



Women in
Astronomy

HEroes & SHEroes

Fostering diversity and gender-equality in astronomy

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Chair of the IAU WG Women in Astronomy



SHE IS AN ASTRONOMER



The under-used but expanding potential



For internal use
and
internal posting only

Thank you

Equality – Diversity – Inclusion

E



Goal 5: Achieve gender equality and empower all women and girls

D

Race, gender, ethnic group, age, personality, cognitive style, tenure, organizational function, education, background and more.

I

To value someone regardless of cultural or other differences (inclusive workplace)



Key benefits

Productivity / Creativity & Solutions / Attract & Retain

On the policy/corporate level

Charters & Recommendations

1992 **Baltimore Charter**

Equally capable
Diversity brings excellence
Communal responsibility & engagement

2003 **Pasadena Recommendations for Gender Equality in Astronomy**

Equity Now

Equal talent \leftrightarrow Equal opportunity
When % female at level A = % female in pool
Concerns: Hiring, Advancement & Recognition,
Policies, Career paths

2009 **IAU Resolution B4**

For all IAU Members: encouragement and support
For members/National Representatives: to break down barriers and ensure equal opportunities

The International Astronomical Union

Founded in 1919



Mission: to promote the science of astronomy in all its aspects through international cooperation.

Members: PhD and above, active in research
About 12500, from 100 different countries

Structure: Divisions, Commissions and Working Groups

Key activities: Organization of scientific meetings*
Promote astronomical education, research and public outreach

* General Assembly: 6 Symposia, 25 Joint Discussions and Special Sessions

IAU WG Women in Astronomy

Established by the IAU EC in 2003, reports directly via IAU GS

Mandate

To collect information, propose measures, and initiate actions in support of, or to advance equality of opportunity for achievement between women and men in astronomy, in the IAU and in the world at large.

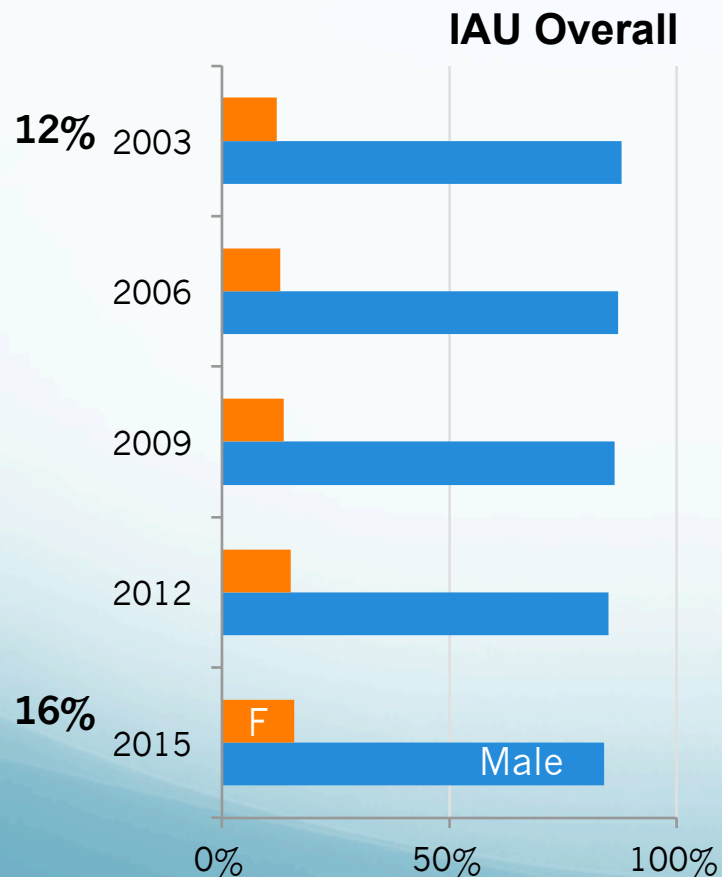
Role/Tasks

- Monitor the status of WiA and recommend future actions;
- Liaise with other committees and WGs on WiA;
- Responsible for organising WG sessions at IAU GAs;
- Provide a voice for women in all countries to ensure they are well represented in the international community;
- Maintain a list of international women who are willing to be on SOCs, serve on peer review panels, who are potential colloquium/conference speakers.

