

Wasted talent: the status quo of women in physics in the US and UK

Marcella Bona
QMUL

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International Women Day's QMUL Faculty Event
@School of Physical and Chemical Sciences



https://en.wikipedia.org/w/index.php?title=Timeline_of_women_in_science

1200 BCE: The Mesopotamian perfume-maker Tapputi-Belatekallim often considered the world's first recorded chemist.



1572: Danish scientist Sophia Brahe (1556–1643) assisted her brother Tycho Brahe with his astronomical observations



1732: Italian physicist Laura Bassi became the first female physics professor in the world

1843: English mathematician and computer programmer



Ada Lovelace



1918: German physicist and mathematician Emmy Noether created Noether's theorem explaining the connection between symmetry and conservation laws.



1888: American chemist Josephine Silone Yates was the first black woman to head a college science department.



1950: Chinese-American particle physicist Chien-Shiung Wu

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Wasted talent:

From paper:

Tracey Berry and Saskia Mordijck,
“Wasted talent: the status quo of women in physics in the US and UK.”
Commun Phys 7, 77 (2024).
<https://doi.org/10.1038/s42005-024-01579-9>



Wasted talent...

Women+ continue to face obstacles at each step along the way of pursuing a scientific career, and physics has one of the lowest gender diverse participation of all STEM subjects.

This is a tremendous waste of potential that can only be reversed with a significant cultural change by all participants.



Wasted talent...

At present, only 24–25% of physics degree recipients in the UK/US identify as women+.

US saw no improvement since 2005 and physics, along with computer science and engineering, has the lowest participation ratio of women+.



Wasted talent...

In the UK the percentage of women physics undergraduates has only increased by 3% points from 2012/13 to 2017/18, and a high proportion of this growth has been driven by foreign women choosing to study physics in UK universities.

In biology and chemistry respectively, 60% and 50% of the degrees are obtained by women, and these percentages have been steadily increasing since the 1970s.



Wasted talent...

The stereotype is that girls do not *or should not* like mathematics. Hence, girls can find it harder to identify themselves with physics professions.

The Institute of Physics (IoP) has been running the Limit Less Campaign since 2020.

This campaign is not directly aimed at young people themselves. Instead, it is aimed at those whom younger people trust and listen to, and who help shape their opinions and decisions.

<https://www.iop.org/sites/default/files/2020-11/IOP-Limit-Less-report-2020-Nov.pdf>



IoP Limit Less Campaign

“My dad told me not to study physics because it wasn't for women and the maths was too hard”

“For individuals who lack social skills ... a bit geeky ... for duller people”

Parents in focus group discussions



“A Black girl studying and being good at physics wasn't the stereotype my teachers were used to. I'm very sure the bias they had towards me was unconscious, as they were really nice people, and in fact, good teachers (to the other, whiter, students).”

England

In 2020,

only **2.6% (7,147)**
of girls chose A-level physics,
compared to

8.6% (24,685)
of boys.

(Source: Joint Council for Qualifications)

interesting fun new expert geek I'm
determined dedicated like professional
cool boring work hard able sure analysis rich
mass bang logical paid wise smart nerdy lab
don't life future good analytical curious brian old
maths bit geeky boffin high atoms nerd cox
clever thinking scientist study white dull
memory autistic relevant matter
male science way social big intelligent

Women account for **50%**
of all apprentices in the UK.

However, for science, technology, engineering and maths (STEM) apprenticeships, in the 2018–19

academic year, only **10%**
of STEM apprenticeships were
started by women.



Wasted talent...

Focus on creating committees to raise awareness of the limited recognition of women physicists.

These policies enhanced outreach opportunities with women serving as role models, improved recognition of women physicists and provided initial networking opportunities at meetings.

The committees, however, did not address implicit bias and active structural gender discrimination.



Wasted talent...

From IoP investigation, issues are lack of recruitment, retention, and progression of women+.

Project Juno was created: an equality, diversity, and inclusion (EDI) award framework to encourage physics university departments to follow, evidence and champion good practices

Over 44 UK universities were engaged in Project Juno.

