Women in Astronomy Workshop 2014

Demographics

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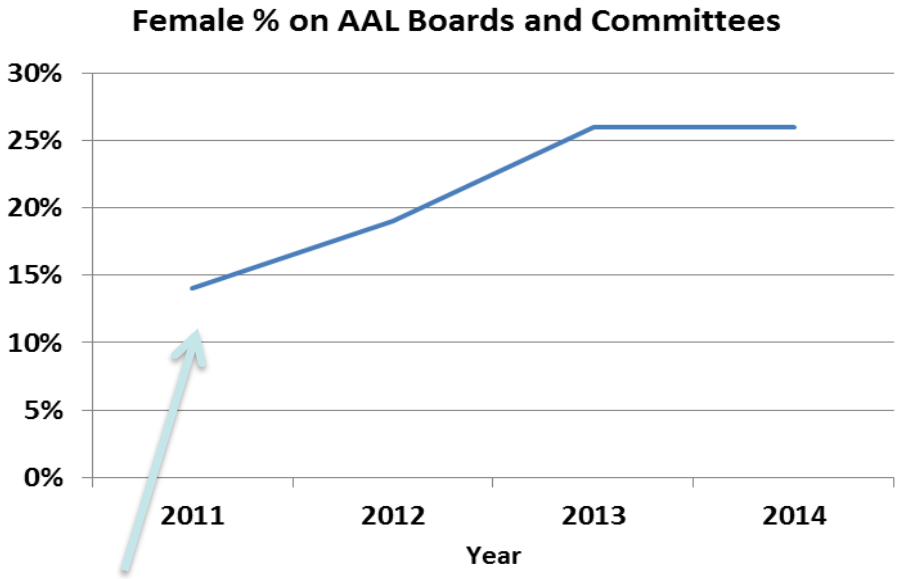
Aims of the ASA WiA Chapter

- Primary goals:
  1. monitor the status of women working in Australian astronomy via collection of statistics
  2. recommend future actions that will improve the environment for all astronomers
- Assist the community to ensure appropriate representation ★ for women at scientific meetings and on high-level decision making committees
- Organise WiA meetings at ASM (+ workshops like this!)

More info: **http://asawomeninastronomy.org/**

AAL Board & Committee vacancies

Astronomy Australia Ltd (AAL) has upcoming vacancies on its Board and Committees, with applications from women strongly encouraged.



AAL reviewed its demographic representation following 2011 WiA workshop, setting a target of at least the proportion of women in the astronomy community (using the Decadal Plan demographic data to set the benchmark)

Call for applications will be announced via the ASA email exploder in mid-Sept.

Great opportunity to contribute your expertise and ideas, and play a leadership role in Australian astronomy.

Community service announcement!

(1) Why do we need demographic data?

- Often reported that:
  - number of women in astronomy positions is not increasing at a rate commensurate with the availability of qualified female students, and
  - women are not represented at highest levels
  - ➔ statistics needed to support these claims
- To monitor the status of women in astronomy we need the data to see temporal trends

(1) Why do we need demographic data?

"For the last 29 years more women have graduated from Universities than men. But men have a 9x better chance of becoming senior executives" [Bain & Co 2013]

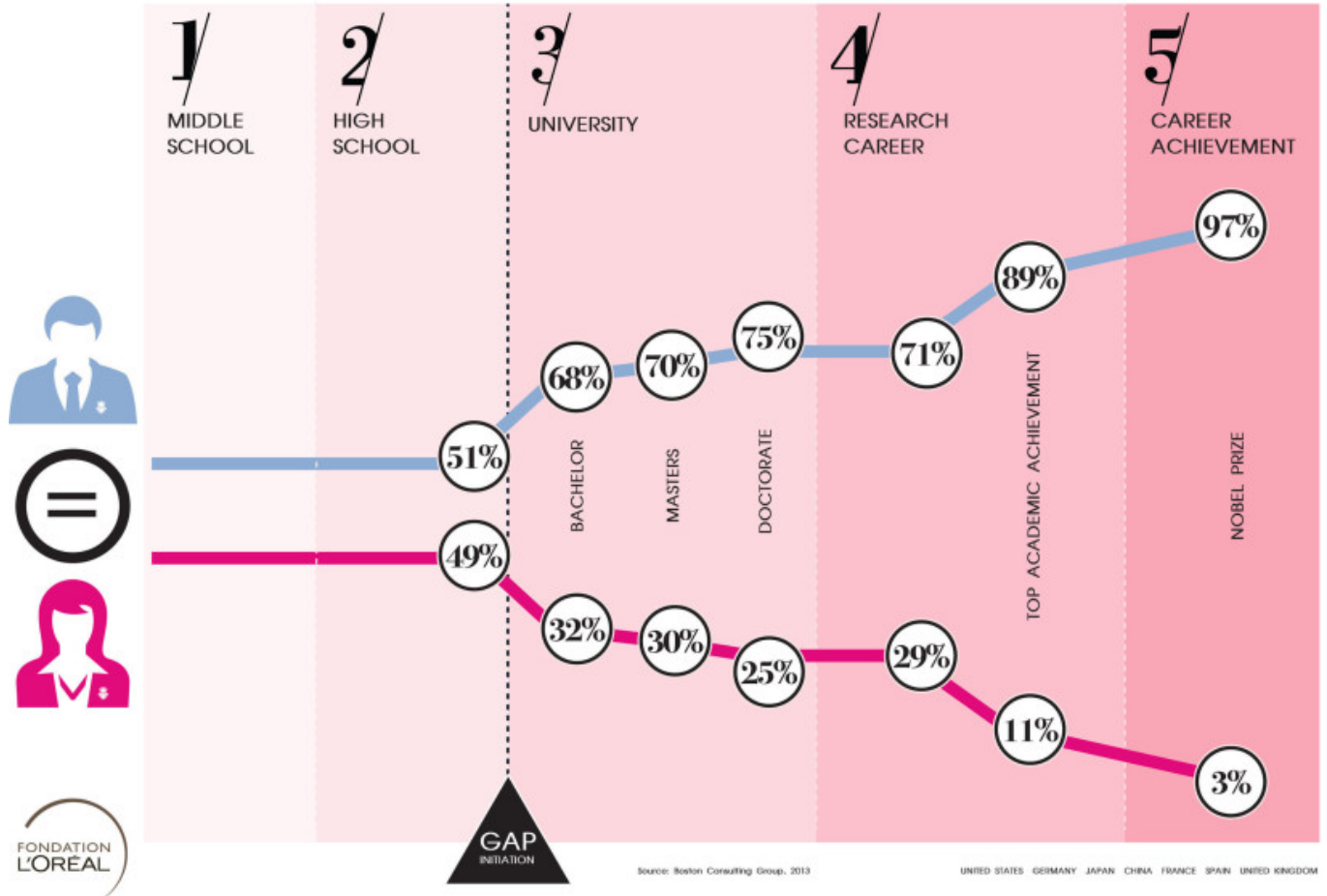
In the top 500 ASX companies, women are only:

<3% of "Chairmen"
9% of Non Executive Directors
<3% of Chief Executive Officers
9% of Key Executives (and 8% across listed cos.)

[WGEA Workplace Gender Equality Agency 2013]

(1) Why do we need demographic data?

First representation gap of women in science arises as early as Bachelor level and continues throughout the scientific career



(2) What data to we need?

- gender and status statistics within (astro) academia:
  - % women students (undergrads & PhDs)
  - % junior women (postdocs & contracts)
  - % tenured women (years past PhD & status)
- gender & status within organisations (ASA, NCA, Academy of Science, IAU…)
- visibility of women:
  - % high-level executive committees
  - % awards & prizes
  - % invited speakers
  - % grant recipients

(3) How do we collect the data?

- Overall statistics via decadal review
  (and within organisations – but generally private…)
- Membership of professional societies
- Government reporting (higher ed; ARC grants; CSIRO)
- Surveys (very difficult/time consuming!)

…true in Australia and internationally

(4) Some numbers….

- National Committee of Astronomy (NCA)
  - community stats via decal review data **2014 update!**
- Astronomical Society of Australian (ASA)
  - membership, meeting and prizes data **2014 update!**
- Australian Research Council (ARC)
  - grant success **2014 update!**
- Federation of Australian Sci &Tech Societies (FASTS)
  [now Science & Technology Australia]
- CSIRO – Australia's government science organisation
- Plus international:
  - IAU, USA (NSF, AAS, APS), UK, European Commission,…

National Committee of Astronomy (NCA) data

- Over decadal timescale (96 → 05) % women increasing:
  - 15% to 20% W academics
  - 20% to 41% W grad students
- But last 10 years (05 → 10 → 14) pretty flat:
  - 20% to 21.5% to 21% W academics ★
  - 41% to 40% to 29% W grad students ★
- Last decade > 30% increase in total number of astro position [with large increase in contracts: 37% → 48% → 65%] ★

  ➔ are more contracts worse for women?

Year	Total Staff (%W)	Total Students (% W)
2005	417 (19.7%)	157 (41.4%)
2010	536 (21.5%)	237 (39.7%)
2014	390 (21%)	326 (29%) ★

Astronomical Society of Australia (ASA) data

Membership	July 2013	Nov 2011	June 2009	June 2007	Oct 2003	Oct 1999
Fellows	103 (13.6%)	105 (13.3%)	79 (12.7%)	77 (11.7%)	53 (3.8%)	59 (1.7%)
Honorary	16 (6.3%)	16 (6.3%)	16 (0%)	16 (0%)	15 (0%)	14 (0%)
Member	279 (24.0%)	243 (20.6%)	229 (19.7%)	204 (18.1%)	214 (16.4%)	260 (20.4%)
Associate	20 (25.0%)	19 (26.3%)	13 (15.4%)	10 (20%)	9 (22.2%)	10 (30%)
Student	228 (35.0%)	190 (37.4%)	153 (33.3%)	106 (46.2%)	84 (42.9%)	68 (39.7%)
TOTAL	646 (26.0%)	573 (24.6%)	490 (22%)	413 (23.5%)	375 (20%)	411 (20.4%)

(Note that not all astronomers are members of the ASA!)

