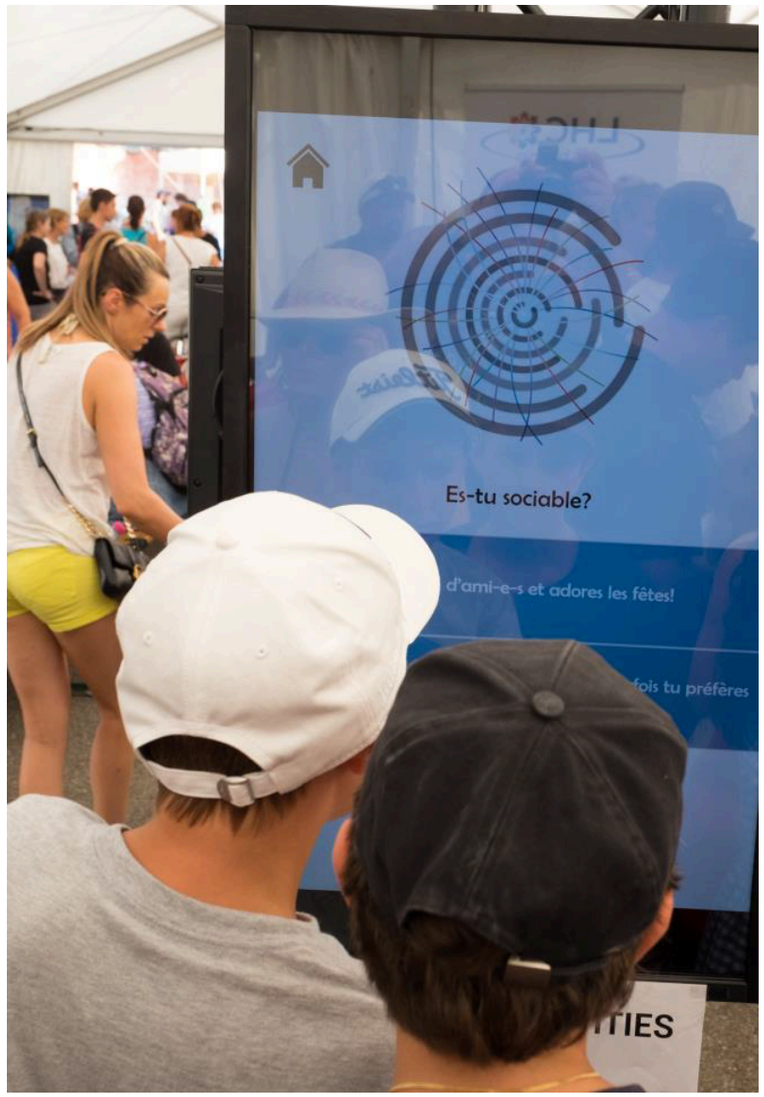
Jonas Strandberg

International Particle Physics Outreach Group (IPPOG) Report



Introduction

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- Brief history: started as a network called the European Particle Physics Outreach Group (EPPOG) in 1997.
  - Sweden represented in the network through Fysikersamfundet.
  - Tightly connected to CERN in the beginning, changed name to IPPOG to reach out worldwide.
  - Has expanded to cover much more than accelerator physics, in particular strong activities in cosmic ray (astroparticle) physics outreach.
- Transformed from a network into a formal collaboration some years ago, with membership fees.
  - Members can be countries, laboratories or experiments.
  - Fees are low (1 kEuro/year), medium (3k) or large (5k), depending on the GDP and the size of the community.
  - This allows to go from ideas to action, to have the means to produce material and pay for critical organisational support.
- Meet twice a year for 2.5 day long, intense, meetings.
  - They are a lot of fun to go to. The meeting this Spring was in Sofia, Bulgaria. The fall meeting is normally at CERN every year.

Meeting in Sofia

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- A bit more than half of the delegates represented in Sofia, the rest online.
  - Reports on lots of different outreach activities going on world-wide, and sharing of materia and practices for outreach activities.

