has been elected secretary of the IUPAP C11 Commission from 1 January 2018 for 4 years. She is a member of the Physics Advisory Committee of Fermilab, member of LHCP international advisory committee and member of the Dark Matter workshop advisory committee.
- *Günther Dissertori* (ETHZ) has been Chair-person of the International Advisory Committee for the FCC project since the beginning of 2017. He is chairman of the scientific policy committee of the INFN National Laboratory of Frascati. He is the Swiss scientific delegate to the CERN Council since January 2019 on mandate of the State Secretariat for Education, Research and Innovation (SERI).
- *Antonio Ereditato* (U. Bern) is the ad interim contact for the Swiss funding agencies (SERI & SNSF) for Swiss participation in the neutrino programme at Fermilab, USA.
- *K. Kirch* (ETHZ and PSI) is member of the Scientific Advisory Committee SAC of the European Spallation Source ESS in Lund/Sweden, is a member of the Hyper-Kamiokande Advisory Committee in Japan, is a member of the Scientific Council of the Excellence Cluster PRISMA in Mainz/Germany, is a member of the Scientific Advisory Board of the Stefan-Meyer-Institute in Vienna/Austria. Member of the European Strategy Group for EPPSU.
- *Bernd Krusche* (U. Basel) continued his longstanding mandate as Swiss representative in the Nuclear Physics European Collaboration Committee (NuPECC).
- *Teresa Montaruli* (U. Geneva) has been the Swiss scientific delegate to the General Assembly of the Astroparticle Physics European Consortium (APPEC) since 2013. Teresa Montaruli has been nominated unanimously as chair of the APPEC General Assembly. She is also member of the LNGS Scientific Advisory Committee. As APPEC Chair she is an invited Member of the European Strategy Group of EPPSU.
- *Katharina Müller* (UZH) has been the Swiss representative in the IPPOG Collaboration since September 2017. She is in the organisation committee of the SM@LHC Conference.
- *Tatsuya Nakada* (EPFL) is Chair of the Linear Collider Board LCB (subpanel of ICFA), is member of the NIKHEF Scientific Advisory Committee SAC, is Chair of the LNGS Scientific Advisory Committee, is Chair of the KEK Belle Program Advisory Committee. Swiss representative at the European Strategy Group of EPPSU.
- *Stefan Ritt* (PSI) is president of the Nuclear and Plasma Sciences Society NPSS of IEEE. He has been awarded a prestigious IEEE prize.

- ***Leonid Rivkin*** (EPFL and PSI) Strategy Secretariat Member of the European Strategy Update in Particle Physics in EPPSU.
- ***Olaf Steinkamp*** (UZH) is a member of the Kruger International Advisory Committee.
- ***Rainer Wallny*** (ETHZ) is member of the Physics Advisory Committee of DESY.
- ***Xin Wu*** (U. Geneva) was re-elected as CHIPP observer in the Swiss Commission on Space Research till December 2021.

## COORDINATIVE TASKS

### Promotion of the next generation

One of the main objectives for CHIPP is to attract the young public to Physics and Astroparticle Physics. To achieve this goal more than 50 educational events like information days for BSc and MSc students, for pupils finishing high school and for high-school classes were organized, throughout Switzerland, involving more than 4000 young students.

More than 200 Swiss high-school pupils (at the Universities of Bern, Geneva, Zurich and the ETHZ) were invited to participate in the International Masterclasses 'Hands on Particle Physics', where over 13'000 Gymnasium level students in about 215 institutes over 52 countries can actually work with real data from the CERN Large Hadron Collider (LHC). A Masterclass took place in person in Bern on 3 March 2020, before the lockdown started. About 20 kids participated. Several EPFL young researchers and Professors (Federico Redi, Fred Blanc, Sonia Bouchibaand EPFL professors) organized different Masterclass events (specific to LHCb Experiment, dedicated to ROOT) in collaboration with the IPPOG collaboration.

*Figure 2 Masterclasses*


*Figure 3 HSSIP - CERN webpage*

Since 2017 CERN invites high-school students to come to CERN for two weeks, to gain practical experience in science, technology, and innovation (High-School Students Internship Programme, HSSIP). Each student gets a supervisor and works on a project, eg. working on vacuum techniques, accelerators or in experimental areas, or working on an analysis or a simulation project. Switzerland takes part for the first time; HSSIP was scheduled for Autumn 2020 and then re-scheduled to Spring '21. It was now decided to move it to Autumn '21 in order to have sufficient support from the supervisors. We received 65 applications from highly motivated students until March 31, 2020. Each student submitted a short statement, a motivation letter and a video. The applications were evaluated by a committee with six members which chose 24 candidates from all over Switzerland.