Astronomical Society of Australia (ASA) data

	Prizes	Years	% Women	Awardees
	Bok prize	1989-2014	33%	Honours
	Charlene Heisler prize	2006-2014	22%	PhD
	Louise Webster prize	2009-2014	33%	Postdoc
!	David Allen prize *	2001-2012	0%	Outreach
!	Robert Ellery lectureship +	1991-2013	8%	Astronomy
	Student poster prize #	2010-2014	67%	Students
	Student talk prize #	2010-2014	55%	Students

* Only 4 David Allen prizes awarded to date
+ Robery Ellery awarded every 2 years
# First prize poster & talks: 4/5 women (80%)

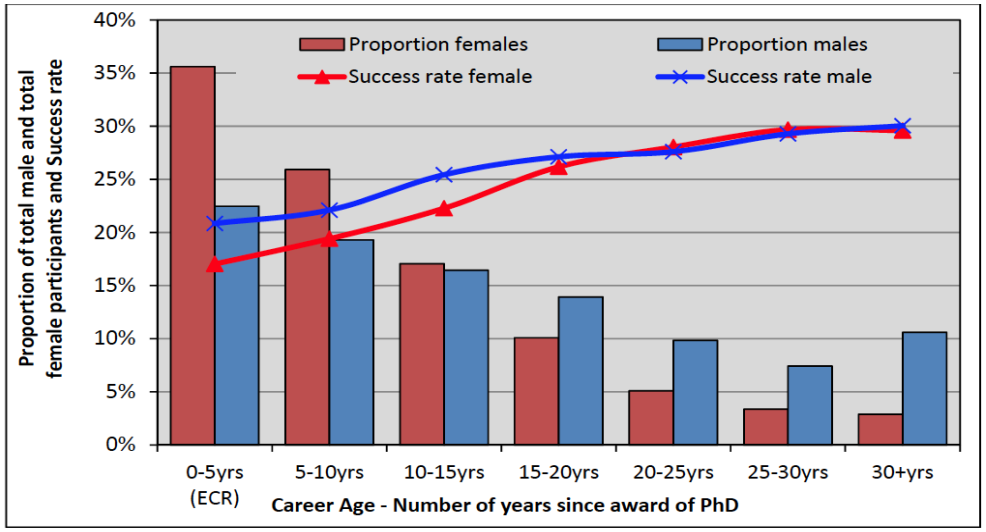
Astronomical Society of Australia (ASA) data

Year, Location	Participants	Invited speakers	Contributing speakers	Posters	SOC	LOC
2009, U. Melb	222 (28%)	16 (19%)	42 (33%)	92 (69%)	7 (29%)	5 (60%)
2010, U. Tas	189 (26%)	12 (50%)	52 (29%)	86 (?)	6 (17%)	9 (45%)
2011, U. Adel	240 (25%)	16 (25%)	53 (32%)	133 (23%)	11 (27%)	8 (25%)
2012, UNSW	237 (30%)	13 (31%)	75 (28%)	102 (30%)	10 (50%)	11 (36%)
2013, Monash	275 (36%)	16 (50%)	86 (31%)	74 (33%)	9 (55%)	12 (25%)

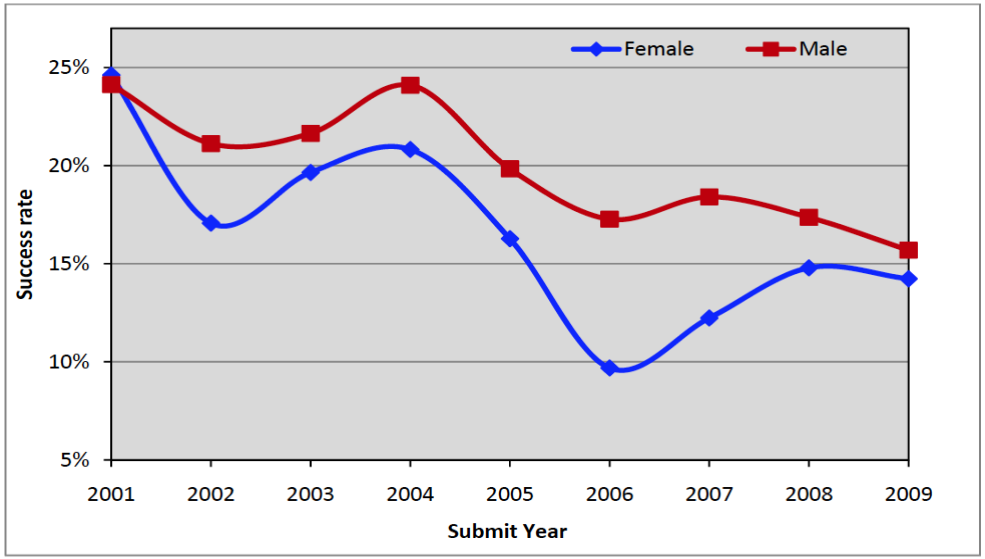
(data only collected for past 5 years)

2014 ASA ASM data from Macquarie coming soon…!

Australian Research Council (ARC) DP success data



- Gender by career age of participants (bar) and success rates (points) for ARC-DP (2004-2009)



- Gender success rate of ECR-only ARC DP proposals (2001-2009)

