PROCEEDINGS OF SCIENCE

Education, Outreach and Public Engagement

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This conference offered the first opportunity to meet in person, assess the impact of the pandemic on HEP public engagement activities and discuss plans to move forward: with fifty abstracts and two days of presentations and discussions, the parallel session was a proof of the health, resilience, commitment and endless energy of the community. This plenary report is given on behalf of the four session conveners who shaped it.

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[*] Speaker

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1. Light at the end of a tunnel: covid memories, legacy and lessons

The preparation of communication campaigns and outreach events usually takes months. When the global pandemic froze the world, in March 2020, shifting to an online mode has not only been stressful for the technical teams setting up the equipment in a rush, it has forced communicators and scientists to re-characterize their audience and adapt their offer.

While the official ceremonies and VIP visits could most often be maintained in their original form, the replacement of the festive and popular parts of the programs with online content had the merit of reaching a different audience. Geographically spread farther away and sometimes unfamiliar with our activities, many of them would, as they wrote themselves, "never have been able to join the party". Story telling played an increased role, as one does not address the same way guests who have travelled, voluntarily, to a laboratory and families who discovered us by chance, from their sofa : anchoring in familiar examples, funny characters and softer transitions help to break the ice and take them, slowly, for a walk towards our world. Several examples of engaging and well written stories, kitchen demos and kids performances were presented in the parallel session.

The language and content of social media and communication material was also modified to highlight, during the difficult quarantine times, both solidarity and the human face of HEP. Clips of scientists working from home, online lectures and coloring books flourished and found their public. The "virtual visits" program setup several years ago by LHC experiments ran in full regime, in up to ten languages: thanks to the collider long shutdown, guides were able to walk through galleries and platforms, and show our impressive detectors to thousands of people in more that 35 countries.

Fig 1 : cables and corridors of the ATLAS experiment as metaphor of covid times ?

The Masterclass program, run every spring by the IPPOG collaboration, was far more challenging to adapt: a new online version was setup in record time, and opened to students without regional restriction. Polls and lively discussion via Q&A functions partially compensated for the lack of face to face interaction and, thanks to an increased coordination and support effort, more than half of the events could be "rescued". After two years of experience and a detailed analysis of the pros and cons, the coordination team is planning to offer both styles in future - face to face and online - but strictly separated.

Indeed, the education and outreach community is conscious that online presence will stay with us and even remain crucial in future. The past two years have allowed us to experiment techniques and tools that the democratization of equipment makes accessible to everyone. Keeping up with other actors know how and the ever-changing landscape of social media is one of the constant and labour intensive challenges.

2. Moving forward: frontiers ?

The theme and diagram of the "energy, intensity and cosmic frontiers" is a classic synthesis of the research paths in HEP. By analogy, future directions can be drawn from projects discussed in this conference:

Tools: keeping up with XXIst century public expectations
Culture: if science is a part of culture, how to we work with others ?
Public engagement: connect better and build trust in a diverse society

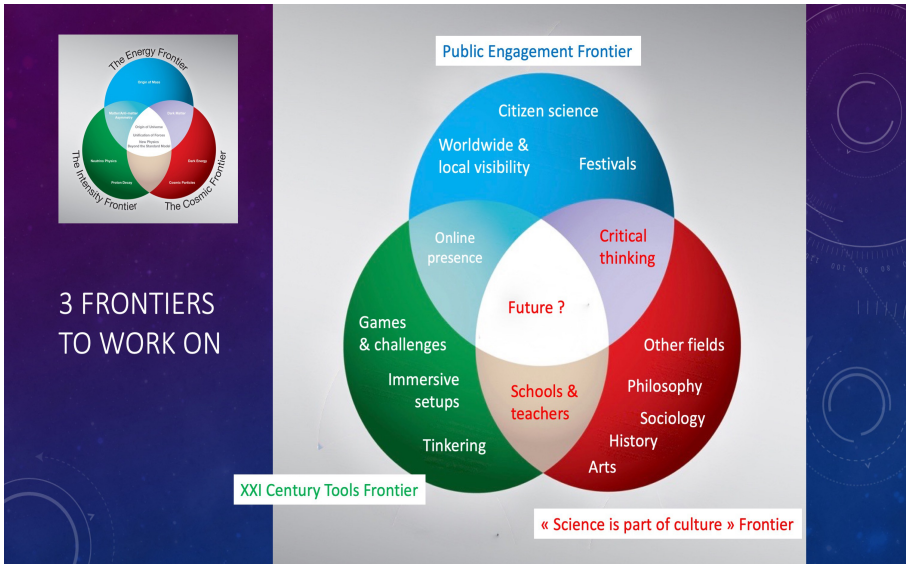

Fig 2 : trends and challenges in HEP outreach projects

Only a few examples could be shown in the plenary summary, readers are strongly encouraged to explore slides and links !

2.1 Tools and activities for the XXIst century

From the lightest to the most spectacular, a wide range of opportunities were discussed in the parallel session:

Serious games, hands-on setups and "tinkering activities" rely on the observation that movement and emotions play a role in the learning and memorization processes. In the recent years, a new generation of engagement tools has been developed, tested and validated by professional scientific mediators [1]. Along these lines, the CERN Science Gateway project team is developing simple and fun illustrations of some of the engineering concepts tackled

while construction our giant detectors. Escape games require more space but are very popular, and one of the Italian HEP oriented versions was presented: “locked up” in the LHC tunnel, the audience must solve enigmas and answer questions to come back. Other institutes guide visitors through a series of “locked” rooms, and more are in preparation for the upcoming post-covid festivals.

