

IPPOG Annual Report 2019



International Particle
Physics Outreach Group



1.

Timeline

Timeline

2019

- September 2019 - The CERN council requested a report of the IPPOG collaboration activities in 2019
- November 2019 - This item was discussed during the 6th IPPOG CB meeting

2020

- February 2020 - Request to CB for content
- March 2020 - Deadline for content
- April 2020 - Deadline for designer for layout and print
- 1st May 2020 - Layout to collaboration

Next

- 7th May 2020 - Presentation to forum
- **14th May 2020 - Deadline for input**
- 28th May 2020 - Final Layout to collaboration and print
- June - Send to Council

Fall meeting - Members shall receive 3 copies of the folder but can print the pdf at anytime!

2.

Target Audience & Goal

■ Target Audience and Goal

Target Audience

- Current funding providers and other stakeholders such as CERN council
- Funding providers of potential new members
- Any other IPPOG supporter and collaborator

Goal

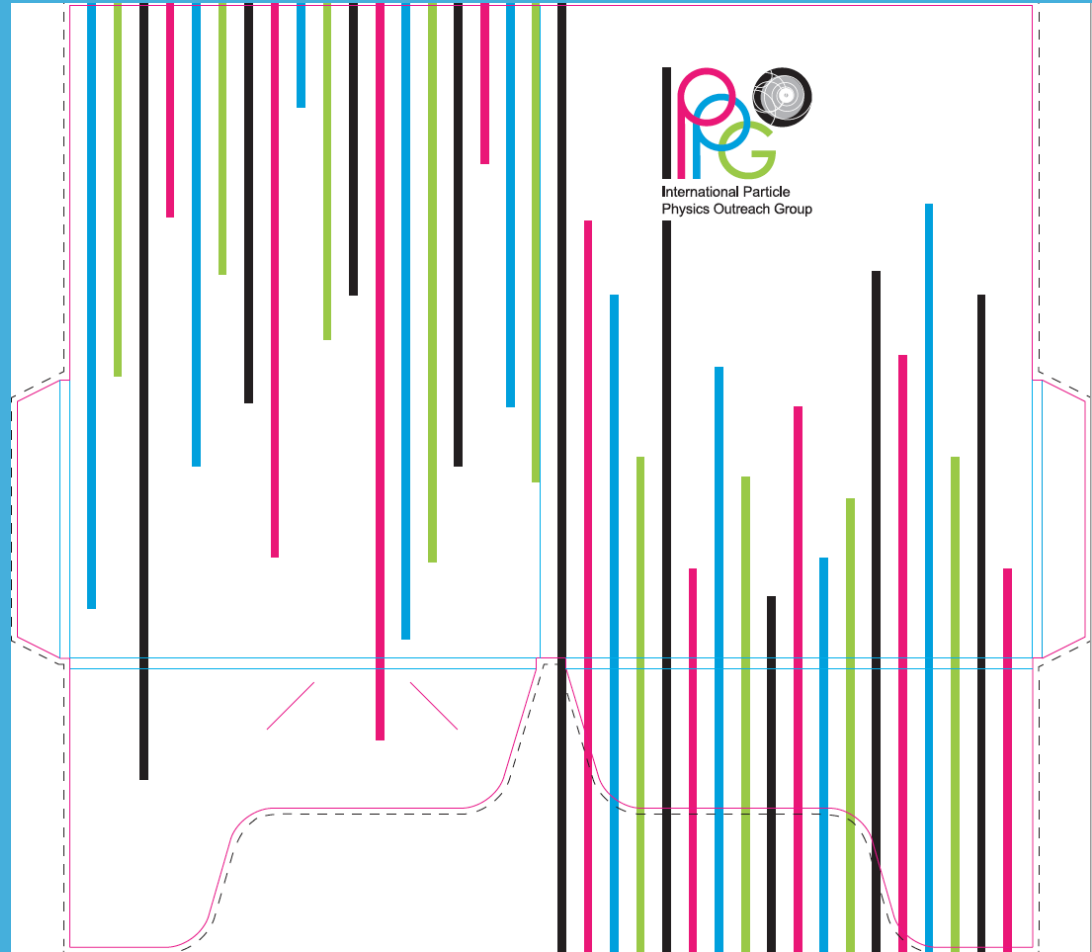
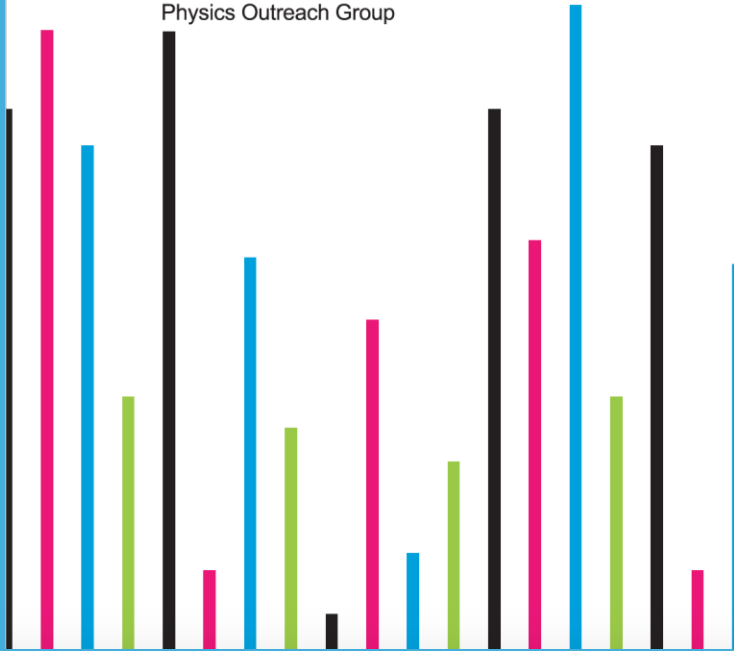
- To create a template format for the annual report of IPPOG, easy to produce, to print and to modify if needed.

