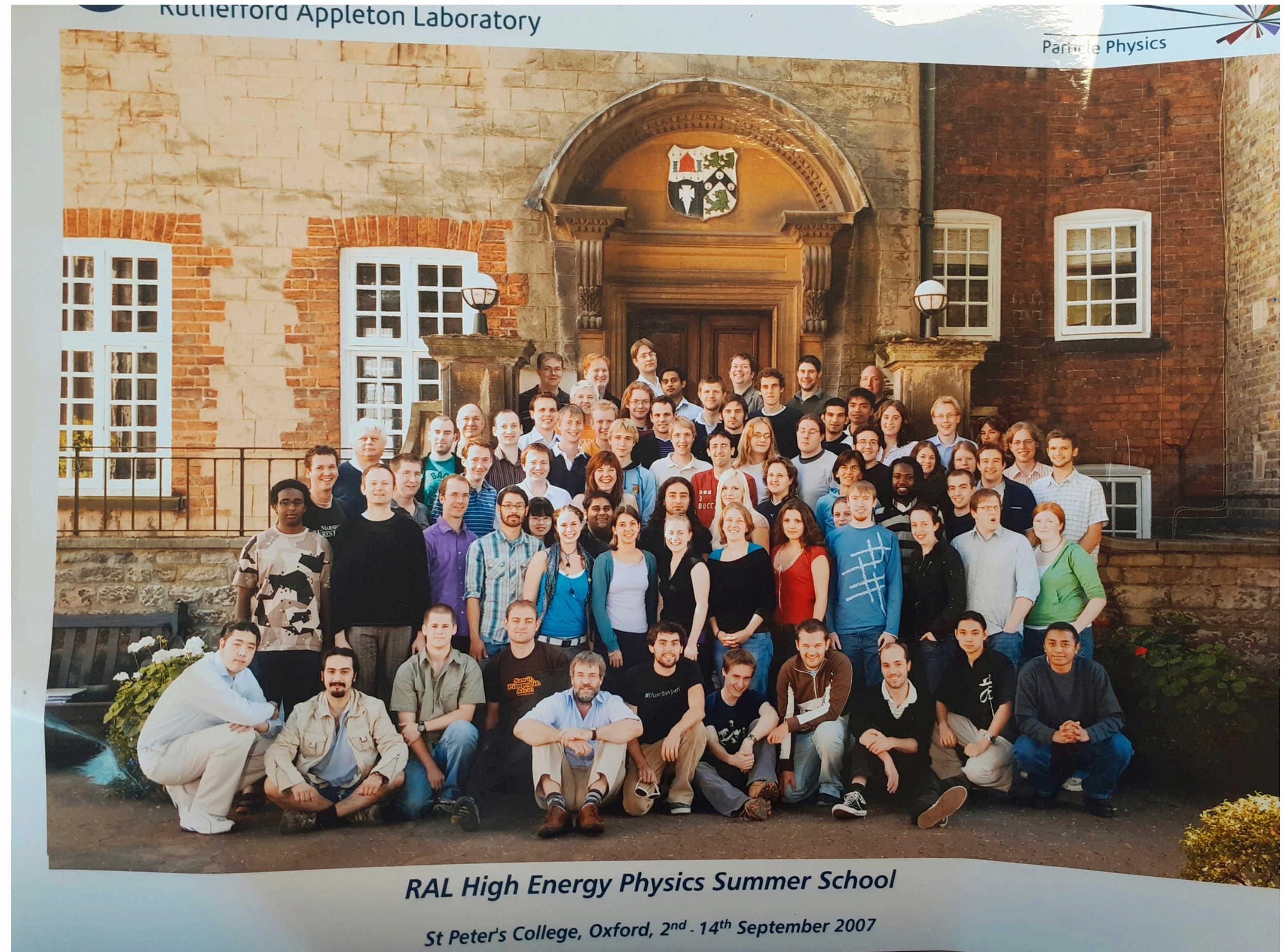




# OUTREACH, EDUCATION AND EDI

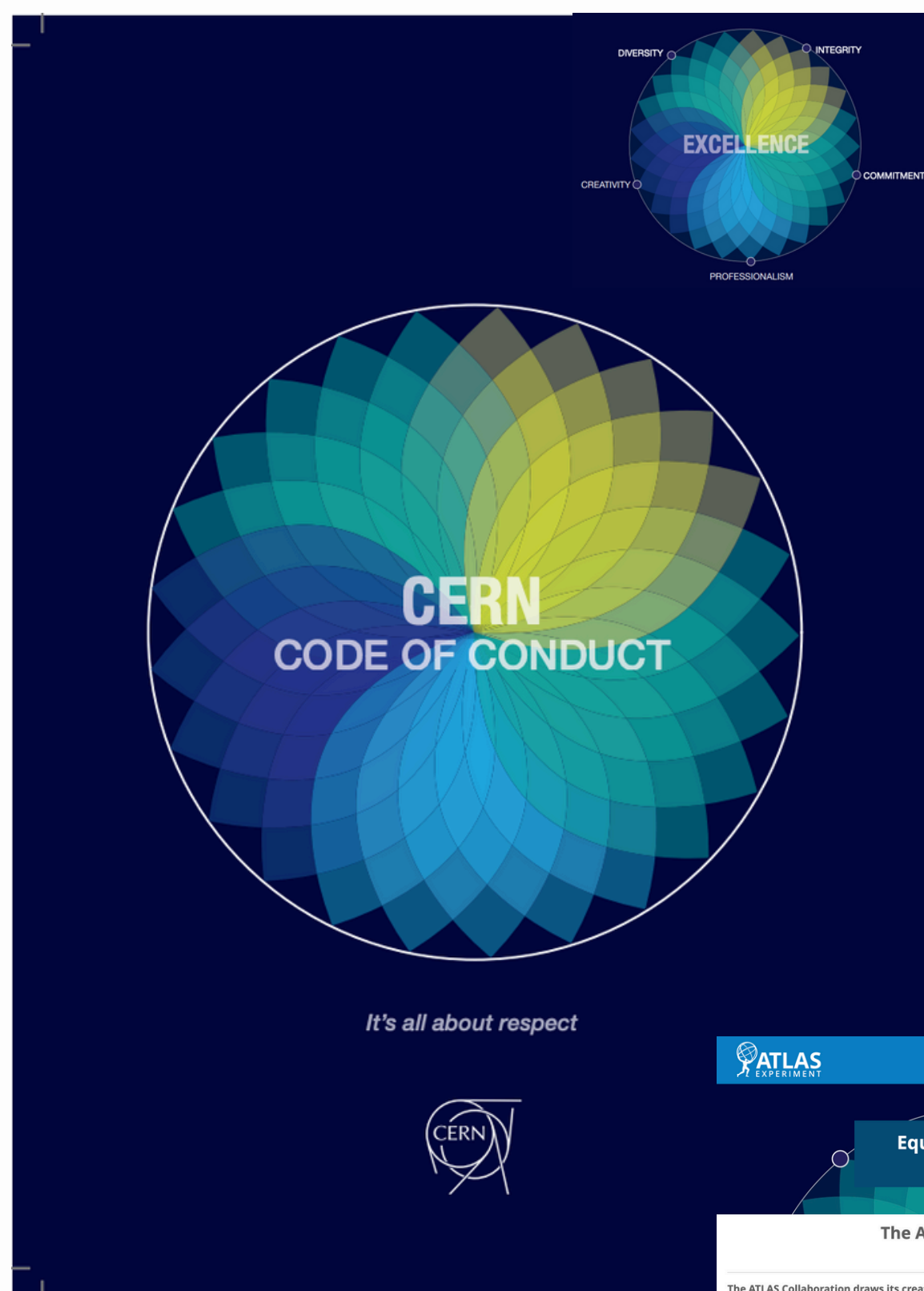
KATE SHAW  
UNIVERSITY OF SUSSEX

2025 STFC HEP Summer School  
3 September 2025





# EDI & Outreach in High Energy Physics



Things have changed a lot!

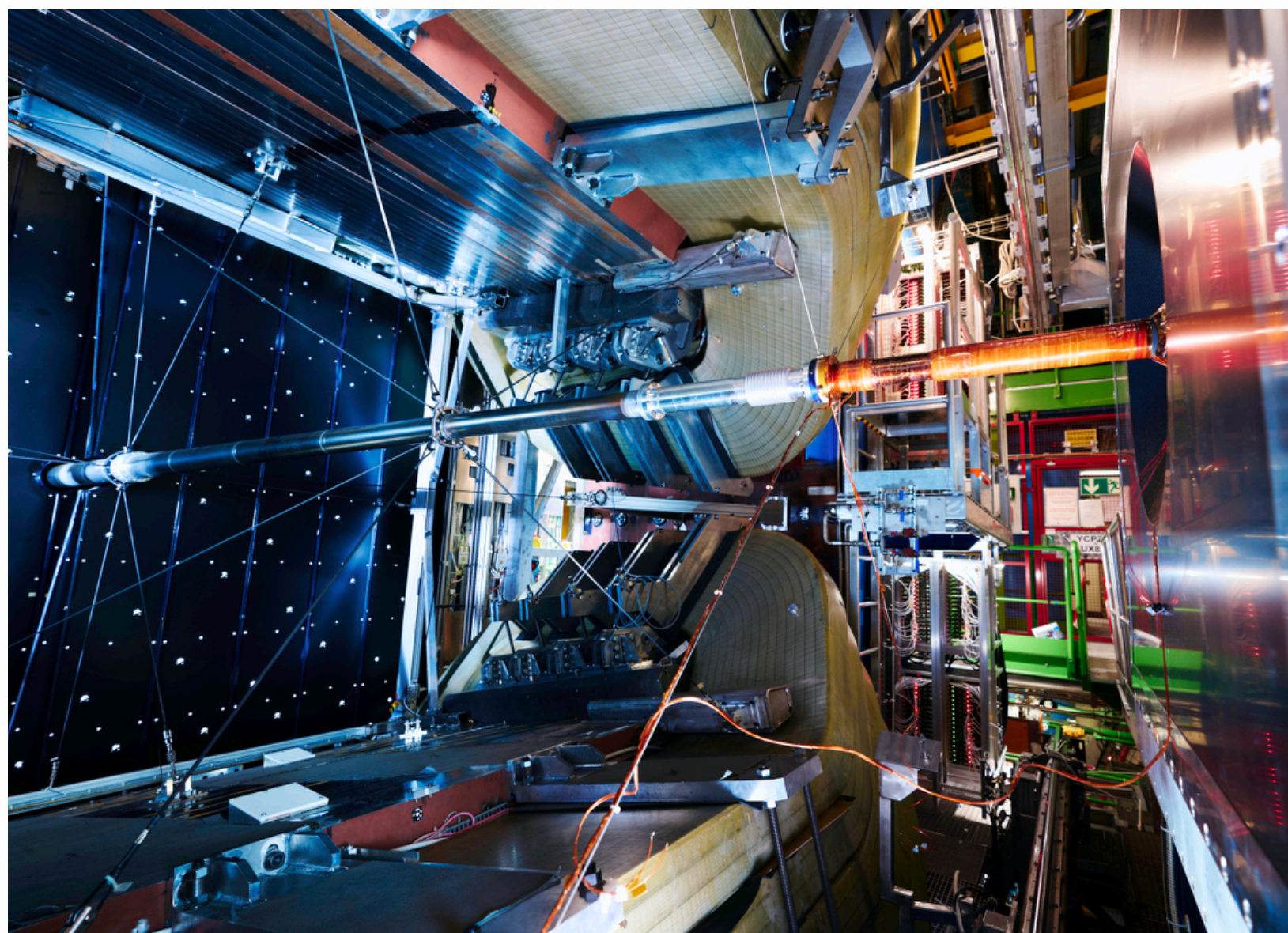
- **Code of conduct** at workshops, meetings & conference
- Experiments have **EDI statements**, EDI groups, lunches
- Many big conferences now have **tracks** on **outreach** and **education**, and on **EDI** so that researchers can present projects and initiatives

***EDI is very important, as we have seen it can take many years to fight for equal rights, but things can also go backwards quickly***





# Diversity and Outreach in High Energy Physics



High Energy Physics is inherently **international**, and our community understands that to get the **best talent** we need to encourage diversity, equity and inclusion!

