International Particle Physics Outreach Group

IPPOG Global Cosmic Rays Portal

Making Cosmic Rays Studies available to schools worldwide

Barbora Bruant Gulejova

Strategic Development and Communications Lead, IPPOG

Outline

- Why outreach in particle physics and related sciences matters
- IPPOG - strategic pillar for worldwide outreach
  - EPPSU context
- IPPOG New websites
- Global Cosmic Rays Portal
  - What? Who for? Why? How?
- IPPOG Resource Database & astroparticle physics community

Challenges of HEP / science community

Main challenges of scientific community

- Challenged financial support of large experimental endeavours
- Falling interest of young people to study physics and STEM
- Mistrust in science

Reasons

- Misperception of physics / science in society – complicated, abstract, disconnected from real life
- Lack of awareness and understanding

Why is physics & basic research misperceived?

Scarce exposure of society to modern physics

- ✓ School curricula – mostly no modern physics
- ✓ Media – misinformation and disinformation

Cell phones and computers were sewn into reality thanks to fundamental science.

Despite this:

Most students finish high school believing that there are only:

- *3 elementary(?) particles (electron, proton, neutron)*
- *2 types of forces (gravitational and electromagnetic)*

Why exposure of society to HEP matters?

Exposure to modern physics, like HEP and its technological applications **increases the interest of students in physics** and their perception of its role in society and sustainable development.

Study in Germany and UK:

General interest in physics at schools has increased strongly thanks to inclusion of extra-curriculum activities in HEP (exhibitions, Physics Masterclasses, teaching)!

European Particle Physics Strategy Update

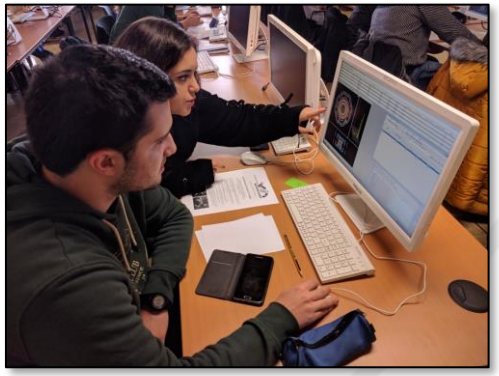
CERN-ESU-014

Exploring the fundamental properties of nature inspires and excites. It is part of the duty of researchers to share the excitement of scientific achievements with all stakeholders and the public. The concepts of the Standard Model, a well-established theory for elementary particles, are an integral part of culture. ***Public engagement, education and communication in particle physics should continue to be recognised as important components of the scientific activity and receive adequate support. Particle physicists should work with the broad community of scientists to intensify engagement between scientific disciplines. The particle physics community should work with educators and relevant authorities to explore the adoption of basic knowledge of elementary particles and their interactions in the regular school curriculum.***

7 Environmental and societal impact

Importance to update physics curricula is now officially recognised by full HEP community