IAU WG Women in Astronomy

Monitoring statistics

Very difficult for country-based (except South America), no leverage possible



April 2018

12467 IAU Members

2074 Female ~17%

10393 Male ~83%

Huge differences among countries

A more global approach

Gender Gap in Natural Sciences: How to measure it, how to solve it?

Submitted in response to the ICSU Grants Programme Call 2017
Approved in February 2017 (lifetime: 2017-2020)

- **Data-based advice and actions** for all 3 key areas of ICSU's strategic plan:
 - International Research Collaboration
 - Science for Policy
 - Universality in Science (ICSU Statute No. 5)
- It supports UN Sustainable Development Goal #5

A very ambitious, inter-disciplinary project that involves several "Unions", from **mathematics, chemistry to physics, astronomy, biology**, including **computing mechanics, history of science ...** and beyond.

With the support of UNESCO, OWSD, ...

The project team



Gender
InSITE



ORGANIZATION
FOR WOMEN IN
SCIENCE FOR THE
DEVELOPING WORLD



United Nations
Educational, Scientific and
Cultural Organization

Main goals & audience

With an important focus on developing countries

GOALS

- Provide evidence and reliable data** Joint global survey + pubs. patterns
- Collaborate with social scientists** To highlight contrasts and commonalities across regions, cultures, low/high development areas and disciplines
- Provide easy access to materials** To encourage young girls into STEM and their families/schools to support them
- Recommend practical policies and actions** To reduce the gender gap

AUDIENCES

- Women in science** At the core of the project
- Teachers/science educators** Data gathering and analysis phases, implementation of actions → their awareness is critical
- Policy makers** Provide ongoing data-based and best practice advice in STEM
- The public, especially parents** Dissemination practices and grassroots actions

Project work-plan

3 main tasks

I. Develop and conduct a joint global survey

- I. Expanding on the 2010 IUPAP/AIP survey
- II. Reaching outside the academic world
- III. With special feedback from ICSU Regional Offices areas

II. Conduct a data-backed study on publication patterns

III. Establish a database of good practices for girls and young females parents and organizations

- | | |
|--------------|---|
| Year1 | Planning, preparation and conception |
| Year2 | Implementing data collection and analysis |
| Year3 | Final analysis, integration of results, recommendations |

Publications' patterns

Bibliometric statistics → one of the top KPI world-wide
explicit or implicit



Very competitive in terms of scientific productivity
number and impact of papers – especially for 'excellence' grants

COMPARATIVE CONTRIBUTIONS

✓ 31% of publications had a woman corresponding author [EU28: 2011-2013]
+3.9% in S&E since 2007

✓ Women and men publish in comparably influential journals
Similar participation in international scientific co-publications

✗ Women lag behind men in terms of size and impact

✗ Smaller portfolio are typically perceived as being of a lower quality → lower impact



perception bias

Scientific publications

Mathematics

Mihaljević-Brand et al. (2016)

zbMATH database, scholarly output of ~150,000 mathematicians, 1970-2013

- Less pubs in early years
- Leave academia more frequently within first 10yrs
- High-impact journals have less female 1st authors

Biology

Bonham & Stefan (2016)

Primary publications, 1997-2014, general vs computational biology

- Less female 1st authors in both
- Female principal investigator influences positively participation of more women
- Marginal but significant negative correlation between impact factor and gender

Astronomy

Caplar et al. (2017)

150,000 publications, 1950-2015, 5 main journals

- Papers authored by women receive 10.4% ($\pm 0.9\%$) fewer citations

Where we are, what comes next

NOW

Global Survey: Being translated in 5-10 languages
Includes feedback collected from regional centres

Publications: Connections established with reference databases
Author disambiguation
&
Gender identification } **A challenge!**

Other activities: 3 regional workshops in 2017

Taipeh 7-8 Nov
Bogota` 22-24 Nov
Cape Town 1-2 Dec

NEXT

- Launch the global survey (May 1)
- Analyse survey results
- Publication patterns analysis (per field, per geographical area, etc)
- Final conference (2019)

