

# Women in Physics – the view from Britain

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# This talk will cover...

- Some autobiographical background
- The situation today and how we got here
- Looking ahead



# My background

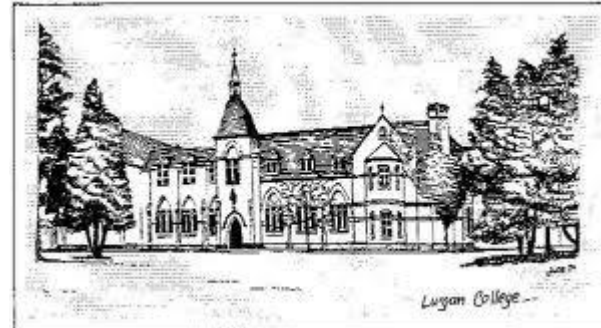
- NB largely academic
- Focus on (astro)physics



Interaction of two galaxies

# What Jocelyn did

- Failed the N. Irish equivalent of the 11+.
- Fight to get into science class
- Next term came top in first science exam, ahead of all those who had passed 11+.
- To boarding school in York at age 13. A and S levels in Maths, Further Maths and Physics.



# Higher Education

- Physics degree at Glasgow University
- To Cambridge to do a PhD in Radio Astronomy



# Cambridge as a PhD student

- Inadvertently discovered neutron stars/pulsars



Congratulations on your engagement.  
Silence on your major astrophysical discovery!

# Consequences of the discovery

- TOTALLY unexpected result – caused a major reappraisal within astrophysics.
- It happened because of ‘Imposter syndrome’
- Initially it did not have a major effect on my career, except helped me survive.



# Family life

- Got married as I finished the PhD – husband worked in Local Government.
- He moved jobs every 7 years or so, to get promotion
- Son born 4 – 5 years later
- Few child-minding facilities as mothers not expected to work





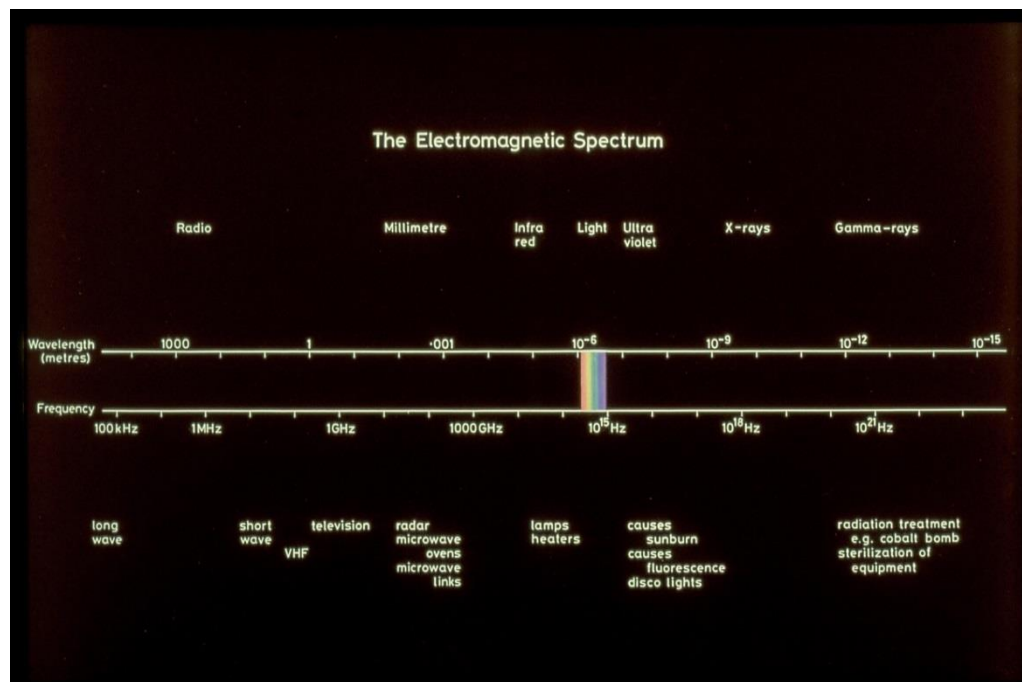
# Hanging in there!



- My 'career' was really a succession of jobs.
- Felt a bit like snakes and ladders!