International Particle Physics Outreach Group



- ✓ Outreach
- ✓ Informal education
- ✓ Extra-curricula activities

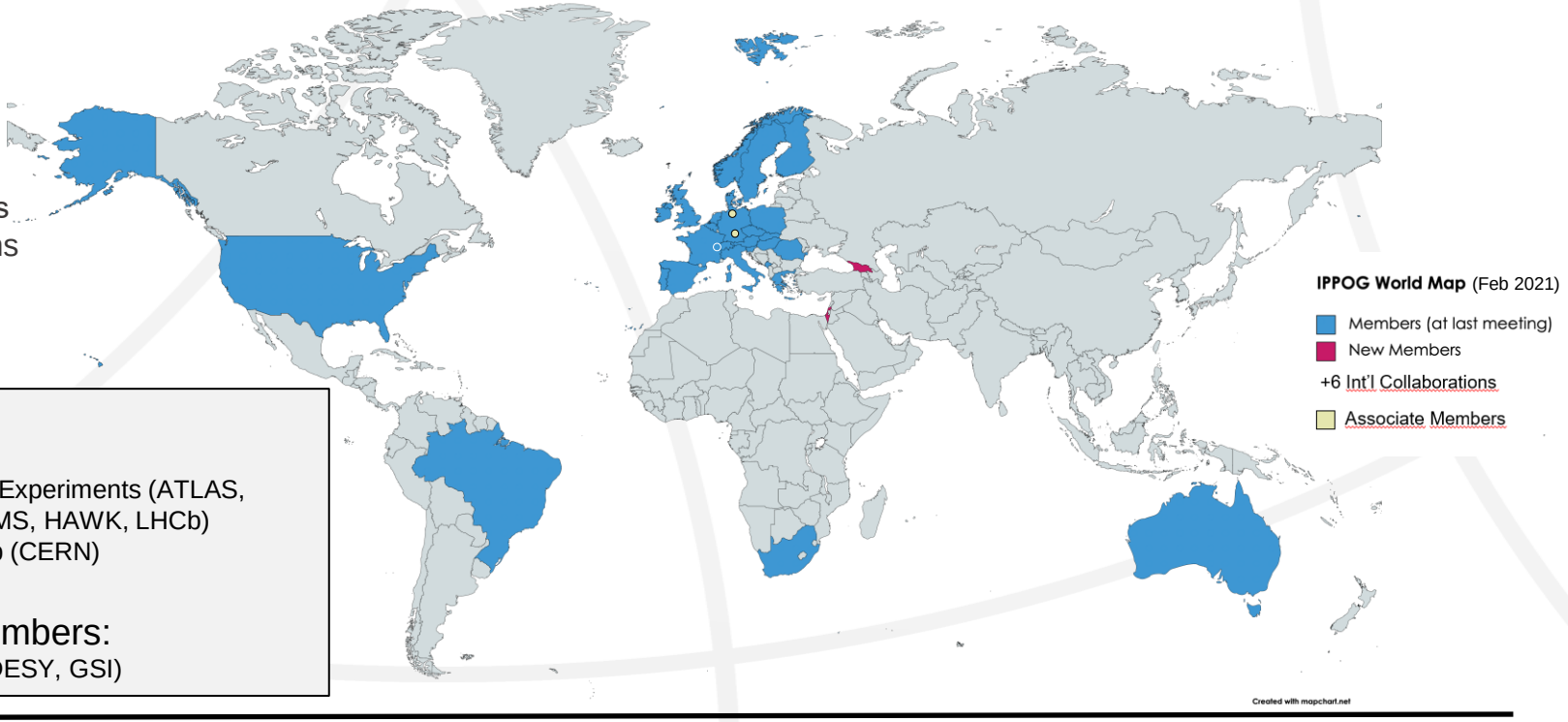
The way to bridge the gap between contemporary science and school education and increase appreciation of science by society

The International Particle Physics Outreach Group (IPPOG) has been making concerted and systematic efforts to present and popularise particle physics and related sciences across all audiences and age groups since almost 25 years.

Today, HEP and **scientific community has in IPPOG a strategic pillar** in fostering long-term, sustainable support for fundamental scientific research around the world.

IPPOG: Global Network

- Asia
- Africa
- Australia
- Europe
- The Americas
- International Labs and Collaborations



37 Members:

- 30 Countries
- 6 Collaborations / Experiments (ATLAS, ALICE, Belle II, CMS, HAWK, LHCb)
- 1 International Lab (CERN)

2 Associate Members:

- 2 National Labs (DESY, GSI)