On the individual level

Awareness – Cannot fix a problem that is not acknowledged

Bias – Understand bias / Best practices

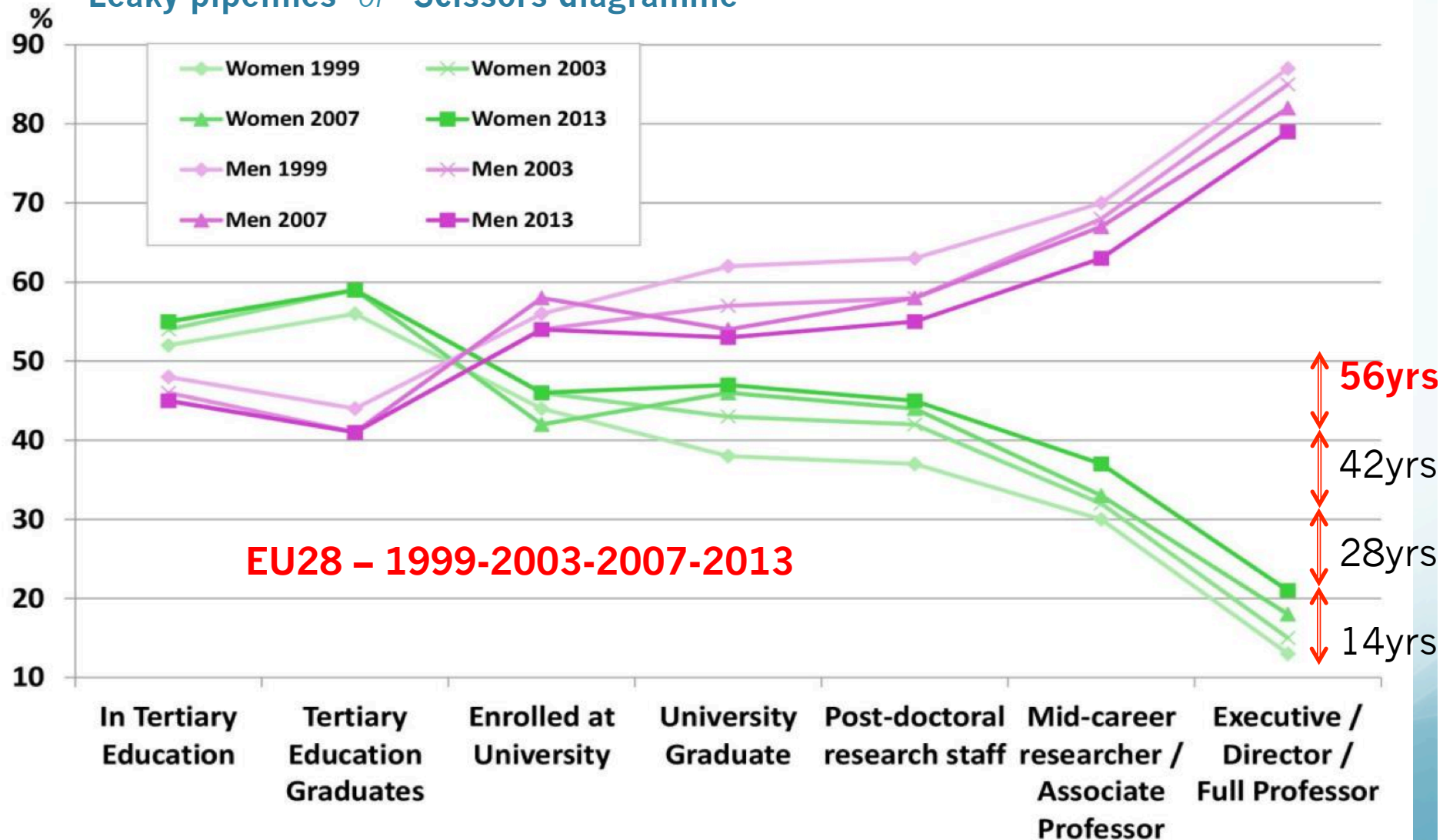
Skills – Negotiating / Networking / Communicating