Replaced with the Physics Inclusion Award in April 2024 to support university physics departments to be welcoming and inclusive to all.
<https://www.iop.org/about/IOP-diversity-inclusion>



Project Juno

IOP gender equality awards for physics in the UK and Ireland

Project Juno is an awards scheme managed by the Institute of Physics. The scheme recognises and rewards physics departments, institutes and groups that can demonstrate they have taken action to address the under-representation of women at all levels, and are encouraging better working practices for all.

1

A robust organisational framework to deliver equality of opportunity and reward.

2

Appointment and selection processes and procedures that encourage men and women to apply for academic posts at all levels.

3

Departmental structures and systems which support and encourage the career progression and promotion of all staff and enable men and women to progress and continue in their careers.

4

Departmental organisation, structure, management arrangements and culture that are open, inclusive and transparent and encourage the participation of all staff.

5

Flexible approaches and provisions that enable individuals, at all career and life stages, to optimise their contribution to their department, institution and to SET.

Project Juno gave support and guidelines and stimulate actions within the schools.

Juno committees involved staff and students at all levels and include also head of school/management figures. Promoted awareness within the schools.

Lots of concrete actions started thanks to this project.

I presented this to the main 2016 physics conference in the EDI session



Wasted talent...

In 2006 the APS started yearly regional CUWiP (Conference for Undergraduate Women+ in Physics) conferences: students are exposed to top research by leading women+ physicists, they engage on topics related to being a minority, they participate in professional development opportunities, and they build their first network of peers.

In 2015 Professor Daniela Bortoletto introduced CUWiP+ to the UK, which is now supported by the IoP.

Other one-day events hosted by various universities and aimed at women+ postgraduate students have since been established (e.g. KCL Womxn in Physics).



Wasted talent...

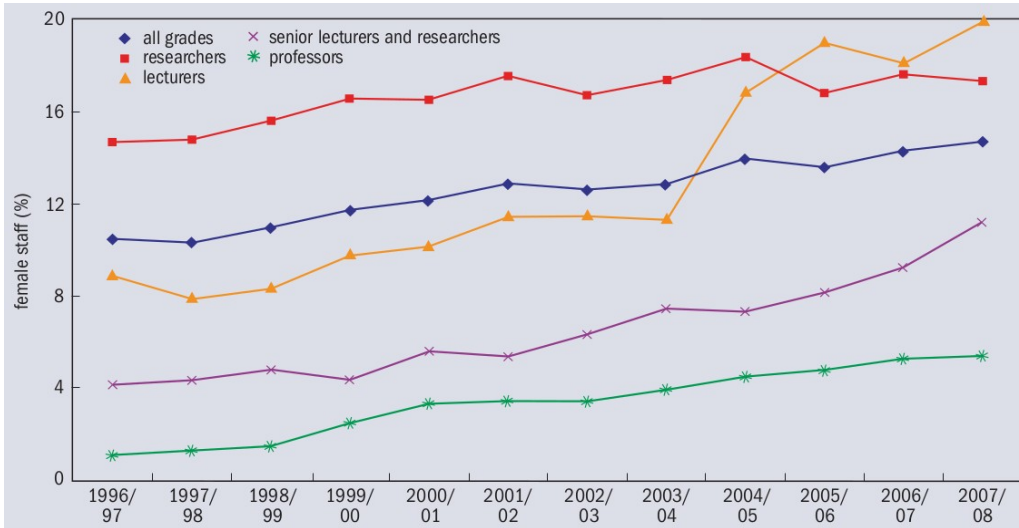
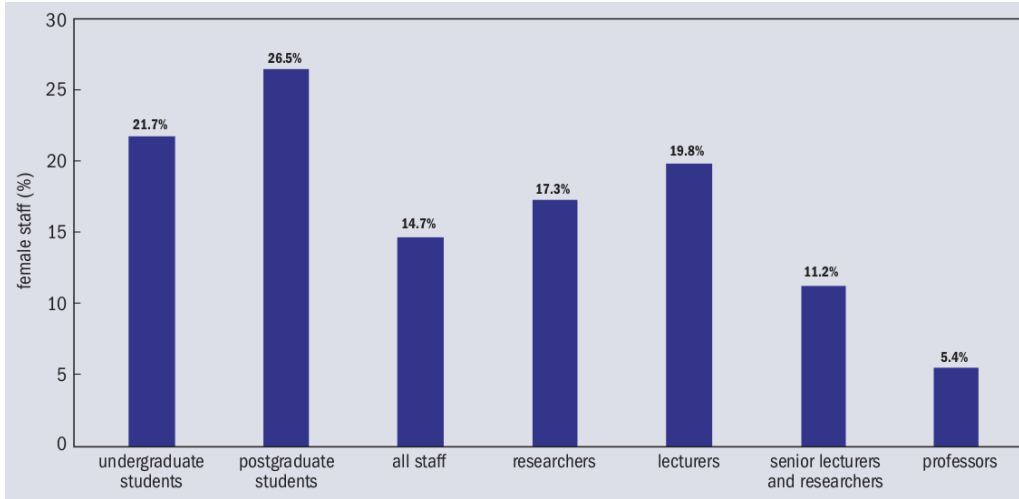
In the UK, only 12% of professorships are held by women while this increases to 26% for all other subjects combined.