3.

Format



International Particle
Physics Outreach Group

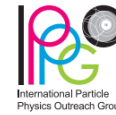




IPPOG
Annual Report
2019



IPPOG
members



4.

Input

Input for Content

Intro

- Former and Current chairs
- WG conveners
- Speakers and Publication conveners
- International Masterclass coordinators
- Global Cosmic Group
- Organizers of Cultural Festivals activities that IPPOG supported

Members

- To fill in their country, experiment or lab template



One photo

Ideally representing an important activity of the year

+ short caption

Summary of activities, main highlights of the year:

(Events, shows, public sessions and other public engagement activities)

250 words - maximum

One photo

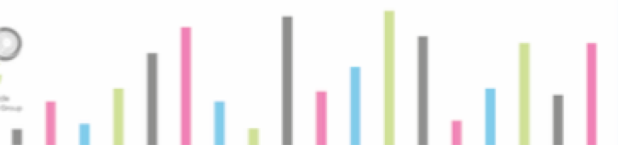
Ideally representing an important activity of the year

+ short caption

**One key
number**

+ comment (50
words maximum)

Can be number or
participants,
audience reach for
a big event, or any
other relevant
number



One photo

Ideally representing an important
activity of the year

+ short caption

One photo

Ideally representing an important
activity of the year

+ short caption

Summary of activities, main highlights of the year:

(Events, shows, public sessions and other public engagement activities)

250 words - maximum

Activity with the most impact of the year (photo or press
clippings)
50 words maximum

**One key
number**

+ comment (50
words maximum)

Can be number or
participants,
audience reach for
a big event, or any
other relevant
number

5.

Content

IPPOG members



IPPOG MEMBERS

COUNTRY/LAB/ EXPERIMENT	SIGNATOR ORGANIZATION	REPRESENTATIVE
ALICE	ALICE Collaboration	Despina Hatzifotiadou
ATLAS	ATLAS Collaboration	Sascha Mehlhase
AUSTRALIA	CoEPP	Paul Jackson
AUSTRIA	HEPHY, ÖAW, ÖPG	Natascha Hoermann
BELGIUM	FWO + F.R.S.-FNRS	Dirk Ryckbosch
BELLE II	BELLE II Spokesperson	Zdenek Dolezal
BRAZIL	Rede Nacional de Física de Altas Energias (RENAFAE)	Marcello Munhoz
CERN	CERN	Ana Godinho
CMS	CMS Collaboration	Marzena Lapka
CZECH REPUBLIC	Institute of Physics of the Czech Academy of Sciences	Vojtech Pleskot
DENMARK	Danish CERN Instrumentation Centre, NICE	Marzena Lapka
FINLAND	Helsinki Institute of Physics	Sami Lehti
FRANCE	CNRS/IN2P3	Nicolas Arnaud
GEORGIA	Ministry of Education, Science, Culture and Sport	Alexander Sharmazanashvili
GERMANY	DESY for KET	Thomas Naumann
GREECE	Ministry for Education, Research, and Religious Affairs	Nick Tracas
HAWC	HAWC collaboration	Ruben Alfaro
HUNGARY	*The Wigner Research Centre for Physics of the Hungarian Academy of Science	Dezso Horvath
IRELAND	Dublin Institute for Advanced Studies	Jon-Ivar Skullerud
ITALY	INFN	Catia Peduto
LHCb	LHCb Collaboration	Bolek Pietrzyk
MONTENEGRO	Ministry of Science of Montenegro	Durdjina Bulatovic
NORWAY	Physics Department of University of Oslo	Farid Ould-Saada
POLAND	The Henryk Niewodniczański Institute of Nuclear Physics, Polish Academy of Sciences	Krzysztof Wozniak
PORTUGAL	LIP	Pedro Abreu
ROMANIA	Institute of Atomic Physics	Gabriel Stoicea
SLOVAK REPUBLIC	Ministry of Education, Science, Research and Sport	Ivan Melo
SLOVENIA	Jósef Stefan Institute, Ljubljana, Slovenia	Andrej Gornsek
SPAIN	The Spanish National Particle Physics Programme	Alberto Ruiz
SWEDEN	The Section for Elementary Particle and Astroparticle Physics of the Swedish Physical Society through the Swedish LHC Consortium	Jonas Strandberg
SWITZERLAND	CHIPP	Katharina Mueller
NETHERLANDS	NIKHEF	Charles Timmermans
UK	STFC Rutherford Appleton Laboratory	Darren Price
USA	The University of Notre Dame on behalf of QuarkNet	Spenser Paseno



IPPOG report 2019 – ATLAS Experiment



In 2019, the **ATLAS Collaboration** once again made significant contributions to the annual IPPOG International Masterclasses and has been continuously developing its Open Data programme for educational use, which will benefit future iterations of the Masterclasses.

Our continuously growing Virtual Visit programme provided an on-site experience to people from 35 countries unable to visit CERN in-person. In 2019, we also launched our first-ever Virtual Visits live from the ATLAS cavern.