To achieve our ambitious goals in HEP we need **international support** and funding.

As scientists we know it's our responsibility to reach out to the public, students and policy makers to **communicate** what we do and why!



# EDI: Very important for our community

**Equity:** Treating people of all identities and backgrounds fairly and respectfully with regard to opportunities, access, treatment, power, outcomes, and resources.

**Diversity:** Embracing differences, which may include ethnicity, gender identity or expression, family status, disability status, sexual orientation, age, and socioeconomic situation.

**Inclusion:** Intentionally creating welcoming and respectful environments and systems in which inequities in power and privilege are addressed and everyone is given an opportunity to flourish.





# DIVERSITY IS THE KEY TO SUCCESS OF PHYSICS

**Monoculture** can create mono approaches

A group of people with different experiences and **perspectives** brings **innovation** and creativity

If certain groups are under-represented, our **talent pool** is smaller

We see that the more diverse a group is, the more **inclusive** it becomes for everyone, and more people are attracted to a **welcoming** environment





# Is Physics Diverse?

Well.. not as much as we would like



## Nationally

- Many under-represented groups in physics (aspects such as gender, sexuality, disability, ethnicity, social-economic background, geographical location)
- Its not enough for under-represented groups to be welcomed, they must also **have a seat and a voice at the table**



# IOP Report on the Potential of Physics



**“Physics knowledge and skills are powerful drivers of productivity and innovation and open doors to a range of rewarding careers across the entire economy.”**

**What are the most significant barriers preventing the UK from developing the workforce needed for physics R&D to thrive?**

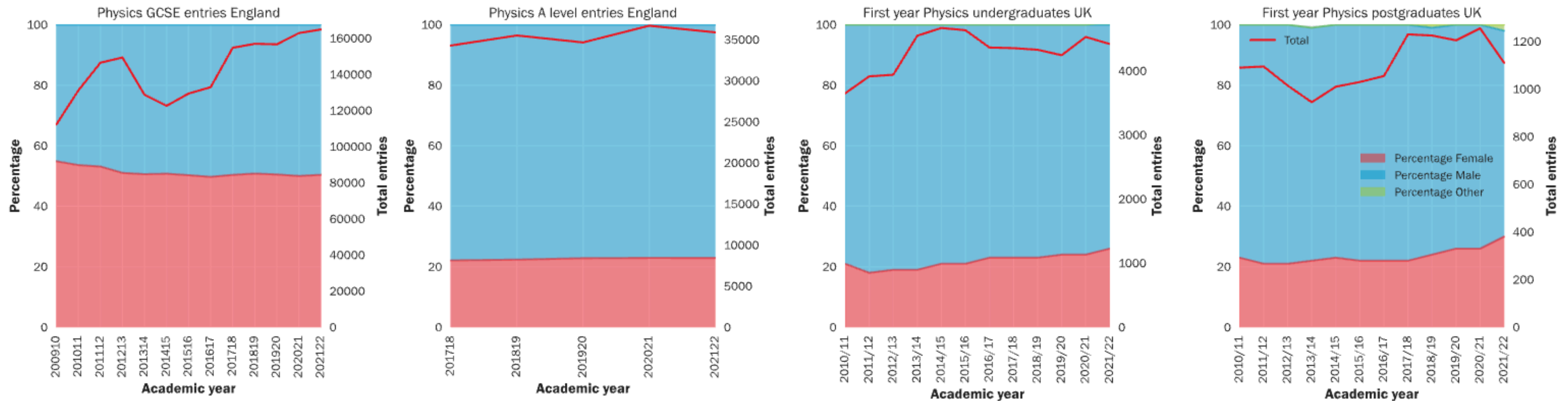
- 1. Teaching workforce challenges:** There are serious shortages of teachers with a physics background in secondary and further education.
- 2. Lack of diversity and inclusive culture:** Women, people from disadvantaged backgrounds, disabled people, those who identify as LGBT+, and minority ethnic groups are all underrepresented.
- 3. Inflexible research careers & interaction with industry:** Research career structures are narrow with few incentives for industrial engagement, preventing people from moving easily between academia and industry.

**“Increasing R&D investment to 2.4% of GDP by 2027 would generate an additional 80,000 jobs and £30.5bn in GDP<sup>1</sup>.”**



# IOP: Physics Education in Schools & Universities

**Physics Student numbers have been on the up (until 2021/22): Gender balance has been improving at UK universities, but less in schools.**





# Gender & Participation: The Pipeline

Physics has an even gender split at GCSE in England & Wales. It's then very male-dominated at further education- slightly less so in higher education.

16 years old

~50%

18 years old

~23%

University  
BSc/ MPHYS

~30%

Researcher

PROF

~14%

Percentage  
Females in ALL  
subjects

Percentage  
Females in  
Physics

- Measure Names
- All Subjects % Female
  - Number doing physics
  - Physics % Female

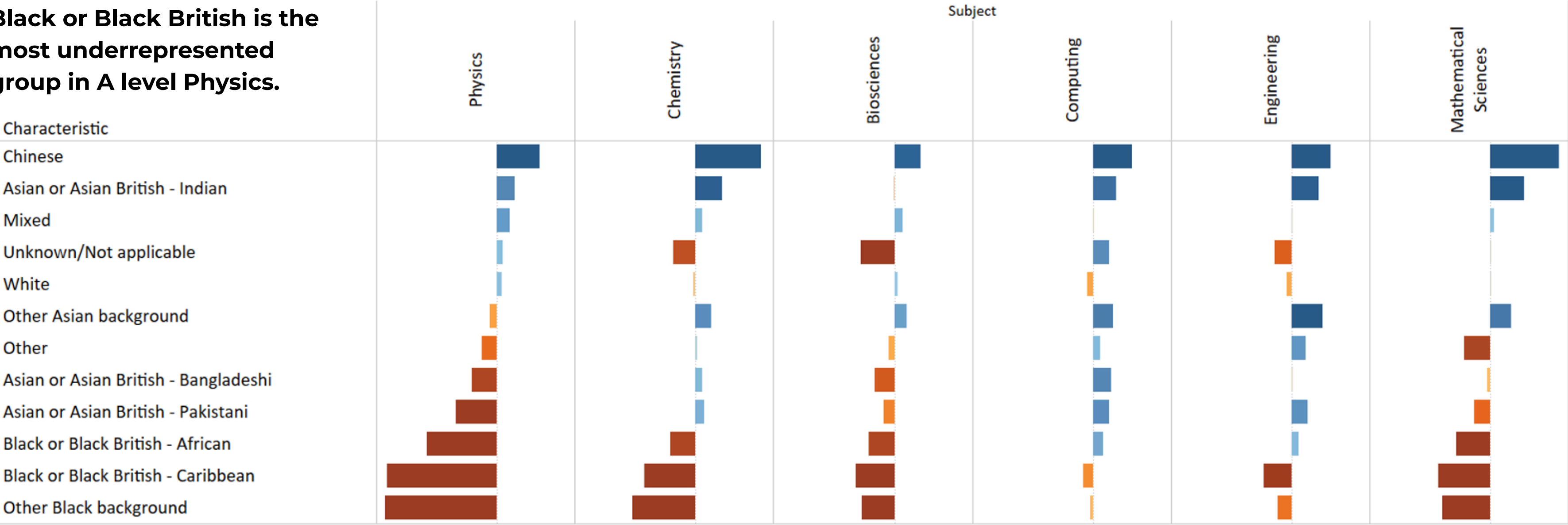
Sources:  
Department for Education (England)  
SQA (Scotland)  
CCEA (Northern Ireland)  
StatWales (Wales)  
HESA / JISC (University Data)  
IOP



# IOP: University Physics Student Ethnicity

Representation Level

**Black or Black British is the most underrepresented group in A level Physics.**

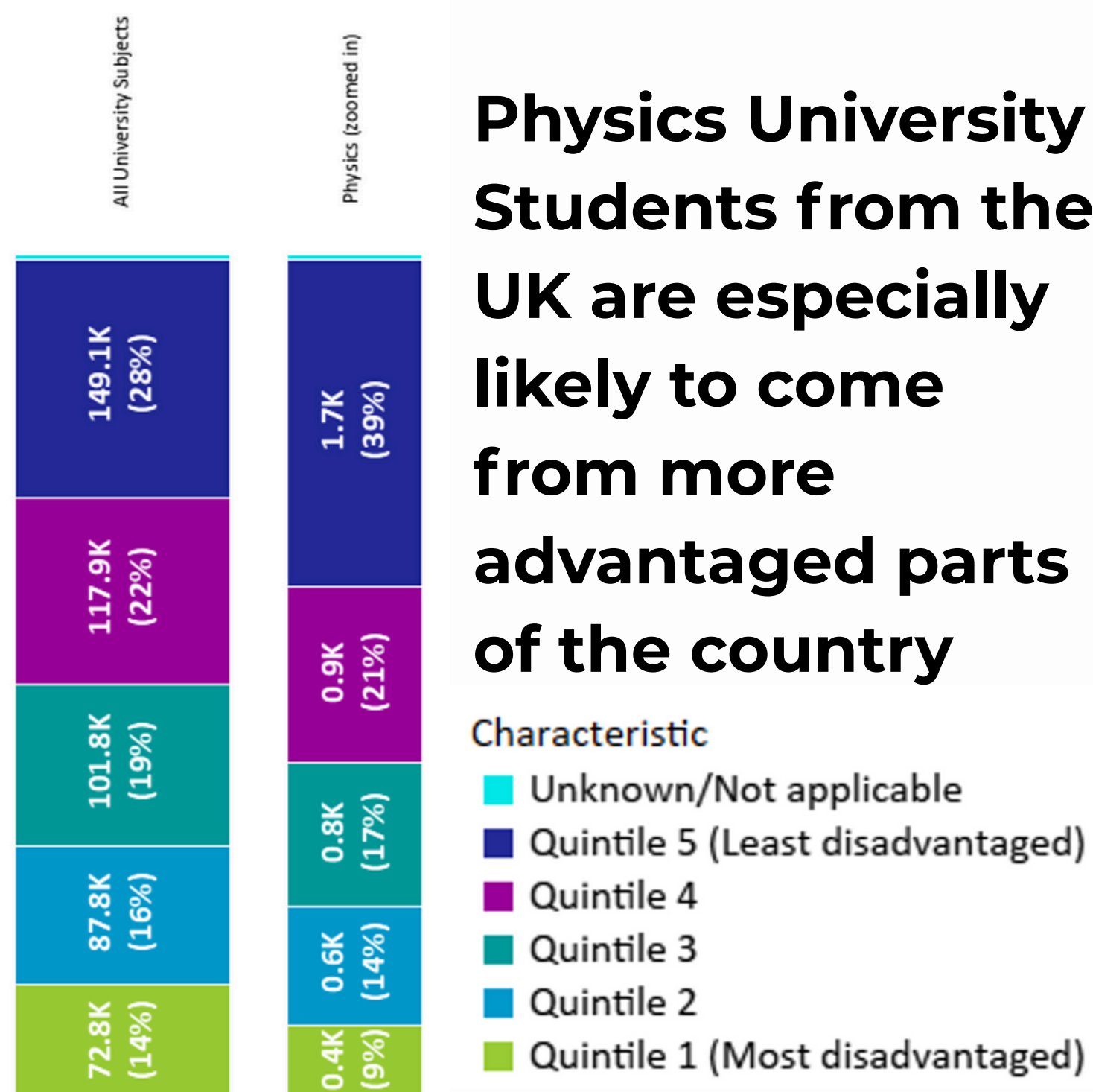


*Students from Black and some Asian backgrounds continue to be under-represented in physics at university: More-so than in many other comparable subjects*

