CARDIFF UNIVERSITY

PRIFYSGOL CAERDYDD

Breaking Barriers: Advancing Diversity and Inclusion in Astronomy and Astrophysics Across Europe

Cosimo Inserra (he/him)

Athena SWAN Silver Award

IOP Institute of Physics

Juno Champion

Outline:

- Early pioneers
- Decades of systemic inequalities
- Balancing Acts
- Ongoing challenges and future directions

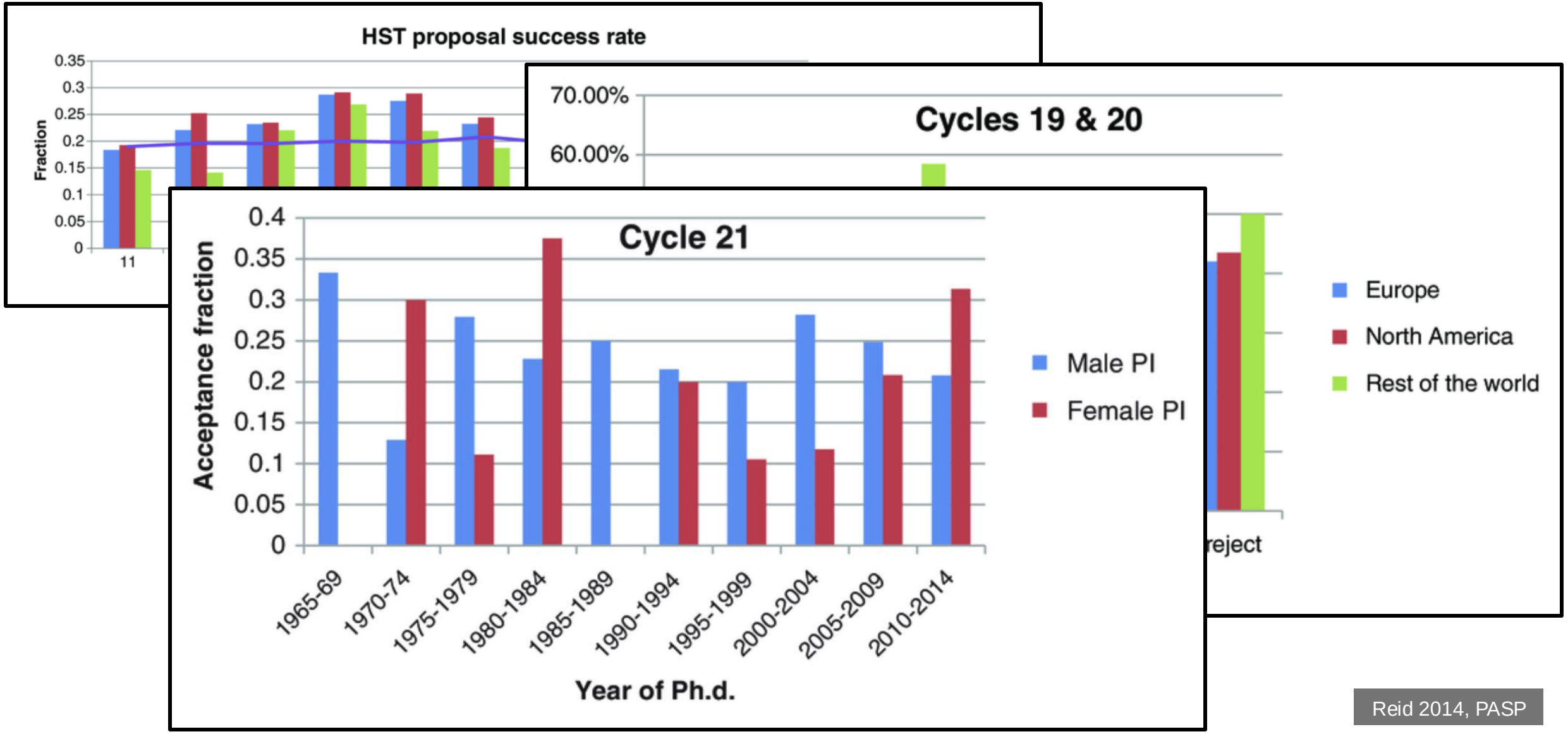
Early pioneers

CAROLINE HERSCHEL

ANNIE JUMP CANNON

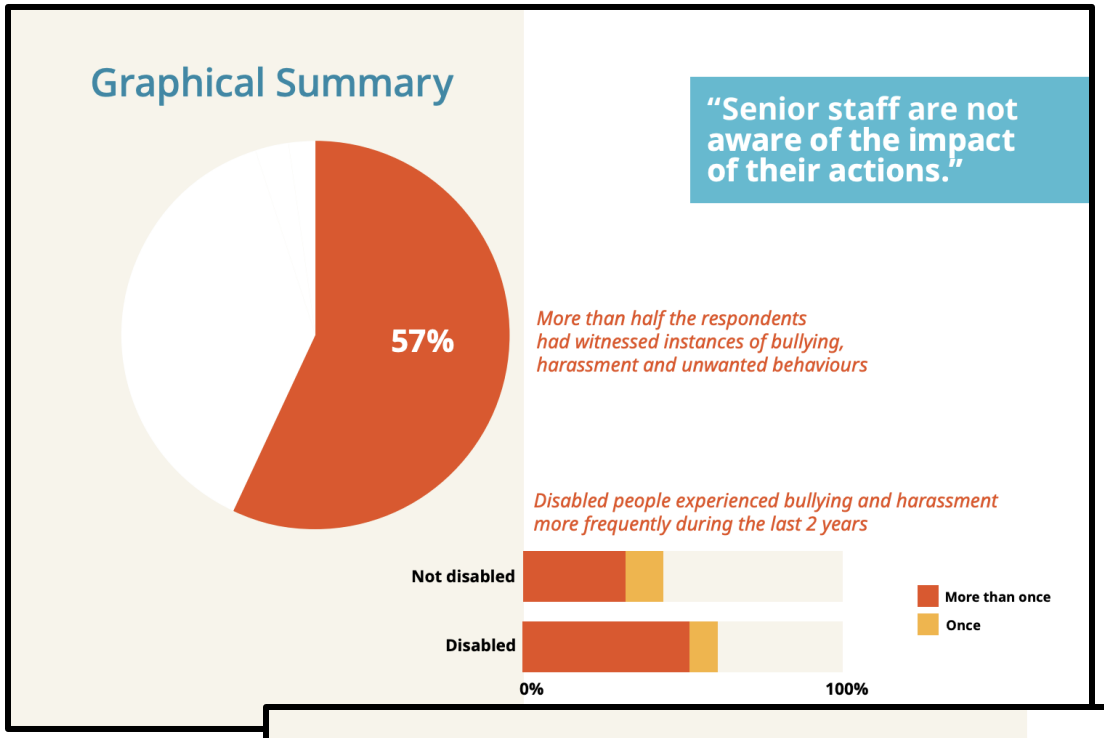
HENRIETTA SWAN LEAVITT

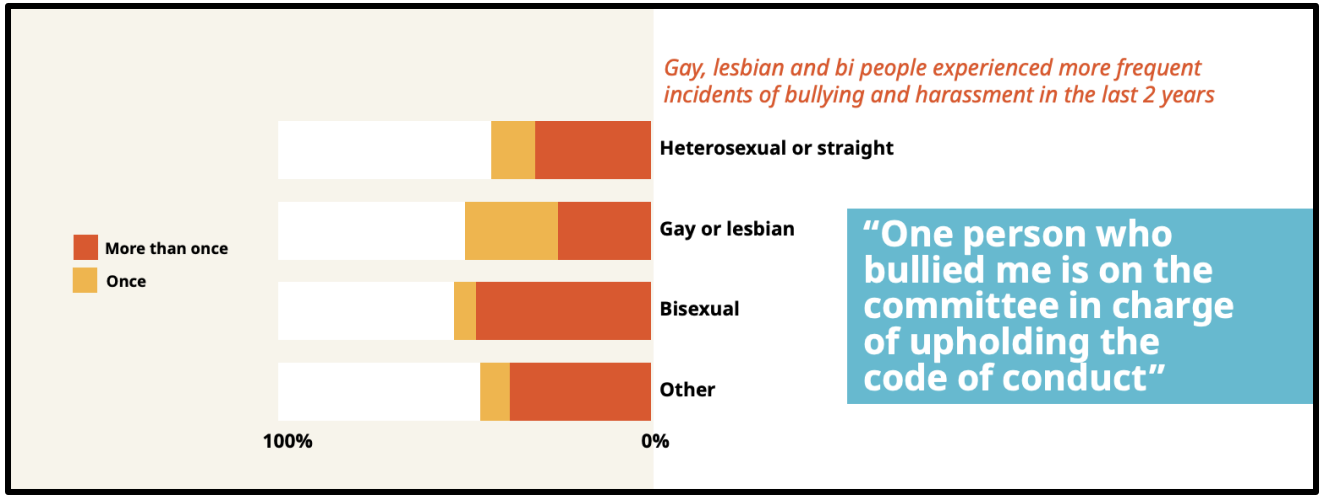
Decades of systemic gender-biased disparities