Environment – Flexibility & Transparency

AWARENESS

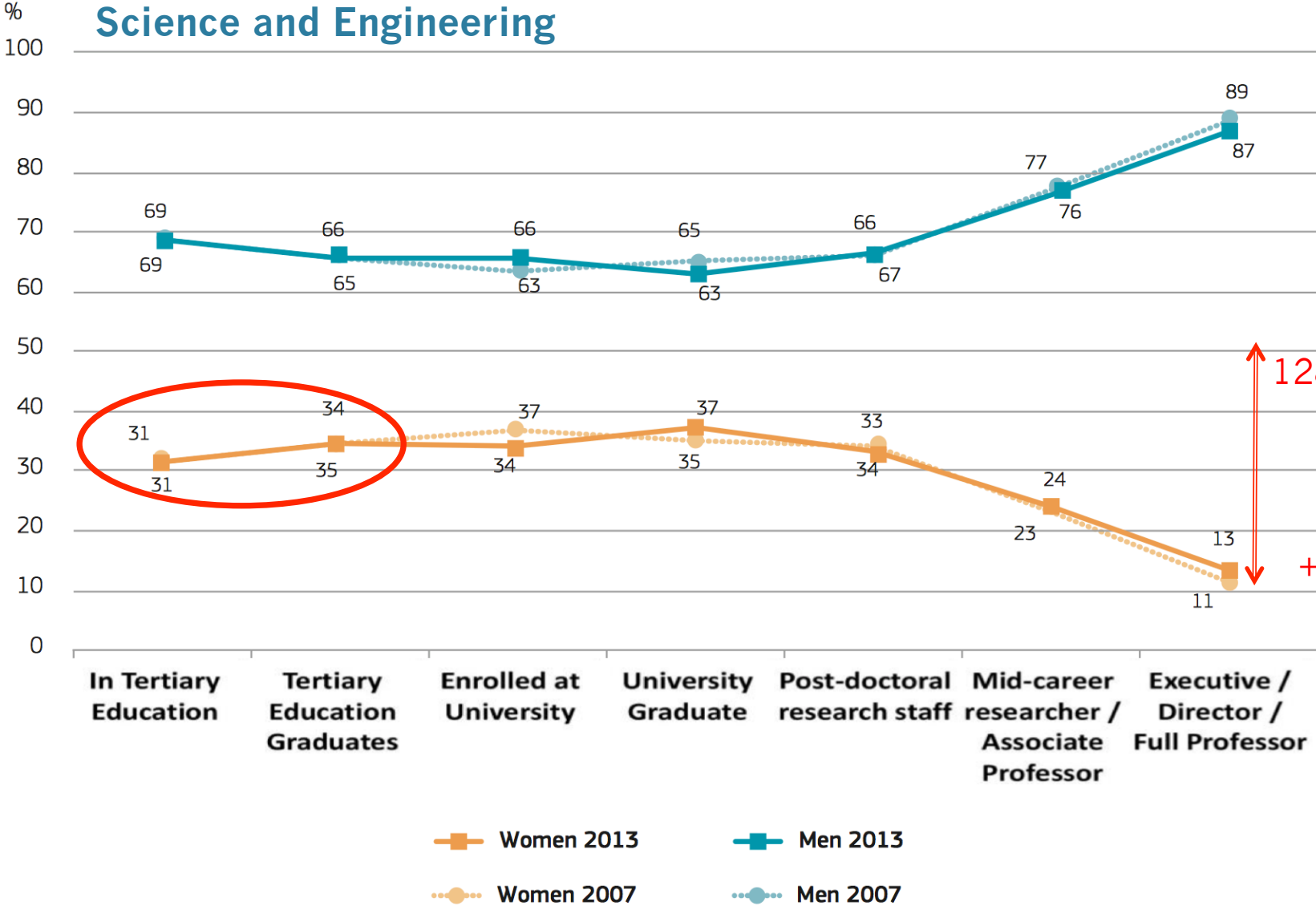
Cannot fix a problem that is not acknowledged

Leaky pipelines or 'Scissors diagramme'



Proportion of women and men in a typical academic career, students and academic staff.

AWARENESS



128 yrs!!

+2% in 6yrs

Academics in Europe (EU28)

The academic career of women remains markedly characterised by strong vertical segregation.