**Sources: Department for Education (DfE), HESA/JISC**

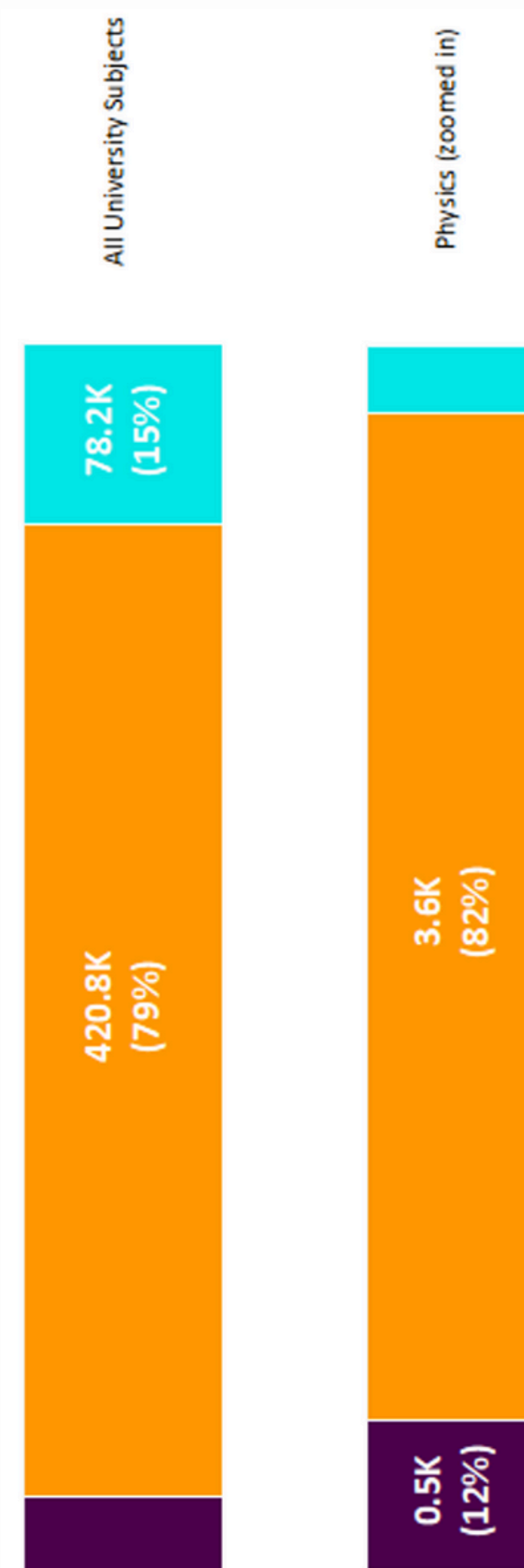


# IOP: Socio-economic background



**Among comparable subjects, Physics students are the most likely to have attended privately funded schools**

- Unknown/Not applicable
- State funded school or college
- Privately funded school





# Promoting EDI in Physics

- In our different scientific communities, work on how to cultivate an **inclusive environment for all**
- Investigate and tackle **barriers** and **issues** encountered by different groups and different stages of their careers
- Develop **outreach initiatives** to encourage the next generation of scientists, focused on those under represented groups





# Public Engagement at STFC



STFC Public Engagement Strategy



STFC Public Engagement Evaluation Framework

## Funding opportunities from STFC

Engage the public with science, technology or facilities

- **Spark Awards** (£1 - £15k)
- **Nucleus Awards** (£15 - £125k)



# IOP Public Engagement Grant Scheme

The **Institute Of Physics (IOP)** Limit Less campaign supports young people to change the world and fulfil their potential by doing physics



**Apply for £500 - £4,000**  
**Three rounds a year!**

[Report](#)

**IOP** Institute of Physics

*Unfortunately, some young people are put off by the misconceived ideas they are told about what physics is. Others are denied the opportunity to study physics due to the prejudice and stereotypes that they experience because of who they are.*

*Many girls are told that physics is more suited to boys, and both girls and boys are told that physics is not for the likes of them based on their **ethnicity**, their **sexual orientation**, their **disability** and their **social background**.*

The [grant](#) looks to prioritise projects that reach families with young people under the age of 16 who identify with one or more of the following groups:

- Girls and young women
- Disabled young people
- LGBT+ young people
- Young people from disadvantaged backgrounds
- Black Caribbean young people



# Is Physics Diverse?

**Well.. not as much as we would like**

**Internationally countries in the Global South fare much worse (in general!!)**

→ Many students, researchers and scientists live in countries that lack educational and training resources, their universities lack investment

→ Many scientists do not have any access to research / travel funding, or governmental support

→ Many students and young people lack exposure to research, and access to research opportunities

**→ This costs us valuable talent and scientists!**



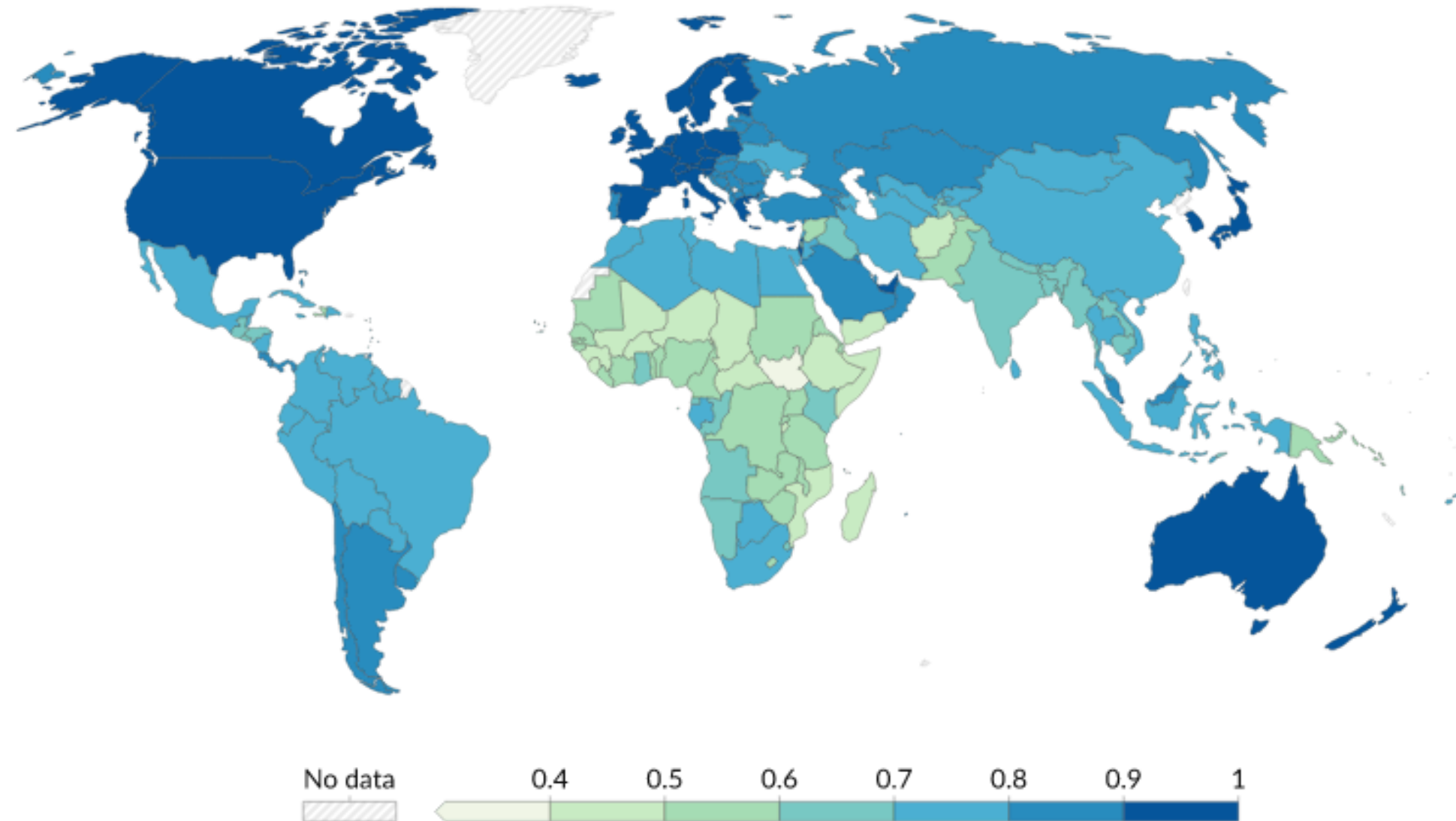


# Research Gap between Global North and South

## Human Development Index, 2023

Our World  
in Data

The Human Development Index (HDI) is a summary measure of key dimensions of human development: a long and healthy life, a good education, and a decent standard of living. Higher values indicate higher human development.



Data source: UNDP, Human Development Report (2025)

OurWorldinData.org/human-development-index | CC BY

Our World in Data

Global South countries account for 80% of the world's population but only 28% of the world's scientists come from these countries

UNESCO Science Reports

# The making of Physics Without Frontiers

**Dr Wafaa Khater, Birzeit University,  
Palestinian Territories.**



- Lacks time for research
- No access to research grants
- No funding to travel to conferences to present results and meet new collaborators

Since faculty struggle to be engaged in research due to

- no access to grants for equipment / time buy outs
- no research time allocated
- no access to funds to travel to workshops, meetings, conferences
- often isolated - scientist don't visit there

BSc and MSc students lack opportunities for research to go onto further study - get MSC/PhD positions

- lack exposure to opportunities such as CERN Summer School

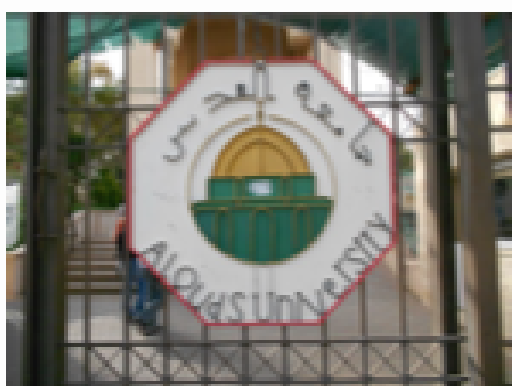
**This costs us valuable scientists!**



# The making of Physics Without Frontiers



- Palestinians place a uniquely high value on education (>25 % in high level education, no issue with educating women)
- Universities with physics departments and high standard of teaching
- Number of Palestinians currently in the field (PhDs or postdocs)





# The making of Physics Without Frontiers



Organised a roadshow with intensive particle physics masterclasses

We visited Palestine (3-4 Universities West Bank, plus 3 Gaza) for several years



# The making of Physics Without Frontiers



**2013 I went for 6 months to teach at Birzeit University whilst working on ATLAS**



# The making of Physics Without Frontiers

ICTP Physics Without Frontiers works to **inspire, train** and **motivate** physics and mathematics university students worldwide with some focus on science and technology lagging countries, to help build the next generation of scientists. Each project is unique, developed with the country's specific needs in mind.