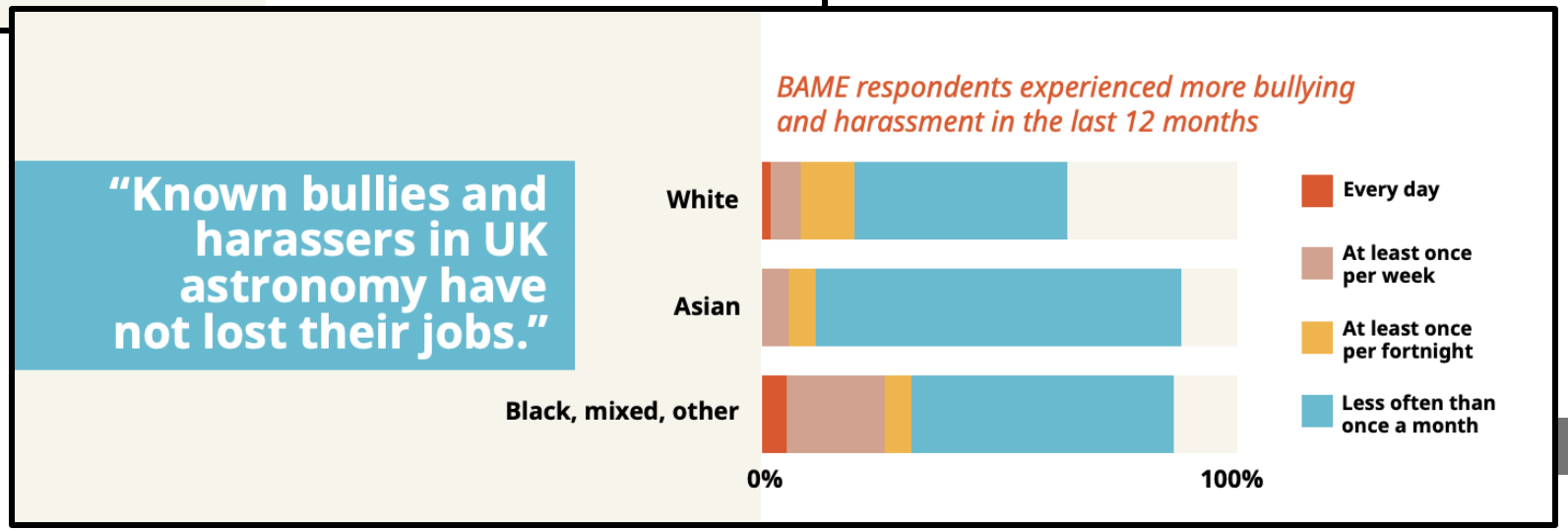


Reid 2014, PASP

Decades of systemic bullying & harassment







Royal Astronomical Society, 2024 report

Decades of racial discrimination

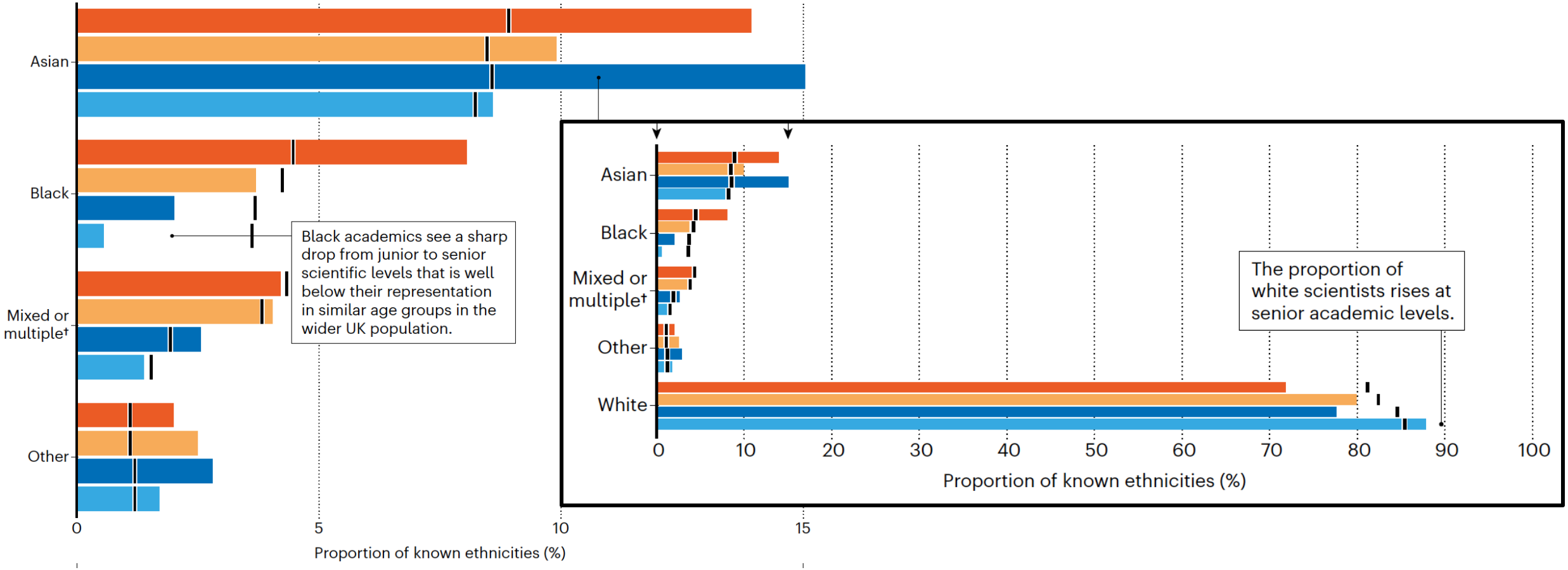
DIVERSITY IN UK SCIENCE

UK undergraduates from minority ethnic groups are largely better represented than in the general population. But by senior levels, that trend reverses.

Career stage (science subjects, 2020–21)