Communicating the latest news and results of the collaboration continued to be a critical aspect of our outreach programme in 2019, with 36 public updates released. We also expanded our direct engagement with social media audiences, hosting live events from major physics conferences and using in-platform tools to interact with our followers.



The 2019 CERN Open Days brought a record 3800 underground visitors to the ATLAS cavern. Many more enjoyed the entertaining and educating surface activities, ranging from a science café and making proton cookies to LEGO competitions and walking tours on the CERN campus.

9,420

Underground visitors to the ATLAS cavern

135,000

combined followers on Facebook, Instagram and Twitter



IPPOG report 2019 – Alice Experiment



Facebook live event at ALICE cavern, March 2019. ALICE physicists talked about the upgrade during LS2 and answered questions from the public.



Physics experiments for the public, by ALICE members, during CERN Open Days 2019.

The ALICE Collaboration welcomed more than 12500 visitors during 2019, not counting those visiting during CERN Open Days. They all had the opportunity to see the new ALICE exhibition and almost 10000 also visited the experiment's underground installations. Open Visits were introduced, for individuals and small groups, to satisfy the increasing demand.

Virtual visits that often included a tour of the cavern, conducted from the ALICE Run Control Centre (ARC), reached remote audiences in 8 countries.

ALICE members participated in the International Particle Physics Masterclasses Programme organising 31 sessions in 26 institutes; we also contributed to the National CERN Teachers Programmes with ALICE Masterclasses and presentations of the physics of heavy ions.

Additionally in 2019, the project of the new ALICE public pages under Drupal 8 was launched.



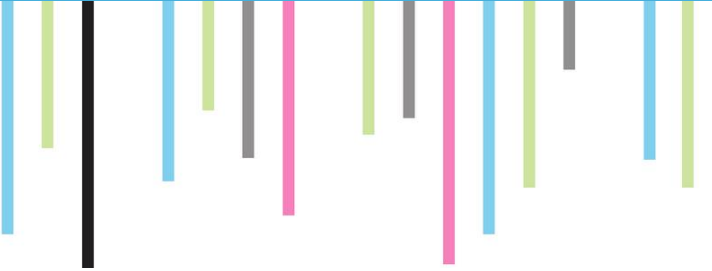
4,600
visitors

to the ALICE cavern and LHC tunnel during CERN Open Days in September 2019, guided by **>200** enthusiastic volunteers!



IPPOG
Annual Report
2019





Preface by former chairs



Loading...

OUR VISION FOR 2020

We in IPPOG are fortunate. We play a role in one of the most fascinating fields of science, one that lies at the very core of human understanding of the universe: particle physics. Furthermore, our hardware, electronics and computing challenges are forever pushing limits and, in many cases, the solutions found result in advances that improve our daily lives.

Equally important, the expertise needed to address these challenges goes beyond the capabilities of any one institution or nation. It requires a concerted worldwide effort, involving international teams of researchers, engineers and technicians working together, each bringing their own cultural backgrounds and points of view to the table.

We at IPPOG thus have a golden opportunity to teach the scientific process and to promote the values of international collaboration around the globe. Toward these goals, the aspirations of particle physics provide a powerful catalyst to engage and interest the public. We, as scientists, educators and communicators can provide the public, especially younger generations, with the tools they need to differentiate fact from fiction, an increasingly important task, today. In fact, it is one of IPPOG's duties and missions to do exactly that.

As always, primary support for IPPOG will come from ourselves and our peers, dedicating significant time, effort and in-kind resources to the education and outreach programs. Core support, provided by the member countries, collaborations and laboratories will continue to grow, as our global membership increases and diversifies.

A key milestone in the coming year will be the European Particle Physics Strategy Update, to be submitted to CERN Council this Spring. It is our hope that the document will provide a clear path toward greater recognition and support of scientific education, public engagement and communication by recognising them as strategic pillars of our field.

Beyond the words of that document, however, we in IPPOG already understand and appreciate the importance and urgency of our work, not only in support of particle physics, but for the future of our planet. We will continue to play a vital role bringing the excitement of fundamental research into the classroom and instilling a deep appreciation of science to the public. And, fortunately, we will continue to enjoy doing just that.



Pedro Abreu (chair)



Steven Goldfarb (chair)

Two handwritten signatures in blue ink. The first signature is 'Pedro T. Abreu' and the second is 'Steven Goldfarb'.

ABOUT IPPOG

INTRODUCTION

IPPOG is a network of scientists, science educators and communication specialists working across the globe in science education and public engagement for particle physics. Particle physics is the science of matter, energy, space and time; it seeks to identify and understand the basic building blocks of our universe. IPPOG brings new discoveries in this exciting field to young people and conveys to the public the beauty of nature that is manifest in the interactions of its most fundamental components - the elementary particles.

IPPOG holds regular meetings for the sharing of ideas and best practices, with the primary goal of raising the standards of science education and public engagement. Its globally coordinated outreach programmes contribute to strengthening cultural awareness, understanding and support of particle physics and related sciences, and developing the next generation of researchers.

IPPOG ACTIVITIES

The collaboration forum, comprising member representatives and their associates, meets twice a year, holding topical panel sessions, working group discussions and presentations of key activities. The meetings are organised by the core team and alternatively hosted by member or aspiring member institutions. These meetings provide a key platform for the development and sharing of ideas and coordination of the programmes.

