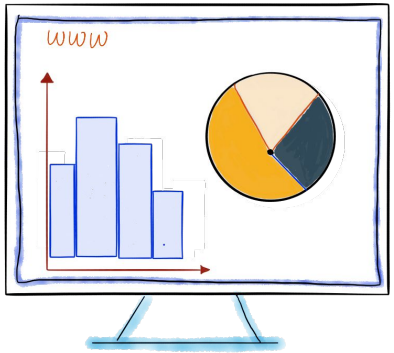
Professional Outreach
by Large Physics Endeavours



Arturo Sánchez Pineda

University of Udine, ICTP and INFN

Interpreting the LHC Run 2 Data and Beyond @ ICTP - Trieste, May 29th, 2019

Present professional associations

My current job

As supporter / co-founder

Large **Physics** Endeavours, in particular, High Energy Physics Collaborations, work to create or boost **Outreach Groups** that work on making their field accessible for *free*.

Today's presentation is about some of those **efforts on training, education, integration and professional career paths.**

I hope you like the story…

…at least in my mind it goes like this :)

The HEP community, has the responsibility and the need **to**

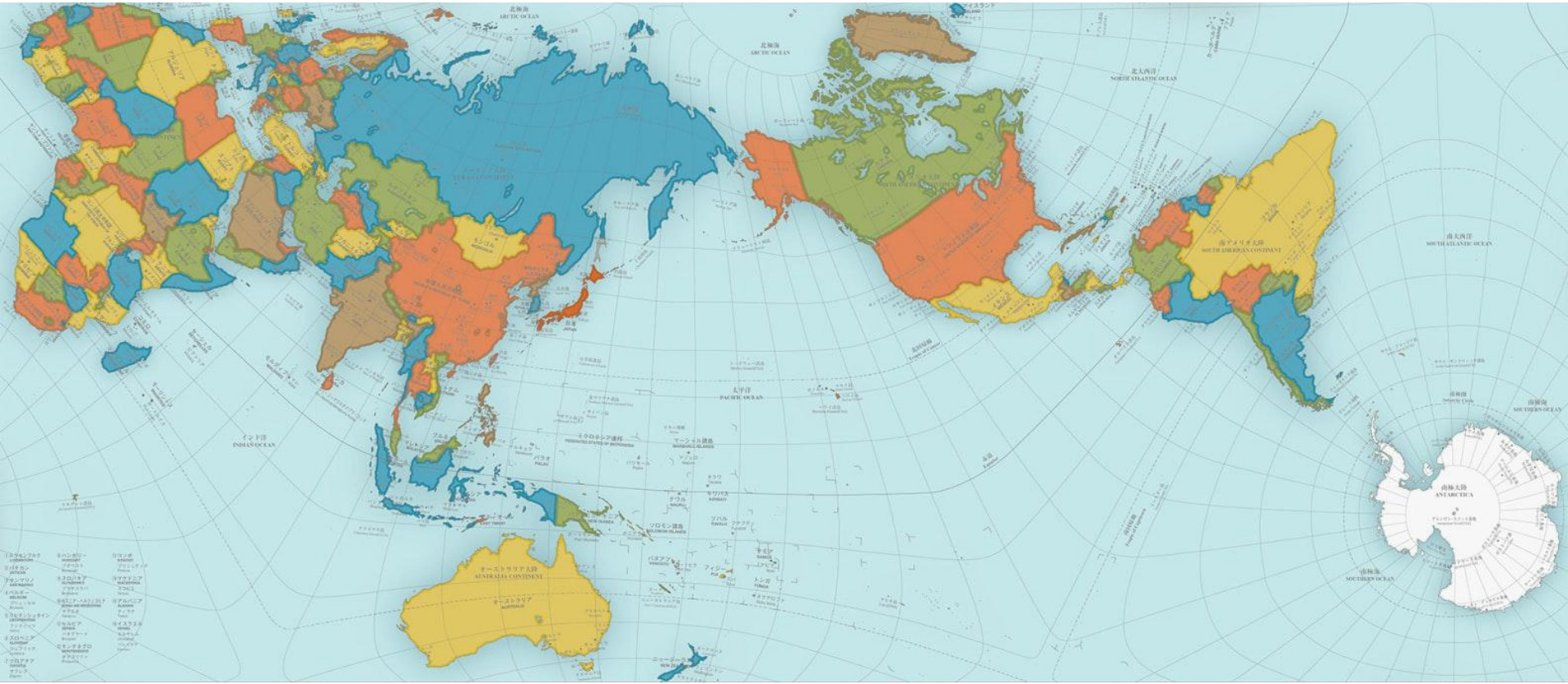
CERN

LHCb

ATLAS EXPERIMENT

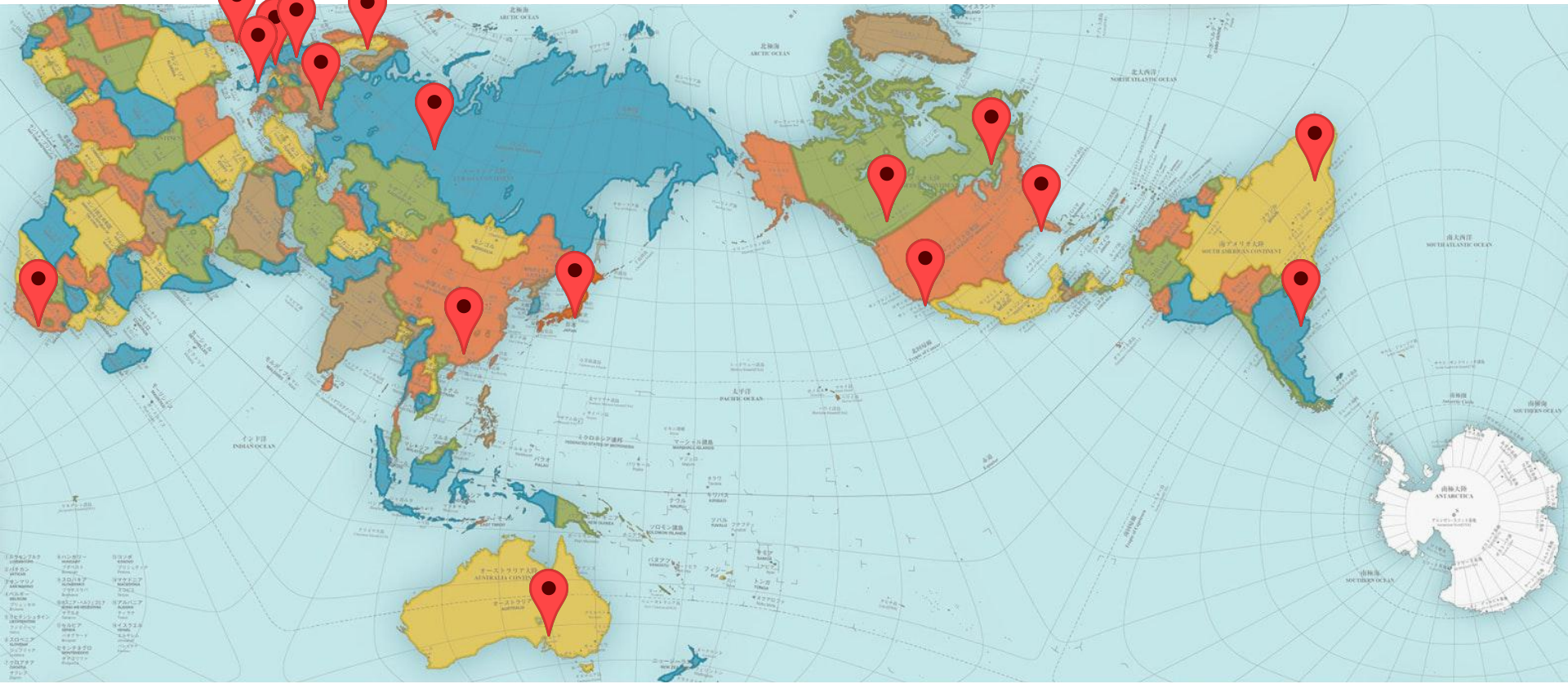
...

transfer knowledge and training **to**



Source → http://www.authagraph.com/category/about

its members institutions **and**



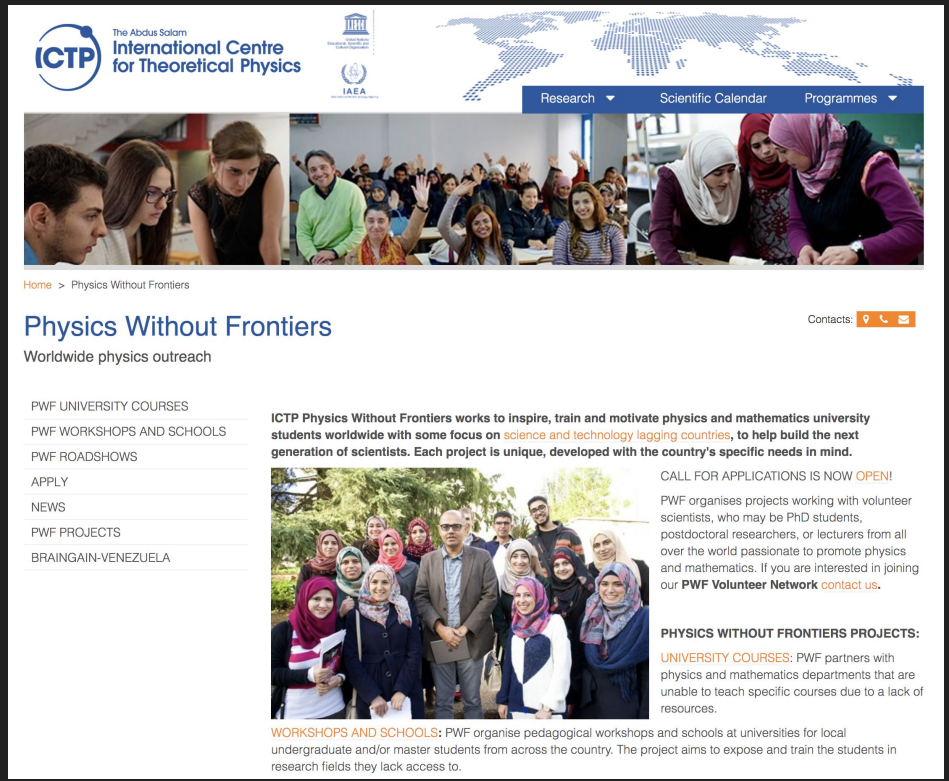
everybody else!