In the US, 19% of the physics faculty are women, however most women are in non-tenure eligible teaching-only positions, and when we only consider PhD granting institutions, the average drops to 16%.

The percentage of women drops with prestige and seniority at each level, and exacerbates the initial societal bias at all career stages.



Diversity in University Physics Statistical Digest 2010



According to Eurostat data, in 2020 in Europe, 41% of people in STEM are women.

The percentage has only slightly increased with respect to 2011 when it was 39%.



Wasted talent...

These statistics clearly showcase the amount of pressure on women+ academic staff in providing that important exemplary “role model” to younger generations, and serves as a reminder that increased outreach to counter societal and cultural bias is not enough.



Wasted talent...

An encouraging example comes from the astronomy community in the USA, which has been a field-leading this paradigm change.

The 1992 Baltimore Charter for Women in Astronomy is a manifesto for women acknowledgement and promotion in the astronomy community, and its recommendations were adopted by various departments.

The Baltimore Charter for women in astronomy
<https://www.stsci.edu/stsci/meetings/WiA/BaltoCharter.html> (1992).



Wasted talent...

The Charter includes affordable childcare, parental leave, extension of the tenure-clock and publishing codes of conduct.

Prizes and fellowships started to allow self-nominations.

Over the past 30 years, all these changes combined led to a doubling of women percentages at the full professor rank, in prize winners, in prestigious leadership positions and post-doc fellowships.



Wasted talent...

Women+'s scientific achievements do not receive the same recognition as men, and this bias affects all aspects of a scientific career: from access to academic positions to the publishing world.

The visibility of women+ in the academic and public sphere is significantly less than that of men, with a lower rate of women+ promotion over that of men, by being under-represented as plenary speakers, contributing to panels, and as prize winners. Several studies show that women+ are cited at lower rates.



Wasted talent...

This persistent under-recognition of women+'s contributions is the leading cause for senior women+ to leave academia at a higher rate than early career women+.

These data indicate a two-fold failure of the physics community: not only does it fail at attracting young women+, but it is also willing to forfeit the scientific expertise matured over years of invested commitment to science.



Wasted talent...

NASA has introduced a double-anonymous review for observational time on all their telescopes. The double-anonymous review improved the acceptance rate for women+ compared to previous years, making it similar to that of men.

Allowing for self-nominations, improving transparency in selection processes and criteria can reduce unconscious bias in nominations and selection of candidates and proposals.



Wasted talent...

As major physics discoveries face increasingly ambitious problems, it is time to get rid of the old-fashioned “lone (male) genius myth”, and start tapping into the rich pool of talented women+.



