

# Science as a global endeavour

The new Ogden  
Centre at Durham



# Science as a global endeavour

Modern science is an **international** endeavour in which the **UK** is a genuine **world power**

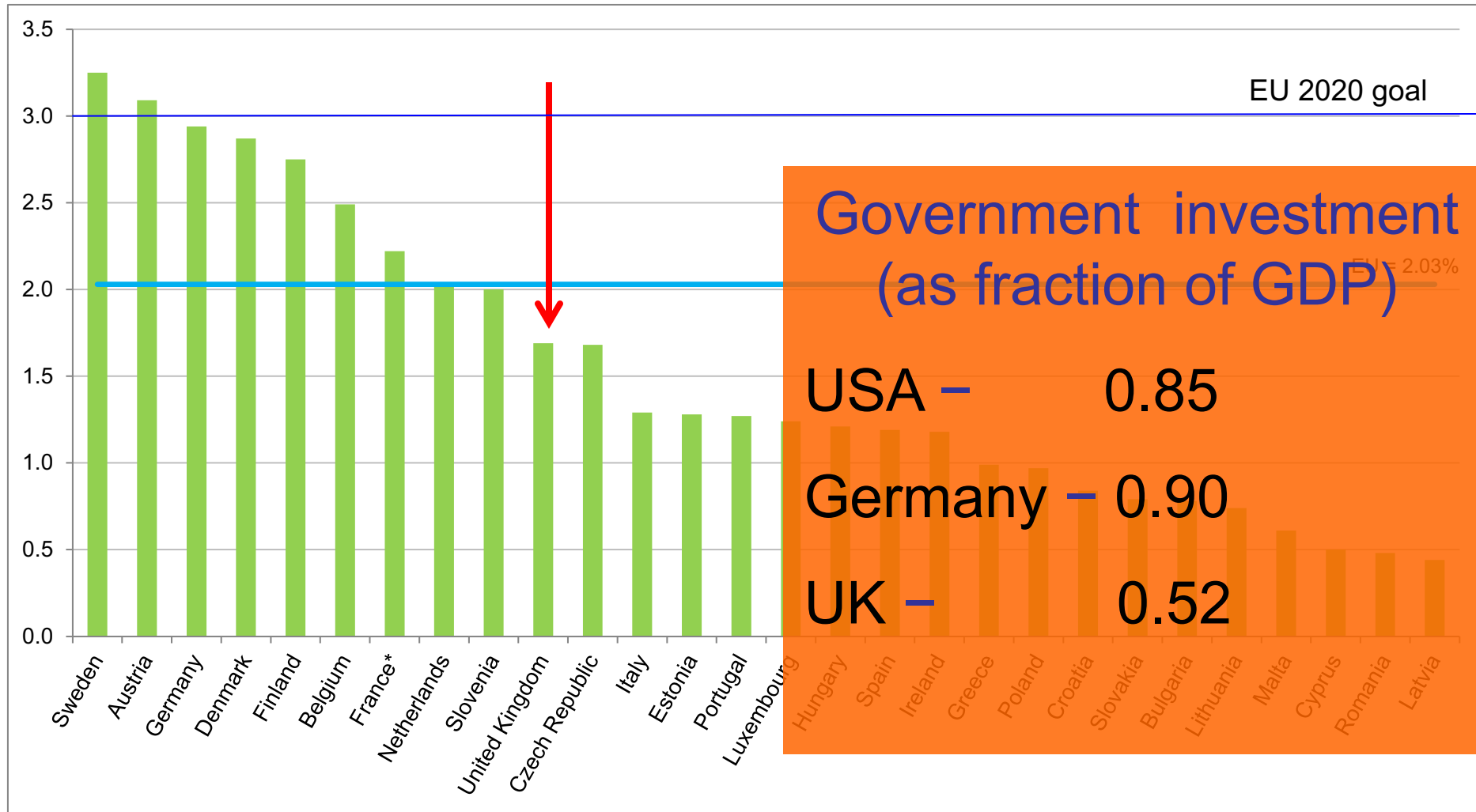
The **UK** (ranked **4<sup>th</sup>**) produces **8%** of the world's research **papers**, but has only **0.87%** of the world's population

**Why** is the UK so good at science?

→ **NOT** thanks to generous funding!