# Subsequently...

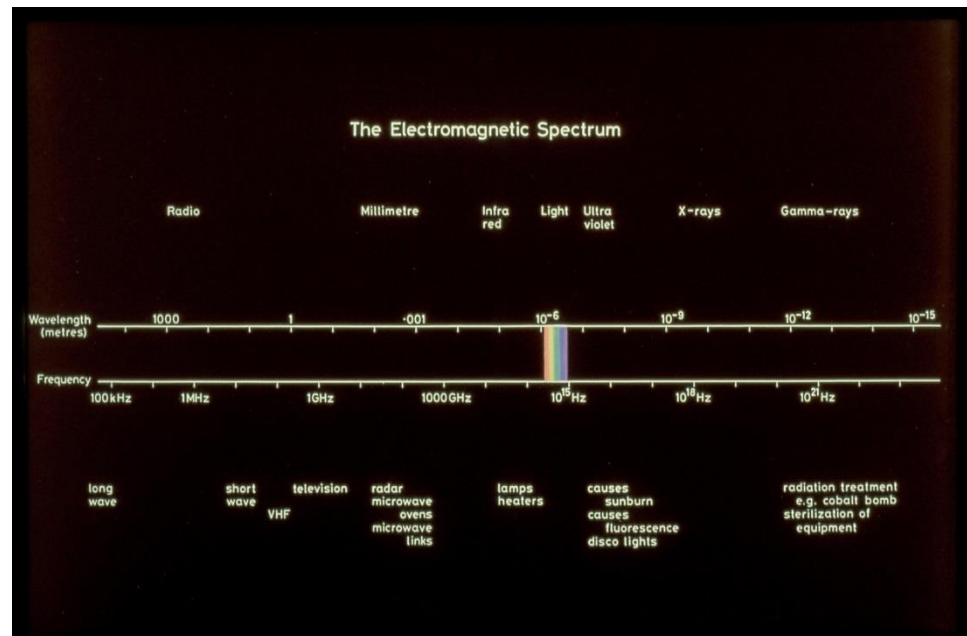
- I have worked in radio, millimetre, infrared, X-ray and gamma ray astronomy



# Subsequently...

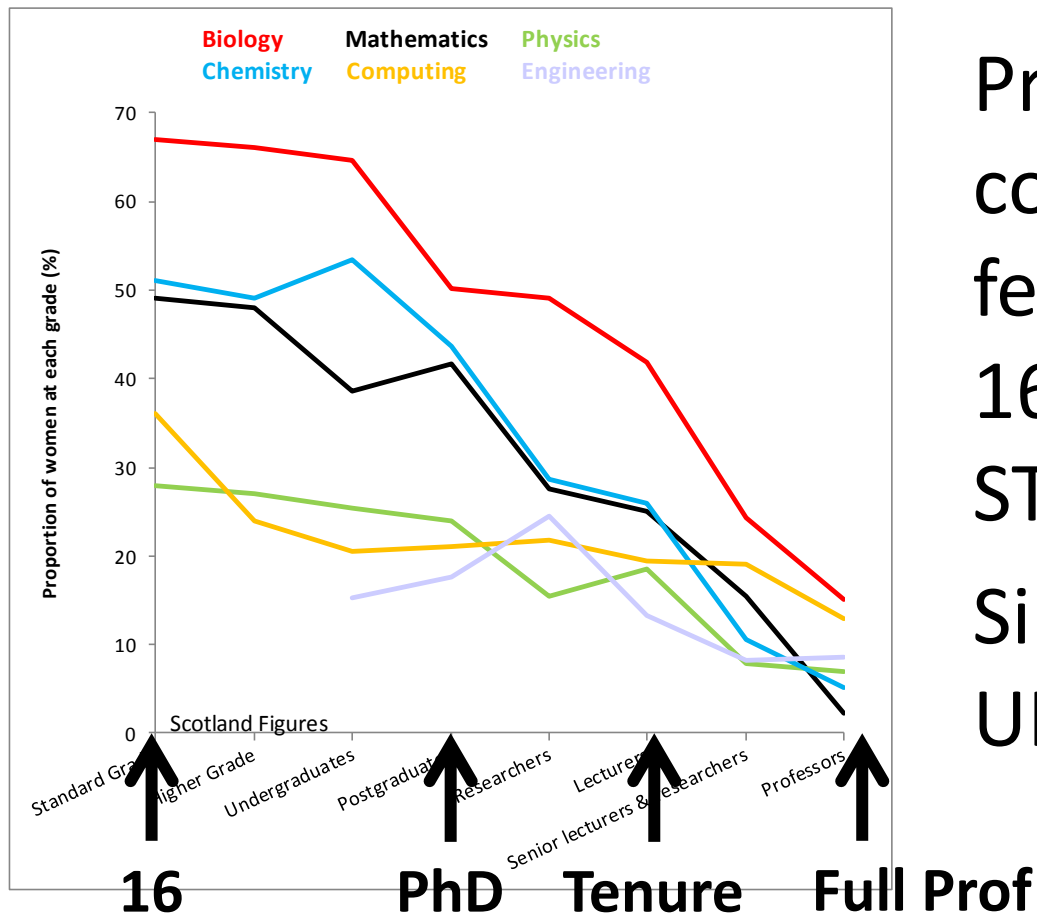
- And as a researcher, a university lecturer, a tutor, a manager, a Professor, a HoD, a Dean, a PR and outreach person.