Undergraduate Postgraduate Academic research staff Professors

Estimated census population levels for each age group*



Decades of racial discrimination

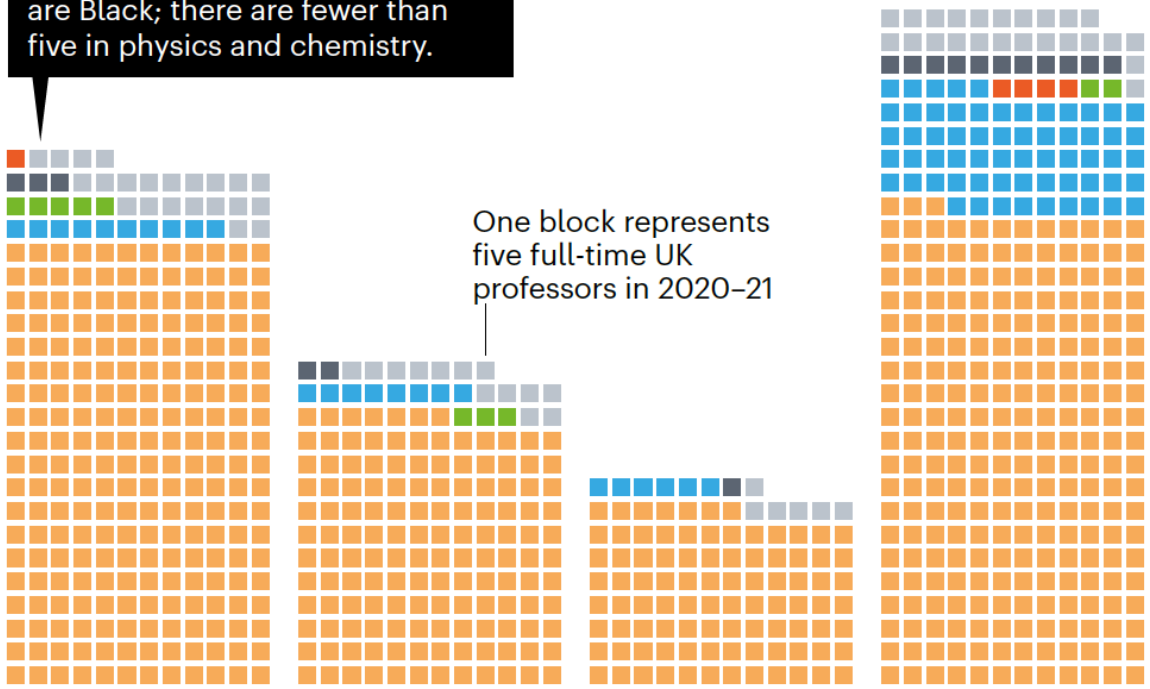
UK SCIENCE PROFESSORS

There are very few professors from minority ethnic groups in some science subjects.

White Asian Black
Mixed Not known Other

Around five bioscience professors are Black; there are fewer than five in physics and chemistry.