Source → http://www.authagraph.com/category/about

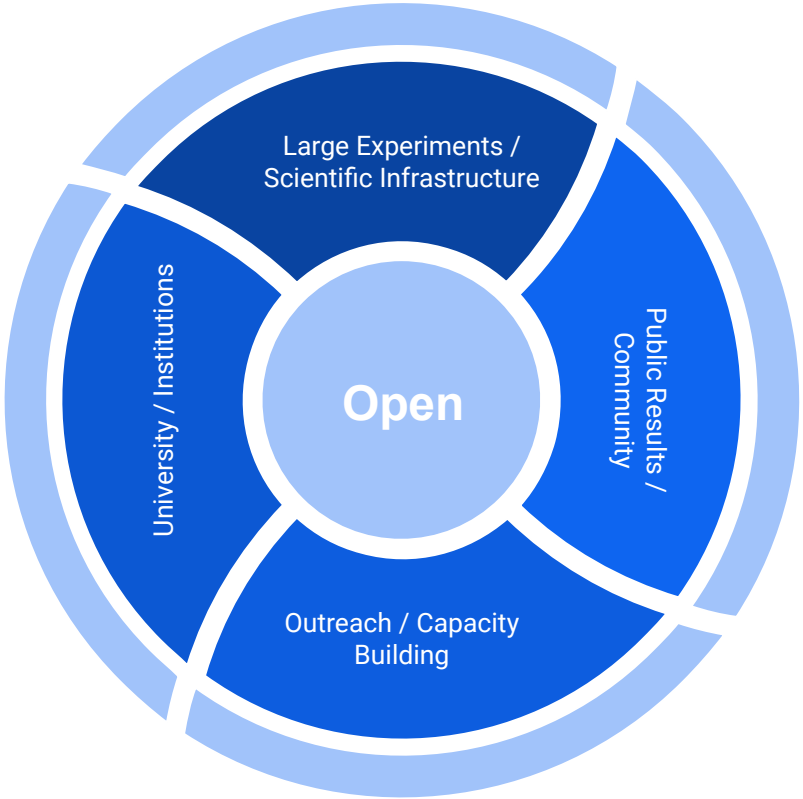
Professional Outreach Large Physics Endeavours

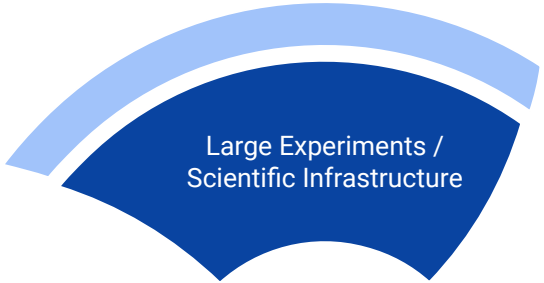
Why?

- Science
- Funding
- People's awareness
- STEM education
- National or Regional Integration
- Diplomacy
- Economy
- ...



https://www.ictp.it/physics-without-frontiers.aspx


Large Experiments / Scientific Infrastructure
Public Results / Community
Outreach / Capacity Building
University / Institutions
Open



Large Experiments / Scientific Infrastructure

The scientific collaborations produce an incredible amount of data and technological resources while performing basic research

University / Institutions

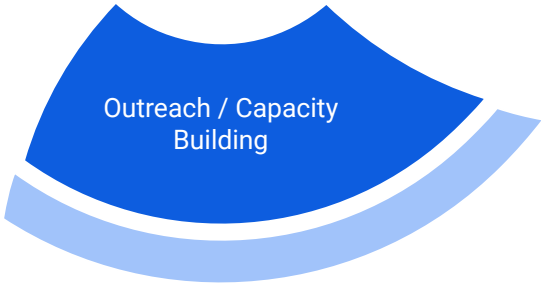
Around the planet are members of those experiments, they deliver the knowledge to students that will integrate the future Human resources for those large scientific endeavours
Non-members universities do the same too! As well, they take part of knowledge production

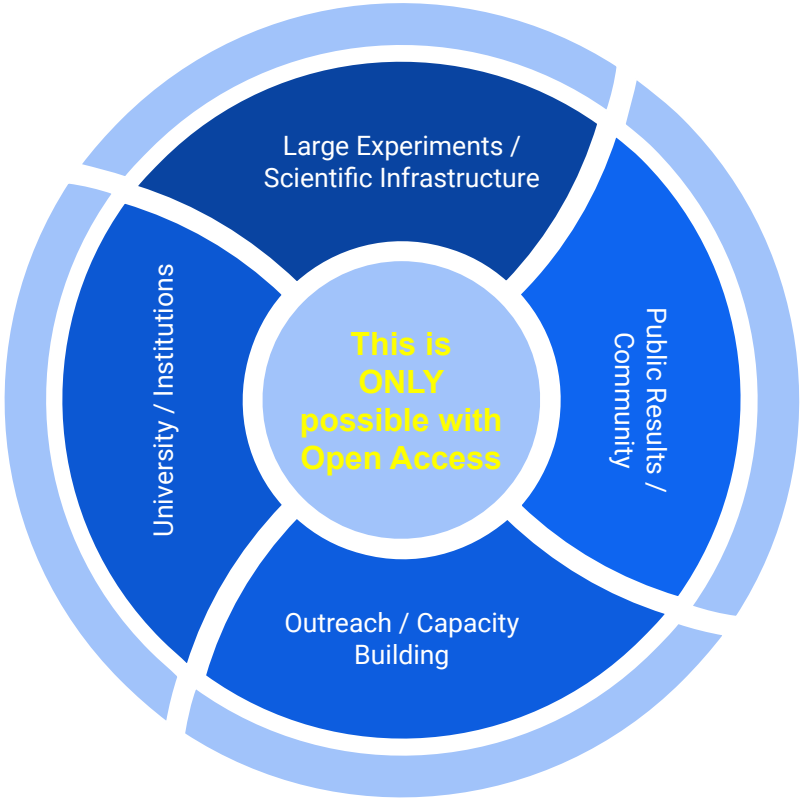
Public Results / Community

We deliver the final scientific results to the public using Open Access.
Besides that, events and public conversations are done all the time by the members of the scientific collaborations

Outreach / Capacity Building

From children in a public event, to small workshop to primary students. Also work-experiences with high-school students,... to dedicated online courses and training in advanced knowledge: Outreach is vital for the survival of sciences




Large Experiments / Scientific Infrastructure
Public Results / Community
Outreach / Capacity Building
University / Institutions
This is ONLY possible with Open Access

Professional Outreach Large Physics Endeavours

Who?