‘Career’ peaking late (70+!)



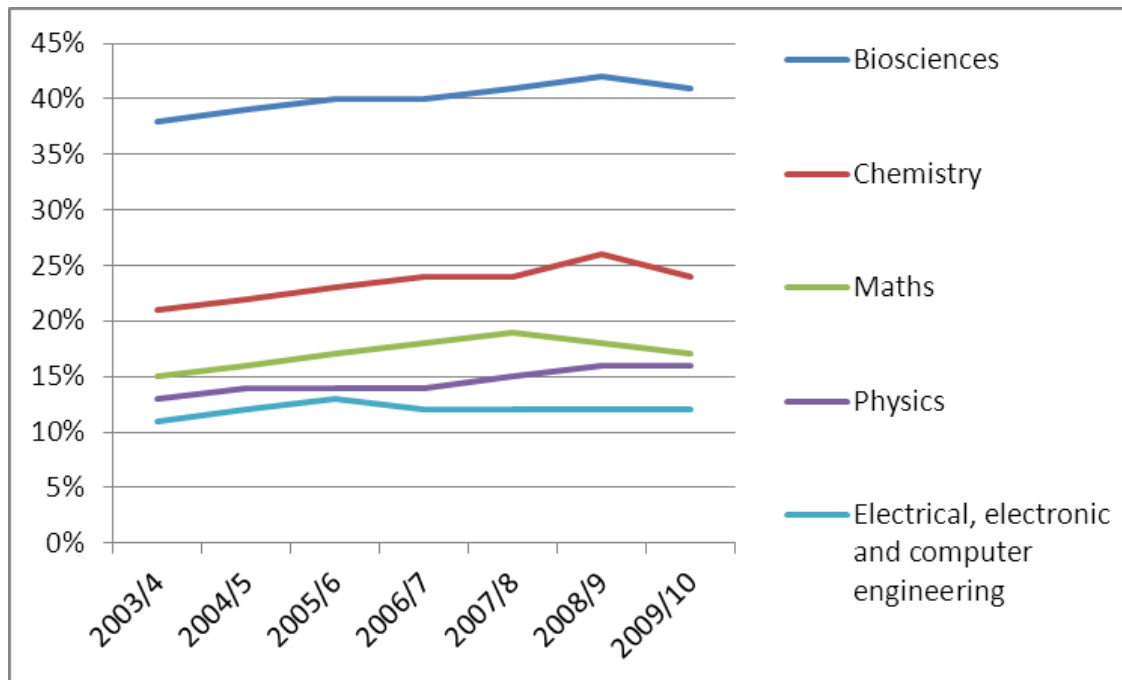
# **WOMEN IN STEM TODAY**

# Leaky pipeline – typical UK data



Proportion of each cohort that is female from age 16 to prof, by STEM subject. Similarly for the UK.

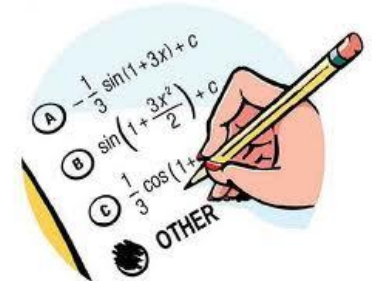
# Slow growth in academia



The proportion of academic staff which is female, by STEM subject and by year

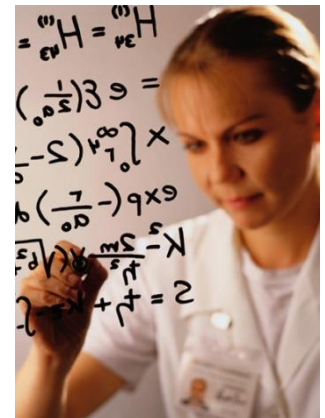
# 2012 Scottish physics data (SQA)

- **Standard Grade (16):** girls make up 30% of the class (and get 38% of the Grade 1's)
- **Highers (17):** girls make up 28% of the class (and get 33% of the Grade A's)
- **Conclusion** – girls **can** do physics (but don't always do it)!