GCI

Glass
Ceiling
Index

A generational effect exists: women represent **49%** and **22%** of grade A positions in the **youngest** and **oldest** age group respectively

The under-representation of women in academic careers is even more striking in the field of **science and engineering** and in **top-level** positions.

Heads of (PhD) institutions:	15%	(10% in 2010)
Board members (chairs incl.)	28%	(40% in 8/29 countries)

Why is it proving so difficult?

BIAS

1. Understand bias / mental schemas

Expectations or **stereotypes** influence our judgments of others
Implicit, non conscious hypotheses about what it means to be male/female

- Strong influence on group expectations
- It has to do with gender, race, ethnicity, etc
- It is not discrimination
- Efficient but inaccurate processing of information

2. Share & Implement best practices

- *The 'height' test*
- *Hurricanes*

The Height-Experiment

The experimenters had matched the photos so that for every photo of a male student of a given height there was a female student of the same height.



The Height-Experiment

Women and men alike

The experimenters had matched the photos so that for every photo of a male student of a given height there was a female student of the same height.

The students nonetheless judged the women as shorter than they really were, and the men as taller.



Hurricanes

Hurricanes with female names are (~3x) more deadly than hurricanes with male names

No matter how controversial this study¹ is ...



Indeed ...

Hurricanes **Cristobal, Marco, Alexander** were predicted to be more intense than **Hanna, Dolly, Alexandra**.