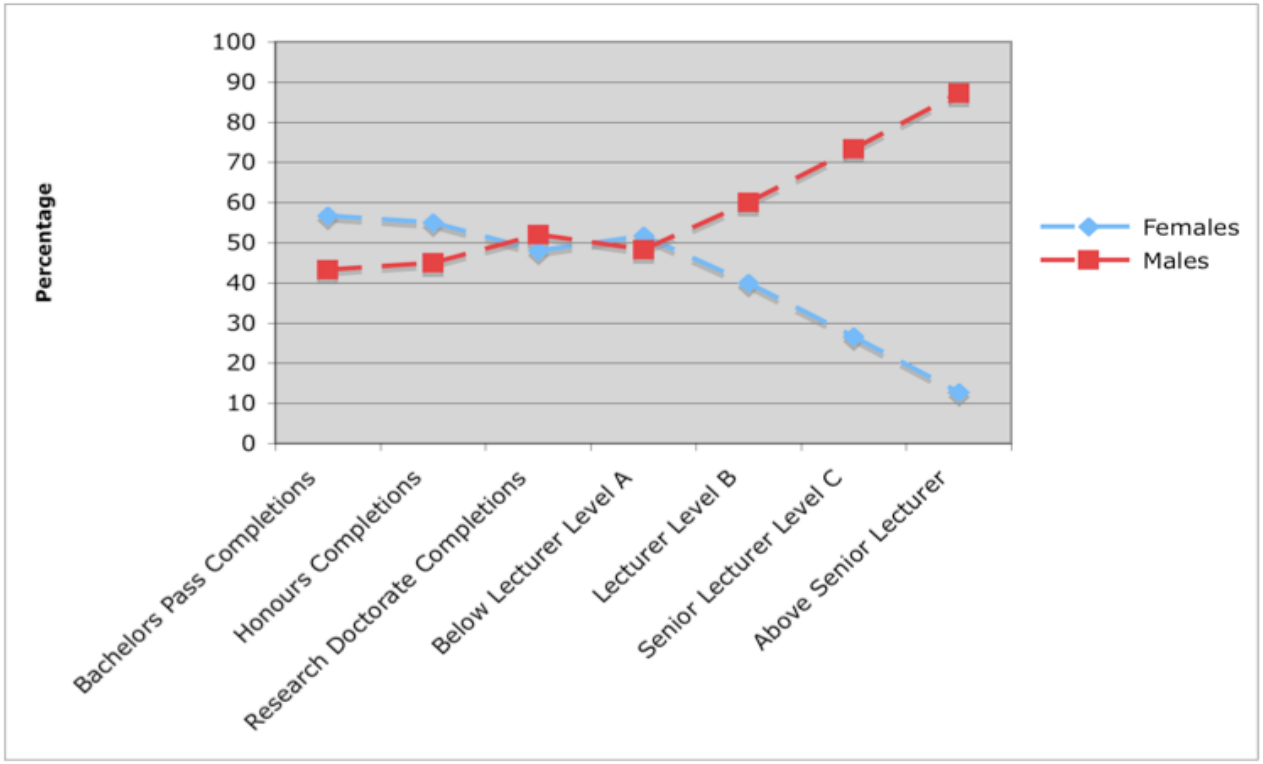
(From 2010 ARC Discovery Project Consultation Paper)

Australian Research Council (ARC) success data

ARC DP	Participants (%W)	Success rate (W)	Success rate (M)
2014 DPs	9951 (24.5%)	18.3%	20.0%
2013 funding	9309 (24.8%)	18.3%	21.6%
2011 fellowships	1389 (31.2%)	14.5%	13.6%
2011 ECRs	753 (33.5%)	15.1%	11.4%
2010 ARC grants	9700 (24.5%)	21.3%	25.3%

(ARC Discovery Project Selection Reports)

Federation of Aust. Sci &Tech Societies (FASTS) data



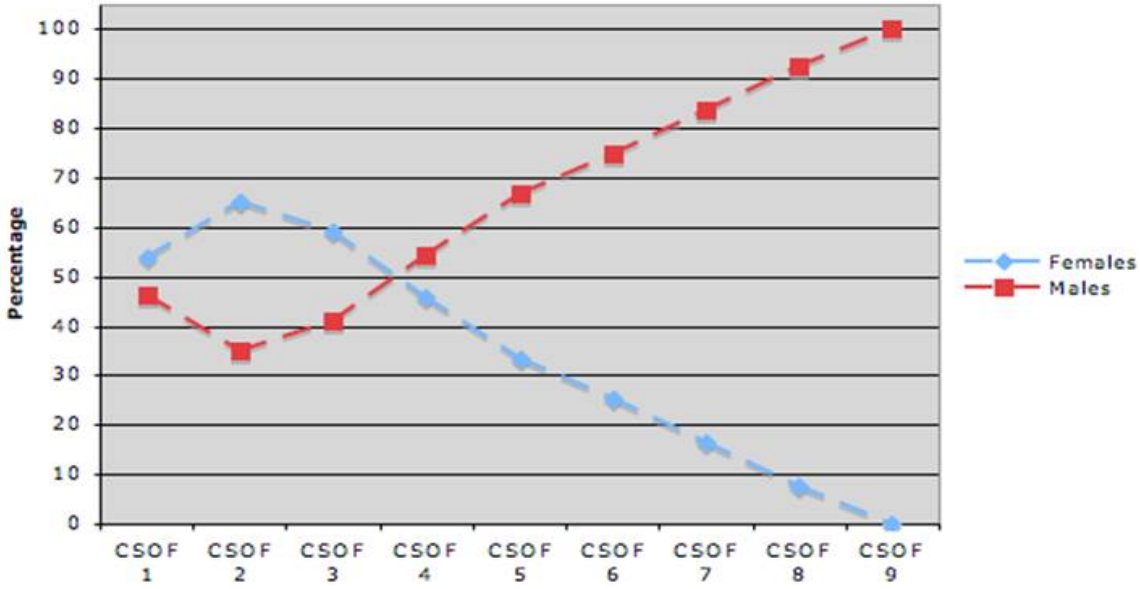
Australian academic profiles by gender in natural and physical sciences 2007
(DEEWR Selected Higher Education Student Statistics + DEST Special Report FTE Staff in AOU Groups 2007)