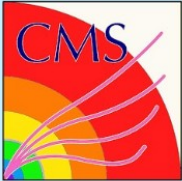

For this cultural shift to occur, awareness and active change must be supported not only by women, but importantly by the man-dominated physics leadership in individual departments, universities, and physical societies. It is well proven that committed leadership can have significant effects in enacting change.



Wasted talent...

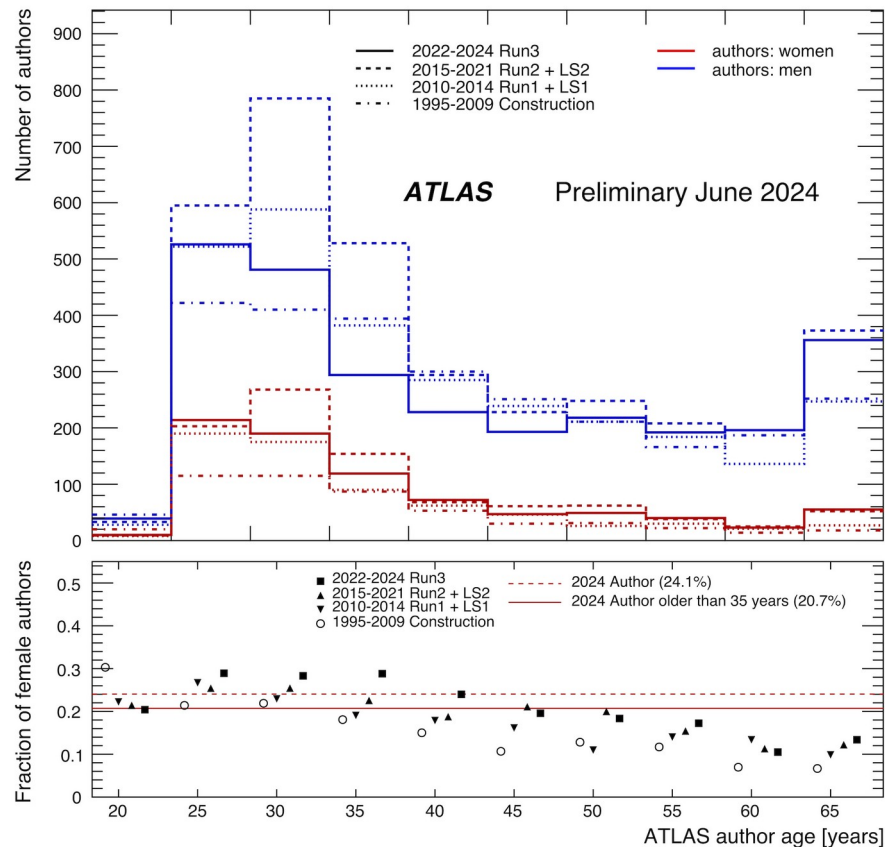
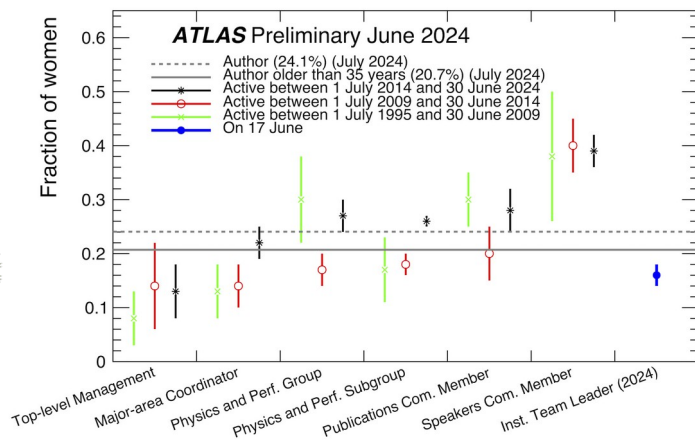
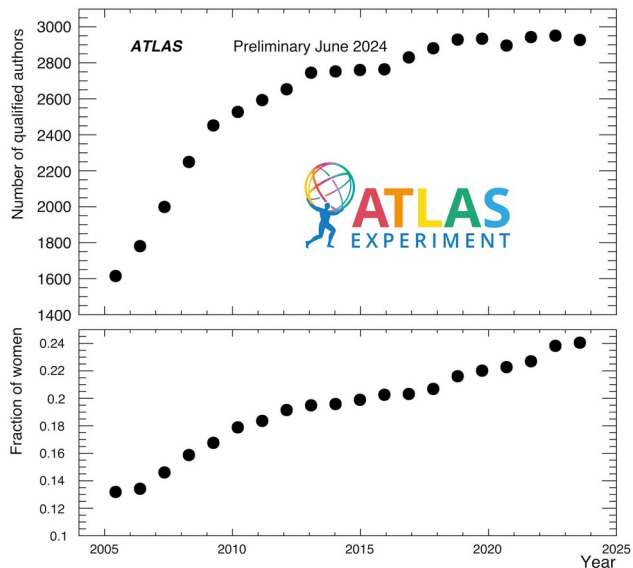
Acknowledging that gender diversity in physics has made little progress in the US/UK in the last 20 years, that an enormous number of skilful early careers and experienced women+ physicists have been lost and that passive waiting for new generations and minorities to lead the change is insufficient