(gender) Schemas: a challenge to our brains



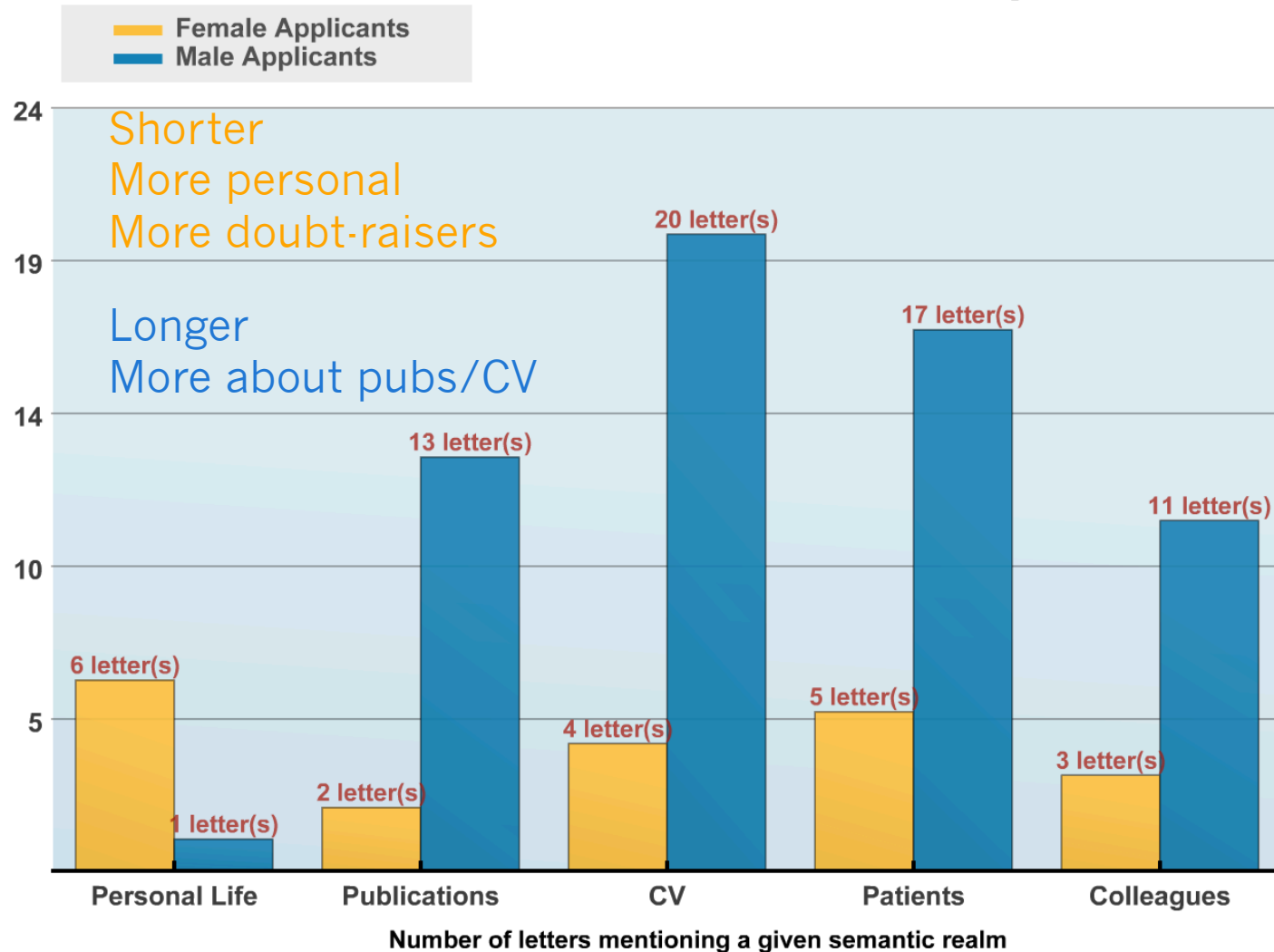
Most relevant under

- Lack of critical mass
- Time pressure
- Ambiguity (including lack of information)

Can affect evaluation outcomes

- Hiring
- Resumes / Job credentials
- Fellowships
- Awards
- Promotions
- Proposal Reviews

Letters of recommendation: An example



Trix and Psenka. (2003). Exploring the color of glass: letters of recommendation for female and male medical faculty. *Discourse and Society*, 14(2). 191-220.

“IT’S AMAZING HOW MUCH SHE HAS ACCOMPLISHED”

Be gender neutral!

Geophysics – Postdoctoral Fellowships → 1224 letters (2016)

**F → Solid scientist, good work, ‘highly intelligent’,
‘very knowledgeable’**

**M → Brilliant scientist, ‘trailblazer’, ‘one of the best
students I have ever had’**

No influence from the writer’s gender ...

‘Relationship-building’ vs. ‘Action-oriented’ characteristics
‘Communal’ vs. ‘Agentic’

Disadvantages from very early on

Telescope time allocation

ESO

Patat (2016)

Overall:

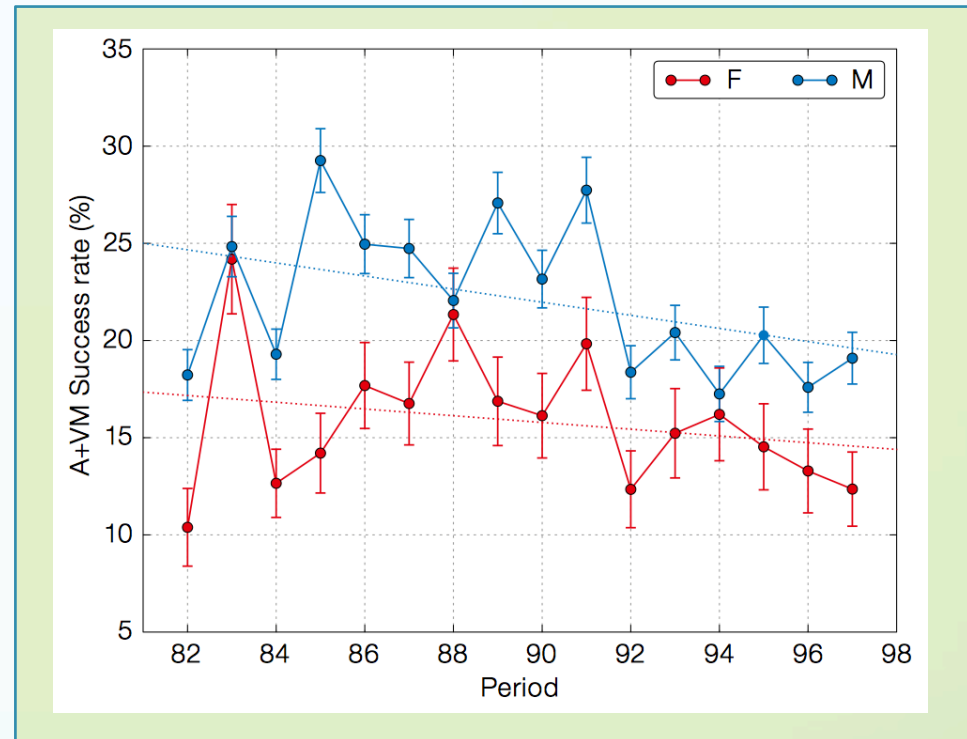
22.2% (M) vs. 16% (F)