# EU: domestic expenditure in R&D as % of GDP (2016)



\* 2015 data instead of 2016

# Why is the UK so good at scientific research?

Five reasons why UK **overachieves** in science:

1. Long **tradition** of scientific research
2. → Efficient **resource** allocation based on high quality **peer review**
3. Educational system that encourages **curiosity** & **independence**
4. Open **doors** to best researchers in the **world**
5. Membership of **EU**

(That world science is conducted in **English** helps)

2, 4, 5 are under now under **threat** from eg **REF** and **Brexit**



# The UK as an international hub for scientific research

In UK universities:

- 28% of **academic** staff are non-UK nationals (**mostly EU**)
- 50% of **PhD** students are non-UK nationals
- 21% **academic** staff in **STEM** are from EU

# International nature of scientific research

CSF:

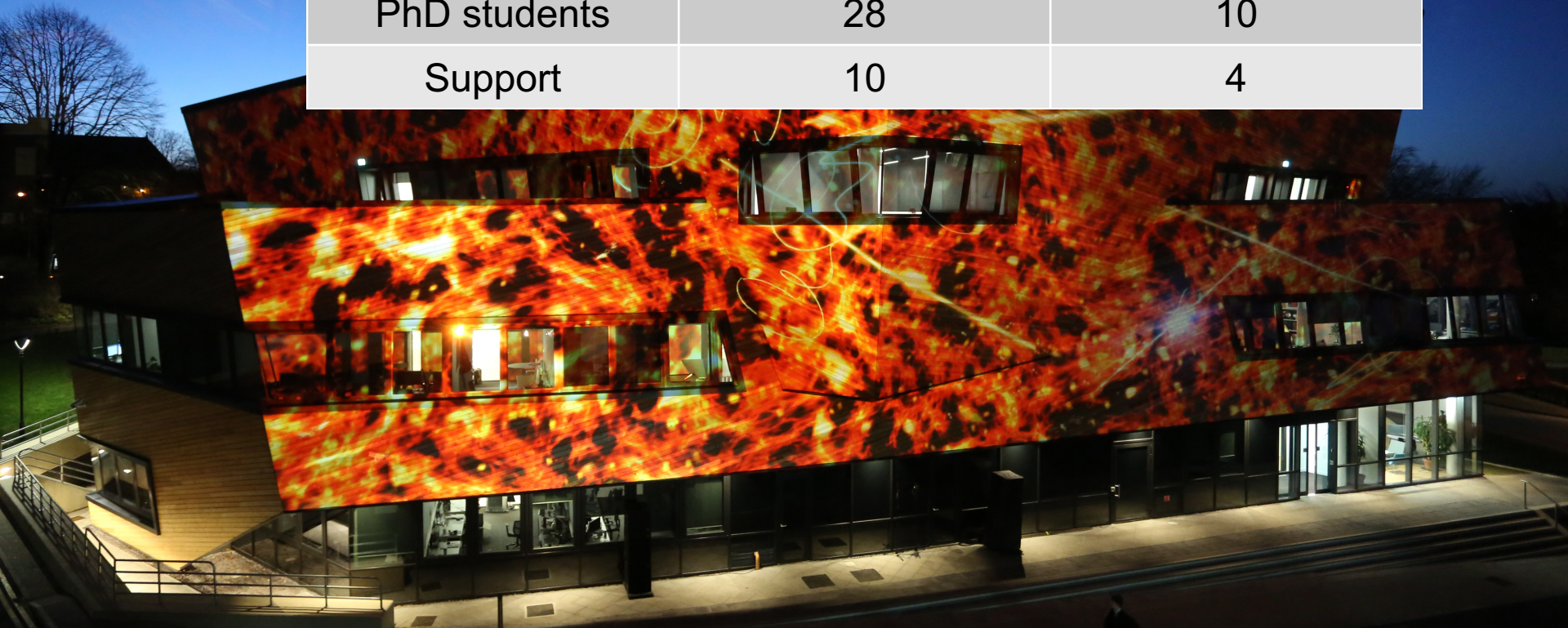
- Undergrad (Physics) – Mexico City, Mexico
- PhD (Astrophysics) – Cambridge, UK
- Postdoc 1 – Berkeley, CA, USA
- Postdoc 2 – Sussex/Sta Barbara, UK/USA
- Academic staff – Durham, UK