Scientists of all institutes support teachers and educate students by going into classes or offering courses at the institutes as standalone events or in the framework of TecDays or technology and IT weeks.
The PSI Laboratory for Particle Physics is home of the vocational training of electronics technicians. Some of the apprentices take part in national and international championships. There are the Swiss Skills at the national level and the gold medal winner can go on to the World Skills. Our electronics apprentices have been, as every year, very successful. PSI researchers, as M. Hildebrandt, are participating in the local high schools as support for exams and presentations about Physics topics. CHIPP Physicists collaborate with Universities for semester works, master thesis and summer student's coordination. Particle Physics laboratory courses at a PSI secondary beam line are organised in cooperation with UniZH (Lea Caminada), ETHZ and Uni Heidelberg.

In the following we outline a few of the key activities for the general public and high-school students of the past years:

- Visits to CERN: CERN as the centre of high energy research is extremely attractive for visits which are organised regularly by CHIPP members. In recent years about 50 visits a year were organised for university students in physics and other disciplines, high-school students, alumni, politicians, members of societies, media, and the general public at large. For example, Maria Vieites Diaz (EPFL) guided 20 high school students from IES do Sar, Galicia (Spain) in a visit to CERN, 26 February. Due to the COVID sanitary restrictions, a group of EPFL researchers (Violaine Bellée, Rodolphe Gonzalez, Sonia Bouchiba, Surapat Ek-In, Olivier Schneider, Veronica Kirsebom) organised a virtual visit of the LHCb experiment; they shoot and edited a film for a 3rd year Bachelor year, and published it in the LHCb YouTube channel, 20 October.
- Teacher education: we collaborate with secondary-school teachers in the development of innovative and interesting physics demonstrations, sometimes using particle physics data. Education of secondary-school teachers is done by providing teaching material, via the CERN Teacher program and specific topical workshops as well as open days for teacher at our institutes.
- Outreach lecture for high school students: young researchers offered to spread their passion for science:
    - Valerie Domcke (EPFL) gave a talk to 100 high school students at the German Young Academy Ana Barbara Rodrigues Cavalcante (EPFL) welcomed students from the Cariri University in the Ceará State in Brazil (1st-3rd year physics students) and presented them a general talk about particle physics and her work (in portugese).
    - Maria Vieites Diaz (EPFL) was a guest for "El bosón de Twitch, Quarks: colores y sabores", a 1h program on the streaming platform Twitch, which was the first of an outreach series covering several HEP topics, the events were transmitted on YouTube allowing 90 students to follow the program live, afterward other 690 viewed the videos.
    - Federico Redi (EPFL) participated at the Royal Institution LIVESTREAM event "10 years at the LHC", 24 September.
    - Tara Nanut participated at the realisation of a video by Youtuber Dr Becky (8:05 onward), 26 February.

- Federico Redi (EPFL) gave an interview broadcasted on the Italian State Radio during the program Caterpillar.


• UNSOLVeD, funded by Agora: is a platform with 10 videos addressing open questions in physics - from quantum field theory to dark matter. They are used to create a dialog with non-scientist, with particular target on high-school students.


*Figure 4 iLab - PSI*

Specialised school labs as well as lectures and workshops for school classes play a key role in attracting young students to study STEM related subjects. There are several dedicated laboratories at our institutes that offer special courses in cosmology as well as particle, astroparticle and neutrino physics for school classes targeting different ages of young students. With hands-on experiments, visits to the labs and by meeting bachelor and master students they get in contact with state-of-the-art research and passionate researchers (iLab at PSI, Science Lab at the University of Zurich, Physioscope at University of Geneva).


*Figure 5 Science Lab - UZH*

Several events were organised during the year; young researchers helped and participated giving presentations and supporting young kids to get closer to scientific topics:

- Frederic Blanc (EPFL) hosted a 13-year-old student from the "collège de Corsier sur Vevey" in the contest of the "Stage en entreprise" at the l'EPFL, 20 January.
- Ana Barbabra Rodrigues Cavalcante (EPFL) participated as volunteer in two workshops to teach the kids (6-8 years old) how to program in a ludic way, Devoxx4Kids @CERN, 7 March.
- Ana Barbara Rodrigues Cavalcante (EPFL) participated at the "Fête de la Science" de Ferney Voltaire [French link]; she organised activity for kids involving a particles hunting in the park and chaired a conversation with an adult public about particle physics and CERN, 10 October.
- Katharina Müller (UZH) hosted gave several online workshops for high-school students and organised virtual visits to the physics institute
- Katharina Müller (UZH) oragnised a 'Schwerpunktsfachwoche' for a high school at the university
- Ondrej Theiner (Uni Geneva) is author of some problems in the Czech Astronomy Olympiad which is a competition for high school students. Last year he proposed a problem for the regional round of the competition and it was about the observation of the cosmic showers.