# It's different for girls – IoP study (England)

- Girls are **more likely** to do physics if in a single-sex school (and/or if in a privately funded school).
- For English State-supported schools:
- 1.8% (4.3%) of girls in co-ed (single sex) school do physics to school-leaver level.





# Big picture...

- Half of English state-funded, co-ed schools have no girls doing physics at school-leaver level!
- Same pattern in Higher Education – all-female colleges have more females studying physics
- What is this telling us?



# THE ROAD TO EQUALITY IN THE UK



# Male dominated

- Universities, especially science and engineering, have been (largely) set up by men, named, interpreted, developed by men.
- Many men comfortable with how things are done; some find it hard to see what's wrong!
- Today very little direct discrimination – more a case of 'unthinking-ness'



# As a young woman scientist/engineer

- Assume the battles have been fought and won by previous generations
- Disillusion grows as one gets older and experiences accumulate!
- More older women than younger women are feminists!



# Statistics

- Data are collected – how many women/men are there at each level
- Shows women are in a minority; the minority gets smaller the higher the level.
- Shows women progress more slowly than their male counterparts
- Shows women put in fewer grant applications, are less willing to apply for jobs...



# Fix the women!

- Make women braver, more willing to put in grant applications, to apply for promotion, to apply for jobs.
- Special training coursed for women to address these deficiencies.
- **NB Assumes the problem is with the women; no problem with the way science/society is run!**

# Supporting individual women not working

- Funding agencies begin to realise that giving funding to individual women helps those women but doesn't change anything in the long run.
- Begin to look for 'institutional change' making a place fairer for all (not just women).



# 'Institutional Change'

- Athena Swan programme – how women-friendly is your university or department?
- Some UK funding agencies now require a university/department to have this accreditation before it can apply for research funds.
- **CHANGE HAPPENING!**





# Institutional change – some examples

- Individuals not discriminating but structures may be
- Institutional sexism –
- possible biases in recruitment or retention
- awareness of different management styles
- unconscious bias
- E.g. M  F



# SPECIAL FUNDING FOR WOMEN

**Returner Fellowships (for coming back after a career break). Other things open to women only?**

Risk that people say *'You only got that position because you were a woman; you are not up to the standard of the rest of us.'*



# In other countries?

- Is this peculiar to Britain?
- International data – professional astrophysicists who are female
- These are women who will have physics degrees.....



# Women in astrophysics around the world

Country	% female	Country	% female
Argentina	37	Belgium	15
Ukraine	27	Poland	13
Italy	25	Sweden	13
France	24	Canada	12
Brazil	23	USA	12
Spain	18	UK	12
Mexico	17	Netherlands	12
Russian Federation	17	South Korea	10
Greece	16	Germany	10
China	15	India	8
Australia	15	Japan	6

**Average all member countries: 15% female**

Table 1. The proportion of professional astronomers who are female, country by country, as compiled by the International Astronomical Union. Only those countries with more than 100 members are considered.

# So.....

- Latin America and S. Europe have high % female
- N. Europe and the English-speaking countries have low % female
- **Limiting factor is culture, not women's brains**
- Similar distributions for physics, maths...
- [www.iau.org/administration/membership/individual/distribution/](http://www.iau.org/administration/membership/individual/distribution/)

# Economic arguments

Using *economic* arguments to make the case – probably the ones most likely to be heard

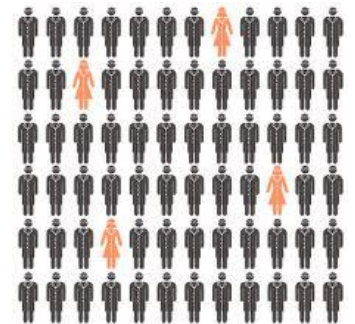
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- Science, technology vital to future; STEM essential for a smart economy
- Leaky pipeline
  - waste of education and training costs
  - loss of talent



# Economic arguments contd

- Diversity (gender, ethnic) makes an organisation more robust, more flexible
- Increasing the number of women in STEM strengthens the economy
- At the same time there is a growing skills and experience shortage facing UK STEM employers (e.g. ITC sector, energy)



# Conclusions

- UK needs more scientists, engineers
- UK failing to make use of its female talent
- Girls can do physics, brilliantly!
- Girls/young women more likely to do physics in an all-female environment
- Global data shows culture, not women's brains, is the problem





# Conclusion/Observation

Well behaved women rarely make  
history

Laurel Thatcher Ulrich

# Next IUPAP Women in Physics Conference

- BIRMINGHAM, England
- JULY 17 – 21<sup>st</sup> 2017