One block represents five full-time UK professors in 2020–21



Biosciences
1,345 professors

Physics
825 professors

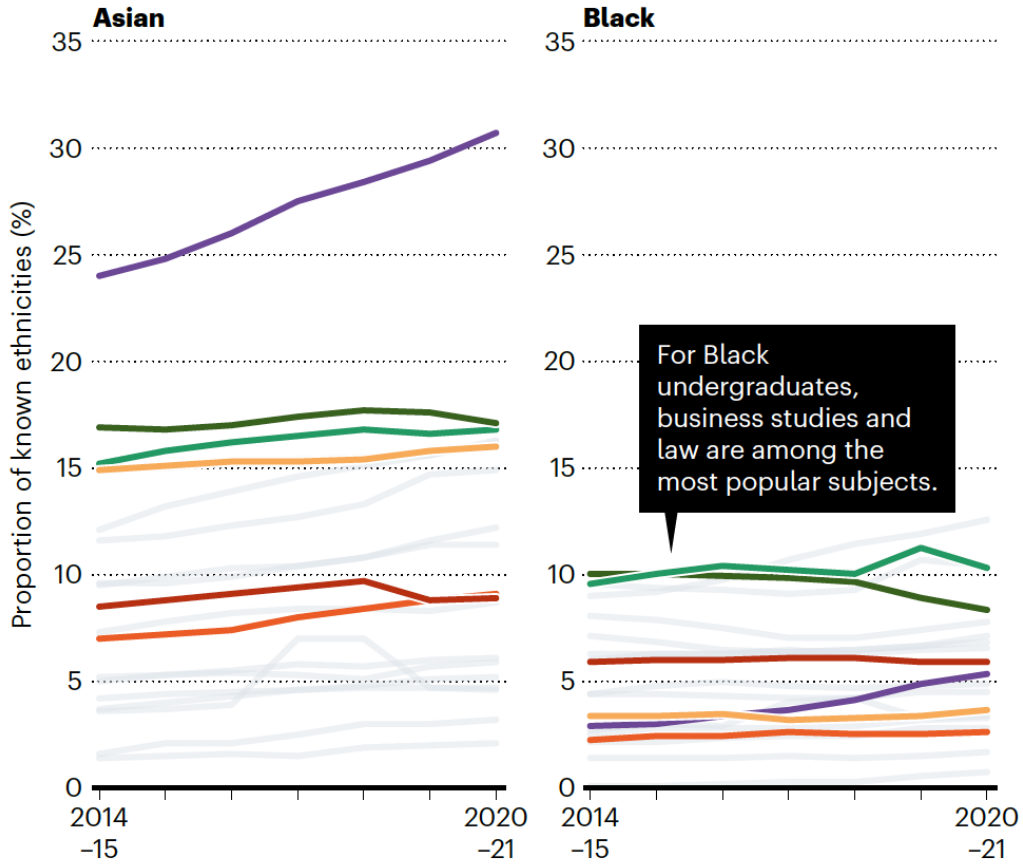
Chemistry
520 professors

Engineering
1,730 professors

UK UNDERGRADUATES

Some science subjects attract fewer Asian and Black students than do courses perceived to lead to higher-wage jobs such as business studies.

Medicine and dentistry
Biological sciences
Physical sciences
Mathematical sciences
Law
Business and administrative studies
Other subjects



Balancing Acts - a UK point of view

1) Equal Pay Act 1970

Enshrining the principle of equal pay for equal work into law; addressing gender-based pay disparities ***by prohibiting employers from discriminating between men and women in terms of their pay and conditions of employment***

2) Equality Act 2010

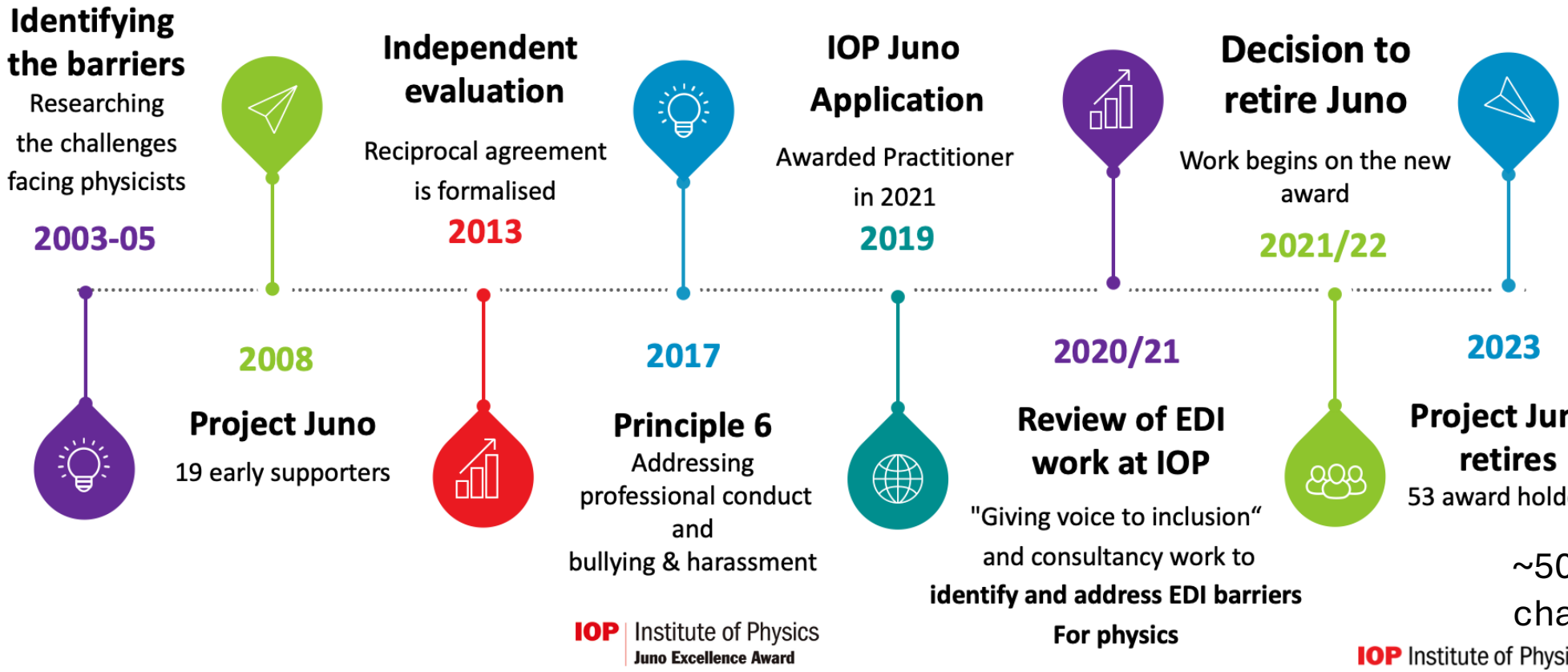
aims to protect individuals from discrimination and promote equality in various areas of life, including employment, education, and access to goods and services…..the Act covers a wide range of areas, ***including recruitment, pay and benefits, promotion and training opportunities, and terms of employment****.*