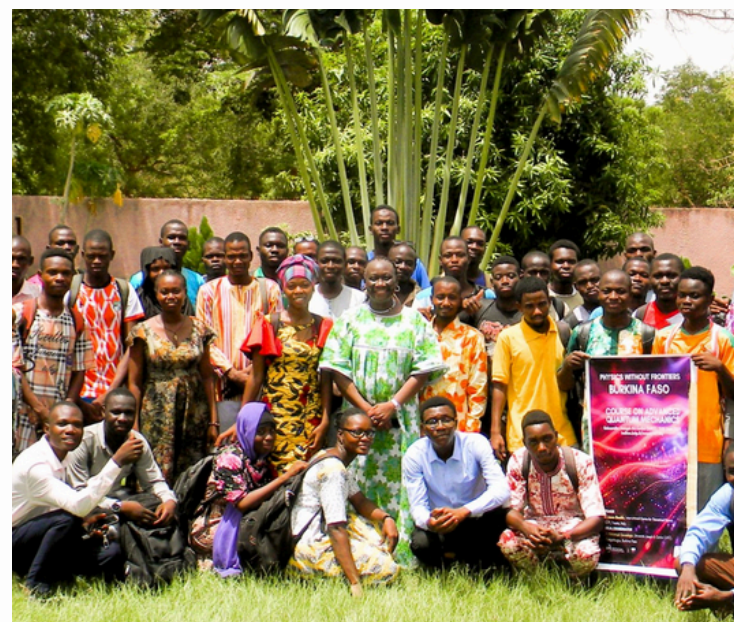
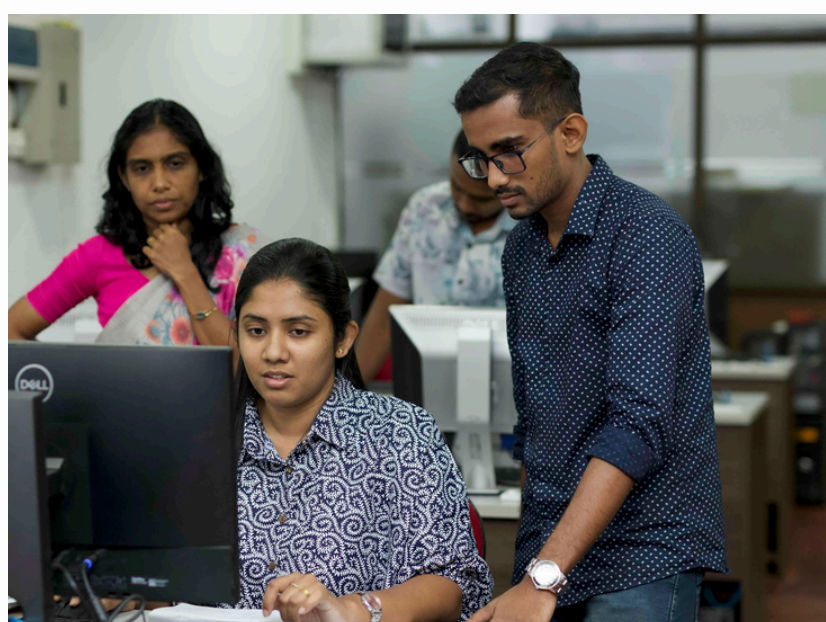
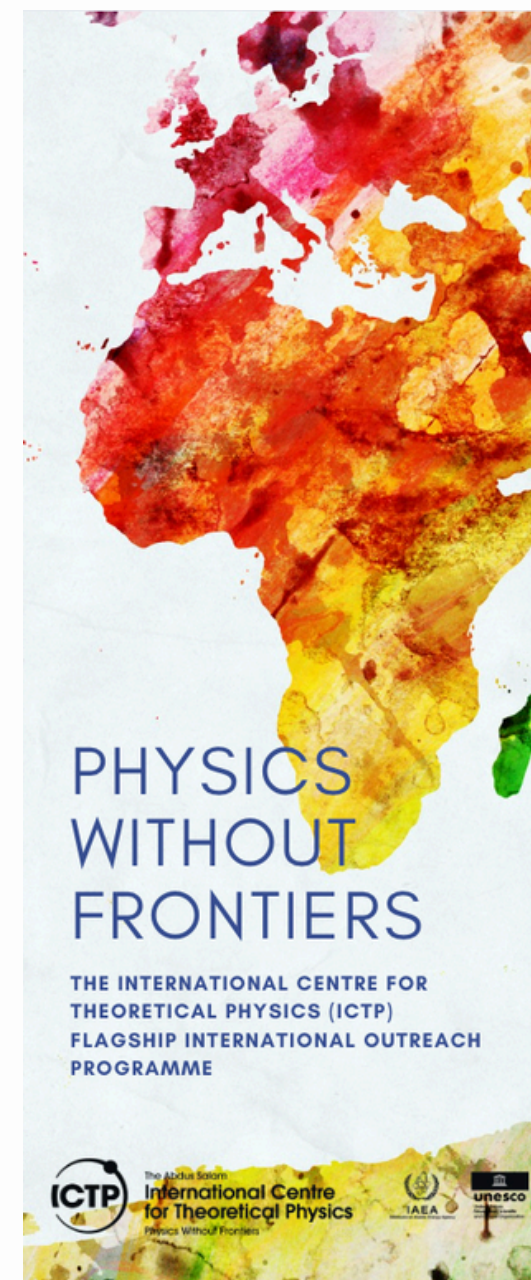
- Inspire and motivate the next generation of physicists
- Train and educate those with less access
- Provide environments for networking and collaboration





# ICTP Physics Without Frontiers @ictpPWF

We work with over **50 countries** worldwide, and run around 25 PWF projects around the world every year, in all areas of physics with some focus on least developed countries and conflict regions

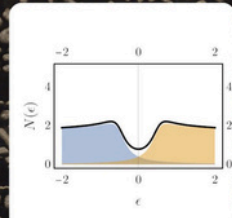




# ICTP Physics Without Frontiers @ictpPWF

**PHYSICS WITHOUT FRONTIERS: MALI**


COURSE ON ORDINARY DIFFERENTIAL EQUATIONS USING GREEN'S FUNCTION



**Dates:** 5 - 16 MAY 2025  
**Location:** Faculty of Sciences and Techniques, University of Sciences, Techniques and Technologies of Bamako (USTTB), Mali  
**Indico:** [indico.ictp.it/event/11004/](https://indico.ictp.it/event/11004/)

**SPEAKER:**  
Dr. Laure GOUBA, International Centre for Theoretical Physics (ICTP), Trieste, Italy


**LOCAL COORDINATOR:**  
Dr. Kaniba Mady KEITA, Faculty of Sciences and Techniques, University of Sciences, Techniques and Technologies of Bamako (USTTB), Mali



**PHYSICS WITHOUT FRONTIERS: SUDAN**

EXPANDING PHYSICS HORIZONS IN SUDAN: LEVERAGING ONLINE SEMINARS FOR GROWTH


1 JUNE - 16 JULY 2025



**Registration:** [tiny.cc/PWFSudan](https://tiny.cc/PWFSudan)  
**Webpage:** [indico.ictp.it/event/11030/](https://indico.ictp.it/event/11030/)

**Project coordinators:**  
Alaa Mohammed Idris Bakhit, Materials Physics Center (MPC), Spain  
Dr. Abubakar Y. A. Ibrahim, Institute of Space Sciences (ICE) & Universidad Autónoma de Barcelona (UAB), Spain

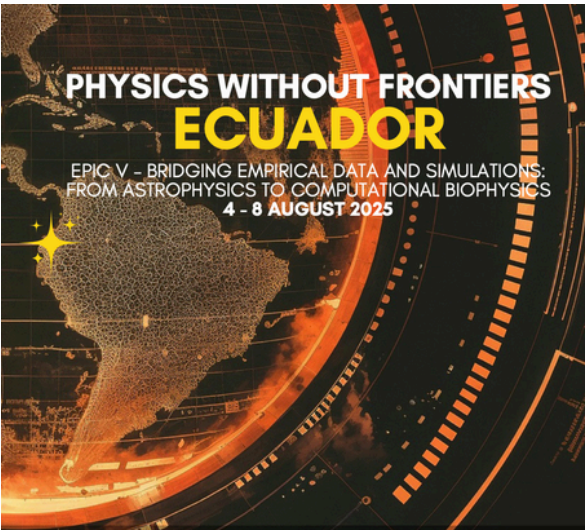
**Local Organizing Committee:**  
Dr. Elbasher M. E. Ahmed, Mohammed Y. A. Eldaw, Hazim E. Y. El Sheikh, Ethihal Siraj Mohammad Othman, Migdad Yahya, Gotiba Hamza.



**PHYSICS WITHOUT FRONTIERS ECUADOR**


EPIQ V - BRIDGING EMPIRICAL DATA AND SIMULATIONS: FROM ASTROPHYSICS TO COMPUTATIONAL BIOPHYSICS

4 - 8 AUGUST 2025



**Indico:** [indico.ictp.it/event/11049/](https://indico.ictp.it/event/11049/)  
**Registration Form:** [tinyurl.com/PWFECUADOR](https://tinyurl.com/PWFECUADOR)

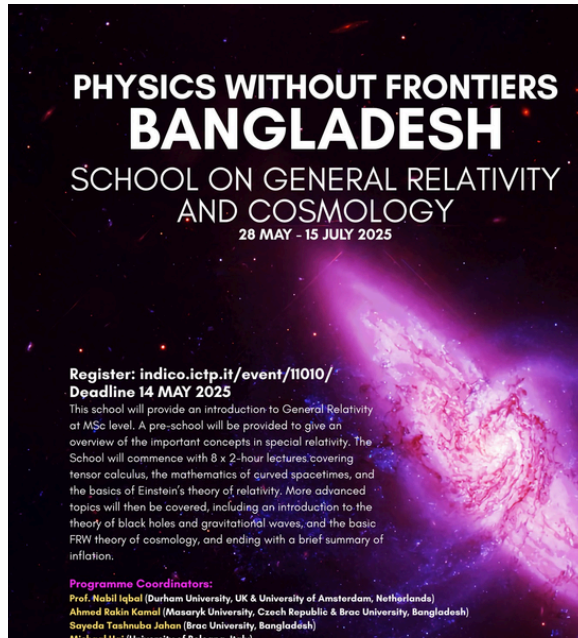
**Speakers and Coordinators:**  
Hernán Andrés Morales-Navarro, UDLA, Ecuador  
Paulina Vizcaino, UIDE, Ecuador  
Wladimir Banda-Sarragán, Yachay Tech, Ecuador  
Helga Dénés, Yachay Tech, Ecuador  
Lupe Villegas, CSIC-UAM, Spain  
Edison Salazar, Leiden University, Netherlands



**PHYSICS WITHOUT FRONTIERS BANGLADESH**

SCHOOL ON GENERAL RELATIVITY AND COSMOLOGY

28 MAY - 15 JULY 2025




**Register:** [indico.ictp.it/event/11010/](https://indico.ictp.it/event/11010/)  
**Deadline:** 14 MAY 2025

This school will provide an introduction to General Relativity at MSc level. A pre-school will be provided to give an overview of the important concepts in special relativity. The School will commence with 8 x 2-hour lectures covering tensor calculus, the mathematics of curved spacetimes, and the basics of Einstein's theory of relativity. More advanced topics will then be covered, including an introduction to the theory of black holes and gravitational waves, and the basic FRW theory of cosmology, and ending with a brief summary of inflation.

