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Particle Physics for Teachers

Michael Gregory
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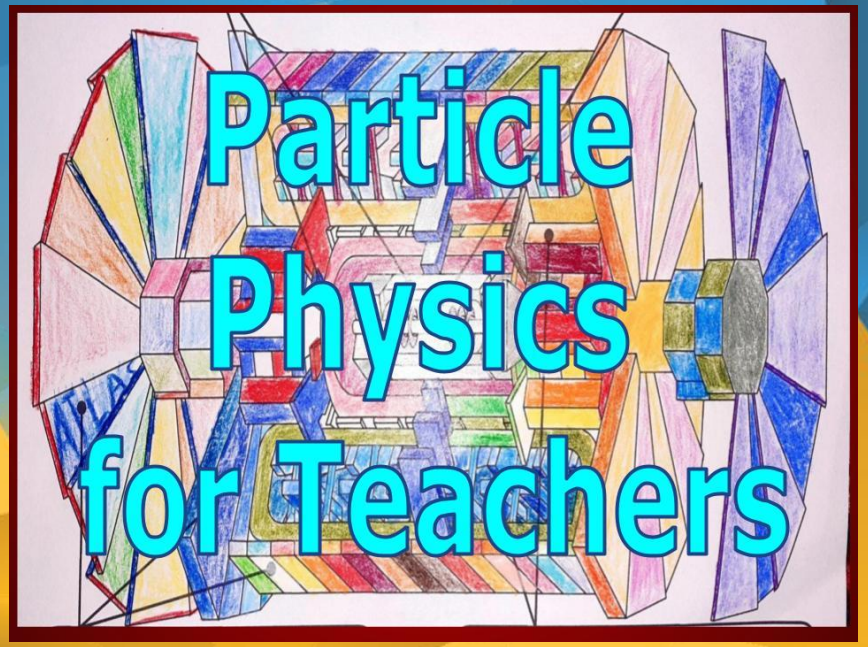
www.scienceonstage.fr/michael-gregory

Link to these slides:
https://tinyurl.com/PP4T-Scientix



European Schoolnet

Scientix is an initiative of European Schoolnet (EUN).

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Hi, I'm Michael!

Where/when was the last time you saw me?

Please write in the chat (can be online or in-person).

Michael at DDD, Madrid last weekend

Past Scientix Appearances

Scientix webinar Feb 2023 - “More Science From the Road”

Scientix TV - Episodes 7 & 8 - Dec 2022 & Jan 2023

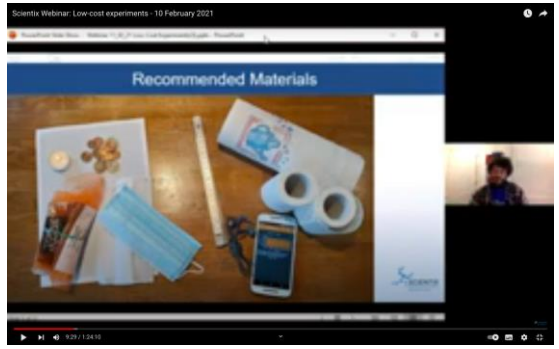
Scientix Conference - Nov. 2022

Scientix webinar June 2022 - “More Low-Cost Science”

Scientix webinar December 2021 - “Hands-on Experiments from Shared Experiences”

Scientix webinar June 2021 - “Perimeter Institute Resources”

Scientix webinar Feb 2021 - “Low-Cost Experiments”



Other places you might have seen me…

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More recently…

Particle Detectives

APS News - November 2023

November 2023 (Volume 32, Number 11)

Science From a Bike: One Teacher's Cycling Journey to Share Physics Experiments Around the World

Michael Gregory leans on APS JNIPER's coffee hours and workshops to support his global outreach efforts.

By Liz Boatman | October 13, 2023

Credit: Michael Gregory

Michael Gregory demonstrating Bernoulli's principle outside of a school in Machraa Ben Abbou, Morocco.