- Riccardo Poggi (Uni Geneva) participated to the CERN virtual visits and to the ATLAS virtual visits. Three of those were also streamed on YouTube and Facebook. One was part of the Bergamo Scienza scientific festival and another was part of the European Researchers Night.

### Information and coordination tasks supporting research and science

CHIPP's website contains news, documents, minutes of all meetings, as well as the link to the complete membership database. The continuous dialogue between the institutes, which is enshrined in the CHIPP Statutes and By-Laws, aims at having at hand in a timely and transparent manner the information about current and planned research activities. As in previous years, CHIPP took an active role in the biannual meetings of SCNAT's **Round Table International Organisations and Research Infrastructures**. The scope of this information forum is the exchange between the research fields involving with large international infrastructures. It accounts for the participation of Swiss groups in international research facilities and also comprises representatives of the SERI, SNSF, and "Swiss universities".

### Dialogue with society

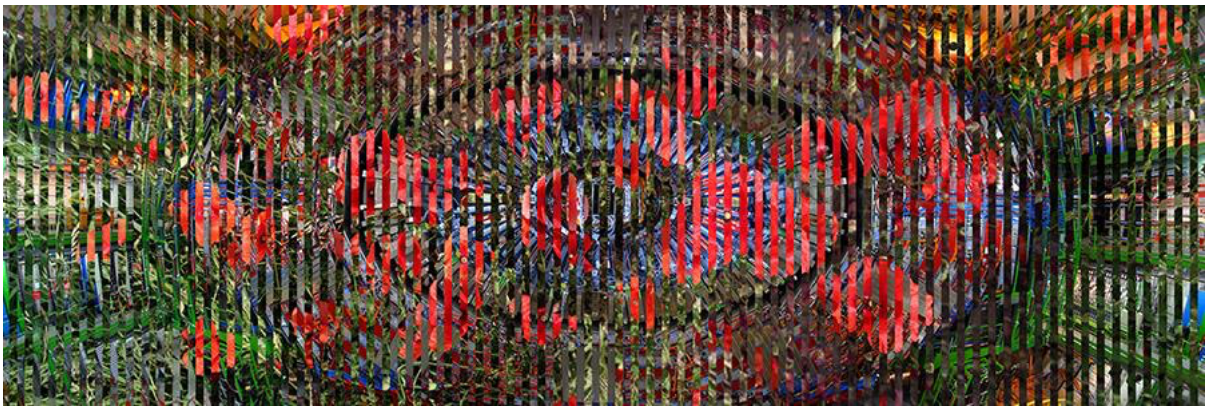

*Figure 6 Michael Hoch art@CMS*

The SCNAT offered a firm place with increased visibility among the other fields of science for both the CHIPP website and the more general Physics outreach website ('particlephysics.ch'). The site was kept lively throughout 2020 with the addition of 10 interviews, a video and other news articles. As approved by the CHIPP Board, the articles are authored by B. Vogel, a science journalist collaborating with CHIPP since many years. Dr. H. P. Beck (the University of Bern) was responsible for their scientific content and Angela Benelli inserted them on the SCNAT portal in Italian, in German and in English. CHIPP is grateful to SCNAT for supporting this activity as an important dialogue with the society.
During 2020 the CHIPP Twitter account @CHIPP_news has continuously spread physics news to increase the public awareness about science and publicized available jobs in academia and outside for physicists.
At the EPFL, G. Pietrzyk is in charge of the LHCb Experiment Twitter account: @lhcbexperiment and the LHCbExperiment Instagram account with around 26.3K and 13000 followers respectively. The University of Geneva has set the Particle Physics Twitter @DPNC_Unige. The Facebook site Verflixtes Higgs continued to be fed by H. P. Beck.

With A. Benelli as the Swiss member in the European Particle Physics Communication Network (EPPCN), CHIPP continues its link between the CERN press office and the Swiss media, as well as with the communication offices of the institutes related to CHIPP. The contact has been established and a measure of the media coverage of particle physics in Switzerland is provided on-line.

The Science Exploratorium UZH of the **University of Zurich** opened on Campus Irchel in November 2020. It offers space for five temporary exhibition islands. With the help of texts, videos, and experiments, scientists from the Faculty of Mathematics and Natural Sciences present their respective field of research or research project. Among the first exhibits three are from physics:

- **Superconductors**
  This exhibits tells the story of the high temperature superconductors. Visitors can directly experience the phenomenon of superconductivity by means of an explanatory video or during a live experiment with a superconductor in a magnetic field.
- **High Energy**

  The exhibit on CERN show how scientists are using the world's largest particle accelerator, the Large Hadron Collider (LHC) at CERN, to investigate the nature of matter and fundamental forces. Visitors can learn how particle collisions are detected at the CMS detector at the LHC by looking at the 1:10 scale model on display.