Masterclasses

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Hellenic Open University
Patra, Greece
profile

University of Zambia
Lusaka, Zambia
profile

Kharkiv National University
Kharkiv, Ukraine
profile

- Quito, Ecuador
  Escuela Politécnica Nacional, profile
  - Near Quito: Cuenca, Montelibano
- Maputo, Mozambique
  Universidade Eduardo Mondlane
- Ben Guerir, Morocco
  Mohammed VI Polytechnic University

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Statistics for IMC23

numbers from 2022 in brackets

CERN LHC Masterclasses

211 MCs with CERN VC (191)

- 99 ATLAS (94)
- 56 CMS (51)
- 26 LHCb (22)
- 30 ALICE (24)

Fermilab LHC Masterclasses

40 MCs with Fermilab VC (32)

- 29 CMS (22)
- 11 ATLAS (10)

MINERvA Masterclasses

8 MCs (9)

NOvA Masterclasses

2 MCs new!

plus Off-Shell MC

KEK Belle II Masterclasses

16 MCs (11)
5 VCs (3)

Malargue Pierre Auger Masterclasses

12 MCs new!
3 VCs

GSI Hadron Therapy Masterclasses

30 MCs (28)
9 VCs (5)

Connect the dots!

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LHC: connect the dots !

What is this ?

At the Large Hadron Collider (LHC), protons collide in the centre of gigantic detectors. Then hundreds of new particles, the tiniest bits of matter (what we are made of, as well as everything around us: air, water, rocks etc.), are produced and fly in all directions away from the collision point.

These particles interact with the detector leaving little dots where they passed. By connecting these dots, we can see the tracks (path) of the particles. These tracks are analysed by the physicists to understand what happened in the collision.

Help the physicists!

On the slice of detector on the right, trace the tracks left by the particles to help physicists identify them! Maybe you will see evidence of a Higgs boson! Follow instructions on the right of the page.

Did you know that...

In reality the LHC detectors record about 1 billion collisions like this each second! You would need a lot of paper and pencils to draw them all. Instead, physicists use many computers (more than half a million processor cores) to store and draw all the tracks. These computers are in 170 data centres around the world!

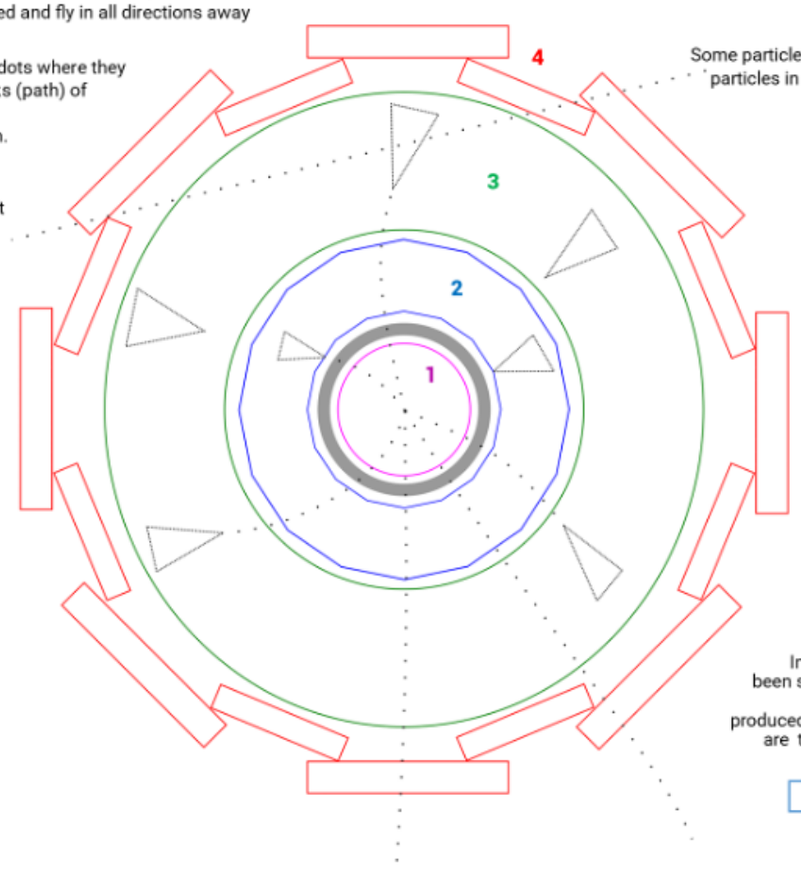
Do you want to know more ?