Well-established IPPOG activities, including International Particle Physics Masterclasses and Global Cosmics, reach thousands of students in dozens of countries around the world, every year. More recent programmes bringing particle physics to music and other cultural festivals, reach new audiences, including members of the public already interested in science, as well as those who have yet to realise they are.

IPPOG also maintains strong visibility in major particle physics conferences, participating in and convening dedicated sessions in education and outreach, and

organising associated public events and exhibitions. These activities increase awareness with both the public and members of the physics community, encouraging and helping young scientists to participate in public engagement.

Through these activities, IPPOG not only communicates the excitement of our research, but it instils young minds with a better understanding of the scientific method and a deeper appreciation of evidence-based decision making. This is essential today, in a world, in which these human values are continually under attack by public figures and the media. Thus, the repercussions of IPPOG activities go far beyond that of simply supporting and popularising our field, but help to create a key strategic basis for the future.

IPPOG MEMBERS

IPPOG forum membership includes a rare mix of scientists and researchers, science educators and communicators from prominent laboratories and institutions engaged in particle physics. Members also represent links to several important national-level science networks. As a whole, the forum constitutes a global network of countries, laboratories, institutions, organisations and individuals, all passionate about particle physics.

There are currently 33 IPPOG members: 26 countries, 6 experiments and CERN as an international laboratory. Below is a list of the members and their representatives at the date of publication. These representatives compose the Collaboration Board, which meets twice a year to discuss and vote on IPPOG matters.



Group photo of participants of the 18th IPPOG meeting - 28-30 November - CERN

IPPOG HISTORY

ORIGINS

In 1997, then CERN Director General Chris Llewellyn-Smith, made the following statement during a council meeting "...the particle physics community has a moral obligation to inform the public on its activities. To do this well, experiences must be shared among countries in view of the need to optimize the use of resources." These words launched the European Particle Physics Outreach Group (EPOG, then later EPPOG), formed under the joint auspices of the European Committee for Future Accelerators (ECFA) and the High Energy Particle Physics Board of the European Physical Society (EPS-HEPP).

The original group comprised one delegate from each CERN member state, one additional CERN and DESY member, a Chair and a Deputy Chair appointed by ECFA and EPS-HEPP, and associate members from within the community, currently active in public outreach and communication. The group agreed to meet twice a year, to exchange ideas and best practices in particle physics education and outreach, to define common activities, and to develop and share material supporting their activities.

INTERNATIONAL MASTERCLASSES

Researchers in the U.K. working on the DELPHI and OPAL experiments on LEP at CERN developed an educational tool called Particle Physics Masterclasses. This activity brought high school students together into research labs and institutes, gave them short lessons in current particle physics methods, then provided access to current tools to look at real data from the experiments. EPPOG members quickly embraced this activity and, in 2005, created a global programme called International Masterclasses (IMC), adding, at the end of each day, a video-conference in which

students shared and discussed their results moderated by scientists at CERN and Fermilab. The programme grew in number, geographic reach and physics scope every year since its inception, and quickly became the flagship programme of EPPOG.

During these years, EPPOG membership also grew, as countries involved in the experiments, but not members of CERN, requested participation. Further, as the LHC started taking data in 2010, the new experiments themselves came on board, offering usage of their own new data and tools. By 2011, LHC Masterclasses were being developed and integrated into the IMC programme.

IPPOG

Activities of the group also attracted the interest of non-European members of the particle physics community active in outreach, such as Israel, Australia and the USA. This global expansion put EPPOG into international terrain and in 2011 the group changed its name to the International Particle Physics Outreach Group (IPPOG). Along with the name change, IPPOG adopted a visual identity, including a logo and website, to serve the global community. A new component of the website was its resource database, allowing the effective global sharing of content, one of the original motivations for IPPOG's formation.

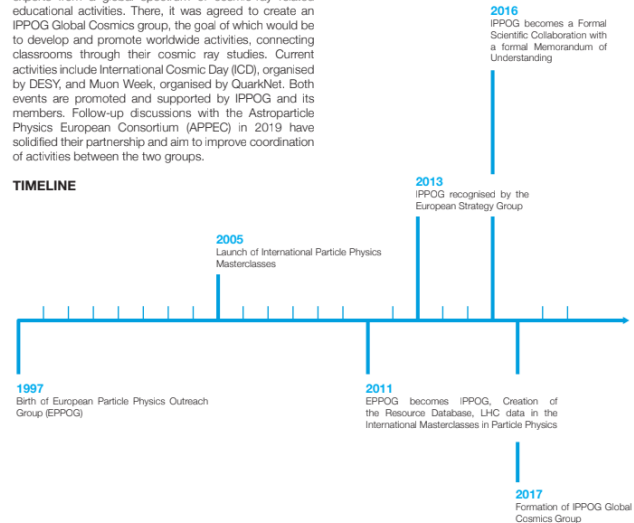
IPPOG PART OF EUROPEAN STRATEGY

In 2013, the European Strategy Group updated the strategic roadmap for particle physics launched in 2006, and the relevance of good communication and public engagement was clearly expressed:

GLOBAL COSMICS

A workshop organised in Rome in 2017 brought together experts from a global spectrum of cosmic-ray related educational activities. There, it was agreed to create an IPPOG Global Cosmics group, the goal of which would be to develop and promote worldwide activities, connecting classrooms through their cosmic ray studies. Current activities include International Cosmic Day (ICD), organised by DESY, and Muon Week, organised by QuarkNet. Both events are promoted and supported by IPPOG and its members. Follow-up discussions with the Astroparticle Physics European Consortium (APPEC) in 2019 have solidified their partnership and aim to improve coordination of activities between the two groups.