November 2023 (Volume 32, Number 11)

APS News Home

Issue Table of Contents

APS News Archives

Contact *APS News* Editor

Articles in this Issue

This Month in Physics History

Once a Crystal Collector, Now a Crystal Scientist

How to Strengthen Computing Instruction in the Physics Classroom

Start Your Search For a Summer REU Now (and Other Advice From a Physics Major)

Science From a Bike: One Teacher's Cycling Journey to Share Physics Experiments Around the World

APS Announces Recipients of the Spring 2024 Prizes and Awards

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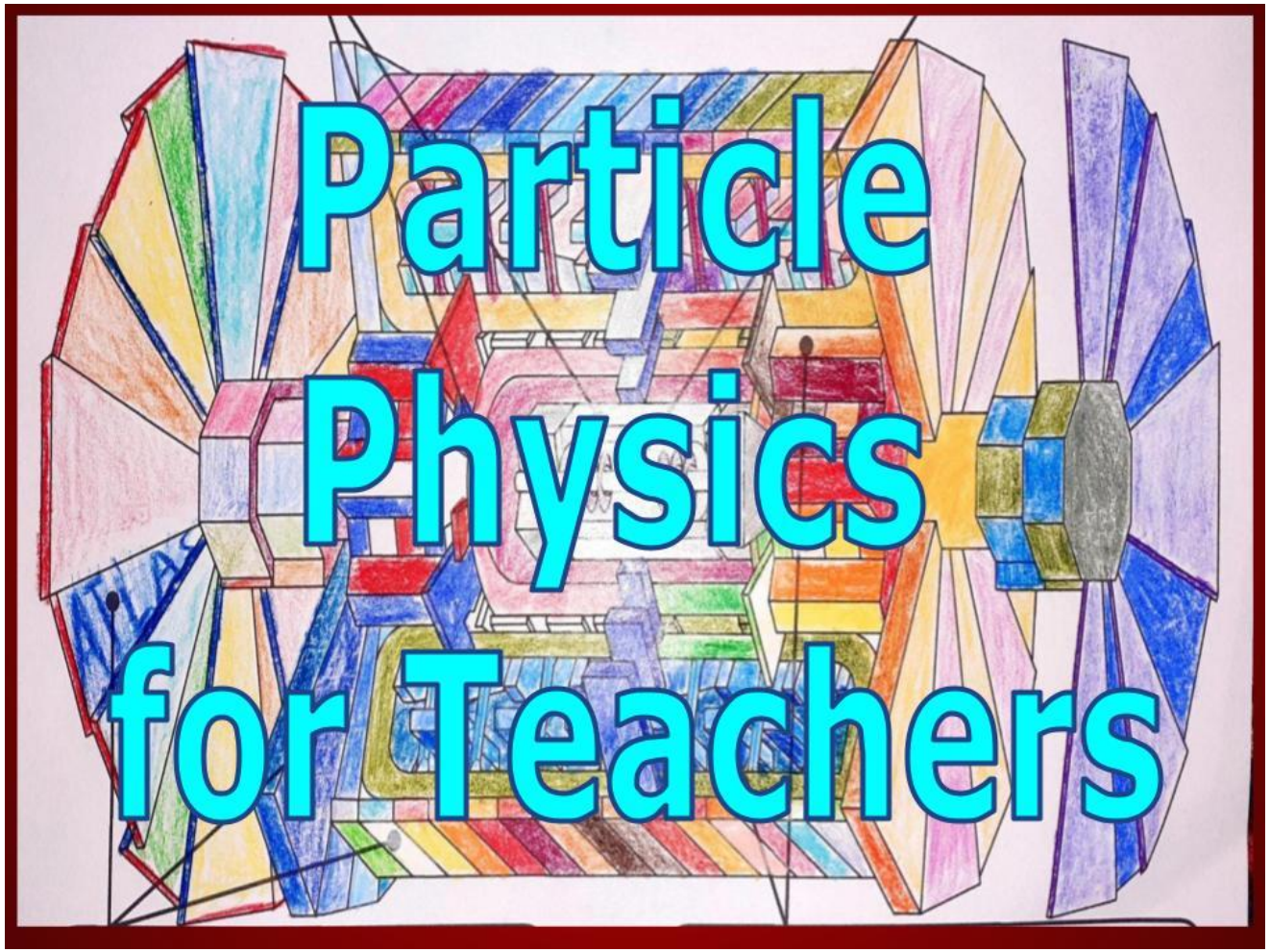
What am I talking about today???



Free, online course running Nov to Dec.

No prior knowledge required.

8-10 sessions - attend as many or as few as you like.

Enough about me, who are you?

In the chat, please indicate which best describes you:

a) Primary school teacher
b) Middle school teacher
c) High school teacher
d) Scientist
e) Other (please share what you do)

Enough about me, who are you?