- Large Scientific Facilities
- Multinational Experiments
- National and International consortia
- Universities and Research Institutions
- ONGs
- Industry
- ...

https://cerncourier.com/

For example https://atlas.cern

The ATLAS Experiment has a wide range of educational resources available for students and teachers. Explore the categories below to find out how you can engage with ATLAS.

Primary School Students

Resources for students aged 5-12

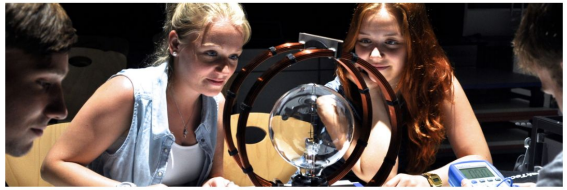
Secondary School Students

Educational initiatives for students aged 12-18

University Students

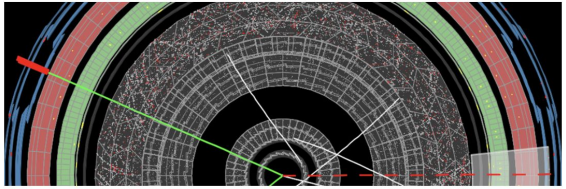
Opportunities for Undergraduate, Masters and PhD students

Teachers



Ideas for physics and science educators

Citizen Science



Resources & Multimedia

The ATLAS Collaboration and the broad set of HEP experiments rely on public funding to support their programs.
Even more important, their **continuity depends on a constant integration and replacement of human power.**

Humans -**students, professionals**- that need to be trained by other senior members of those collaborations.

We can call it **Knowledge Transfer**, and it goes in both ways: to retribute to society and to keep running the -even more- large scientific endeavours worldwide.

No single nation or entity can do this job alone, nor it should do so. **When knowledge is everybody's property, progress is possible and equally distributed.**

Professional Outreach Large Physics Endeavours

The only way I see how this can be done is with

Open

- Access
- Source
- Data
- Software
- Hardware

https://www.youtube.com/watch?v=CTfp2woVEkA

WELCOME

CERN Courier – digital edition

Welcome to the digital edition of the March/April 2019 issue of *CERN Courier*.

In March 1989, Tim Berners-Lee, while working at CERN, released his proposal for a new information-management system. Within two years, the web was born. CERN's subsequent agreement in 1993 to place the underlying software in the public domain (reproduced in this issue) shapes the web's character to this day. It is part of a culture of sharing and collaboration that was set out in the CERN Convention 40 years earlier, and which is deeply engrained in the software and particle-physics worlds. The features in this issue – from open-source software, to open-access publishing, open data and entirely open analysis procedures – show how far ahead our field is in the growing open-science movement. Our Viewpoint, meanwhile, argues that we have only begun to harness the full potential of the web to benefit humanity.

On other pages of this issue – the second in the Courier's new format – theorist Nima Arkani-Hamed explains why the world needs a new collider, physicists reflect on 40 years of fixed-target experiments at CERN's North Area, sterile neutrinos come under increasing pressure from experiment, a survey assesses the impact of working at CERN on your career, supersymmetric lasers demonstrate advanced theoretical physics in action, and more.

To sign up to the new-issue alert, please visit:
http://cerncourier.com/cws/sign-up.

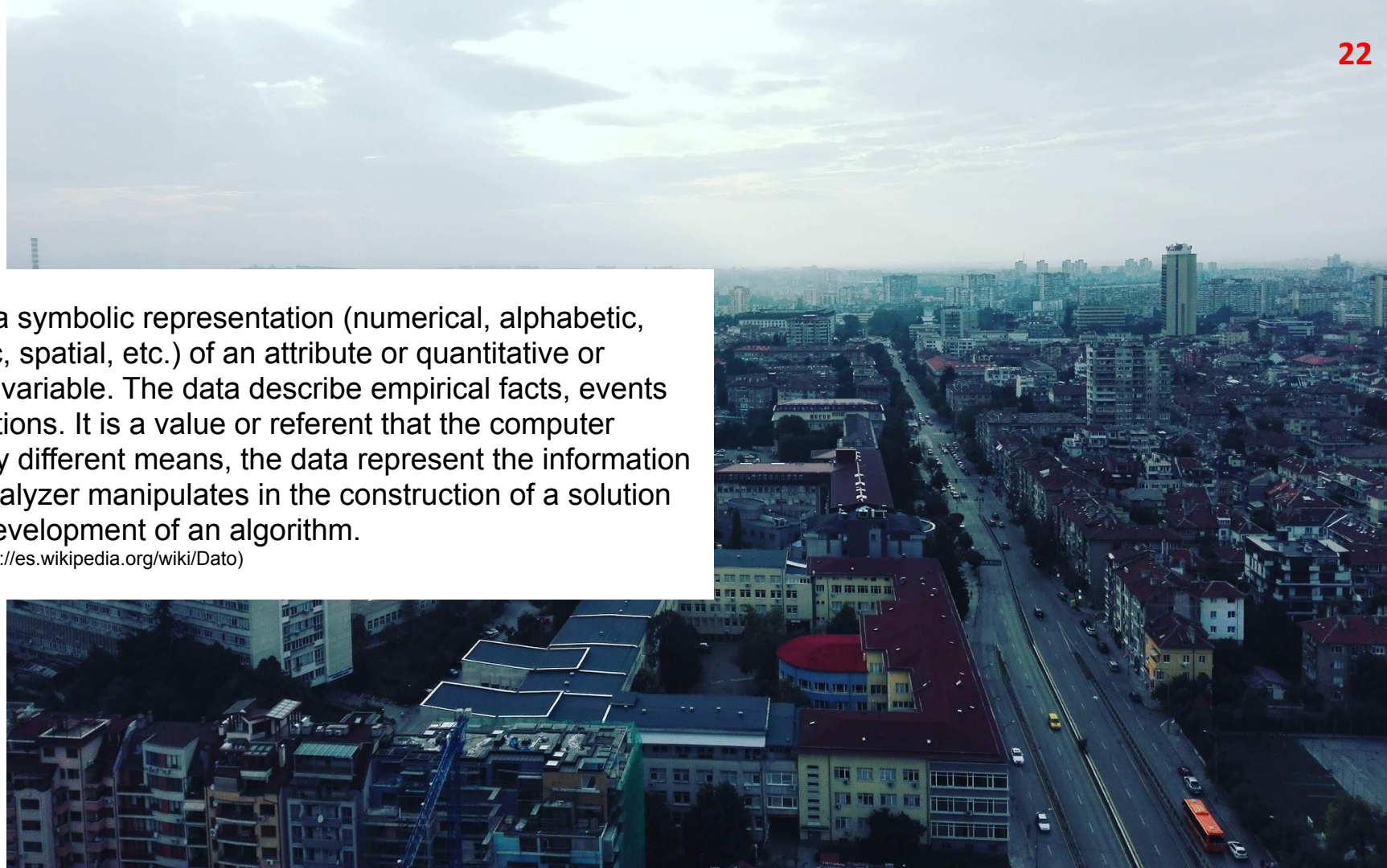
http://iopp.fileburst.com/ccr/archive/CERNCourier2019MarApr-digitaledition.pdf