Balancing Acts - a UK point of view

Athena SWAN (Scientific Women's Academic Network) - 2005

It is now being used across the globe (e.g. Pleiades Awards in Australia) to address gender equality more broadly, and not just barriers to progression that affect women.

26 Physics/Astronomy departments (20 Silver | 6 Bronze)



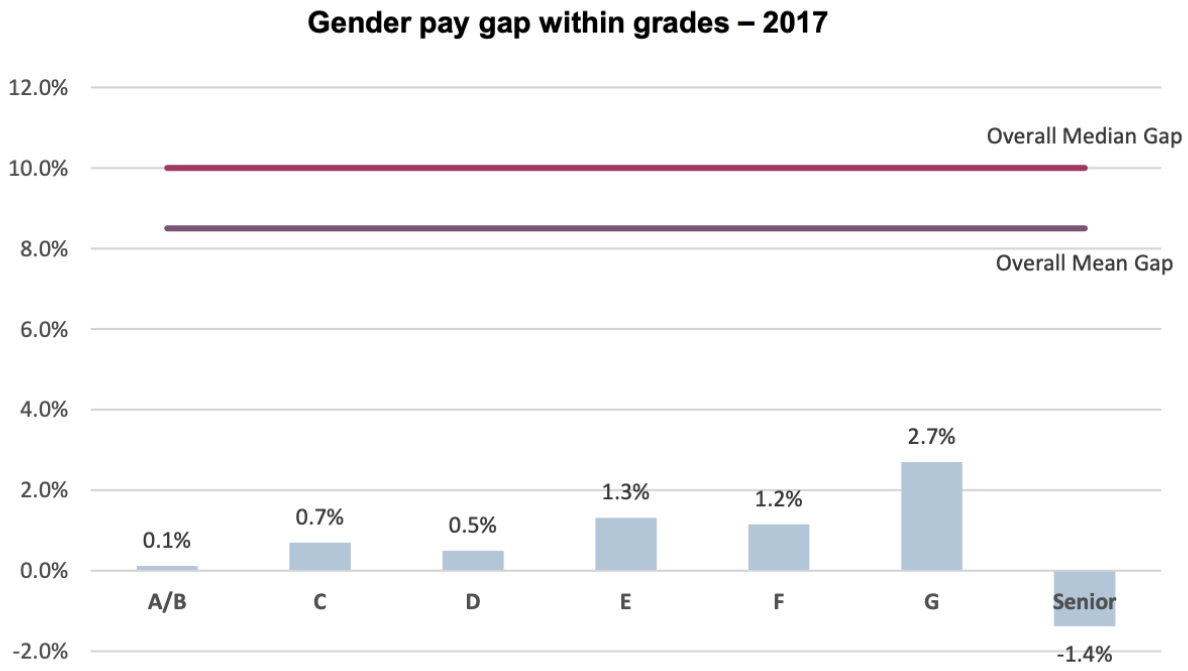
Balancing Acts - a UK point of view

- Empowering (support) networks
- Leadership networks and training
- Keep in Touch days after maternity
- Allyship
- Seminar series and balance
- PhD Scholarships

	Female	Male	F success rate	M success rate
Total* PIs	39	130	51%	48%
Total* Investigators	52	180	50%	53%

Table 3. Number of applicants and success rates for applicants indicating male or female in Je-S. Five applicants did not disclose their gender.