In the chat, please indicate why you're interested in this webinar:

a) I love particle physics!
b) I love Scientix!
c) I love Michael
d) Other

Particle Physics for Kids 2021

Two sessions per week Jan-April

Targeted kids aged 10-16 years

Tuesdays - Scientist lecture or visit (from CERN, JINR, Perimeter)

Saturdays - Hands-on Session with experiments at home

Ex. “It’s Just a Phase” Science Show from CERN S’Cool Lab, followed up by “Phase Changes in the Kitchen”

Hands-on Sessions **Saturdays 18:00 - 18:45 (Paris time)** *recommended ages 10 to 14* With experiments to do at home using the list of recommended materials.		**Guest Lecture Sessions** **Tuesdays 18:00 - 19:00 (Paris time)** *recommended ages 12 to 16* With guest hosts from around the world	
9/01	**Launch of Particle Physics for Kids** https://youtu.be/RxQ27Yn6asQ	12/01	**It’s Just a Phase** Science Show hosted by Anja and Sarah, CERN’s S’Cool Lab, Geneva, Switzerland
16/01	**Phase Changes in the Kitchen** https://youtu.be/WCZDlK2iKjA	19/01	**Introduction to CERN** Guest host Jeff Wiener, CERN, Geneva, Switzerland https://youtu.be/otvOVs9197E
23/01	**Modelling Magnification**	26/01	**The Big Bang Theory. The Evolution of the Universe** Guest host: Dmitry Dryablov, JINR, Dubna, Russia
30/01	**Intro to Electromagneti** *Recommended preparation* *Superconductors Take Off!*		
6/02	**Measuring Sound** A slight divergence from particle physics to share m current favourite experime		
	Two-week *Virtual Science* *schedule w*		

Particle Physics for Kids re-run 2022

Repeated partly thanks to encouragement & contacts.

More amazing guest hosts than ever before!

More than 50% of participants were teachers looking for new ideas...

After 1.5 years of reflection and planning - **Particle Physics for Teachers is born!!!**

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Particle Physics for Teachers - Goals

- **To make particle physics more fun and accessible**
- **To bridge the gap between researchers/outreach and teachers**
- Increase teacher interest in particle physics
- Increase in teacher confidence and knowledge
- Get new ideas into classrooms

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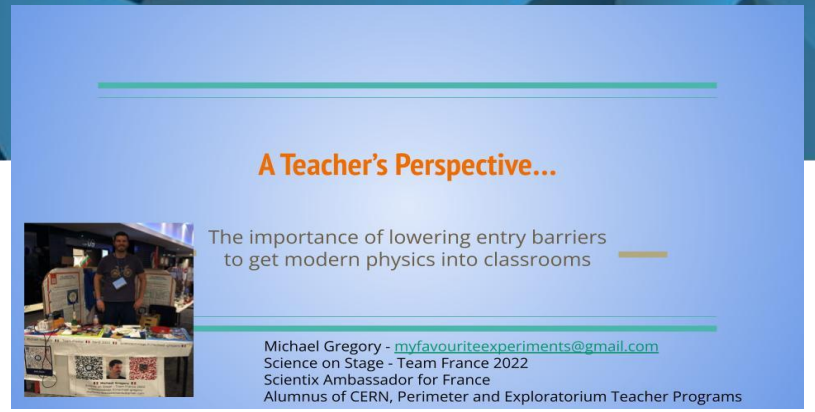
Bridging the gap with researchers

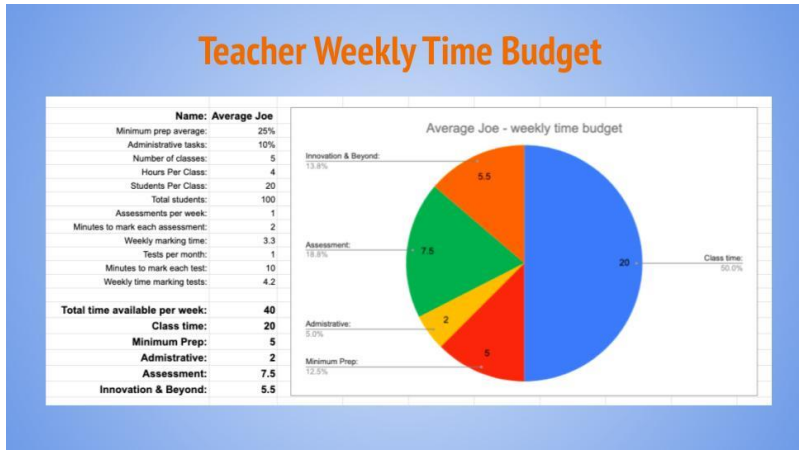
-most adults assume they are experts on school