TIMELINE





IPPOG CORE TEAM ACTIVITIES 2019

CORE TEAM

The IPPOG Core Team in 2019 comprised Hans Peter Beck (Univ.Bern, Switzerland) and Steven Goldfarb (Univ. Melbourne, Australia), as elected chairs, Claudia Marcelloni (CERN) as scientific secretary, Barbara Gulejova (Univ.Bern) as strategic development lead, Uta Bilow (TU Dresden, Germany) and Kenneth Cecire (Univ. Notre-Dame, USA) as Masterclass coordinators. The team is responsible for organising global IPPOG activities by promoting twice-yearly collaboration meetings in cooperation with IPPOG members, proposing and managing the core budget, coordinating the International Masterclasses in Particle Physics programme and related projects (reported on separately), and developing infrastructure and activities in support of the collaboration, in line with the strategic vision set forth by the chairs.



Hans Peter Beck (chair)



Steven Goldfarb (chair)



Claudia Marcelloni
(scientific secretary)



Barbara Gulejova
(strategic development
lead)



Uta Bilow
(Masterclass coordinator)



Kenneth Cecire
(Masterclass coordinator)

By Claudia, Steve and Pedro

STRATEGIC DEVELOPMENT ACTIVITIES IN 2019

The IPPOG Friends Network

In recent years, IPPOG worked with the CERN International High School Teacher programme, to offer projects to teams of participant teachers. These teams provided input for the development of the new IPPOG website by proposing a structure for the site and by helping to procure content and offer recommendations for the interfaces of the resource database. Those teachers have since helped to disseminate knowledge of IPPOG to their colleagues, creating the IPPOG Friends mailing list and Facebook group hosting hundreds of members. This growing network allows IPPOG a direct means to reach high school teachers and students, its primary audience, and has created a strong following in non-member locations, such as Iran.



Girls, do physics!

"Girls, do physics!" was a social media campaign and competition run in 2019, with the aim of empowering, inspiring and motivating girls in primary and secondary school to pursue studies in physics and related STEM subjects. It took place between February 11th (International Day of Women and Girls in Science) and March 8th (International Women's Day) and was organised under the umbrella of IPPOG by forum members and volunteers. Female physicists pursuing careers in academia, business and industry were presented on the project website (<https://ippog.org/websites.com/girlsdophysics>) and IPPOG Instagram channel (<https://www.instagram.com/ippogorg>) as inspirational role models.



Participants were asked to present a physics project on Instagram with hashtags #girlsdophysics and #girlsdoarticlephysics. Several hundred girls and young women from around the world (including a four year-

old) participated in the campaign, with some receiving thousands of "likes" on their posts. Seven individual winners or winning teams were awarded certificates, merchandise and virtual visits from the CERN experiments, as well as in-person visits to their classroom from a local physicist.

The project highlighted IPPOG's continuing efforts to promote diversity and to engage in social issues affecting particle physics and the broader science community, and was modelled on the Sustainable Development Goals put forth by the United Nations. It also widened IPPOG's global reach by activating its presence on Instagram, a platform that attracts a younger audience, and increasing activity on its existing Facebook and Twitter accounts. Significant contributions were made by students of Geneva International High School (ECOLINT), as follow-up to a 2018 IPPOG workshop "Creating Ambassadors for Science in Society" (<https://indico.cern.ch/event/736469>).

IPPOG WORKING GROUPS, STEERING GROUPS AND COMMITTEES

The IPPOG collaboration meets twice a year to share, exchange and expand knowledge on worldwide initiatives in particle physics education and public engagement. In addition to presentations from the members and core team, topical panel discussions and other networking opportunities, the meetings feature reports from established working groups, steering groups and committees. The working groups, which meet during and/or between meetings, focus on various aspects of particle physics outreach, with the goal of improving the effectiveness of current methodology or implementing new ideas. The steering groups address specific IPPOG programmes, focusing on their growth, improvement and evolution. The committees support the various organisational activities of the collaboration.

In 2019, active groups and committees in IPPOG included:

- Bringing Masterclasses to New Countries Working Group
- Explaining Particle Physics Hot Topics to a Lay Audience Working Group
- Exhibits and Exhibitions Working Group
- Outreach of Applications for Society Working Group
- European Particle Physics Strategy Update Document Working Group
- International Masterclasses Steering Group
- Global Cosmics Steering Group
- Speakers and Publications Committee
- Finance Advisory and Auditing Board

Here we present descriptions and brief summaries of the 2019 activities for a sample of these groups and committees.

EXPLAINING PARTICLE PHYSICS HOT TOPICS TO A LAY AUDIENCE WORKING GROUP

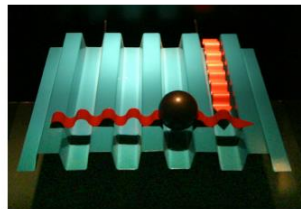
In 2019, the Explaining Particle Physics Hot Topics to a Lay Audience Working Group discussed methods for effectively communicating LHC physics after the discovery of the Higgs boson. The conversations included:

- Ways to explain the Higgs mechanism
- The importance of precision in particle physics
- What if there is only the Higgs but no big discoveries in the near future

The working group also worked on the outreach recommendation to be given to the European strategy group on behalf of IPPOG. The discussion for the strategy illustrated differing visions for the future and how to convince the public of the need for a new accelerator in 20 years time. The working group proposed a document on public engagement, education and communication stressing the need for cooperation with other fields, such as the astroparticle Physics community, as well as the need to include the Standard Model in formal educational curricula.