Experiment	 ALICE	 ATLAS EXPERIMENT	 CMS	 LHCb LHCb
Countries Involved	39	40	54	19
Institutions Involved	172	180	242	88
Number of Collaborators	1968	5900	5416	1482
Gender Ratio	~21 %	~21%	~20%	~19%

CERN LHC experiments monitor their collaborators







ALICE

Our mandate and scope

- advise collaboration members and management about diversity matters
- promote diversity initiatives and maintain diversity web pages
- monitor diversity issues and report periodically to the collaboration
- liaise with diversity offices at CERN and in other LHC experiments

Useful links

- [CERN Diversity office](#)
- [CERN Ombuds](#)
- [CERN's response](#) channels for inappropriate behavior, misconduct and harassment.
- [CERN's Code of Conduct](#)
- The CERN Diversity and Inclusion Program has released a handbook that serves to assist in adopting a more inclusive approach towards persons with disabilities. It can be found [here](#).
- For the ALICE rainbow logo, click [here](#).

Events:

- [International Women's Day - 8 March 2021](#)
- [International Day of Women and Girls in Science, 11 February](#)

[YouTube Video 11 Feb 2021](#)

Contact

You can send us an email that will be treated confidentially by using the email address alice_diversity_office@cern.ch or send us an anonymous message by using this [form](#).



LHCb Early Career, Gender and Diversity Office

LHCb homepage > ECGD homepage



News & upcoming events

(last updated 18 Apr 2022)

April 25-26 2022

The two-day **SIEM-HEP AEC 2022 Workshop**, an opportunity for early career scientists, is an opportunity to discuss tools and workflows related to the "SIEMing Grids at CERN" (SIEM) together with SIEM-HEP and partners. The deadline for registrations is April 22nd 2022, and the workshop will be fully virtual. Registration may be done via the web page.

April 28-30 2022

Orange Girls, the programming workshop for girls and women aged 15 and over, is returning to CERN on 28 and 29 April 2022 in an online edition on Zoom. With coaching by CERN tutors, the participants will learn how to create a blog and launch it online. The organizers are looking for volunteer coaches to lead the workshop, where each volunteer will coach a team of three participants. Sign up and registration by 21 March on the web page.

Older news

ECGD newsletter

Latest newsletter

All 2022 newsletters
All 2021 newsletters
Older newsletters (2019-2020)

What are we here for?

To quote from the LHCb constitution,

"The Early Career, Gender and Diversity (ECGD) Office oversees the well-being and working environment of all LHCb members.