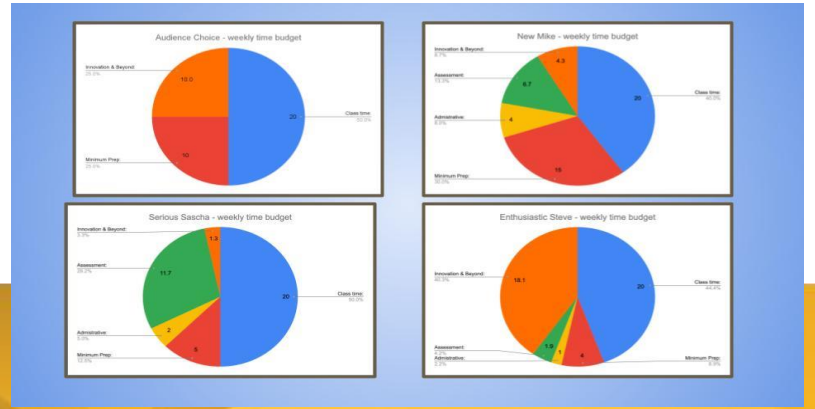
-teaching is a very specialised skill

-scientists often have weeks to prepare a lecture, whereas teachers give several lectures a day!

-research model discourages feedback and evaluation from users







Intro to Particle Physics - Nov-Dec 2023

*A mix of **Scientific Sessions** (led by scientists) and **Pedagogical Sessions** (led by myself and other educators), in an attempt to make the course both scientifically interesting, and relevant to teachers.*

Tues 21/11 - Introduction to Particle Physics and CERN

with Anja Kranjc Horvat (CERN Science Gateway science show manager)

Thurs 23/11 - Particle Physics in the classroom and beyond

with Michael Gregory

Fri 1/12 - ATLAS Detector Visit

with Steve Goldfarb (Canettes Blues Band lead singer)

Mon 4/12 - Making the Invisible Visible with Detectors

with Marco Kirshner (teacher, Germany)

Tues 12/12 - CMS Muon Telescope & History of Gas Detectors

with Jesus Puerta Pelayo (Head of Outreach, CIEMAT, Spain)

Thurs 14/12 - Homemade Radon Detector

with Federico Andrioletti (teacher and president of Aghi Magnetici, Italy)

Mon 18/12 - The Triumphant Discovery of the Higgs Boson

with Claire David (AIMS South Africa, York University, FermiLab)

Wed 20/12 - CERN Science Gateway Resources

Yiota Chatzidaki, Guillaume Durey, Anastasia Tezari

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Photo from: https://visit.cern/proton-express

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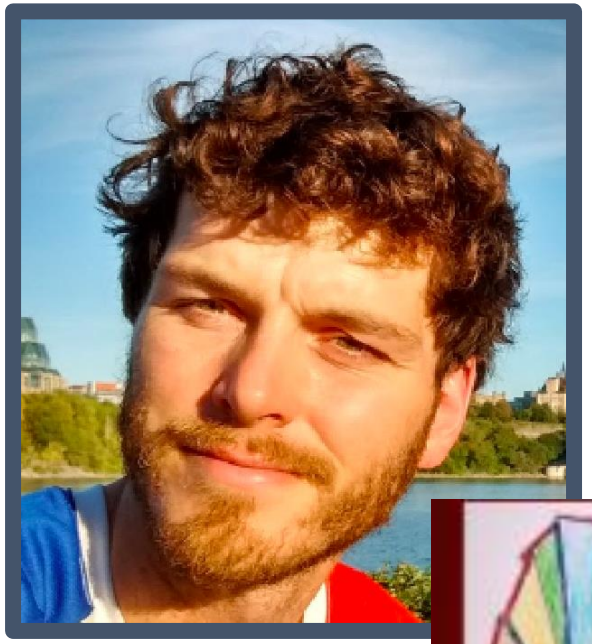

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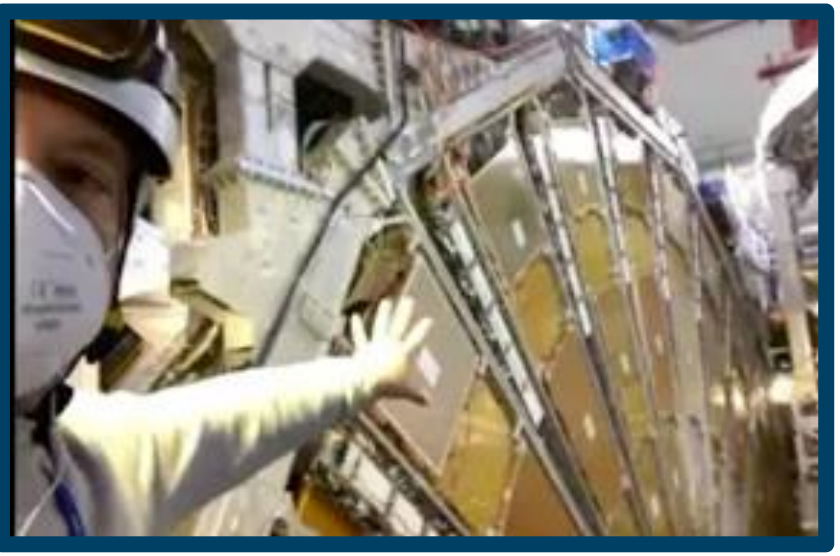