Members of the working group have also published a paper on this subject in: Communications - Scientific Letters of the University Of Zilina, Volume 19. The abstract of the paper reads:

Authors will discuss a few ethical questions in today's particle physics: high costs and purported dangers of Big Science projects, relevance of fundamental research for society and the way particle physicists fill their duty to communicate with the public. Examples will be given including the story of a possible mini-black hole creation at CERN and two outreach activities for high school students, International Particle Physics Masterclasses and Cascade competition



A model produced by the working group symbolizing the propagation of a massive particle in the Higgs field.

OUTREACH OF APPLICATIONS FOR SOCIETY WORKING GROUP

In today's world of instant communication, in which we have become accustomed to a rapid and continual flow of information, concrete examples on the impact of science need to be readily available to address a variety of target audiences. In addition to the quest for knowledge and satisfying curiosity, there will always be pressure from taxpayers for justification of fundamental research funding, requesting tangible examples of return to society.



In 2019, the Outreach of Applications for Society Working Group focused on the need to produce engaging stories with a human touch. These often present the most impactful and effective means to communicate successful applications for the benefit of society from fundamental research to the public. The aim of this initiative is to offer short stories with clear messages connecting science to everyday lives of citizens and to make them available through the IPPOG web page and resource database. The goal is to also show, through them, the importance of fundamental research and related sciences for global sustainable development and to inspire the young generation. These stories provide a powerful tool when approaching non-scientifically educated stakeholders.

After collecting material from a variety of sources, including the CERN knowledge transfer collection, as well as individual contributions, the group worked on story-building around the available facts, while trying to find a human touch and anecdotes for each of them. While most know the story behind World Wide Web, we plan to offer stories behind a variety of other applications, such as PET scanners, cancer therapy, UNOSAT, touch screen, GPS and many more.



As a most recent example, an on-board system for cleaning the exhaust of marine diesels was successfully developed in an accelerator R&D project (<http://acceleratingnews.web.cern.ch/article/bringing-particle-accelerators-ships>). Stories like this inspire and help the public to better understand the benefits of our research directly to society. Even less known is the fact that there are tens of thousands of medium and high energy accelerators operating worldwide, solely for the direct benefit of society, based on breakthrough developments of a handful of those dedicated to fundamental research. Applications of these devices vary from medical to industrial, security, and environmental applications, with many other potential possibilities. Creating stories and clear explanations of such applications helps to secure support for fundamental research and the particle physics community, and will prove to be an invaluable strategic pillar during the roll-out of the EPPSU proposals.

SPEAKERS AND PUBLICATIONS COMMITTEE

This committee of elected IPPOG members takes a regular survey of conferences of interest for IPPOG participation, including specialized conferences in physics education or the Outreach & Education tracks in major conferences in Particle Physics and High-Energy Physics. Then abstracts are prepared and sent to these conferences. For the abstracts accepted, speakers are identified and selected to attend the conference and present the communication on behalf of IPPOG (in plenary, parallel, or poster sessions). The committee also helps to prepare the presentation, regarding the contents, the style and the speech, and after the conference helps to prepare and finalise the proceedings and/or other publications.

In 2019 IPPOG was present at the following conferences:

- APS'2019 April Meeting, Denver Co., USA, April 13-16 (2 oral presentations)
- LHCP'2019, Puebla, Mexico, 20-25 May (1 oral presentation, parallel)
- EPS-HEP'2019, Ghent, Belgium, 10-17 July (3 oral presentations, parallel)
- DPF'2019, Boston Ma., USA, 29 July-2 August (1 oral presentation, parallel)
- ICNFP'2019, Kolympari, Crete, 21-29 August (1 oral presentation, parallel)
- JENAS'2019, Orsay, France, 14-16 October (1 oral presentation, plenary)
- CHEP'2019, Adelaide, Australia, 4-8 November (4 oral presentations, parallel)

INTERNATIONAL MASTERCLASSES

OVERVIEW

International Masterclasses¹ (IMC) offer high school students the possibility to perform measurements on real data from particle physics experiments at CERN and other facilities and get insights into the methods and tools of cutting edge research in high energy physics. The program is the flagship activity of the International Particle Physics Outreach Group (IPPOG)². Central coordination is done by Uta Blow, Technische Universität Dresden, and Ken Cecire, QuarkNet/University of Notre Dame; Blow and Cecire organized the 15th edition of IMC in spring 2019.

IMC were held over a period of six weeks from 07.03.–16.04.2019 plus two satellite events in February and two in May. Masterclass Institutes in 54 countries from all continents save Antarctica participated. A total of 188 institutes registered for the program with CERN video conferences and were scheduled in 59 videoconferences with CERN, with a maximum of two video conferences in parallel and up to five institutes in each video conference. These included 266 individual International Masterclasses with the following breakdown per experiment: ALICE: 30, ATLAS: 131, CMS: 64, LHCb: 39.

Fermilab physicists moderated an additional 19 videoconferences for Masterclass Institutes in countries from America, Asia, and Oceania. Another two video conferences were held in Spanish for participants in South America. In total, 51 research labs participated in videoconferences with Fermilab. TRIUMF held an additional video conference with groups from British Columbia, Canada.