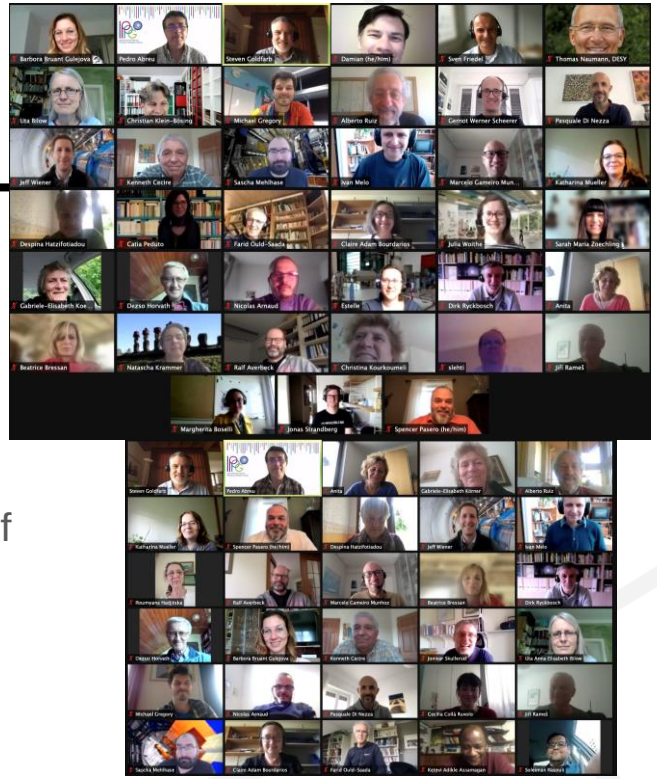
IPPOG Collaboration

International Scientific Collaboration

- Active Researchers with Experience in Education & Outreach
- Experts in Communication & Education

Mission

- **Establish Understanding** of scientific process
- **Instil Appreciation** of fundamental research and importance of evidence-based reasoning
- **Build Trust** with communities
- **Inspire Next Generation** of scientists



IPPOG meeting, May 2021

Organise Global Activities

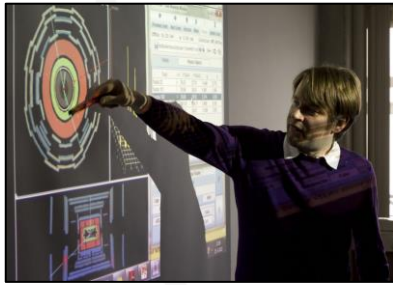
Support Local Activities

- Sharing of expertise, best practices, resources to support events, kick-start activities

Activities with global reach

International Masterclasses in Particle Physics

- Flagship activity for high schools students (15–18 y.)
- Real Data from ATLAS, CMS, ALICE, LHC-b, Belle-II, MINERvA, Hadron therapy



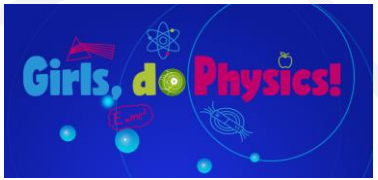
Worldwide data Day

Global Cosmics

- Network of Cosmic Rays Projects for Schools
- International Cosmic Day and International Muon Week

Resource Database

- Primary source of particle physics outreach material in the world



… and many other projects, competitions, campaigns and activities…

Broad physics scope…

Physics topics

- Particle Physics and **related sciences**
- Beyond LHC physics
- Neutrinos
- Astro-particle physics
- Heavy ions
- Gravitational waves

IPPOG and astroparticle physics

Big added value for outreach!

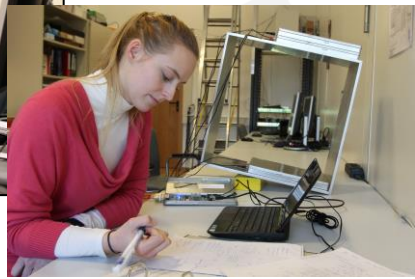
- Everybody can see stars
- Easy to accept that particles are showered on us from the cosmos
- Cosmic studies are more “tangible” for the public…
- Connection to real life and curriculum

IPPOG and astro-particle physics

IPPOG has been promoting since many years…

International Cosmic Day

- organized by DESY every year



International Muon Week

- organized by Quarknet every year

IPPOG – Community builder
Global Cosmic Rays Studies

2010: **ASPERA** meeting on **cosmic ray detectors** at CERN

High school cosmic ray projects representatives expressed interest to:

- Develop common website with real data available
- Enable teachers and students worldwide with or without detector

  - to design and conduct cosmic studies

  - using data from existing projects

2015: **IPPOG** meeting: **Panel with 5 original cosmic rays projects**

- COSMIX, Extreme Energy Events, HISPARC, QuarkNet, Teilchenwelt Netzwerk
- Interest expressed from both IPPOG and projects to continue dialogue
- Partnership with APPEC discussed

2016: **Panel discussions on Global Cosmic Rays collaboration** at IPPOG meetings

- Continued common efforts and strategic discussion how to kick-off the project

IPPOG – Community builder
Global Cosmic Rays Studies

2017: **Workshop on High School Cosmic Ray Experiments** in Rome, Centro Fermi

- 2 days meeting organized by IPPOG
- 25 experiments / cosmic rays programs shared information and experiences
- Identification of projects willing to provide experiments, results & data for educational purposes:
- Finland, France, Germany, Italy, Poland, Russia, Spain, Sweden, Taiwan, UK, US

2017 - 2018 **IPPOG Global Cosmics Steering Group** created

- Convener: Carolin Schwerdt (DESY)
- All projects temporarily listed at the ICD website: https://icd.desy.de/e49245/

2018: **IPPOG New online portfolio development started….**

- Decision taken to build the Global Cosmic Studies Educational Platform as part of the new IPPOG website and developments…

IPPOG New Websites

IPPOG website major upgrade and build-up (2018-2021):

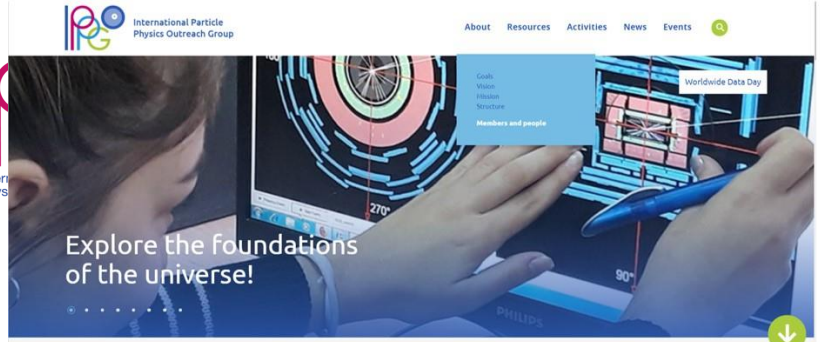
- *improve the user experience across the IPPOG digital portfolio*
- *strengthen IPPOG online presence by creating a new website including new Resource Database and new Global Cosmic Rays Portal*
- *greatly broaden the audience type and use of the webpages & available resources*

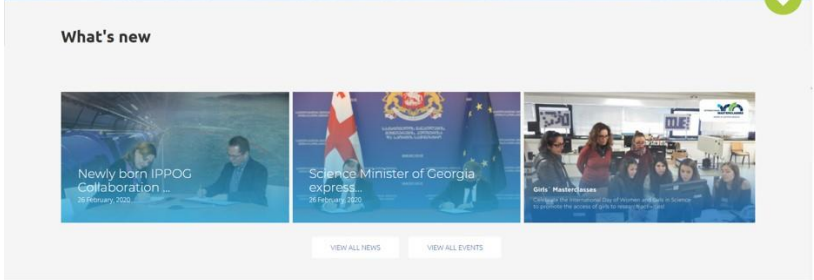
"IPPOG wants the new website to become more open to students, teachers and the general public"