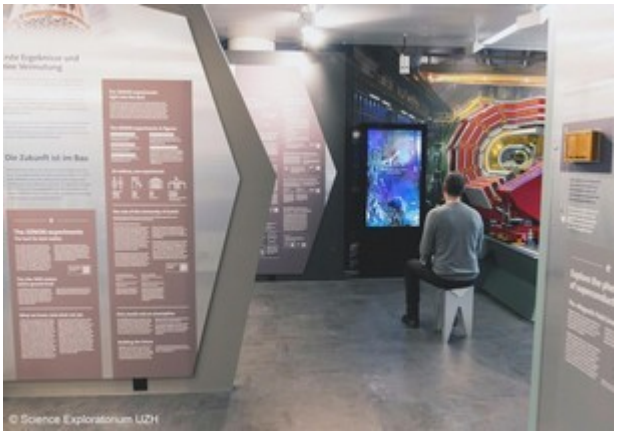

*Figure 7 Science Exploratorium UZH: CMS exhibit*

- **Dark Matter**

*Figure 8 Science Exploratorium UZH: XENON Exhibit*

The Dark Matter exhibition highlights the XENON experiment at the Gran Sasso underground laboratory in Italy. The heart of the XENON detector - a time projection chamber that was filled with 150 kg of liquid Xenon and operated until 2018 - is on display in a showcase.

One of the strong benefits of Physics in Society is the medical application of Particle Physics and Accelerator Technology, in the magazine "5232", was covered the important topic of proton therapy research applications in PSI.

Hans Peter Beck (University of Bern/Fribourg) was invited to LHCP 2020 Paris (that took place virtual), to talk about the balloon flight: "Science & Art at the 42nd International Hot-Air Balloon Festival and the Balloon Museum in Château-d'Oex". HP Beck gave an invited zoom talk at the conference of the

Science Leadership School of the West Siberian Center of Science and Education, Tyumen, Russia the 25 August 2020: «Knowledge transfer. Science and society — The Large Hadron Collider at CERN, Accelerating Science and Innovation» (in English).

**Video:** Since the traditional open day at the Physics Department of the University of Zurich had to be cancelled the students and postdocs of the University of Zurich prepared short videos presenting their research.

### Gender issue & society

Several events were organized in the contest of the "International day of women and girls in science" project of the United Nation, around the 11 February:

- Maria Vieites Diaz (EPFL) participated as visiting scientist at the "Women scientists visit local schools" organized by CERN, EPFL and the University of Geneva Scienscope, 7 February.
- Ana Barbabra Rodrigues Cavalcante (EPFL) gave two presentations in two different primary schools in Geneva, as moderator for masterclass for girls, [link to the projects 1,2], 3 February.
- Sonia Bouchiba (EPFL) presented CERN activities and the daily work of a PhD student at the Mont Olivet school, Vich to a group of school students of 13-15 years old. ("Volunteering for Women in Science day"), 5 February.
- Tara Nanut (EPFL) participated as moderator to a Masterclass session for more than 300 girls connected online from Europe and Africa, 11 February.
- Violaine Bellée (EPFL) gave four presentations of 1h each at the Ecole primaire de Cayla, Genève, 5 February.
- Lea Caminada (PSI) engaged with students mentoring them and in particular young women to MINT subjects. Caminada participated also to a short CMS-Clip released on the International women's day.

Laura Baudis (UZH) was interviewed (together with her husband, Michael Baudis) "Behind the Scenes: Life & Family as International Researchers" for Nextrends, 7 May.

### Exhibitions

A multidisciplinary Art & Science exhibition took place at the Espace Ballon in Chateau-d'Oex; the special exhibition about cosmic rays was organised by Hans Peter Beck (University Bern/Fribourg) and Michael Hoch from CMS.

*Figure 9 Espace Ballon in Chateu-d'Oex*

CERN's Science Gateway project: will be an education and outreach facility at CERN featuring exhibitions and hands-on educational activities. It will enable people of all ages and backgrounds to engage in the science and the technologies of CERN, sharing the passion for knowledge and research.

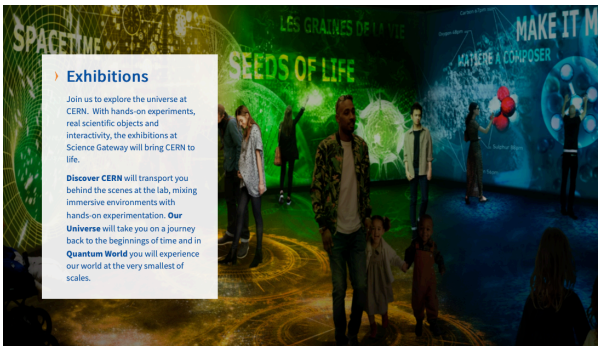

*Figure 10 Gateway project, CERN*

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