Immersive experiences are now a “must”, but require a significant financial and technical investment and are therefore the privilege of larger institutes. The “gift of mass”, an installation hosted by the Bruno Touscheck visitor center, in Frascati, is a striking example of the impact created by the combination of historic objects, exhibit design and partnership with artists.

2.2 Science is a part of culture !

“Two Cultures, one Prize”: students involved in scientific books selection such as the INFN Azimov prize [2] prove that the apparent divide between science and humanities is outdated by the youngest generation. One of the parallel session speaker described the artists as “experts in natural skills”, highlighting the existence of multiple paths to enter the HEP world.

A number of partnerships with other fields of culture were presented : visual artists leading workshops, philosophers discussing with scientists and students the evolution of the gravity concepts, sociologists bringing their expertise to frame presentations and contests on gender issues. In that process, organizers learn as much as participants from the encounter.

2.3 Public engagement

Major public event are a well established tradition in our field, and this conference was no exception.

Fig 3 : public event organized for this conference, in the Bologna historical center main square.

However, public engagement can be more active, through detector construction, data collection and even analysis: the Italian Extreme Energy Events project [3] allowed to build a network of 60 muon tracking telescopes installed inside high schools over the full country. Hundreds of students take, analyze and discuss data each year. Local communication and events are encouraged, hopefully spreading the students knowledge and curiosity in the rest of society.

The Auger collaboration went one step further, by enrolling the Observatory neighbors into the building and commissioning of upgrade modules, which are then named and “looked after” with the team.

The presentation of the REINFORCE citizen science project [4] was one of the highlight of the session, as it offered four demonstrators to the public: gravitational waves noise hunting, KM3NeT neutrino telescope deep sea environmental data classification, search for new particles with the ATLAS detector at the LHC, geoscience and archeology studies with Muography. Reaching the EU scale and maintaining the public interest implied an extensive program of conferences, summer schools and challenges. Final reports are expected by the end of 2022.

3.Behind the scenes

Our projects and relationship with the public are the fruits of the individual commitment of colleagues who count neither their time nor their energy. But, to move forward, support and training are mandatory. Three type of institutional structures were discussed:

- IPPOG, the 25 year old International Particle Physics Outreach Group, is now a formal collaboration where 32 countries, 6 experiments, 3 laboratories share ideas.

- LA-CONGA physics is a growing partnership between researchers and universities in Europe and Latin America, interacting through globally distributed, collaborative and multidisciplinary resources sharing.

- On the funding agencies side, the INFN strategy of the last decade was reviewed: in supporting and improving HEP outreach, the benefits of enhanced preparation, selection and evaluation processes are outstanding.

4. Communicating the future

While the community is discussing and evaluating the feasibility of several future colliders, communicators are already on board to prepare generic arguments. The celebration of the Higgs boson discovery was an occasion to familiarize the public with the concept of "Higgs factory" and stress why "it has something to tell us about nature".

F*ig 4 : communication material developed about the Higgs, LHC Run 3 and next collider.*

However, many challenges are ahead of us. In the society, sustainability and environment issues, lack of trust in science, low youth interest in academic careers have to be balanced with the benefit of long term investment in scientific equipment. Internally, getting young scientists on board, highlighting the diversity of our world-wide community is an ongoing effort that must continue and receive support. A long and open discussion was included in the parallel session, many more will be needed.

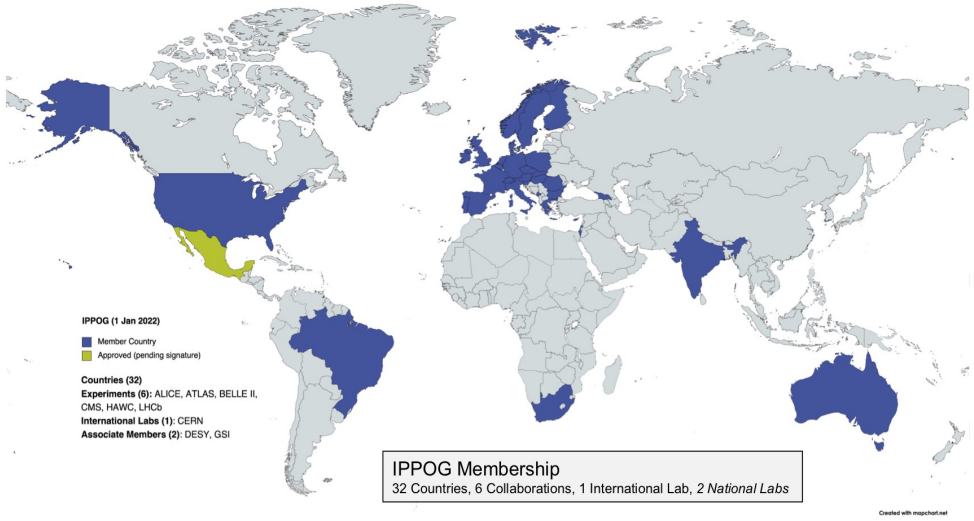

Fig 5 : the growing number of countries, labs and experiments joining IPPOG [5]

On behalf of the parallel session organizers, it is a pleasure to thank all the contributors to this session, either though an abstract, a talk, a poster or by their presence and involvement. None of this would have been possible without the conference local contacts and chairs: thank you. And, last but not least, representing the vibrant and diverse HEP outreach community was an honor and a delight !

References

[1] ECSITE conference series https://www.ecsite.eu/activities-and-services/ecsite-events/conferences/2018-ecsite-conference

[2] Azimov Prize https://www.bo.infn.it/divulgazione/en/asimov-prize/

[3] E.E.E project https://eee.centrofermi.it/it/

[4] REINFORCE https://reinforceeu.eu/

[5] IPPOG https://ippog.org/