SCOPE OF PARTICLE PHYSICS MASTERCLASSES

Within the framework of IMC, six different measurements with data from the four major experiments at the LHC are available: two from ALICE, two from ATLAS, one from CMS, one from LHCb³. In 2019, all measurements remained stable with minor updates.

U.S. physicists have developed a Neutrino Masterclass⁴ with data from the MINERVA experiment. In this Masterclass, students examine the interactions of muon neutrinos with a carbon target, using the MINERVA event display ARACHNE. They extract kinematic information to measure the properties of neutrons in the carbon nucleus. They use this data to test two simple interaction models (free neutrons and Fermi gas), discovering the Fermi

By Ken and Uta

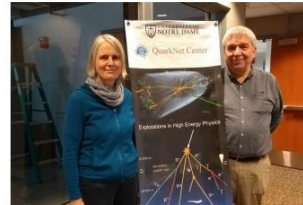
¹ www.physicsmasterclasses.org

² <http://ipog.org/>

³ https://physicsmasterclasses.org/index.php?cat=local_organisation&page=measurements

⁴ <https://quarknet.org/content/neutrino-masterclass-project-map-2019>

PHOTOS



REGISTRATION INDICO EVENT 865864

Masterclasses Curious?

When: Thursday 28 November at 11:00 and 11:45
Where: Room Georges Charpak, 600-015

Need checklist to see how students learn from real measurements from ATLAS, CMS, ALICE, LHCb, Belle II from IMC or MINERVA from Fermilab.



GLOBAL COSMICS GROUP

The Global Cosmics Group was founded in order to bring together and enable closer cooperation between the worldwide existing informal science education and outreach programs in the field of astroparticle physics.

For this reason, all representative scientists from cosmic outreach, education and citizen science projects are invited to participate in the group. An overview of the projects involved can be found in fig. 1. It is an open group that meets once a year at the annual IPPOG Spring Meeting. At this meeting, ideas are collected, exchange is encouraged and activities for long-term collaborations are discussed.

The attending scientists are multipliers by sharing the information to their local networks. A common website provides an overview of the existing projects worldwide. This website will be integrated into the new IPPOG website in the future. Moreover, the website will be expanded so that more content can be shared.

As examples of intensified international cooperation in recent activities, International Muon Week and the International Cosmic Day are highlighted in this report. Both events are organized once a year and focus on high school students. The primary aim is to bring together scientists, teachers, and students to perform an experiment with atmospheric muons and thereby to learn more about cosmic rays.

International Muon Week is organized by QuarkNet and took place from April 1-5, 2019. During this week, all participating groups were asked to have their detectors running for 24 hours a day, 7 days a week. Subsequently, the data and measurement results were shared on a common website. This year, 54 groups participated worldwide which meant a significant increase in participation and

international cooperation compared to 2018 with 12 participating groups. A particularly large number of groups were integrated into the Italian EEE project of Centro Fermi in 2019.

Subsequent to Muon Week, International Cosmic Day took place on 6 November, 2019, organized by DESY. Here, all participating groups investigated an identical question. The students were encouraged to work together as an international collaboration and then to discuss their results in joint videoconferences. To create a lasting event, all participating groups were asked to document their results for the day with images, comments or notes, and their measurement results were recorded on one common page. All proceedings were published in a booklet and distributed to the participants. Similarly, in this event, the Italian groups played a major role, organised by the EEE project and by the OCRA project from INFN. So, International Cosmic Day is a growing event that is gaining in popularity (see fig. 2). A quiz on Kahoot!, a game-based learning platform, and a selfie contest on Instagram and Facebook accompanied the day on social media.

Both offers, International Cosmic Day and Muon week, have proven to be successful and are referred to as unique experiences by teachers and students alike.

Country	Name	Website
FINLAND	Calio Lab	https://caliolab.com
FRANCE	Cosmos à l'École	http://www.sciencesalecole.org
FRANCE	e-PÉRON	https://eperon.omp.eu
GERMANY	Netzwerk Teilchenwelt and Cosmic@Web	https://www.teilchenwelt.de https://cosmic.desy.de
ITALY	Extreme Energy Events EEE	http://eee.centrofermi.it/
ITALY	OCRA	https://web.infn.it/OCRA/
NETHERLANDS	High School Project on Astrophysics Research with Cosmics (HISPARC)	http://www.hisparc.nl/en/
POLAND	Cosmic-Ray Extremely Distributed Observatory (CREDO)	http://credo.science/ https://www.zooniverse.org/projects/credo/dark-universe-welcome
RUSSIA	Showers of Knowledge	http://credo.science/ https://www.zooniverse.org/projects/credo/dark-universe-welcome
SPAIN	Cazadores de Rayos Gamma	http://www.cazadoresderayosgamma.com/
SWEDEN	Cosmic ray outreach in Stockholm	http://vetenskapenshus.se/loopiadsn.com/info-kosmisk-stråling
TAIWAN	QuarkNet-TW	http://hsiaoscu.pbworks.com/w/page/19665685/Quarknet-TW-page
UK	Detecting Cosmic Rays	http://www.ep.ph.bham.ac.uk/twiki/bin/view/General/QuarkNet
UK	High School Project on Astrophysics Research with Cosmics (HISPARC)	http://www.hisparc.nl/en/
UK	QuarkNet Cymru	http://blogs.cardiff.ac.uk/physicsoutreach/2016/11/03/quarknet-cymru/
USA	Cosmic Ray e-Lab Studies	https://www.12u2.org/elab/cosmic/home/project.jsp