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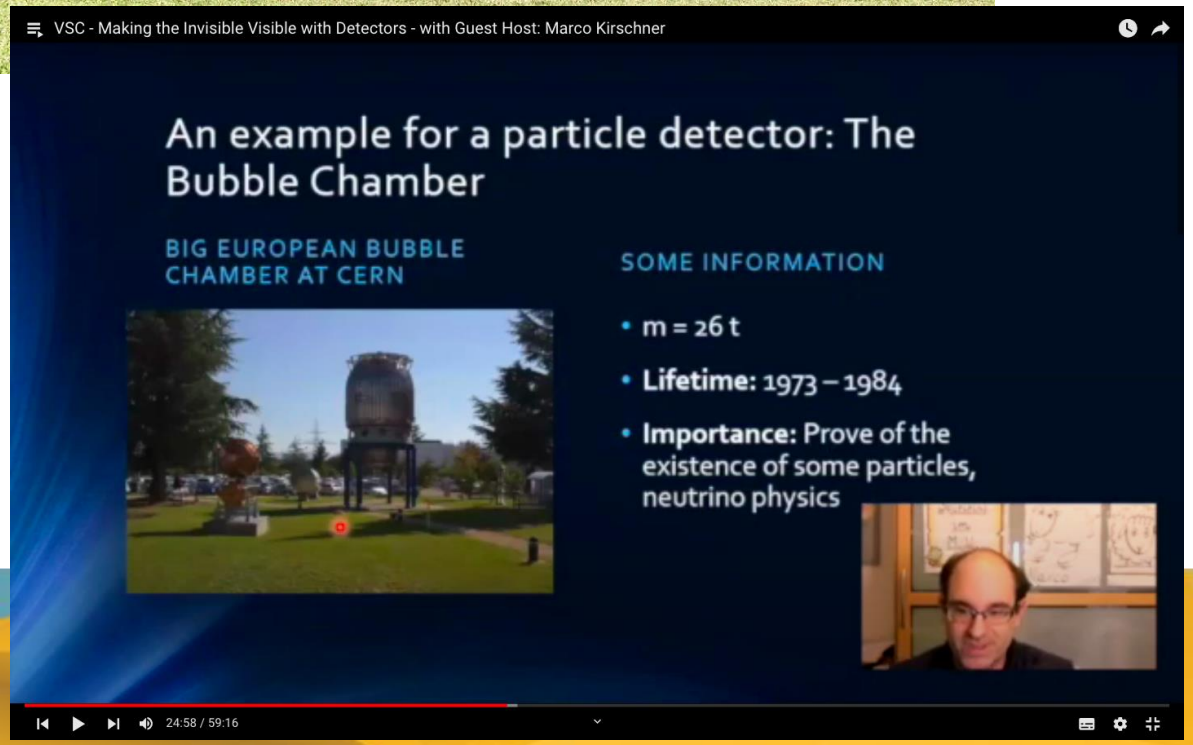
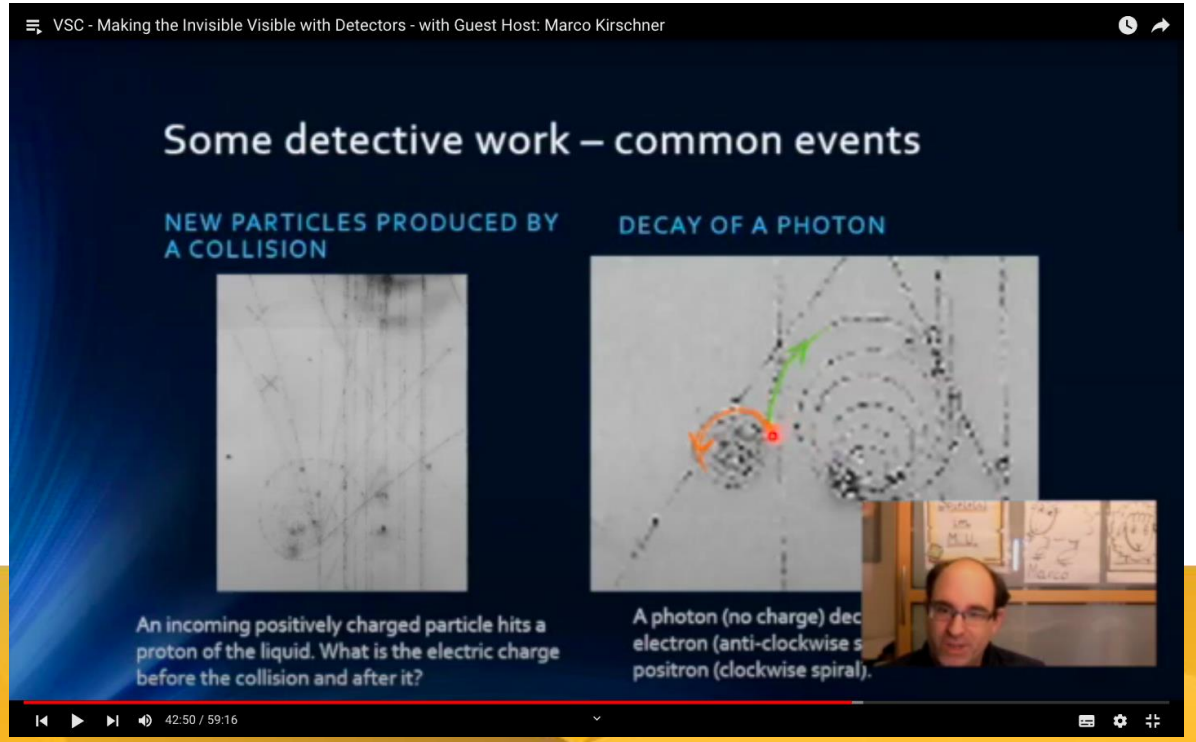
Mon 4/12 - Making the Invisible Visible with Detectors