2007 snapshot data clearly indicates:

- relatively high levels of participation at undergraduate and post-graduate levels achieved
- but persistently low levels of representation of women at senior levels of the academy

(From FASTS Report: *Women in Science in Australia: Maximising Productivity, Diversity and Innovation*, 2009)

CSIRO data

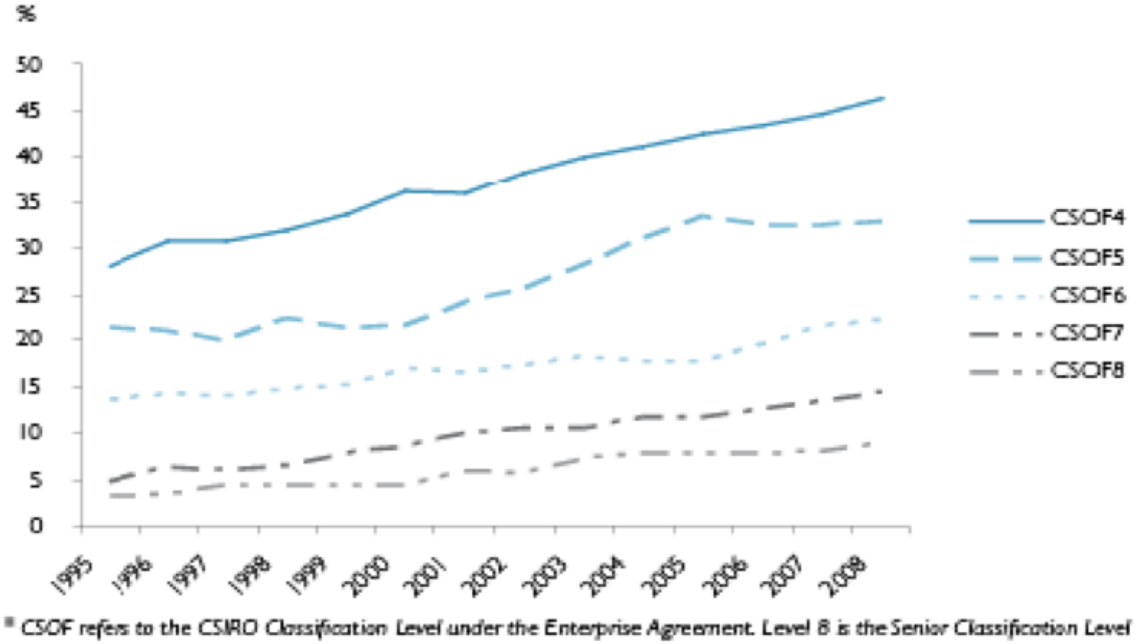


Summary of 2009 snapshot:
CSIRO has few women, particularly in higher levels and in the physical sciences across all levels.

- 38.5% women in CSIRO
- 8% of level 8 are female (was 4.5% ten years ago)
- at this rate, will ~60 years for % of women at Level 8 to equal % of CSIRO women (i.e. 39%)

Percentage of CSIRO women by CSOF level, from 2009 Annual Report

CSIRO data



* CSOF refers to the CSIRO Classification Level under the Enterprise Agreement. Level 8 is the Senior Classification Level

Figure 1.8 Percentage of Females by CSOF level 1995 - 2008
Source: CSIRO Annual Report 07/08

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Percentage of CSIRO women by CSOF level: 1995-2008
(from 2007/2008 Annual Report)

(From *Women in science at CSIRO,* excerpt from *2009: FASTS Women in Science in Australia: Maximising Productivity, Diversity and Innovation report.)*