**Programme Coordinators:**  
Prof. Nabli Iqbal (Durham University, UK & University of Amsterdam, Netherlands)  
Ahmed Rakin Kamal (Masaryk University, Czech Republic & Bras University, Bangladesh)  
Sayeda Tasnuva Jahan (Bras University, Bangladesh)  
Michael Hui (University of Bologna, Italy)

**Lecturers:**  
Prof. Nabli Iqbal (Durham University, UK & University of Amsterdam, Netherlands)  
Prof. Naïfs Ishikawa (IHES, Paris, France)  
Hassan Saleem (CUNY, New York, USA)  
Luca Brunelli (University of Bologna, Italy)

**Guest Speakers:**  
Prof. Clifford Burgess (Perimeter Institute & McMaster University, Canada)  
Prof. Samir Mathur (Ohio State University, USA)



**PHYSICS WITHOUT FRONTIERS UGANDA**


EAST AFRICAN TRAINING WORKSHOP ON MACHINE LEARNING AND DATA SCIENCE APPLICATIONS IN SPACE WEATHER AND IONOSPHERIC RESEARCH

8-12 SEPTEMBER 2025



**Indico:** [indico.ictp.it/event/11009/](https://indico.ictp.it/event/11009/)  
**Location:** Ucofa Boardroom-Mbarara University of Science and Technology (MUST), Uganda  
**Project coordinator:** Dr. Patrick Mungufeni, Muni University, Arua, Uganda

**Local Organizing Committee:**  
Dr. Sharon Aul, Mbarara University of Science and Technology, Mbarara, Uganda  
Ms. Yvonne Mpagye-Orio, STI unit, ICTP, Trieste, Italy  
Dr. Valence Habyarimana, Mbarara University of Science and Technology, Mbarara, Uganda  
Dr. Geoffrey Andima, Busitema University, Tororo, Uganda  
Dr. Phillip Opio, Mountains of the Moon University, Fortportal, Uganda



**PHYSICS WITHOUT FRONTIERS AFGHANISTAN**

AFGHAN PHYSICS STUDENTS CONFERENCE 2025

7-8 November 2025  
<https://indico.ictp.it/event/10781/>



**ORGANISING COMMITTEE**  
Bahattar Amin, University of Freiburg, Germany  
Chaman Ali Dostdaran, IASBS, Iran  
Sharif Hussain, University Medical Center Hamburg-Eppendorf, Germany  
Fawad Naeem, Stockholm University, Sweden  
Akmal Sajad Nazari, Kabul University, Afghanistan  
Zainab Nazari, European Brain Research Institute (EBRI), Italy  
Farzila Payandi, IASBS, Iran  
Mahmoud Rahimi, Kabul University, Afghanistan  
Safid Mohean Sadr, IASBS, Iran  
Kate Shaw, ICTP, Italy  
Humaira Yaqoobi, IASBS, Iran

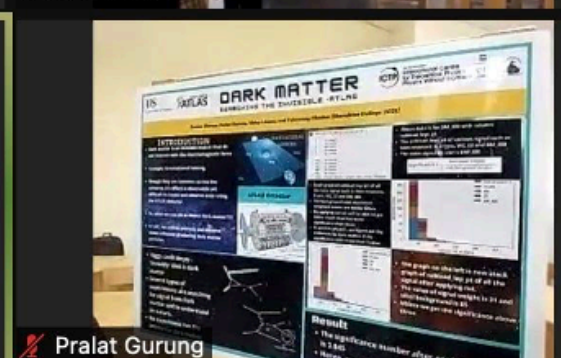
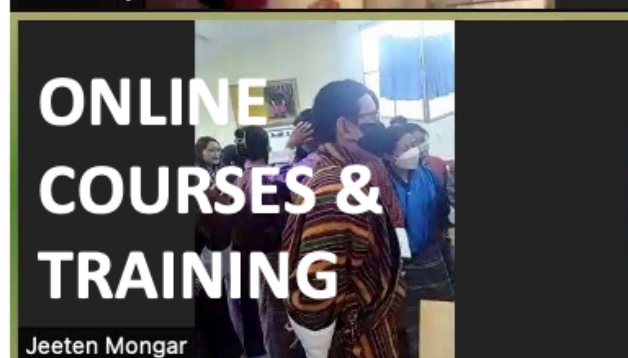


We work to bring physics to each corner of the Globe, with focus on:

- **Economic Frontiers:** Low income & science & technology lagging countries
- **Social Frontiers:** Women and Girls, cultural frontiers
- **Geographical Frontiers:** Rural and remote areas
- **Sociopolitical Frontiers:** under represented ethnicities and conflict regions or political turmoil



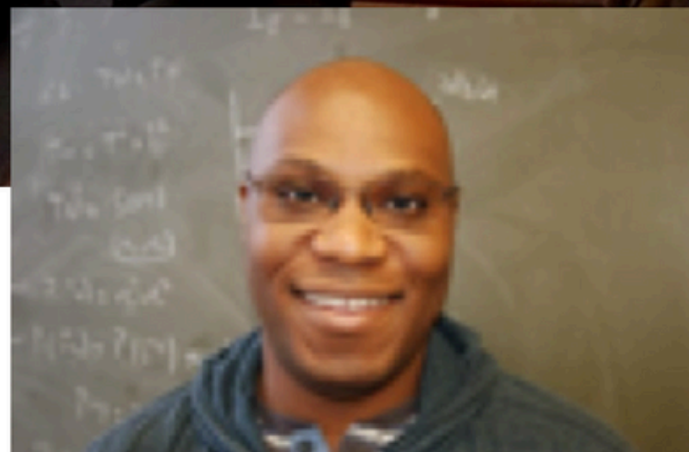
# ICTP Physics Without Frontiers @ictpPWF





# ICTP Physics Without Frontiers @ictpPWF

## VOLUNTEER NETWORK



PWF volunteer, Ibrahima Bah  
Assistant professor, John Hopkins University.



*'Thanks for the opportunity for participating in the PWF Senegal. I had a fantastic time! I am looking forward to doing one again anywhere, I will be happy to volunteer as opportunities arise. '*



# ICTP Physics Without Frontiers @ictpPWF

We have a focus on countries in conflict or political turmoil

Afghanistan



- Annual Schools 2018, 2019
- Working with governments and UNESCO to develop BSc and MSc courses
- With no MSc, PWF works with IASBS and Iranian universities to provide now 30 MSc scholarships for students

Kate Shaw, Baktash Amini, Encieh Erfani, Marco Celoria, Fawad Hassan, Zainab Nazari, Sajad Nazari, Jawad Ahmedi



# Women in Physics in South Africa

We have a focus on supporting under represented groups

Women and Girls




**Tana Joseph**  
Astronomy, University of Cape Town

You do what you must to achieve your dreams! It's probably not going to be easy, but if it's what you want to do, then it's worth it.

Tana Joseph is a Radio Astronomer at the University of Cape Town. As part of her research she studies black holes outside of our galaxy which emit X-Ray radiation.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com



**Sylvia Ledwaba**  
Material Modelling, University of Limpopo

I love doing research, learning about how technology works, and actually improving the science. I find it beautiful.

Sylvia Ledwaba is a PhD student at the University of Limpopo. Originally from Ma-shashane, Limpopo, Sylvia spends her time working to make for efficient portable power sources as part of her PhD at the University of Limpopo.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com




**Hellen Chuma**  
Material Modelling, University of Limpopo

My mother is my greatest support, she always says 'If you have education you can equip yourself for life.'

Hellen Chuma is from Makgote, Limpopo. She is a PhD student at the university of Limpopo where she studies the use of palladium as a catalyst for emission control technology.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com



**Riona Ramraj**  
Astronomy, University of Cape Town

My grandfather used to take me to the library every week. And I always made sure that at least one of the books I took was a science book.

Originally from Pietermaritzburg, Riona Ramraj is a PHD candidate from the University of Cape Town working on the details of the light emitted from the brightest part at the centre of a galaxy (the Active Galactic Nucleus) in order to determine their nature and evolution.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com

Developed an outreach initiative to encourage the next generation of scientists, focused on those under represented groups



**Igle Gledhill**  
Fluid Dynamics, Centre of Scientific and Industrial Research

I have a burning interest in science and the success of science in South Africa.

Igle Gledhill studies the aerodynamics of agile aircraft for the CSIR. She is from Grahamstown. An expert in fluid dynamics, Igle has studied a wide range of problems ranging from molecular treatments of TB and HIV to the Space Shuttle.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com



**Hester Burger**  
Medical Physics, University of Cape Town / Groote Schuur

I had two loves. One was biology, and the other one was physics. So medical physics was actually the obvious choice to go into. I love making a difference in peoples' lives.

Hester Burger grew up in Stutterheim in the Eastern Cape and completed her MSc degree in Medical Physics in 1997. She is Head of Division for Medical Physics at UCT / Groote Schuur Hospital and spends her time trying to make a difference in the lives of cancer patients.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com



**Adriana Marais**  
Open Quantum Systems, University of KwaZulu-Natal

I hope one day to continue my research on Mars, and possibly even contribute to the discovery of evidence that life once existed there.

Adriana Marais is a theoretical physicist with the University of KwaZulu-Natal, and investigates quantum mechanical effects in biological systems. She is currently striving to be one of the pioneers to establish a colony on Mars.

Some information about the project, maybe an internet website and other details details details

www.womenphysicistsinsouthafrica.com



# PWF ALUMI



*"I love physics and want to make a difference in the world. I am driven to build a career in medical physics, particularly in radiation therapy and imaging for cancer treatment."*

Rami Dhungana K.C took part in the 2018 PWF HEP Winter School, Kathmandu, and is currently a CERN summer student.



Physics Without Frontiers Palestine  
Islamic University of Gaza

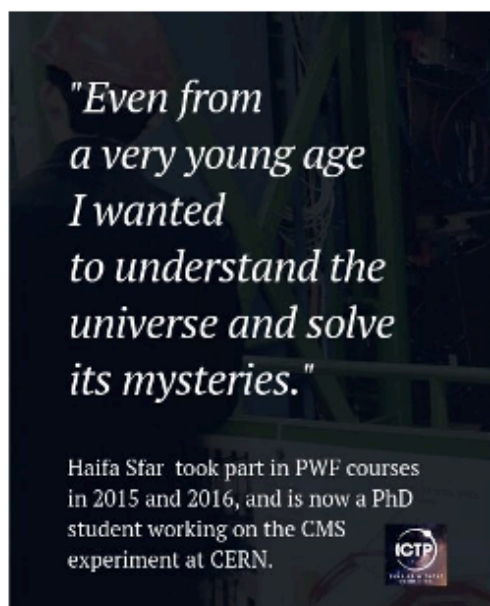


*"I believe physics is life and life is physics!"*  
Layla, physics student



*"There are many inspiring women with great contributions in physics and my dream is to become one of them."*

Afnan Alostaz took part in the 2017 PWF Palestine program, Islamic University of Gaza, and is now participating in programmes at CERN.



*"Even from a very young age I wanted to understand the universe and solve its mysteries."*

Haifa Star took part in PWF courses in 2015 and 2016, and is now a PhD student working on the CMS experiment at CERN.



PHYSICS WITHOUT FRONTIERS  
BRAINGAIN-VENEZUELA

SUPPORTING PHYSICS TEACHING  
AND RESEARCH IN VENEZUELA

[WWW.ICTP.IT/PHYSICS-WITHOUT-FRONTIERS/BRAINGAIN-VENEZUELA](http://WWW.ICTP.IT/PHYSICS-WITHOUT-FRONTIERS/BRAINGAIN-VENEZUELA)

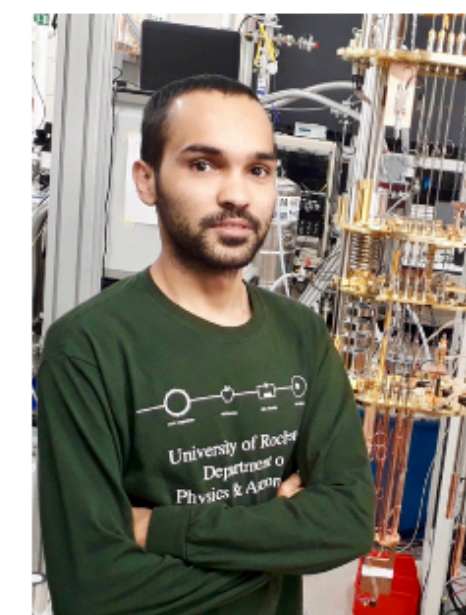


Over **600** students have been mentored to further study, MSc, PhD, Postdocs!  
Many have become PWF Volunteers!



*"I had always wanted to know how nature works, and at the PWF workshop, I felt a step closer."*

Mahesh Thakuri took part in the 2014 PWF particle physics workshop, Nepal, and is now studying for his masters in physics.



*"My aim is to continue research, and to share what I've learned and provide support for those deprived of opportunities and exposure."*

Yadav P. Kandel took part in the 2014 PWF particle physics masterclasses in Nepal, and is currently a graduate research assistant at the University of Rochester, working on quantum computing and quantum information.





# Physics for Sustainable Development

Physics **outreach** and **communication** in all countries around the world is vital to promote **scientific literacy** in the population

School students benefit from **enquiry based learning** (observation, measurement and experimentation)

Understanding scientific discovery requires continual readjustment with new facts

**Democracy** relies on a scientific literate population





# Physics for Sustainable Development

Countries at all income levels are looking to transition towards **digital and green economies** and **sustainably develop**

This vitally involves **investment into science**, and accelerating technology transfer into industry

To reach SDG by 2030 countries will need to **invest** more into **scientific research** and innovation



The Sustainable Development Goals Report:

<https://sdgs.un.org/documents/sustainable-development-goals-report-2023-53220>



# Open Science Movement




Open science is an **accelerator** for the **Sustainable Development Goals (SDGs) 2030** and a powerful tool to bridge the science divide between and within countries

**Open science** aims at making scientific knowledge openly **available, accessible** and **reusable**.

The key elements include open access to scientific publications, **data**, educational resources, software and hardware, and open infrastructures



# CERN OPEN DATA PORTAL



Help ▾ About ▾

Explore more than **five petabytes** of open data from particle physics!