with Marco Kirshner (teacher, Germany)





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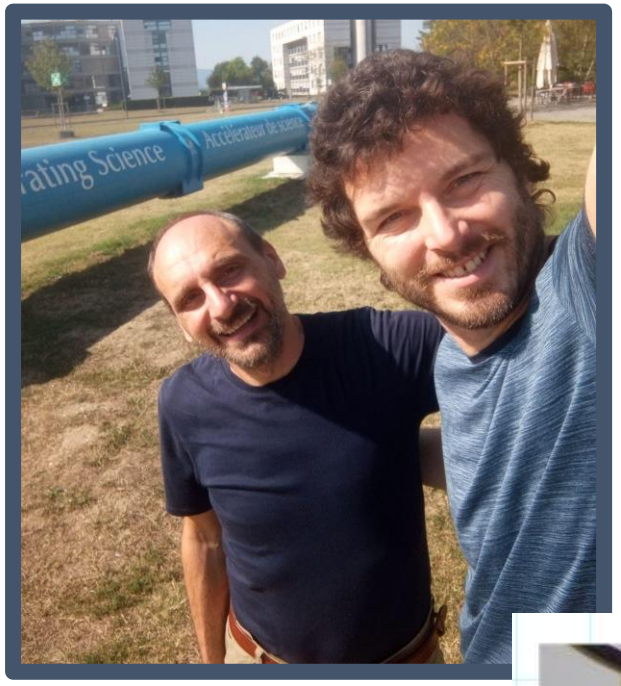

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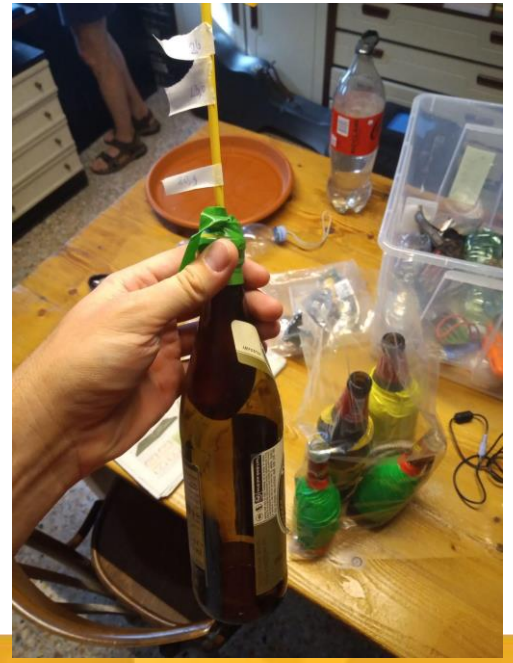