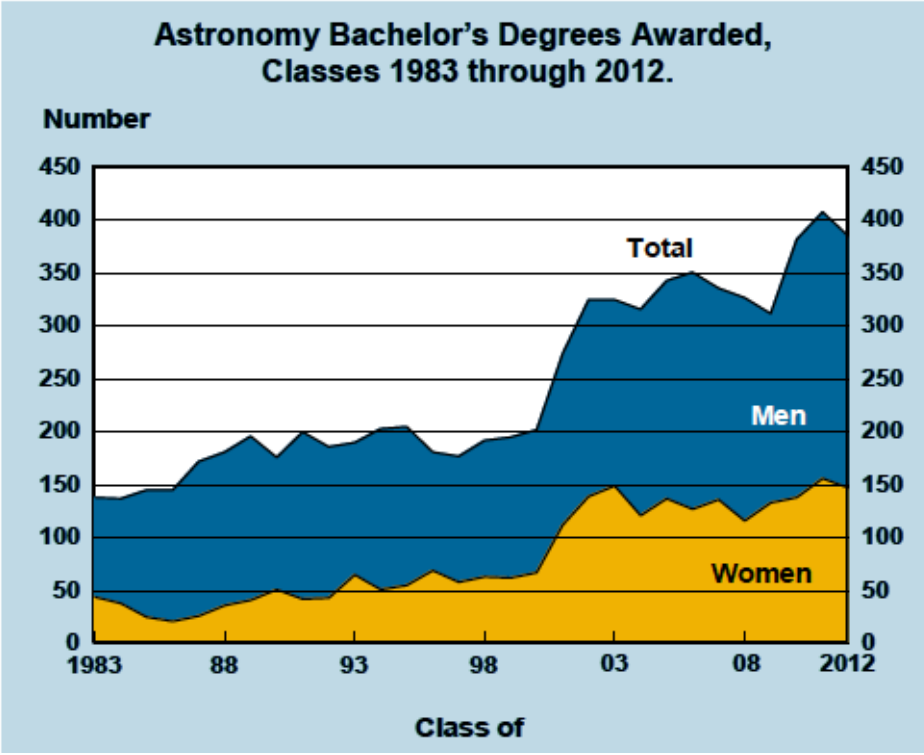
CSIRO data

SMH: "Equity a distant prospect for women in CSIRO" 25 Aug 2014:

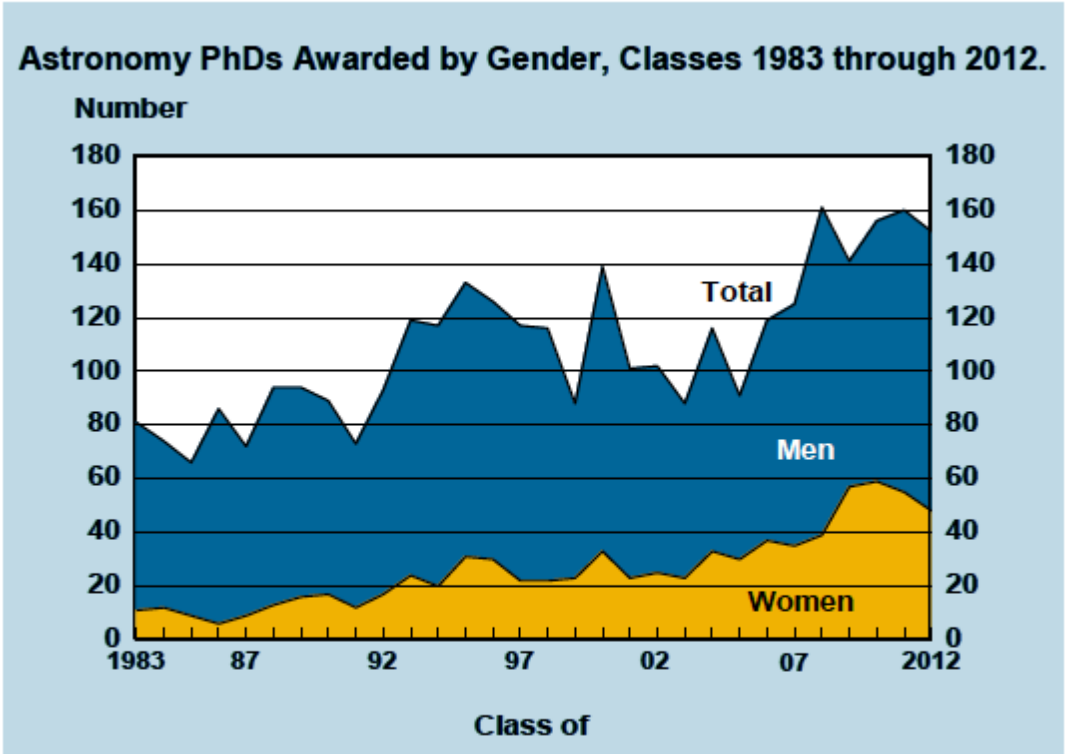
CSIRO's latest 2013 annual report indicates:

- 40% CSIRO employees W
- 24% research scientists W
- 12% technical services roles W
- 11% research management W
- 76% admin staff W