STFC – Astronomy Grant Panel Report 2023



STFC – Gender Pay Gap Report 2018

- A factor of **2.5 more Female Professors** in UK Universities over the last 10 years
- Female staff around 20%
- More female students up to 30%

- **Data collection**
- **Understanding of barriers**
- **Detailed and shared actions to address them**

Balancing Acts – separating bias from science

Introduction of anonymous dual review:

- Space Telescope Science Institute (US – Hubble, James Webb)
- European Southern Observatory (Europe)
- European Space Agency (Europe)
- Atacama Large Millimeter Array (Europe)
- National Science Foundation (US)
- US Department of Energy (US - National Accelerator Laboratory
- Australia's Nuclear and Science Technology Organisation (Austr
- National Computational Infrastructure (Australia)

Table 2. Referee-Referee Quartile Agreement Matrix

first ref. quartile	second referee quartile 1	2	3	4
1	0.34	0.26	0.22	0.18
2	0.26	0.26	0.25	0.23
3	0.22	0.25	0.27	0.27
4	0.17	0.21	0.26	0.36

Patat 2018, PASP

Volkswagen Foundation's Experiment (2017 – 2021)

Adding a partial randomisation factor to peer review ranking in the 'grey' area. As a result, there was a **marked increase in representation on the part of women, early career researchers, and underrepresented disciplines**. Surveys further echoed the sentiment that the grantees found the lottery system more equitable and diverse.

The comparison between traditional review and **this randomised method revealed no discernible difference in project outputs.**

Balancing Acts – increase awareness and training

Committee/bodies/schemes:

- European Astronomical Society EDI Advisory Committee
- International Astronomical Union – Women in Astronomy Working Group
- EDI officers (or ombudspeople) in many large consortia (e.g. Dark Energy Survey, Legacy Survey of Space and Time)
- Grant funding agency publishing EDI plans
- Grant funding agencies publishing their data based on gender (e.g. European Research Council)
- Mentorship schemes (e.g. the Supernova Foundation Mentoring Programme in South Africa)
- Leadership programmes

Training (mandatory):

- Unconscious bias
- EDI Awareness
- Active Bystander Training
- Antiracism
- Antisemitism

Balancing Acts – ASTRO 3D case

The Australian Research Council Centre of Excellence for All Sky Astrophysics in 3 Dimensions (ASTRO 3D) is a government-funded project involving nine Australian universities that focuses on understanding the evolution of the Universe

In early 2018, 38% of the centre's roughly 150 personnel were women.
But by 2023, 50%of its more than 300 personnel were women.

- all hiring committees and shortlists of candidates for postdoctoral roles across its nine universities to be 50% people who identify as women
- all its members, including those who were selecting job candidates, to attend a two-day workshop on implicit bias and stereotypes