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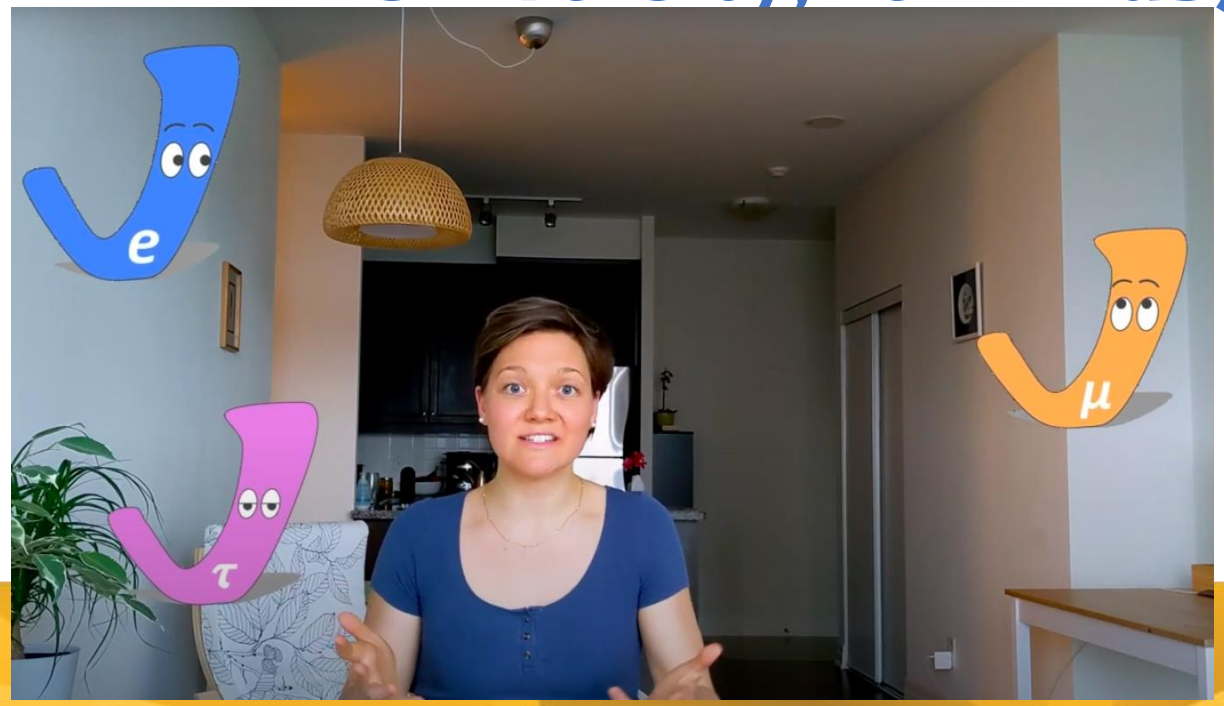

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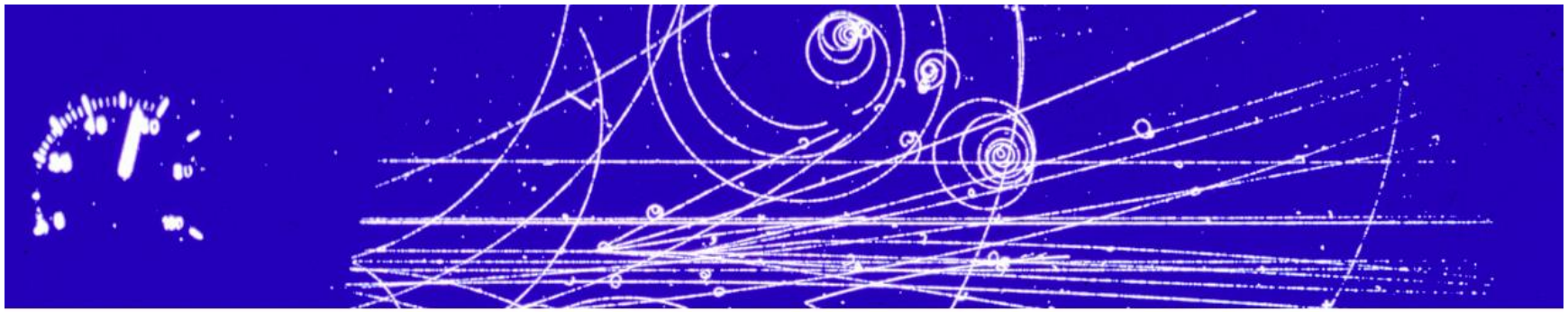
Wed 20/12 - CERN Science Gateway Resources

Yiota Chatzidaki, Guillaume Durey, Anastasia Tezari



Educational Resources

Here you will find a collection of educational resources developed in the framework of education and outreach activities at CERN.

Whether you're a student, a teacher, or simply someone with a curious mind, these resources are designed to spark your interest by bringing you closer to the physics and technology of CERN. You will also find material that can aid you in preparing for, enjoying, and following up on a visit to CERN, or engaging with it online if you cannot visit us physically.