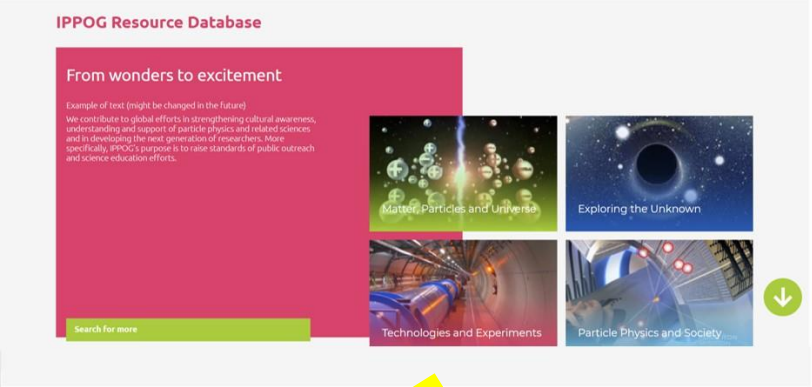
Global Cosmic Rays Educational Portal

- **Universal platform** including **all available CR projects** (with open data)
- Information on **Astroparticle Physics**
- List of **all projects**, each with **entry webpage** with description and links, **World map**
- **Events:** possibility to request information, to join etc…
- **Resources:** - background information on detectors etc…
  - data, analysis tools
  - educational framework for students investigations
  - info on how to build, buy or borrow detector for classroom use

IPPOG wants to enable all teachers and students around the world to participate in cosmic rays studies all year long.

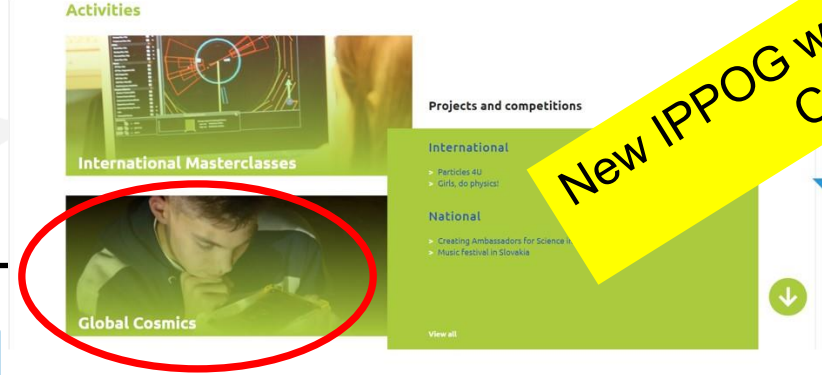


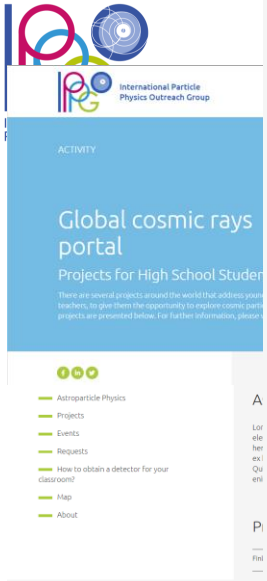




Scroll down

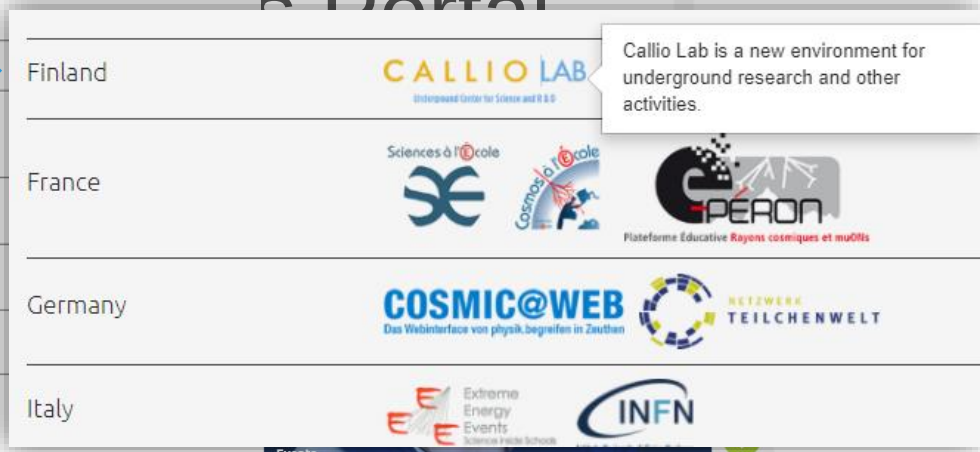
New IPPOG website under development
Currently BETA-TEST!