Professional Outreach Large Physics Endeavours

How?

- Institutions and publishers
- Open Access
- Open Source
- FAIR (findable, accessible, interoperable and reusable) data
- CERN Open and LHC Open Data projects
  - CMS and ATLAS
- Educational programs
  - IPPOG
  - CEVALE2VE
  - ...

https://www.isis.stfc.ac.uk/Pages/PARI2019.aspx

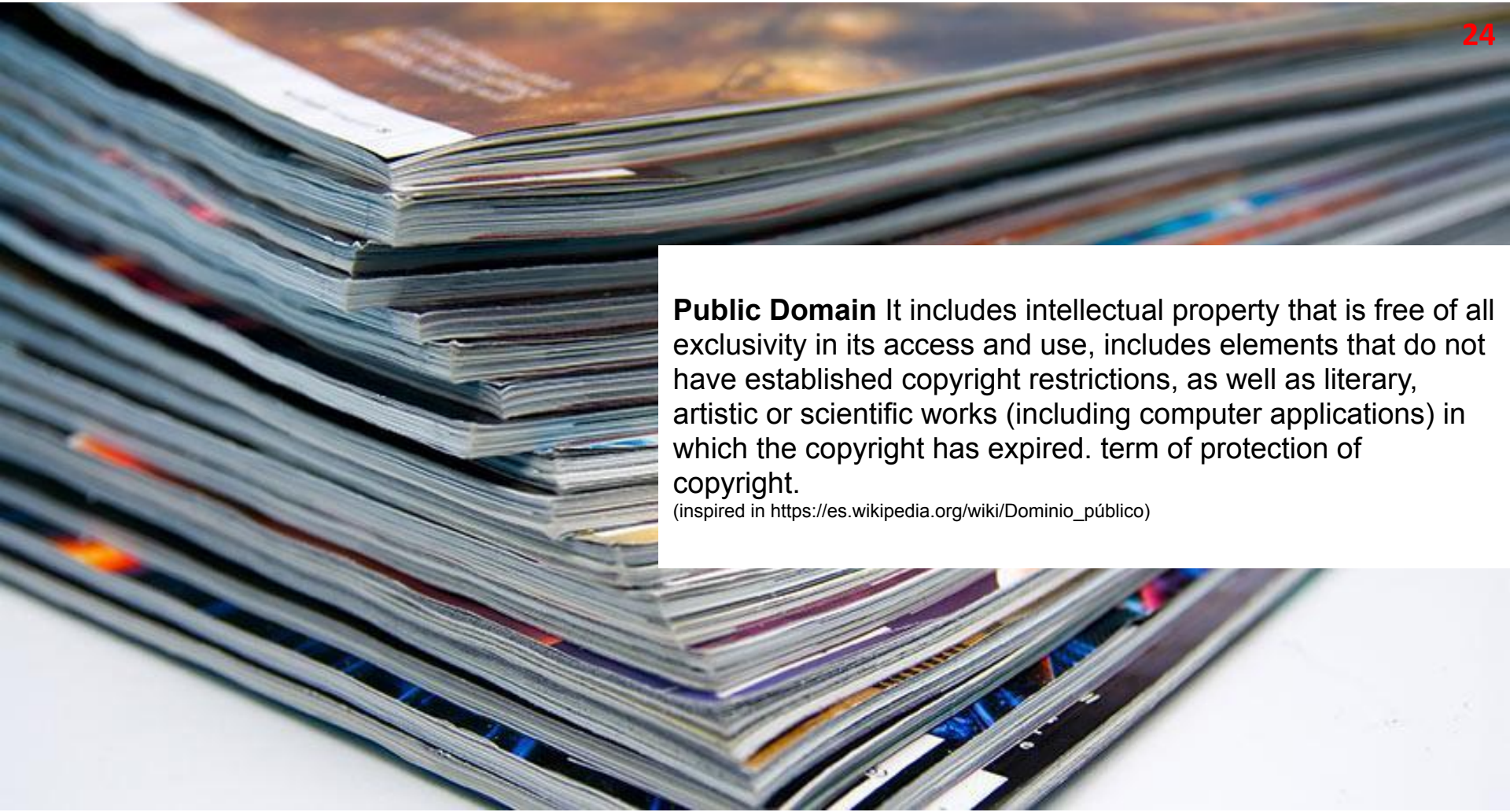


Data, it is a symbolic representation (numerical, alphabetic, algorithmic, spatial, etc.) of an attribute or quantitative or qualitative variable. The data describe empirical facts, events and institutions. It is a value or referent that the computer receives by different means, the data represent the information that the analyzer manipulates in the construction of a solution or in the development of an algorithm.
(inspired in https://es.wikipedia.org/wiki/Dato)

Software, the software of a computer system, which comprises the set of necessary logical components that make it possible to perform specific tasks.