We are here for all issues related to gender and diversity, and to the needs of our colleagues at an early career stage. We are here for all issues related to any type of indirect or direct discrimination, be it on grounds of gender, sexual orientation, ethnicity, disability creed, cultural background or other factors. Please contact us if you have experienced or witnessed any type of discrimination or harassment or any inappropriate behaviour in conflict with the LHCb Code of Conduct. We guarantee absolute confidentiality.

We organize regular meetings at every LHCb collaboration week and we advertise news and activities related to ECGD issues through this web page and through emails to the collaboration. Please help us help you by letting us know of your concerns and by pointing us to relevant news, events and resources.

Who are we?

The ECGD office is composed of two senior ECGD officers, Sina Habeeb and Eli Ben Heim and two early career representatives, Sara Capelli and Harsha Mishra.

ECGD officers

The two ECGD officers are appointed for a two-year term by the LHCb management and endorsed by the Collaboration Board. ECGD officers are equally "senior" members of the collaboration, with long-term work contracts, to make sure we can act independently and are not easily intimidated.



Contact

For general messages: You can reach the ECGD office by email to hub.ecgd@cern.ch.

For all confidential matters: Please write to the senior ECGD officers' personal emails.

COVID-19

Please join our matremot channel to share advice, news and help - or just to stay in touch with your colleagues in these crazy times.

Links

- ECGD:
- Discrimination, harassment
- LHCb mentoring programme
- ECGD meetings
- ECGD presentations
- LHCb and beyond:
- Statement initiative
- Here on (Data) Career
- Laura Bassi initiative
- More on Gender & Diversity

<https://alice-collaboration.web.cern.ch/DiversityOffice>

https://lhcb.web.cern.ch/ECGD_Office/ECGD-intro.html



The ATLAS Collaboration

The ATLAS Collaboration draws its creativity and strength from world-wide members with different backgrounds. This pluralism is an essential part of our identity as scientists and we fully uphold CERN's principles of inclusiveness and diversity as enshrined in the CERN Code of Conduct.

As a collaboration of over 5000 scientists, students, engineers, technicians, and administrators, ATLAS is made up of different members from various backgrounds and different ages, gender identity, sexual orientation, ethnic, physical ability, use and identity, appearance, neurodiversity, education, or religious background. We respect high standards of professional conduct and commitment to equality, diversity and inclusion in our community.

We value the opinions of people with different experiences and backgrounds. A diverse group brings different perspectives and enhances our ability to tackle complex problems. We expect colleagues to listen from all sides of building and maintaining a working environment where every form of abuse or discriminatory act is taken (e.g. racist, sexist, sexist or gender) and is a criminal offence.

We recognize that discrimination persists in many aspects of society, including science. People who experience discrimination in all other forms, the knowledge that more must be done to address this. To the extent of our inclusion, we continue to strive to identify and remove barriers that restrict people from being able to work here from harassment, and to quickly address issues that may prevent members of the Collaboration from being successful in their work.

We would advise that our colleagues have the tools and resources they need to succeed. Promoting and taking responsibilities can be challenging, particularly having a higher mental or physical, and we would advise that support is in place. We would also like to encourage you to please be heard, especially by colleagues with various physical differences, such as vision, speech, hearing or other impairments.



<https://atlas.cern/diversity>

Log In CMSPublic

Twiki > CMSPublic Web > CMSDiversityOffice (2022-04-07, ToyokoOrimoto)

Welcome to the CMS Diversity Office Homepage

This is the main page for the newly-formed CMS Diversity Office. For the moment, this page includes the charge of the Diversity Office and its membership. Further information will be provided in due course.

- Public webis
 - Welcome to the CMS Diversity Office Homepage
 - Committee membership
 - Scope and Mandate of the Diversity Office
 - Contact Information
 - Anonymous Message Box
 - CMS Code of Conduct
 - CMS Guidelines for Hybrid Meetings
 - Introduction to Implicit Bias
 - CMS resources
 - CMS DO Questions & Answers Page
 - Resources Available at CERN
 - References from other experiments
 - Photos
 - Past chairs and former members

<https://twiki.cern.ch/twiki/bin/view/CMSPublic/CMSDiversityOffice>