Particle Detectives (portable science show)

Experiment	Inspiration	Explanation	Materials	Ease, Cost, Hardest part	Relevance/ Impressiveness	Order
Air Vortex w/bubbles	STI Bryson (UK)	Visualising air vortex travelling through bubbles above the audience. Can show other vortex fun.	Box (ex. From A4 paper) Garbage bag Large elastics Small bubble wands/containers (many)	4	3 Seeing air	1
Coloured Flame Vortex	David Haller (USA)	Flame test using fire tornado	Chlorides of: Copper Sodium Potassium Barium Lithium Strontium Boric Acid Wire waste bin (or homemade substitute) Marbles (or bearings) Large plate Methanol	3	5 Seeing presence of metal ions (consider using colourless salts/solutions)	2
Marinko's Rutherford Model	Marinko (Serbia)	Game to model the Rutherford experiment to discover the size of the nucleus	Large frame (1x1 m approx) Target "nucleus" (cardboard) String Elastics "Alpha particles" - can be nuts, rocks, etc. Chart paper or projector	4	4 "Seeing" the nucleus Fun & interactive	3
Colour Clapping	STI	STI uses theatre lights, portable version can use coloured	RGB Flashlight (large)	5	2 Detector	4 Or 2,

Combines elements of my previous show "Experiments World Tour" and CERN Science Gateway's "Seeing the Invisible"

Low-cost show to be accessible, transportable and free.

Takes inspiration from teachers and communicators I've met across Europe and beyond - modelling the same international collaboration we see in modern physics!

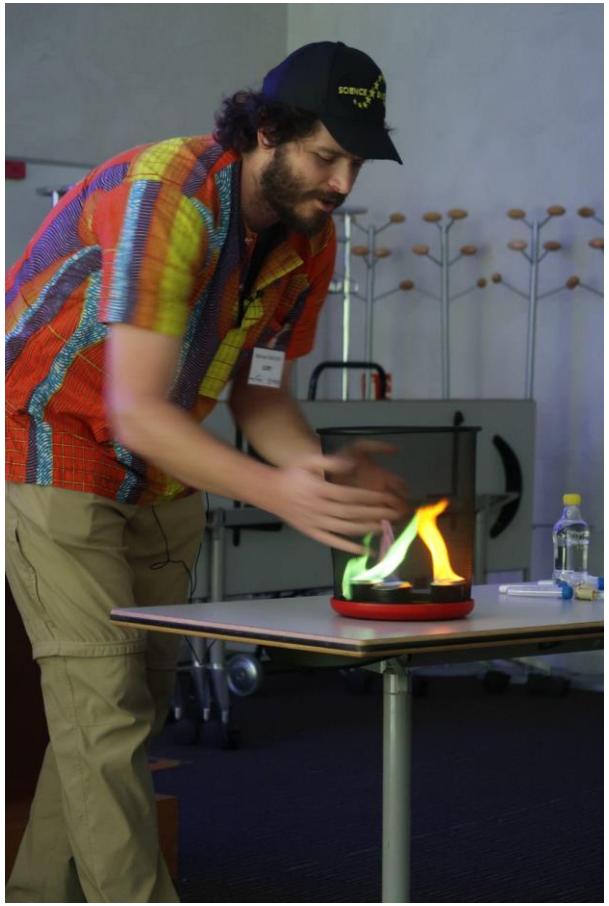
From September 2023 performanced in Kazakhstan, Serbia and Montenegro, Italy, France, Bulgaria and Spain.

Script and how-do guide should be published on CERN Science Gateway website for all to use for free.

Invite me! I'm always happy to perform and to provide training others to perform.

For more info, see: https://www.scienceonstage.fr/particle-detectives/

Experiment Time!!!



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Experiment Share

Monthly Zoom meetings for teachers to share experiments.

Typically 5-10 teachers present, and another 10-20 come to watch.

Experiment Share webpage:
www.scienceonstage.fr/experiment-share/

Next Experiment Share:
Tuesday November 28th, 18:00 CET
Registration: https://forms.gle/gGSXgD45kn2QuB8K7

Join in the fun!

Particle Physics for Teachers: www.scienceonstage.fr/pp4teachers/

mailing list: https://tinyurl.com/PP4T-mailing

Particle Detectives: www.scienceonstage.fr/particle-detectives/

Experiment Share: www.scienceonstage.fr/experiment-share/

Registration for Tues 28/11: https://forms.gle/gGSXgD45kn2QuB8K7

Link to these slides: https://tinyurl.com/PP4T-Scientix

email: myfavouriteexperiments@gmail.com

@myfavouriteexperiments