Search

search examples: [collision datasets](#), [keywords:education](#), [energy:7TeV](#)

Explore

[datasets](#)

[software](#)

[environments](#)

[documentation](#)

Focus on

[ALICE](#)

[ATLAS](#)

[CMS](#)

[DELPHI](#)

[LHCb](#)

[OPERA](#)

[PHENIX](#)

[TOTEM](#)

[Data Science](#)

**ATLAS  $\sqrt{s}$  simulation for ML-based jet flavour tagging (JetSet)**

Flavour-tagging — the task of identifying the flavour of jets — is essential for many physics analyses at the ATLAS experiment. This dataset provides simulated jets for training and evaluation of flavour-tagging algorithms.

[Dataset](#) [Derived](#) [Simulated](#) [ATLAS](#)

**ATLAS releases first open data from heavy-ion collisions**

The ATLAS Collaboration has released its first open data of heavy-ion collisions for research purposes. This data includes the first open data of heavy-ion collisions, recorded in 2015 as part of the Large Hadron Collider's second operation period (LHC Run 2).

[News](#) [ATLAS](#)

**ATLAS releases 65 TB of open data for research**

Explore over 75 billion LHC collision events — from home

[News](#) [ATLAS](#)

**ATLAS DAOD\_HION14 format Run 2 2015 Pb-Pb MC simulation**

Run 2 2015 Pb-Pb MC simulation from the ATLAS experiment

[Dataset](#) [Simulated](#) [Heavy-Ion Physics](#) [ATLAS](#)

**ATLAS DAOD\_HION14 format Run 2 2015 Pb-Pb collision data**

Run 2 2015 Pb-Pb collision data from the ATLAS experiment

[Dataset](#) [Collision](#) [ATLAS](#)

**DAOD\_HION14 format 2015 Pb-Pb Open Data for Research from the ATLAS experiment**

2015 Pb-Pb Open Data for Research from the ATLAS experiment

[Dataset](#) [Simulated](#) [Collision](#) [Heavy-Ion Physics](#) [ATLAS](#)

**ATLAS top tagging open data set with systematic uncertainties**

Boosted top tagging is an essential binary classification task for experiments at the Large Hadron Collider (LHC). This dataset provides open data for research purposes.

[Dataset](#) [Derived](#) [Simulated](#) [ATLAS](#)

**DAOD\_PHYSLITE format 2015-2016 Open Data for Research from the ATLAS experiment**

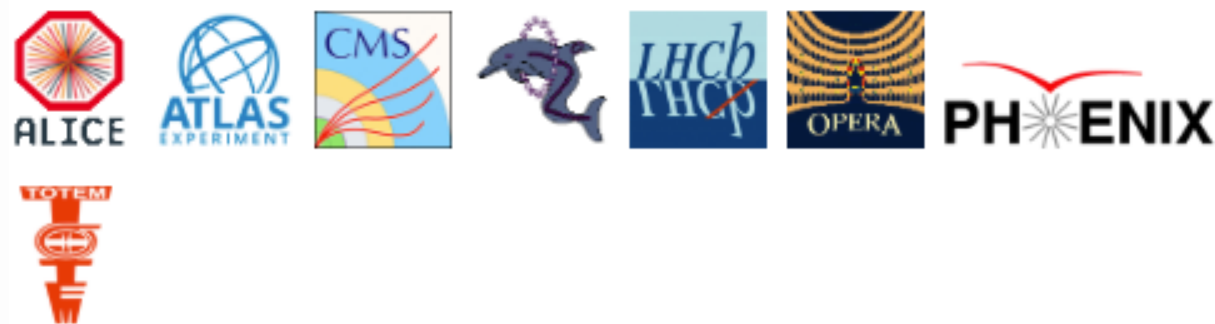
2015-2016 Open Data for Research from the ATLAS experiment

[Dataset](#) [Simulated](#) [Collision](#) [ATLAS](#)

**ATLAS DAOD\_PHYSLITE format MC simulation top systematic variation samples**

MC simulation top systematic variation samples from the ATLAS experiment

[Dataset](#) [Simulated](#) [Standard Model Physics](#) [Top physics](#) [ATLAS](#)



<https://opendata.cern.ch>



# ATLAS OPEN DATA

High Energy Physics data for everyone.

## For Education

To provide data and tools to high school, undergraduate and graduate students, as well as teachers and lecturers, to help educate them and exercise in physics analysis techniques used in experimental particle physics.

## For Research

To provide researchers with high-quality data recorded by the ATLAS detector, enabling them to conduct state of the art analyses in particle physics.

Get Started

## Our values

The collaboration shares the data gathered by the ATLAS detector committing to three fundamental principles:

### Accessibility

Make the data and the tools openly available for everyone to use, without technology, region, or knowledge restrictions.

### Transferable expertise

Along with particle physics analysis and ATLAS learning objectives, provide skills in programming, software and machine learning.

### Usability

Different target audiences, with different backgrounds and skills must be able to use the data and tools for a wide range of learning objectives.

## For Research Webpage

- **13 TeV Proton-Proton collision** datasets, 36 fb<sup>-1</sup>, 2015-2016, 65 TB in [PHYSLITE files](#) , with 2 billion events of simulated data
- **5 TeV Lead-Lead collision datasets**, 486μb<sup>-1</sup> , 2015, 4 TB in [DAOD HION14 files](#), with corresponding simulations
- **Event generation data** in [HEPMC format](#)
- **Heavy ion data** from the hard probes stream with corresponding simulations

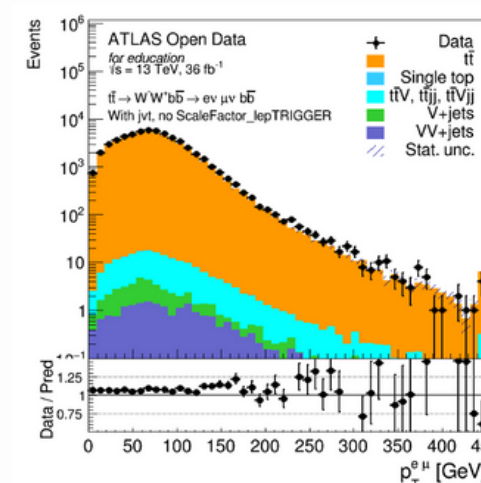
**NEW**

## For Education Webpage

Open Data for  
Research release  
65 TB, 36 fb<sup>-1</sup>  
PHYSLITE

Open Data for  
Education release  
2 TB, 36 fb<sup>-1</sup>  
ROOT NTuples

Skimmed samples  
selecting dedicated  
final states  
1.5 GB to ~350 GB  
ROOT NTuples



Datasets on  
[CERN Open Data Portal](#)  
including first  
and second  
releases.

Fully accessible [website](#) with step-by-step tutorials, tools, videos, data visualisation ([Histogram Analyser](#), [Machine Learning online application](#), teacher [workshop](#), [Jupyter Notebook analyses](#), and analysis facilities.



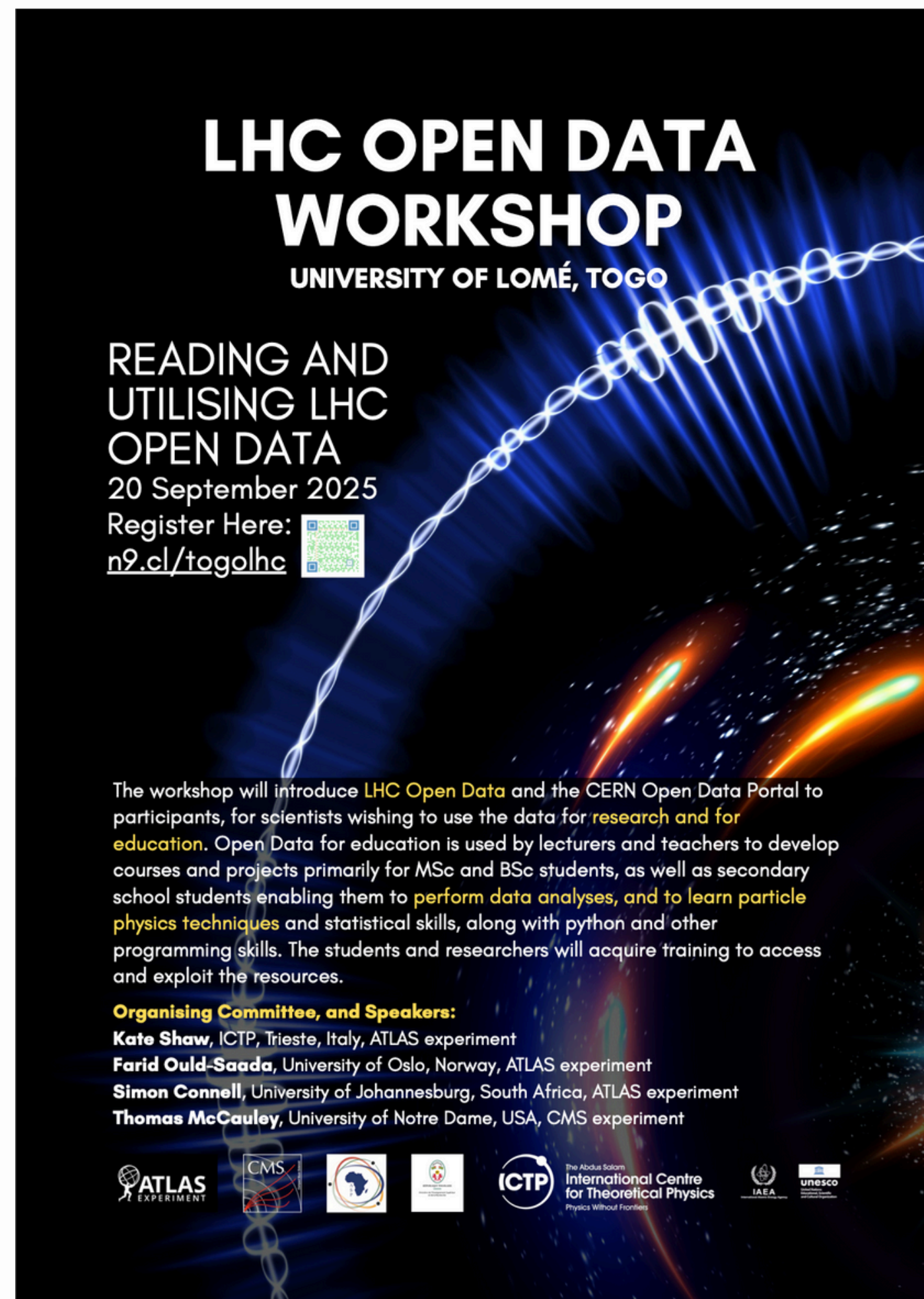
# OPEN DATA: How is it used?

Theorists/ scientists wanting to do studies

PhD training, undergraduate courses and BSc and MSc projects


- Students can dive into the learning objectives immediately (physics, statistics, analysis skills such as fitting and machine learning);

**Training** and **outreach** activities such as **hackthons** and **workshops**, with PhD students, university students, 16–18 year olds or even younger

The poster features a dark blue background with a glowing blue particle track (resembling a helix) and streaks of orange and yellow light. The text is white and yellow. The title 'LHC OPEN DATA WORKSHOP' is at the top in large white letters. Below it, 'UNIVERSITY OF LOMÉ, TOGO' is in smaller white letters. The subtitle 'READING AND UTILISING LHC OPEN DATA' is in white, followed by the date '20 September 2025' and the registration link 'n9.cl/togolhc' with a QR code. A paragraph of text describes the workshop's purpose. Below that, the 'Organising Committee, and Speakers:' section lists four names and their affiliations. At the bottom, there are logos for ATLAS, CMS, IAEA, UNESCO, and ICTP.