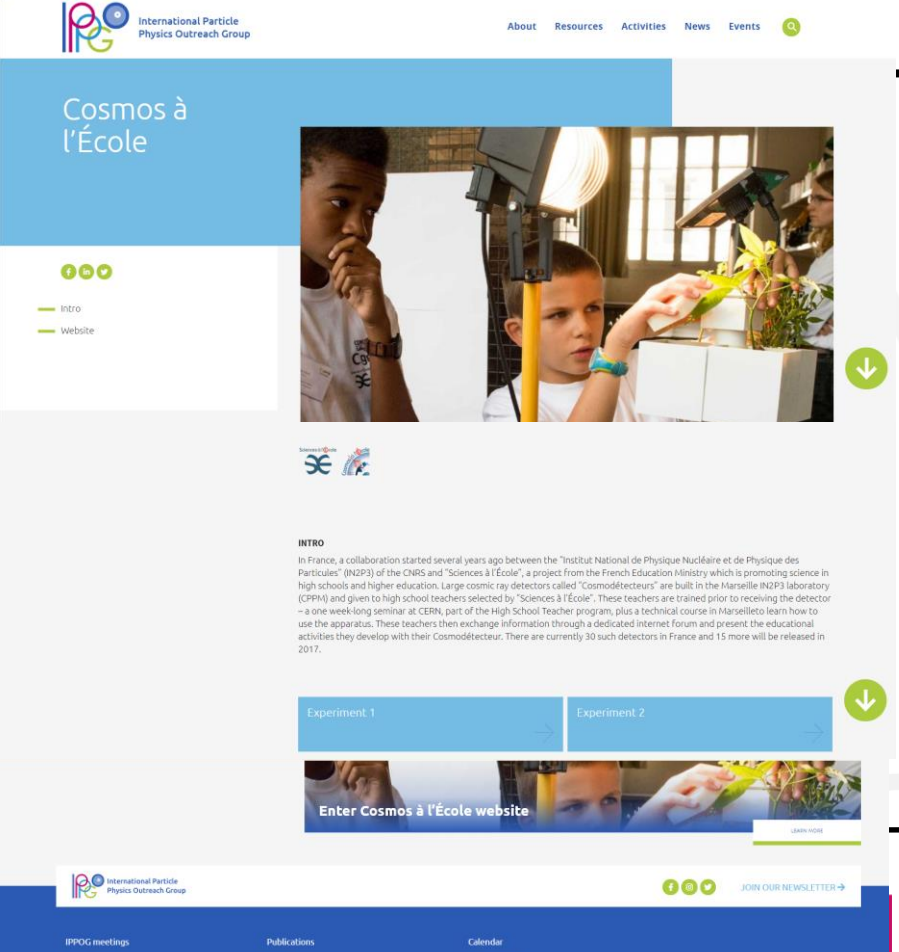
Projects

Finland	CALLIO LAB
France	Sciences à l'École, Cosmos à l'École, EPERON
Germany	COSMIC@WEB, NETZWERK TEILCHENWELT
Italy	Extreme Energy Events, INFN
Poland	CREDO
Japan	探Q
Russia	Showers of Knowledge
Spain	CAZADORES DE GAMMA
Sweden	
Taiwan	QuarkNet-TW
UK	UNIVERSITY OF BIRMINGHAM, HiSPARC, QuarkNet Cymru
USA	QuarkNet



Callio Lab is a new environment for underground research and other activities.