USA data:*students*



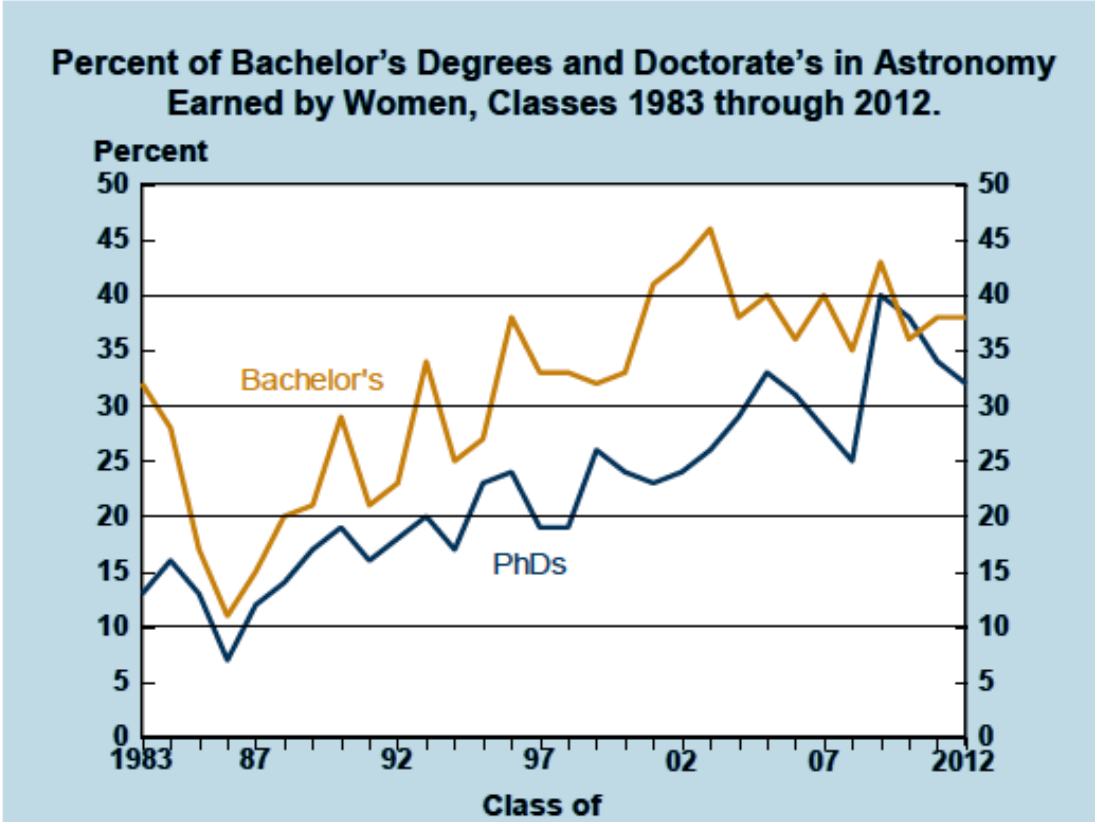
Astro BA graduates more than doubled in 15 years, while % women pretty flat over past 10 years (~40%)



Astro women PhD doubled n past ten years. 2012 PhD graduates: 32% women

(From AIPS Statistics Research Centre, *Astronomy Enrollments & Degrees,* Mulvey & Nicholson 2014)

USA data:*students*



- Steady rise in % W astro BA until early 2000s, then relatively flat for last decade at 40% (cf. physics: 20% W graduates).
- Triple the % W astro PhDs in past 25 years; currently 32%

(From AIPS Statistics Research Centre, *Astronomy Enrollments & Degrees,* Mulvey & Nicholson 2014)

USA data *: faculty*

- % W **physics** faculty continues to rise (14% in 2010)
- % W in each academic rank continues to rise
- Largest rank (Prof) has fewest W (< 10%)

- % W **astronomy** faculty similar trends (rising, Profs lowest %)
- % W in astro generally 5% higher than physics (19% in 2010)

(AIP 2010 Physics Survey, Ivie et al. 2013)

Percentage of Physics Faculty Members Who Are Women

	Year			
	1998	2002	2006	2010
by Academic Rank	(%)	(%)	(%)	(%)
Full Professor	3	5	6	8
Associate Professor	10	11	14	15
Assistant Professor	17	16	17	22
Instructor / Adjunct	*	16	19	21
Other ranks	13	15	12	18

Percentage of Astronomy Faculty Who Are Women
in Departments which offer an Astronomy degree and no Physics degree

	Year		
by Academic Rank	2003	2006	2010
	(%)	(%)	(%)
Full Professor	10	11	15
Associate Professor	23	24	22
Assistant Professor	23	28	30
Instructor / Adjunct	15	15	*
Other Ranks	15	21	17
OVERALL	**14**	**17**	**19**

USA data:*new jobs*

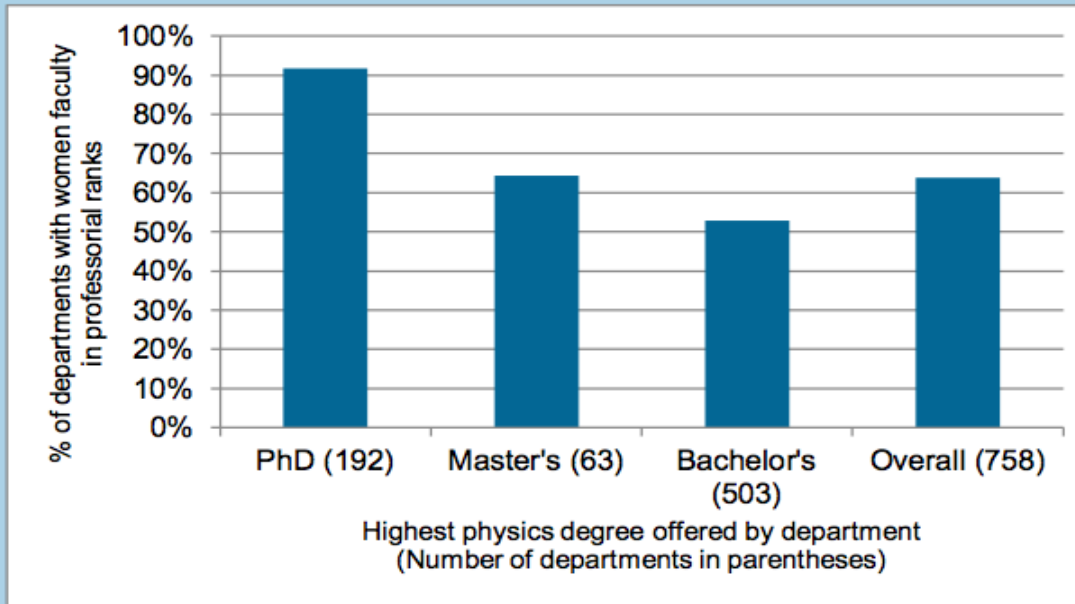
- % W newly hired continues to rise
- assistant prof, instructor, adjunt above rate of doctorates (18% 2007)