## LHC OPEN DATA WORKSHOP

UNIVERSITY OF LOMÉ, TOGO

READING AND  
UTILISING LHC  
OPEN DATA  
20 September 2025  
Register Here: [n9.cl/togolhc](https://n9.cl/togolhc) 

The workshop will introduce **LHC Open Data** and the CERN Open Data Portal to participants, for scientists wishing to use the data for **research and for education**. Open Data for education is used by lecturers and teachers to develop courses and projects primarily for MSc and BSc students, as well as secondary school students enabling them to **perform data analyses, and to learn particle physics techniques** and statistical skills, along with python and other programming skills. The students and researchers will acquire training to access and exploit the resources.

**Organising Committee, and Speakers:**  
**Kate Shaw**, ICTP, Trieste, Italy, ATLAS experiment  
**Farid Ould-Saada**, University of Oslo, Norway, ATLAS experiment  
**Simon Connell**, University of Johannesburg, South Africa, ATLAS experiment  
**Thomas McCauley**, University of Notre Dame, USA, CMS experiment

     The Abdus Salam  
International Centre  
for Theoretical Physics  
Physics Without Frontiers



# HEP Communication

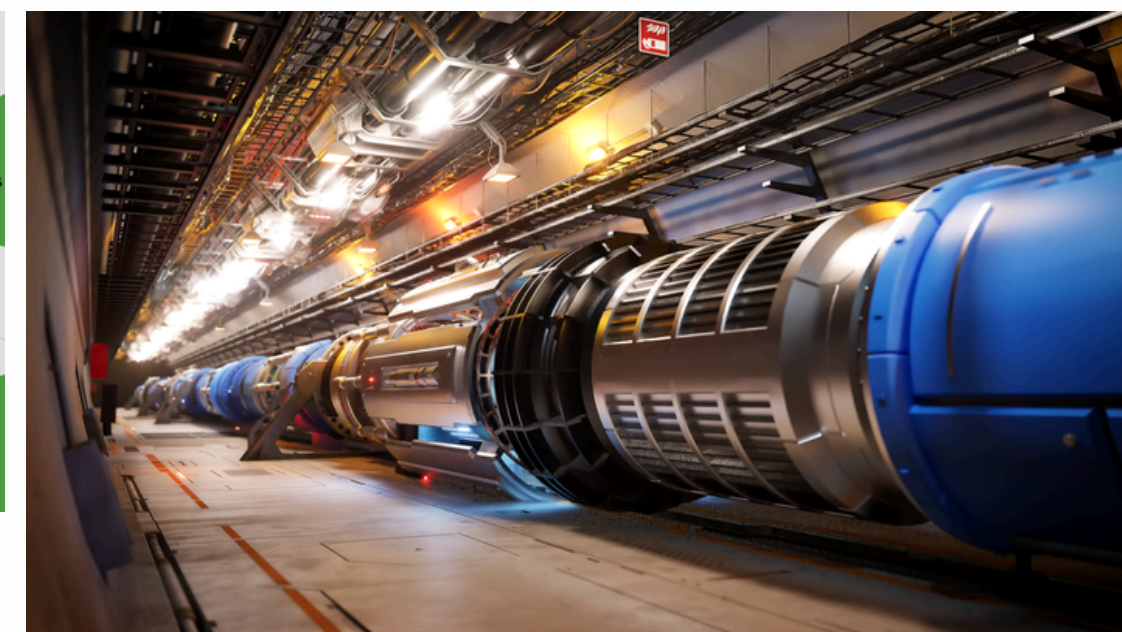
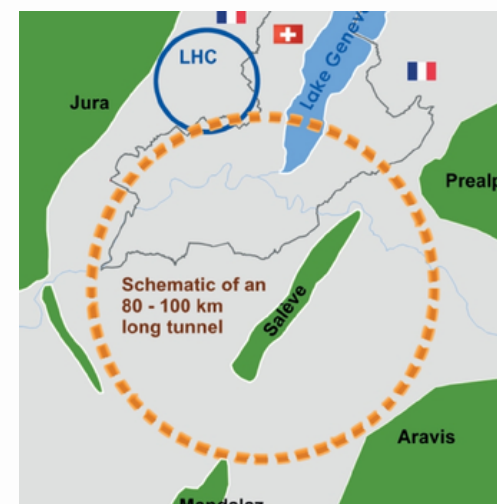
## We have big plans

→ We need to show the **societal impact** of our work

- Inspiration, education, high-level training, new technology, spin outs

→ **Communicate** our news and updates from our collaborations and groups using **press releases, websites** and **social media**

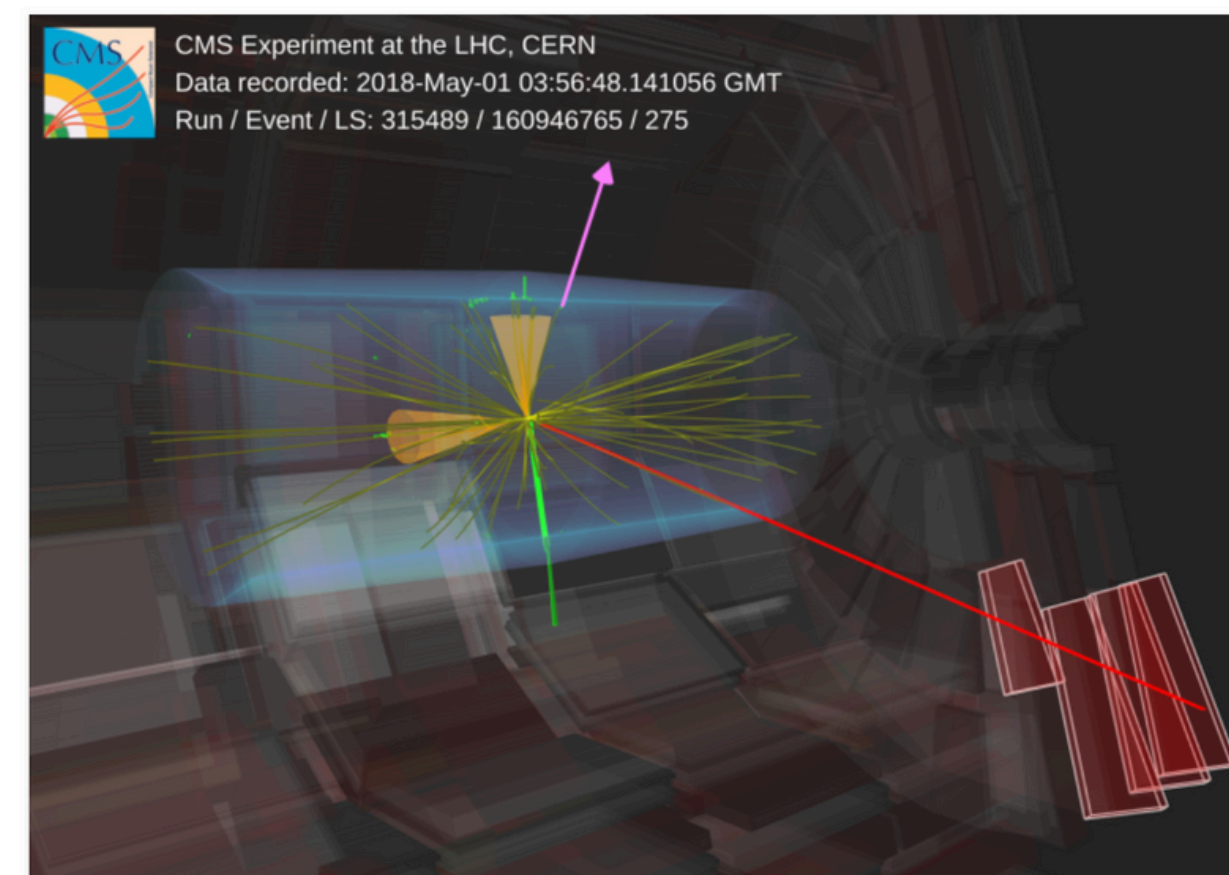
→ Build **trust** with the public, **inspire** policy makers, **educate** and train young people



## CMS finds unexpected excess of top quarks

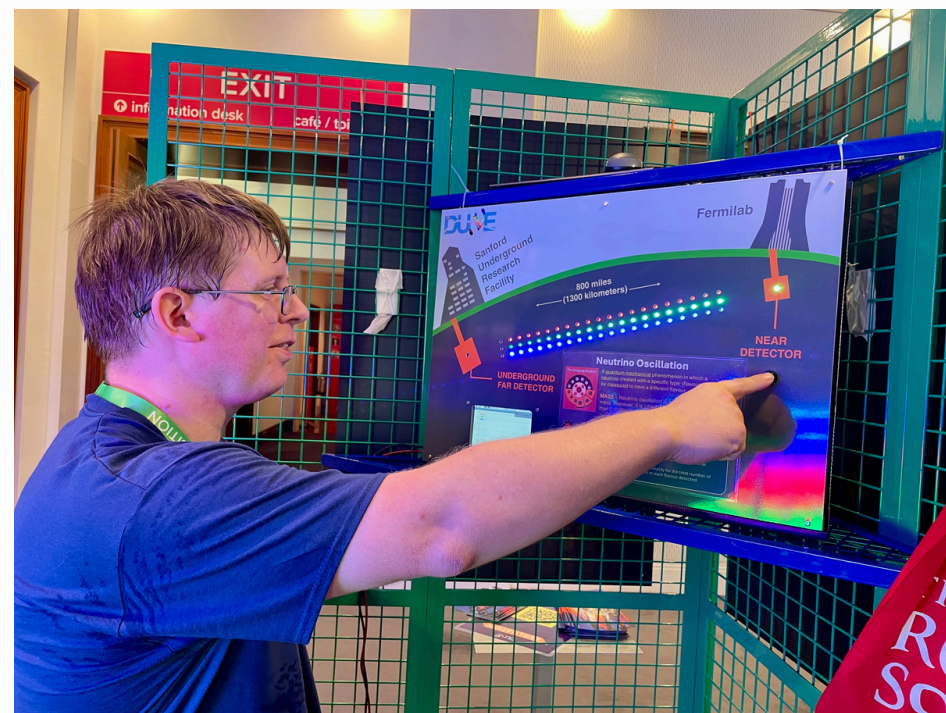
Data from the CMS experiment at CERN's Large Hadron Collider reveals an intriguing excess of top-quark pairs, hinting at the first observation of a composite particle with unique properties