	Number	No of nationalities
PhD students	34	12
Postdocs	37	23



# Institute for Computational Cosmology Durham University

ICC	Number	No of nationalities
Academics	13	6
Postdocs	17	10
PhD students	28	10
Support	10	4









## Why is the best science international?

- Biggest problems are too big for single nations to tackle
- Greater pool of talent
- Greater resources

**CERN:** Budget -- £0.875 billion

- 22 member states; 8 associate member states; cooperation agreements with 36 countries;
- Facilities used by 600 universities and institutes

**European Space Agency:** Budget -- £4.9 billion

- 22 member states; 1 associate member state; cooperation agreements with 8 countries

# Why is the best science international?

- International teams combine different expertise, skills and talents

## Most cited paper in astrophysics/space science in 2015



### **The EAGLE project: simulating the evolution and assembly of galaxies and their environments**

Joop Schaye,<sup>1★</sup> Robert A. Crain,<sup>1</sup> Richard G. Bower,<sup>2</sup> Michelle Furlong,<sup>2</sup>  
Matthieu Schaller,<sup>2</sup> Tom Theuns,<sup>2,3</sup> Claudio Dalla Vecchia,<sup>4,5</sup> Carlos S. Frenk,<sup>2</sup>  
I. G. McCarthy,<sup>6</sup> John C. Helly,<sup>2</sup> Adrian Jenkins,<sup>2</sup> Y. M. Rosas-Guevara,<sup>2</sup>  
Simon D. M. White,<sup>7</sup> Maarten Baes,<sup>8</sup> C. M. Booth,<sup>1,9</sup> Peter Camps,<sup>8</sup>  
Julio F. Navarro,<sup>10</sup> Yan Qu,<sup>2</sup> Alireza Rahmati,<sup>7</sup> Till Sawala,<sup>2</sup>  
Peter A. Thomas<sup>11</sup> and James Trayford<sup>2</sup>

*Affiliations are listed at the end of the paper*

22 authors – 12 countries

Argentina Belgium Canada China Germany Iran Ireland Italy  
Mexico Netherlands UK Switzerland



# Brexit: a potential disaster for UK science

Of the world's research outputs:

Europe produces → 39%

USA → 25%

UK → 8%

Total funding for R&D in 2016, billions of US dollars)

USA → 355

EU → 345

China → 279

UK → 42

UK's collaborative papers have European co-authors

Between 2007 and 2013,

UK contributed €5.4bn to EU R&D

But received €8.8bn

ERC:

UK-based researchers received

€1.7 bn (22.4% of total)

UK contributes 10.5% of EU budget

# Brexit: a potential disaster for UK science

Funding is **not** even the **key** issue

The **key** issue is the **quality** of the **programmes** that the EU funds.

Many programmes fund:

- fundamental science
- on basis of excellence
- rigorous peer review
- long term

Highly cited papers:

37% by **ERC**-funded UK researchers with **EU** collaborators

13% UK authors funded by any **other** source

4 key strategic goals to mitigate effects of Brexit:

1. Continued full **membership** of EU Framework programmes (**Horizon Europe**)
2. **Mobility** of EU scientists (“scientist’s **passport**” or cheap, bureaucracy-free, long-term visa )
3. Continued participation in **development** of **technology** by enabling **transit** of equipment without **customs barriers**
4. Government to **compensate** for loss of EU **funding** (shortfall of **€1.5 bn** even if we remain in Horizon Europe)

What can I do?

- Raise awareness
- Lobby your dept, V-C, MP, Science Minister