The logical components include, among many others, the computer applications,... the operating system, which basically allows the rest of the programs to function properly, also facilitating the interaction between the physical components and the rest of the applications, and providing an interface with the user.

(inspired in https://es.wikipedia.org/wiki/Software)

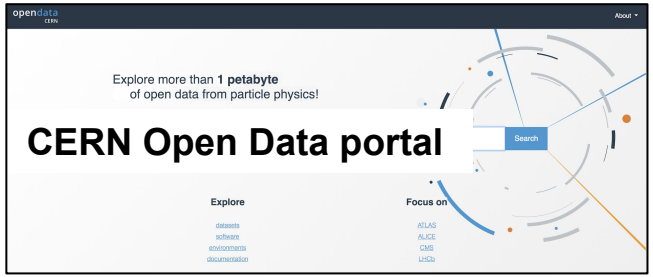


Public Domain It includes intellectual property that is free of all exclusivity in its access and use, includes elements that do not have established copyright restrictions, as well as literary, artistic or scientific works (including computer applications) in which the copyright has expired. term of protection of copyright.
(inspired in https://es.wikipedia.org/wiki/Dominio_público)

Licences, allow restrictions on the ownership, commercialization and / or use of a certain creation.

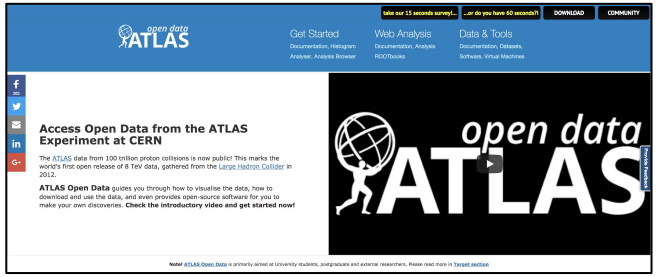
They can range from the well-known **CopyRight** to the various licenses generated and distributed by organizations such as the MIT, GNU and **Creative Commons**

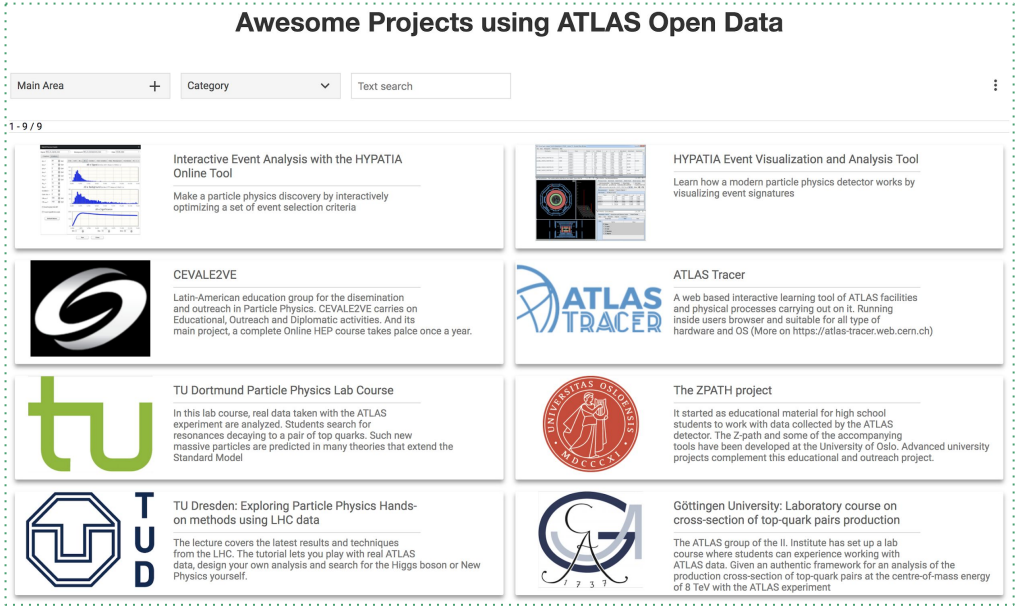
(https://network.creativecommons.org)



http://opendata.cern.ch/

Several platforms exist, developed by the HEP community to reach and hub Groups and Resources





Professional Outreach Large Physics Endeavours

How?

- Examples Educational programs

https://www.facebook.com/notes/arturo-sanchez/physics-outreach-colombia-and-the-ictp-physics-without-frontiers-cevale2ve/10155802613906088/

Centro Virtual de Altos Estudios de Altas Energías (Venezuelan chapter, CEVALE2VE)

cevale2
Centro virtual de altos estudios de altas energías
http://www.cevale2ve.org

- Initially started by a group of venezuelans postdocs based in European and North-American institutions to help promoting particle physics in Venezuelan and Colombian universities
- **CEVALE2VE is now a regional effort with key members from Mexico, Colombia and Venezuela** and organise several training and educational activities
- I.e. CEVALE2VE developed a 60-hours virtual course "Introduction to HEP" for master and PhD students
- **More than 100 students so far... In 2019, ~40 students from Guatemala, Peru, Ecuador, Mexico, Brazil, Chile, Colombia, Venezuela are following the course**
    - In many of those cases is a formal course in their physics curriculum, getting credits for it, thanks to the support of the local professors
- **Many of these students have continued a career in HEP**
- **A dozen have participated in HEP international schools, six are doing a master in HEP and five are following PhD studies**

http://atlas.cern/updates/atlas-blog/HEP-education-worldwide-with-atlas-open-data

2019 — **5th "IPP" + 4th PWF-LA program**

The call was opened in social media, reaching a broader group of institutions and students. We are currently running the course. And the PWF program is already proposed for evaluation.