3 APRIL, 2025





# Exhibits, Exhibitions, Festivals



**DUNE @ The  
Royal Society  
July 2024**



# Exhibits, Exhibitions, Festivals



UK Research  
and Innovation



SUMMER  
SCIENCE EXHIBITION  
2 – 7 JULY 2024  
THE ROYAL SOCIETY



CERN  
LANCASTER  
SUSSEX  
IOP



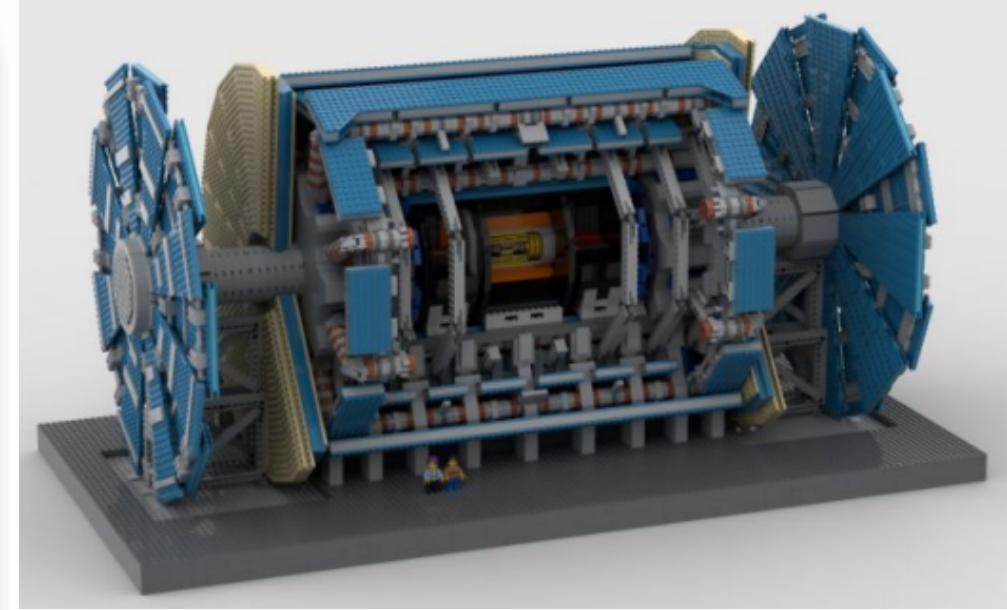
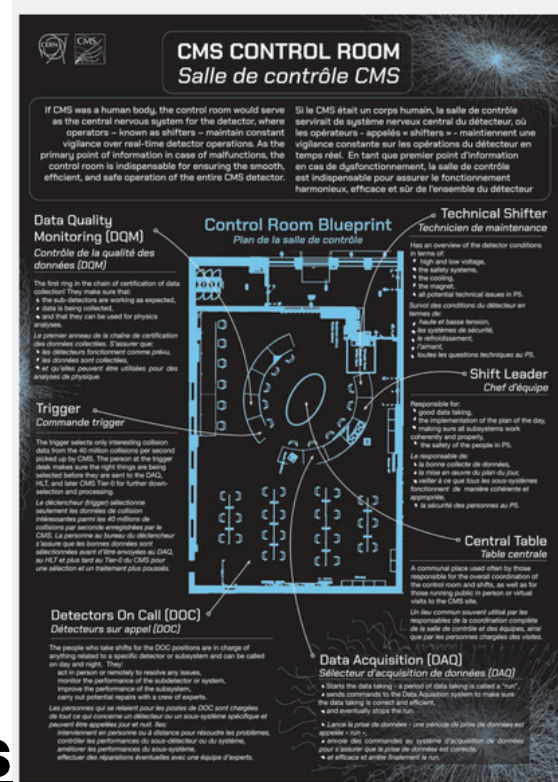
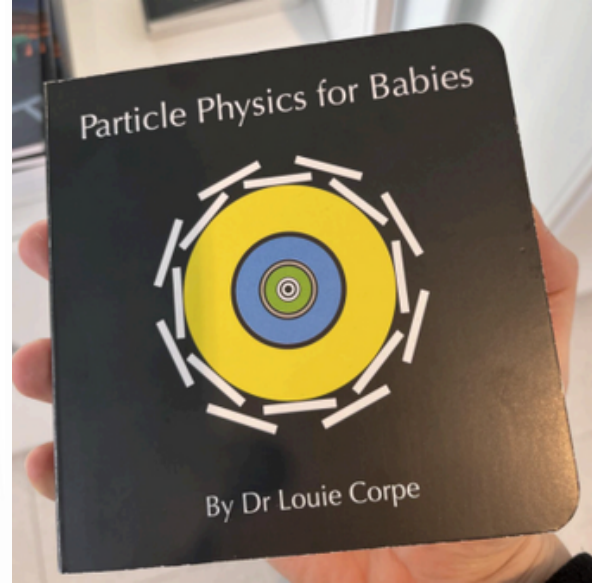
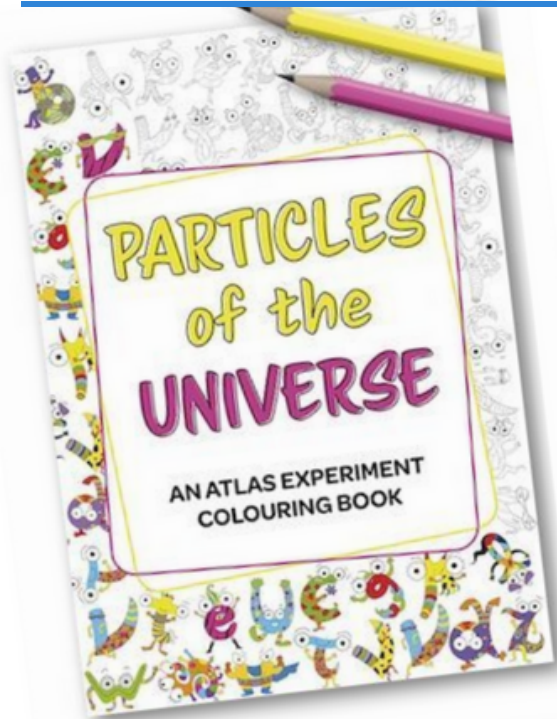
WOMAD  
THE WORLD'S FESTIVAL



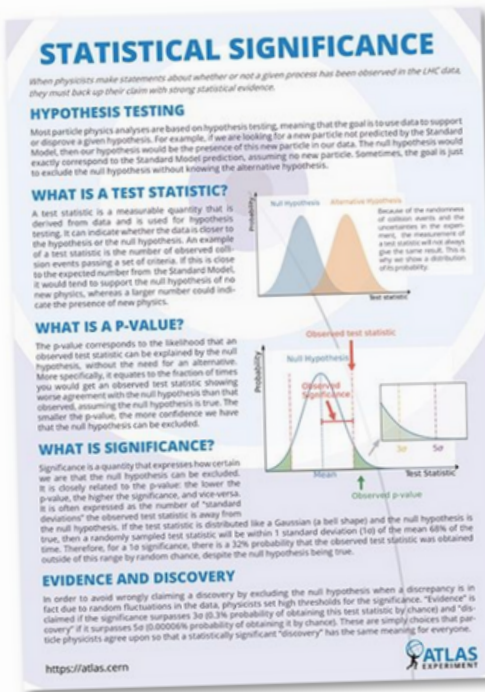


# Resources: Physics for all ages

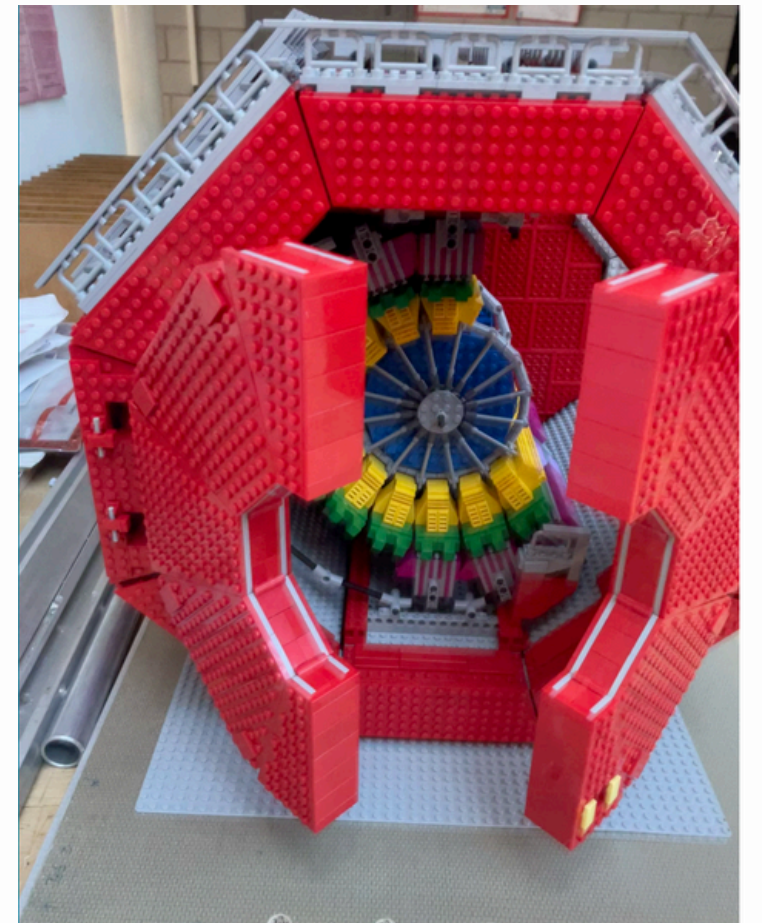
## ATLAS Resources



## Particles of the Universe Colouring Book



## CMS Resources

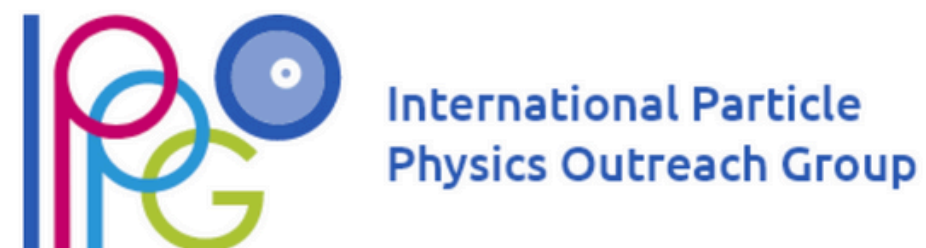




# Virtual Visits, & Masterclasses



[CMS Virtual Visits](#)

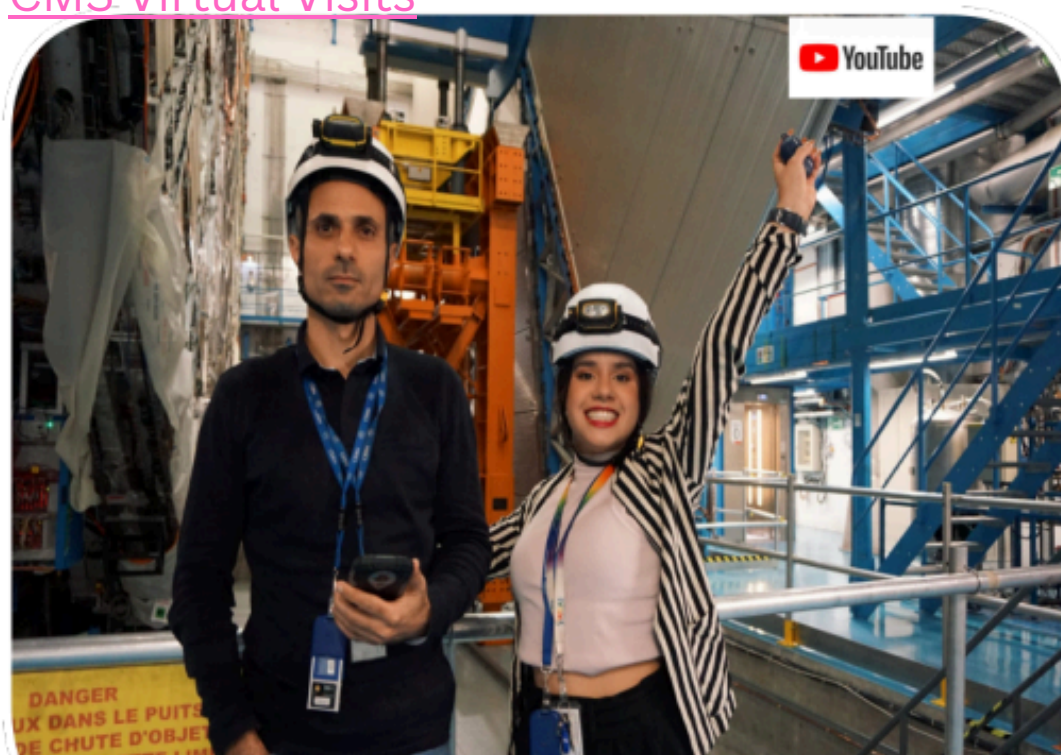


ACTIVITY

International  
Masterclasses



[IPPOG Masterclasses](#)



[ATLAS Virtual Visits](#)

[ALICE Virtual Visits](#)



MC2016Waw





# Summary

**EDI** is such an important part of building our community, we all must invest in supporting initiatives, and support the **international** community

**Outreach** and **Open Data** is an important part of our experiments deliverables, for research and education, to build trust and help secure support

Get in touch with your **collaboration EDI** team or **outreach** team, many resources out there.