Global Cosmics Projects Pages



PROPER URL (as part of GC portal):

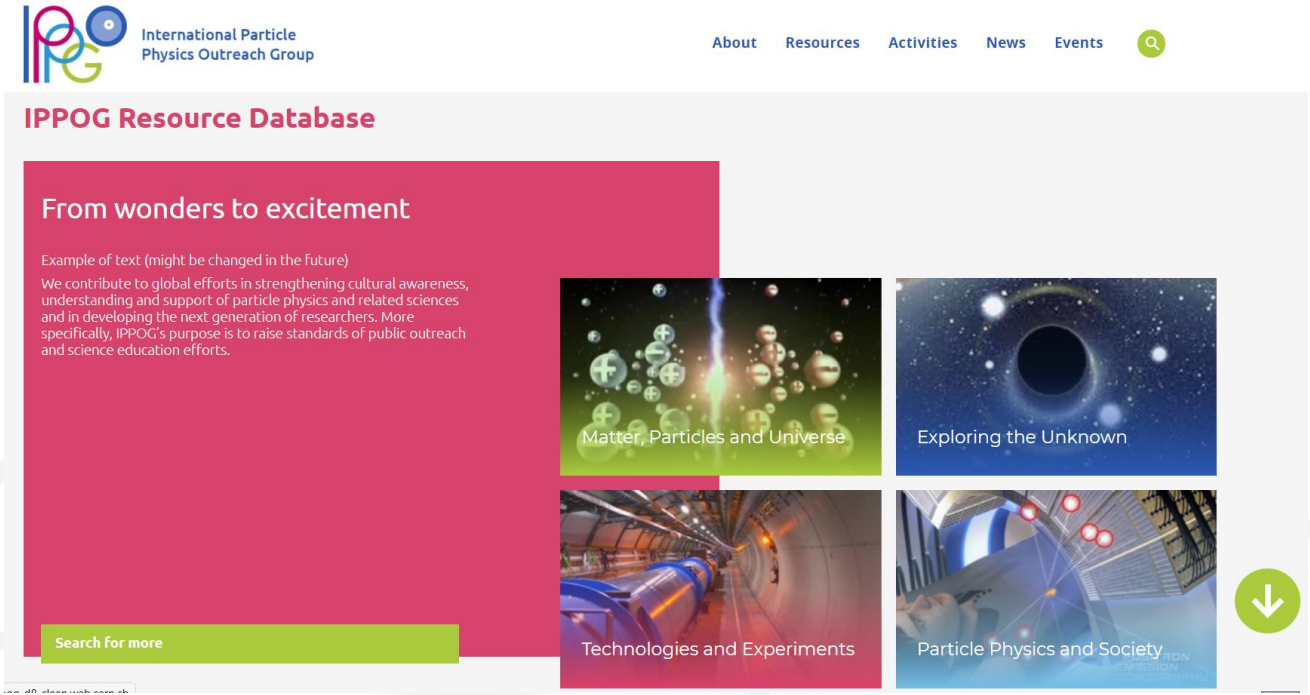
https://ippog.org/global-cosmics/cosmos-lecole

NEXT STEPS:

- Beta-testing of IPPOG website till 31/8/2021 (test-ippog-d8-clean.web.cern.ch)

  FEEDBACK WELCOME!
  barbora.gulejova@cern.ch
- Collecting final input from all projects (Global Cosmics Steering Group)
- Publishing end 2021

IPPOG Resource Database



New IPPOG Resource Database is / will be…

- *…form to facilitate the exchange of HEP E&O resources across the globe*
- *col… …ngaging materials (e.g. videos, posters, talks, hands-on activities, too…)*
- *content recommended by ex…*
- *to share wonders and excitement of HEP w… …nd general public*
- *readily understandable and regularly updated to reflect the… …EP*
- primary source of HEP outreach material in the world

Ideal place for educational and outreach materials also for Astro-particle physics community!

THANK YOU

barbora.gulejova@cern.ch