2018 — **4th "IPP" + 3rd PWF-LA program**

The course had a lower participation but those students that reached the end, continue their path into HEP studies. At the same time, the PWF program visited Uruguay and Argentina too.

2017 — **3rd "IPP" course + 2nd PWF-LA program**

Students from Peru joined the course, and a second round-trip to Latin America strength the network and opened the opportunity to get visibility in the region.

2016 — **2nd "IPP" course + alliance with ICTP**

Different instructors and more students joined to the classes. While another modus operandi was implemented. The CEVALE2VE group joined the ICTP-PWF program.

2015 — **1st "Introduction to Particle Physics"**

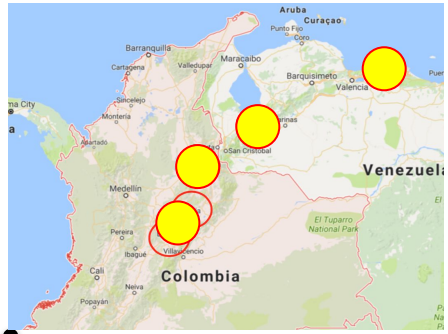
The course, called "Introducción a la Física de Partículas" or "Introduction to Particle Physics" goes official. Venezuelans and Colombians students are present.

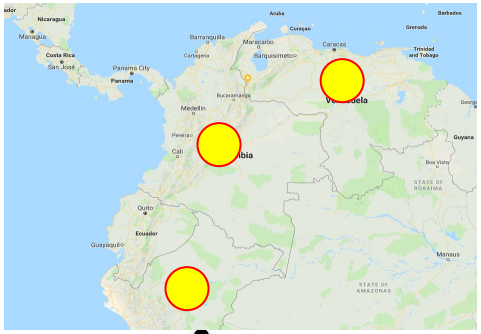
2014 — **CEVALE2VE created as outreach project**

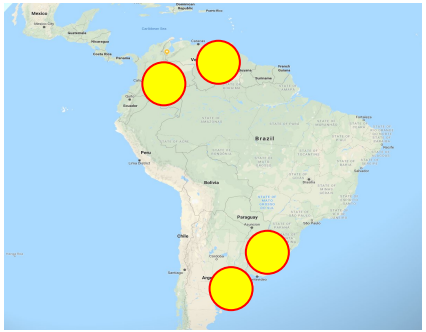
Venezuelans researchers working in international collaborations (CMS, ATLAS, ISOLDE, TOTEM, PICSEL,...) together with researchers and professors in Venezuela created a set of seminars and design a particle physics "course".

ICTP Physics Without Frontiers program (ICTP-PWF) in Latin America

- The Latin American section of the ICTP Physics Without Frontiers program is an effort leading by the ICTP, in coordination with Venezuelan and Colombian researchers.
- The team has organised roadshows annually since 2016.
  - The roadshows were also supported by the ATLAS experiment and the CEVALE2VE group.
- Several educational activities take place during the roadshows including seminars by LHC physicist, hands-on sessions where the students analyse LHC data collected by ATLAS, virtual visits directly to scientists working at CERN and career and opportunities sessions in HEP.







2015

First conversations with the ICTP
Venezuelans and Colombians researchers starts to coordinate a pilot project for their countries

2016

The 1st edition of the PWF-LA
The first edition took place in six institutions in five cities in Colombia and Venezuela

2017

The 2nd edition of the PWF-LA
Three countries visited: Peru, Colombia and Venezuela. Peruvian students started to follow the CEVALE2VE course

2018

The 3rd edition of the PWF-LA
Four countries visited: Argentina, Uruguay, Colombia and Venezuela. In 2019 we plan to add Ecuador!

Professional Outreach Large Physics Endeavours

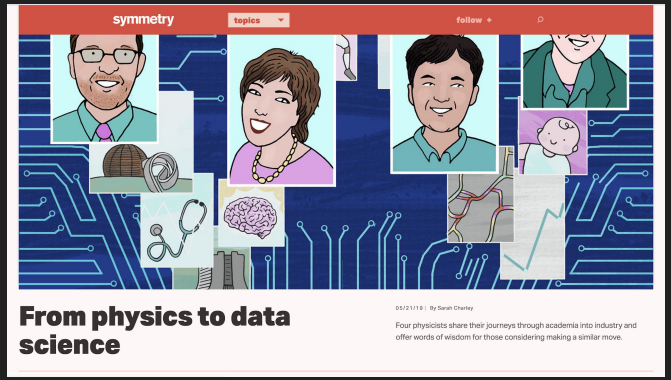
Project done, now what?

The career perspectives and opportunities inside and outside of the field
- Important to tell this part of the history as well
- Vision for the future
- Associations (e.g. https://alumni.cern)

Other form of outreach

- Public and early age engage
  - Festivals
  - Films
  - Print & Social Media
  - ...

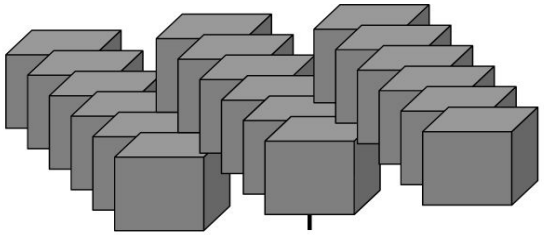
- In-house “outreach” or capacity building for the collaboration