Australian Astronomy Decadal Plan target of 33% women

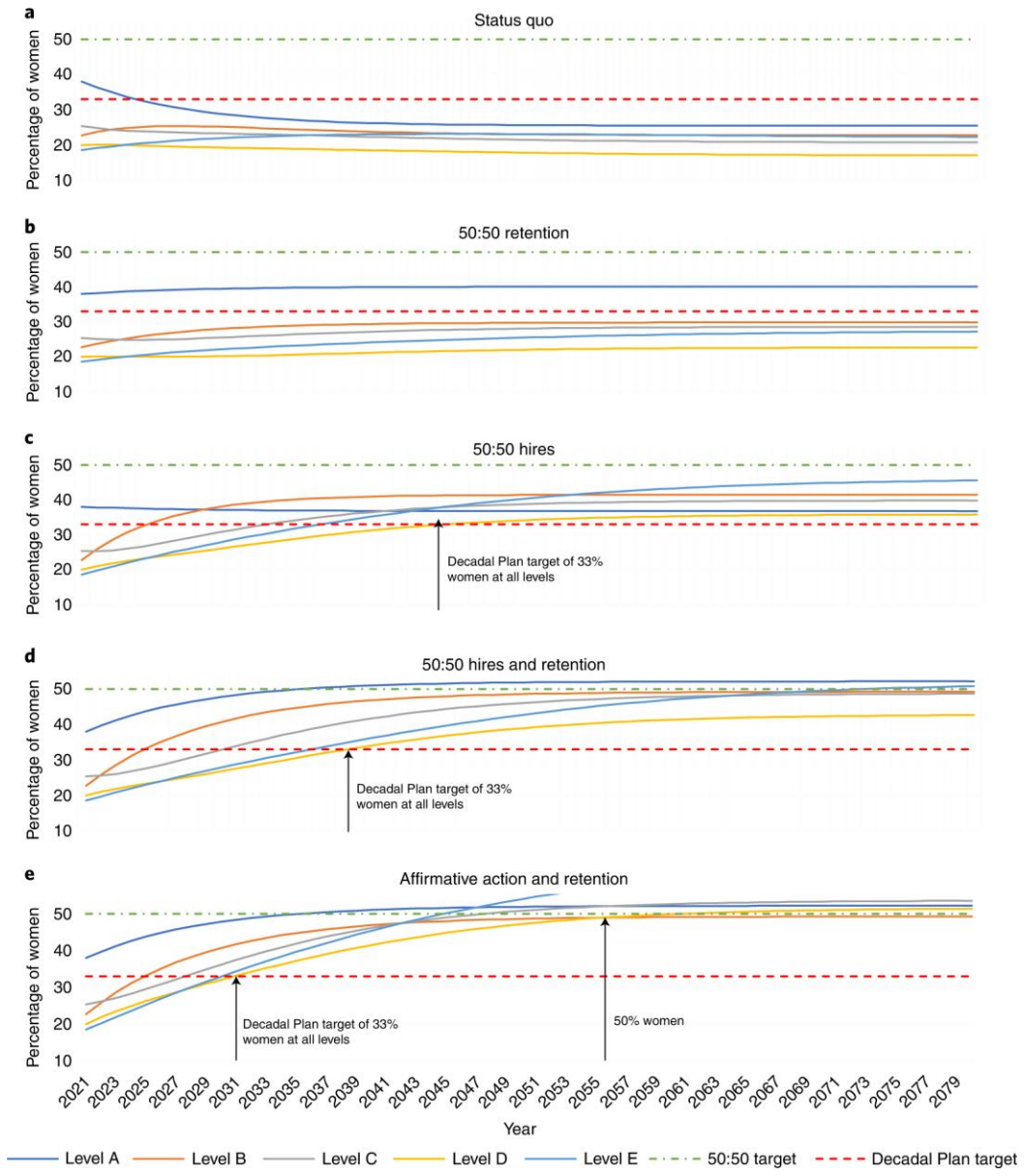
Kewley 2021, Nature ; Conroy 2023, Nature

Balancing Acts – Australian case

Australian Astronomy Decadal Plan target of 33% women

- longer-term (five-year) postdoctoral positions with part-time options
- support for return to astronomy research after career breaks
- increasing the fraction of permanent positions relative to fixed-term contracts,
- offering women-only permanent positions, recruitment of women directly to the professorial levels
- mentoring of women for promotion to the highest levels

Kewley 2021, Nature



Challenges

- Roughly 50% of the employable UK workforce (18-66) is female and 22% comes from ethnic minorities, i.e. more than double (or 4-10 times more) than what observed in Academia for any type of science
- The fraction of senior women in astronomy in the US, Germany, Canada, Australia, China and the UK has remained at or less than 20% for several decades, despite 30–40% of PhDs in astronomy being completed by women internationally over the same timeframe
- Astronomy labour market models suggest that women depart astronomy at a rate 3–4 times higher than men, but international statistics on the fraction of women and men leaving astronomy are still lacking
- Women in physics and astronomy report that their careers progressed more slowly and received fewer career resources and opportunities than men. Widespread implicit bias towards men exists in hiring, writing referee reports of papers, citing papers, inviting speakers for colloquia and conferences, student assessments of teaching, allocation of grants, awards and telescope time. These implicit biases have been shown to play a role in the gender gap in science by impacting recruitment rates and promotion rates
- Women and non-binary are 50% more likely to be bullied. Moreover, 50% LGBTQ+ astronomers were bullied in 2020-2021

Kewley 2021, Nature ; RAS report 2024

Future directions

- Shift from Equality to Equity (+ not only gender but intersectionalities)
- Gender, ethnicity and disability data gathering will be the norm
- EDI plans for grants
- Diversity and Inclusion lens for any type of submission
- EDI practices and approach in research/research culture
- Changes in hiring processes and assessments

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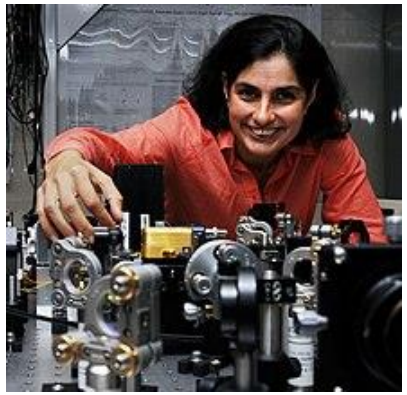

R^{2}4P - Role models for all Physicists