Scan the QR code below to discover more about this collision and find others collisions to analyse.

Come to CERN, in Geneva, Switzerland and visit our permanent exhibitions or get a guided tour of the Laboratory. More info on *visit.cern*.

Scan this QR code to find out more about this collision

More collisions on cern.ch/connectdots



Collision # 15425874568
Analysed by : .....

Level 1– Easy

Take a pencil and connect the dots. That will reveal the tracks left by the particles.

Some particles are stopped by the detector generating dozens of new particles in what we call a *particle shower*. They are represented by triangles. Draw showers in the triangles.

Level 2 – Intermediate

Label each track with the name of one of the particles written in the first column of the table. There is a column for each detector part, numbered from the inside out. Identify particles by the traces they left.

Particle	1	2	3	4
Photon		Shower		
Electron	Track	Shower		
Neutron			Shower	
Proton	Track	Track	Shower	
Muon	Track	Track	Track	Track

Level 3 –Advanced

A. **Have you found a Higgs boson in this collision ?**

In 2012, the LHC detectors found a particle scientists had been seeking for decades: the Higgs boson. When a Higgs boson is produced at the collision point, it turns into other particles, which are then seen in the detector. You can find a Higgs boson by seing any of these three combinations of particles:

4 muons	2 electrons + 2 muons	2 photons

If you have not found a Higgs, try another collision...

B. **Strange track...**

One track does not pass by the point of collision in the centre. What is it ? Scan the QR code on the left to find out!

- Scan QR code for answers. Download events from:
  - https://connectdots.web.cern.ch/

Connect the dots!

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Connect the dots!

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And fun reports like this …

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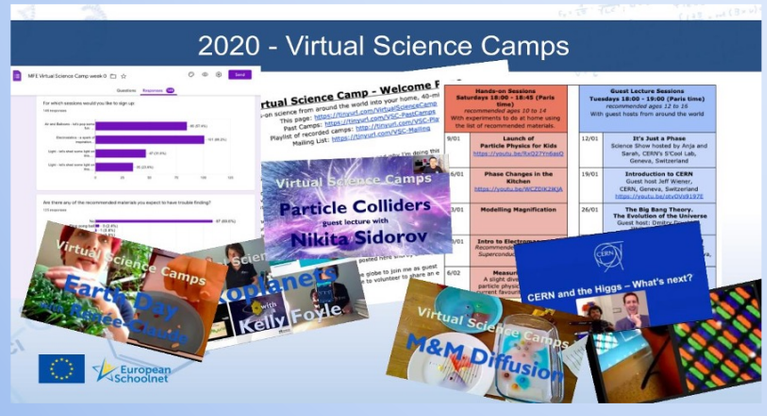
My Favourite Experiments

Science is universal, but how we teach it varies greatly around the world.

Since 2017, I've travelled through 44 countries, largely by bicycle, to meet teachers and share ideas.



New Swedish Representative Needed!

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- It is time to find someone new to represent Sweden in IPPOG!
- It is in fact not entirely clear how we appoint our representatives in Sweden, but it should be through the Fysikersamfundet somehow. Maybe a document even exists (it is being searched for).
  - If there are volunteers I personally believe that helps the process.
- The work load is not immense:
  - Attend (preferentially travel to) the two yearly IPPOG meetings.
  - Ideally call a yearly national meeting for outreach coordination.
  - Give reports in Particle Days.
  - Collect material for IPPOG yearly report on outreach.
  - Find money for the yearly fee.