Fig. 1: Involved Projects in Global Cosmics Group

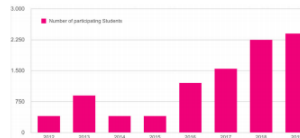


Fig. 2: Number of participating students from 2012 to 2019

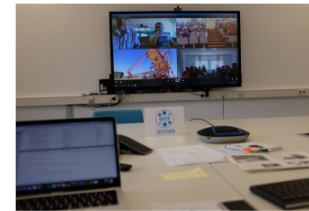


Fig. 3: Video conference at International Cosmic Day between school groups and scientists at the H.E.S.S. telescope

IPPOG PRESENCE IN CULTURAL FESTIVALS IN 2019

IPPOG supports its members to organise activities in music and science festivals, public sessions in conferences and other events reaching a wide variety of audiences. Below are few of the outreach events in which IPPOG participated as one of the partners.

THE BIG BANG STAGE, CZECH REPUBLIC, JUL 17-20, 2019

The Big Bang Stage was an official part of the biggest Czech music festival, Colours of Ostrava. The entire stage was dedicated to particle and nuclear physics. It offered 28 hours of programme during four days, full of talks, workshops, discussions and shows. About 3000 visitors of the stage enjoyed the programme and rewarded organizers with feedback like "Absolutely loved it!" or "Very nice opportunity to extend knowledge in between concerts." The organization team also prepared additional accompanying activities for the festival visitors: two hands-on tents where people could touch and try simple physics experiments and virtual reality videos about CERN on VR glasses. These activities attracted an additional 1000 visitors. The Big Bang Stage was organized by four Czech Universities, Vojtech Plieskot (IPPOG Czech Representative), Cornie Potter (CERN) and The Big Bang Collective, discussion forum Meltingpot, The Science and Technology Center Ostrava and IPPOG.



By Ivan, Vojtech and Steve

21

MAGICAL SCIENCE AT POHODA FESTIVAL, SLOVAKIA, JUL 11-13, 2019

Pohoda is the largest art/music festival in Slovakia with a limited capacity of 30 000 visitors. The physics programme in the Magical science tent ran on Friday Jul 12, 9:00 – 13:30 and Saturday Jul 13, 9:00 - 13:30. It included seven lectures (from "What have CERN and the LHC ever done for you" to "Smells, pheromones and passion") and five workshops (from "Cloud chamber workshop" to "The physics of beer workshop"). The programme was amazingly successful with the total audience of about 5000 people. The Magical science was organized by Cornie Potter (CERN), Roger Jones (Lancaster U), Chris Thomas (Iowa U), Larry Lee (ATLAS) and a local team: T. Dado, R. Astalos, J. Tekel, S. Kovacki, B. Sitar, I. Melo (IPPOG Slovakia Representative) and 5 assistants. Financial support came from IPPOG and the Slovak committee for cooperation with CERN; in-kind contribution from Pohoda (Magical tent with all equipment, accommodation, food and beer for the beer workshop). Vedator.sk and FMFI Comenius University supplied speakers and volunteers, CERN gave permission to use its logo.



Credit :-Martina Zimova @Pohoda Festival-

UNIVERSAL SCIENCE AT CHER, ADELAIDE, AUSTRALIA, NOV 3, 2019

IPPOG hosted the 2nd edition of Universal Science on the eve of CHEP 2019, the International Conference on Computing in High Energy and Nuclear Physics. The event brings together the local public with participants of the conference, in order to maximise engagement between the groups. This is accomplished through a combination of hands-on exhibits, short presentations,

and a highly interactive panel discussion. The public are presented current activities in particle physics research, worldwide computing and international collaboration, while our colleagues exercise their skills in public engagement. The full program can be viewed at <https://universalscience.web.cern.ch>. Participants and sponsors included: The University of Adelaide, IPPOG, CERN, ATLAS, Belle II, CMS, and Women in Technology. Marzena Lapka (IPPOG CMS Rep) and Steven Goldfarb (IPPOG Chair) hosted speakers Lucia Silvestris (CMS), Hannah Short (CERN IT) and Paul Jackson (IPPOG Australian Rep). Joining them in the discussion panel were Tim Smith (CERN IT) and two local students. At the demand of the 250-person public, the Q&A session was extended to an hour. Diversity in science was once more an overarching theme, and one we plan to continue to feature in future editions.



22

6.

Feed-back



Feed-back on Annual Report

We welcome your feed-back about the overall layout, content and obviously specific mistakes. To ensure that I do not miss anything I urge you to please have a look at it before the meeting and use this form to give your feed-back through this form. The final deadline for feed-back is 14th May. After that date we will proceed to the final proof and print in order to send it to the council by the end of May. We have spent a lot of hours on this and we hope you will find it up to the standards of the collaboration!

Overall design - Is there anything about the overall layout that you would like to comment

Long answer text

**Overall content - Is there anything about the overall content that you would like to comment?
Anything that we missed?**

Long answer text

Specific comments on the introduction part of the report - PLEASE MENTION PAGE AND PARAGRAPH

Long answer text

Specific comment on a member contribution that is not yours! PLEASE MENTION MEMBER AND PARAGRAPH

Long answer text

Specific comment on your submission? PLEASE MENTION MEMBER AND PARAGRAPH

Long answer text

By May 14th!

THANKS!

Any questions?