https://www.symmetrymagazine.org/article/from-physics-to-data-science

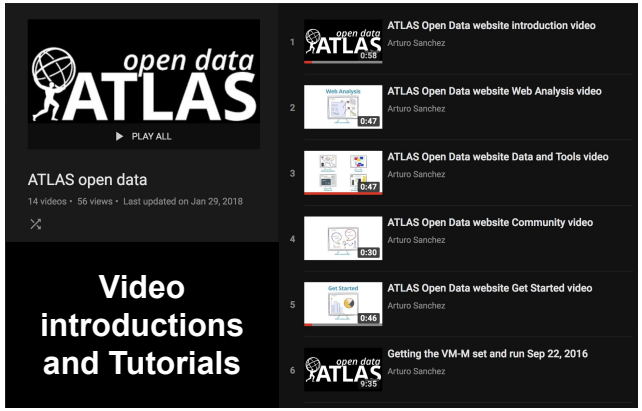
Summary

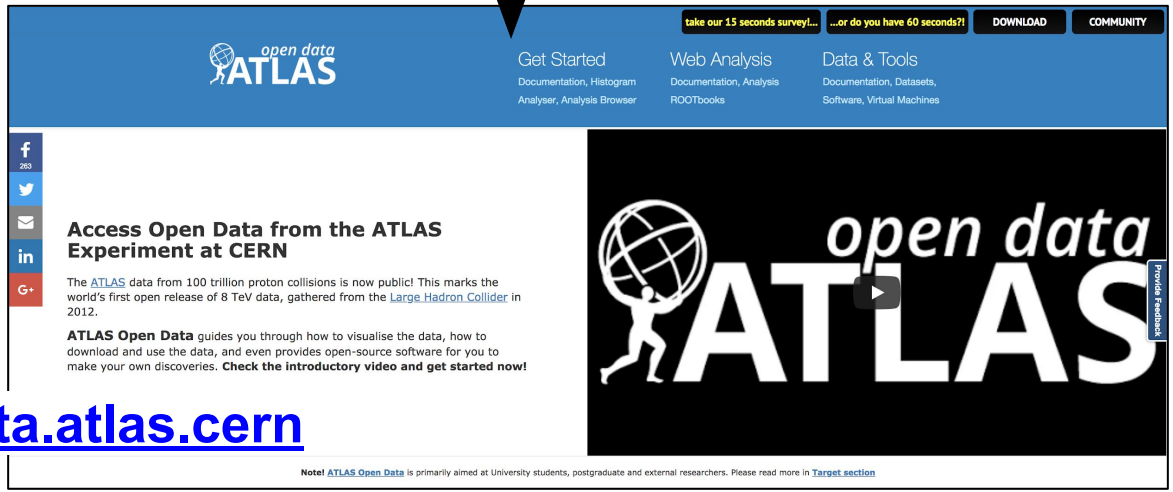
- The outreach of Large Physics Endeavours is nowadays a professional job that involves a lot of factors and has diverse goals
- In all the cases, outreach means free and easy access to resources
    - The challenges remain in how to do this in reproducible and permanent ways
- The future of the ongoing and future multinational collaborations/experiments relies on human-power that is very young right now
- The outreach of sciences and the scientific method itself is a powerful tool to fight misinformation and fake data regarding relevant subjects (climate change, cybersecurity,...)
- We encourage the participation of more people in these activities, even to the simple action of promoting it.



datasets

The ATLAS Open Data project (more here) aims to release real and simulated **Data**, together with Open Source **software resources** to analyse those samples.
As well as **documentation** in several useful formats!





http://opendata.atlas.cern

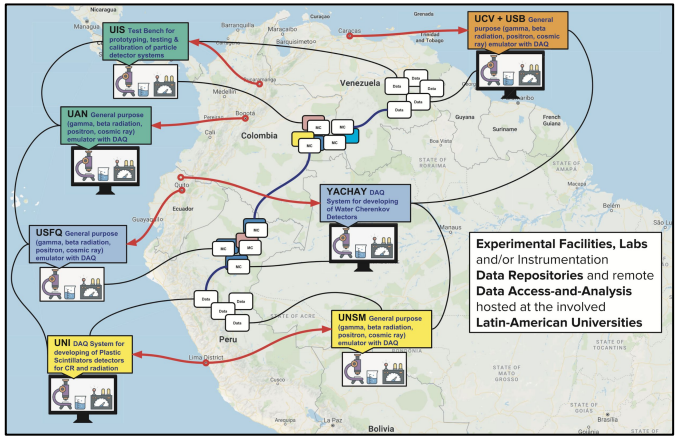
Many resources are in constant integration and updates

Latin American Alliance for Capacity building in Advanced (LA-CONGA) Physics Initiative

- The primary objective of **this proposal** is to **modernise the educational platform in eight Latin American targets higher education institutions** (HEI) from the Andean region (Colombia, Ecuador, Peru, and Venezuela), **using HEP as a model**.

- The aimed modernisation relies strongly on the development of innovative e-learning platform, based on low-cost open-access tools, a flexible problem solving oriented nano modules, and strengthening of inter-institutional relations among the target HEI's.

- **It aims to share a one-year master/specialisation program through a unique collaborative virtual research and learning communities network of universities, HEP research centres and data science/IT companies.**



The participating institutions

In Latin-America

- **Colombia**: Universidad Antonio Nariño (Bogota) and Universidad Industrial de Santander (Bucaramanga)
- **Ecuador**: Universidad Yachay Tech (Ibarra) and San Francisco de Quito (Quito)
- **Peru**: Universidad San Marcos and Universidad Nacional Industrial (Lima)
- **Venezuela**: Universidad Central de Venezuela and Universidad Simón Bolívar (Caracas)

In Europe

- University Paris Diderot
- Centre national de la recherche scientifique (CNRS, France)
- University Paul Sabatier (Toulouse)
- Technische Universität (Dresden)
- International Centre for Theoretical Physics ICTP (Trieste)
- Deutsches Elektronen-Synchrotron DESY (Hamburg)
- Conseil européen pour la recherche nucléaire CERN (Geneve)

ArturoS

arturos@cern.ch

asanchez@ictp.it

Linkedin

/arturo-sanchez-pineda/

@artfisica