Top-rank:

29.4% (M) vs. 27.1% (F) **M**

28.0% (M) vs. 23.5% (F) **W**

→ Prestige bias



HST Cycles 11-21 (10yrs period)

Reid (2014)

1. Success rates of female PIs astronomers are consistently lower than those of male PIs
2. # female PIs submitting HST proposals has increased (from 19% to 24%)

Age effect

→ **Younger** generation seems to perform much better

→ Panels with **younger** astronomers produces a more balanced outcome

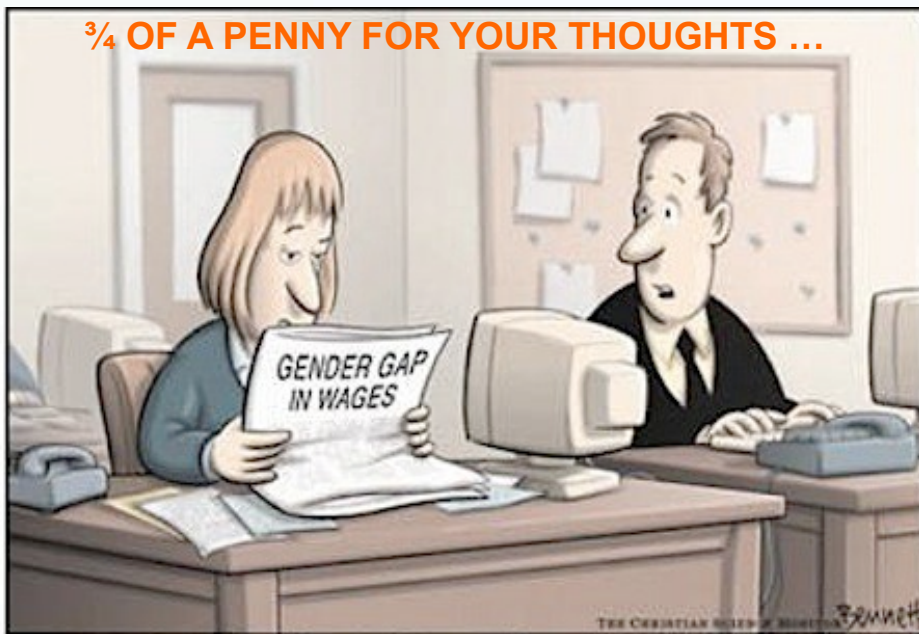
Skills

Negotiating

Networking

Communicating

Pay gap



¾ OF A PENNY FOR YOUR THOUGHTS ...

Three-fourths of a penny for your thoughts..

Expectations vs. Entitlements

Tennis

Associations

Working Groups

Events

Initiatives
(EU-funded projects)

*Being strategic
about contacts
is "cheating" ...*

Environment

Building a skill-set does not help if environment is inflexible or disadvantages women even more ...



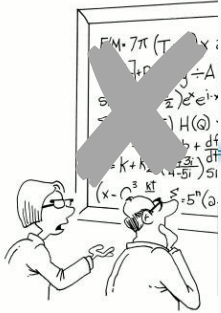
Needs for:
“Can do” (instead of “that’s not done”)
More transparency in decision-making process
Clear/firm positions on behavioral attitudes



Harassment

Bullying	Office/Inst.
Teasing	Field trips
Mimicking	Obs. Runs
Commenting	Conferences
Being offensive	Social events

Take home messages



- **Get committed**

- Awareness & vigilance
- Change initiatives
- Strategic priorities

THINK

- **Broaden your action**

- Sponsoring
- Neutralise stereotypes
- Include diversity
- Evolve (promotion) criteria

- **Hold challenging conversations**

- Where are the women in our talent pipe?
- Do we provide sponsors/role models?
- Are we rooting out unconscious bias?
- Do our policies help? How much?

Women hold up half of the sky

Thank You