Percentage of Newly-Hired Physics Faculty Who Are Women

by Academic Rank	Year 2006 (%)	2008 (%)	2010 (%)
Full Professor	9	10	20
Associate Professor	8	20	14
Assistant Professor	25	22	29
Instructor / Adjunct	23	23	24
OVERALL	**22**	**21**	**26**

- 47% of BS/BA depts have no W
- < 10% PhD depts have no W
- BS/BA depts have fewer faculty, so higher proportion have no W

Proportion of Physics Departments with Women Faculty by Highest Degree Granted, 2009-10 Academic Year



USA data:*prizes*

(From *The Ongoing Demographic Shift in the AAS*, STATUS, Jan 2009)

Prize	Men		Women	
	As of 1990	Since 1991	As of 1990	Since 1991
Russell	41	11	2	2
Warner	38	17	1	1
Pierce	15	12	3	4
Tinsley	3	11	1	0
Heinman	10	19	1	0

Table 1: Prizes of the AAS through 2008

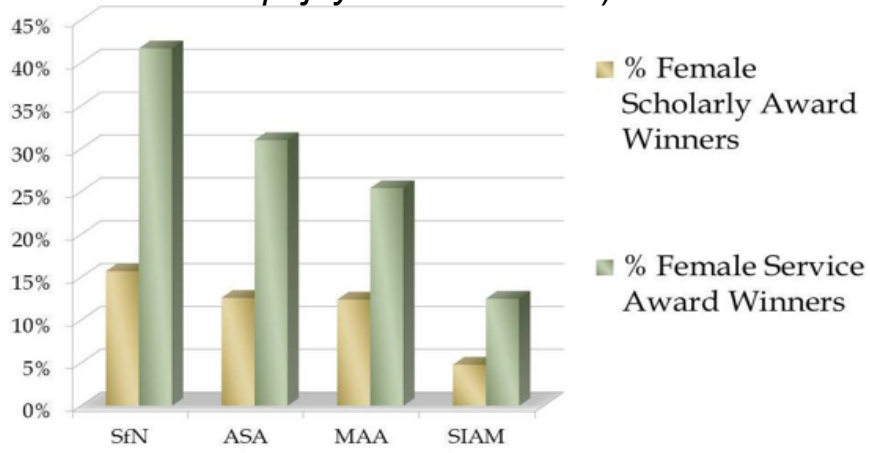
AAS Prizes	Men	Women
before 1990	93%	7%
since 1991	91%	9%

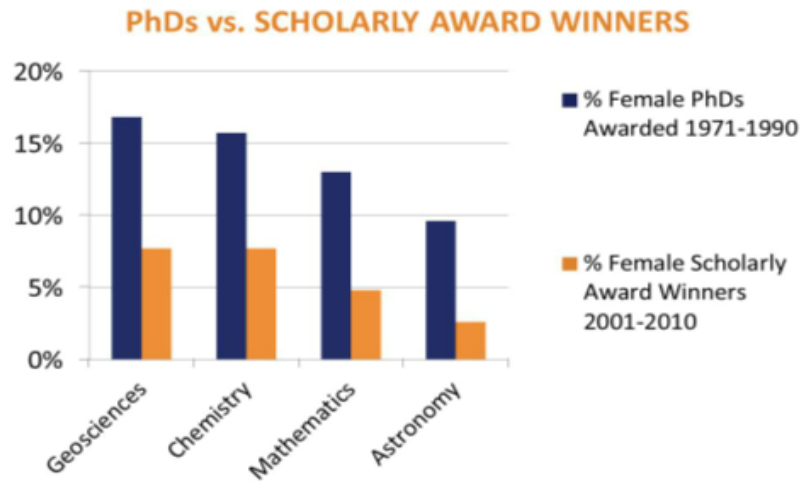
AAS members:
1973: 8%
1990: 12.6%
1995: 16.5%

USA data:*prizes*

- Women in life sci, phys, maths signif. less likely to receive scholarly awards cf. teaching awards
- Regardless of % women, men x2 as likely to win research award than women
- Women on prize committees help, but gender of chair most signif.

(From *Assoc. for Women in Science – Popejoy & Koster 2010*)





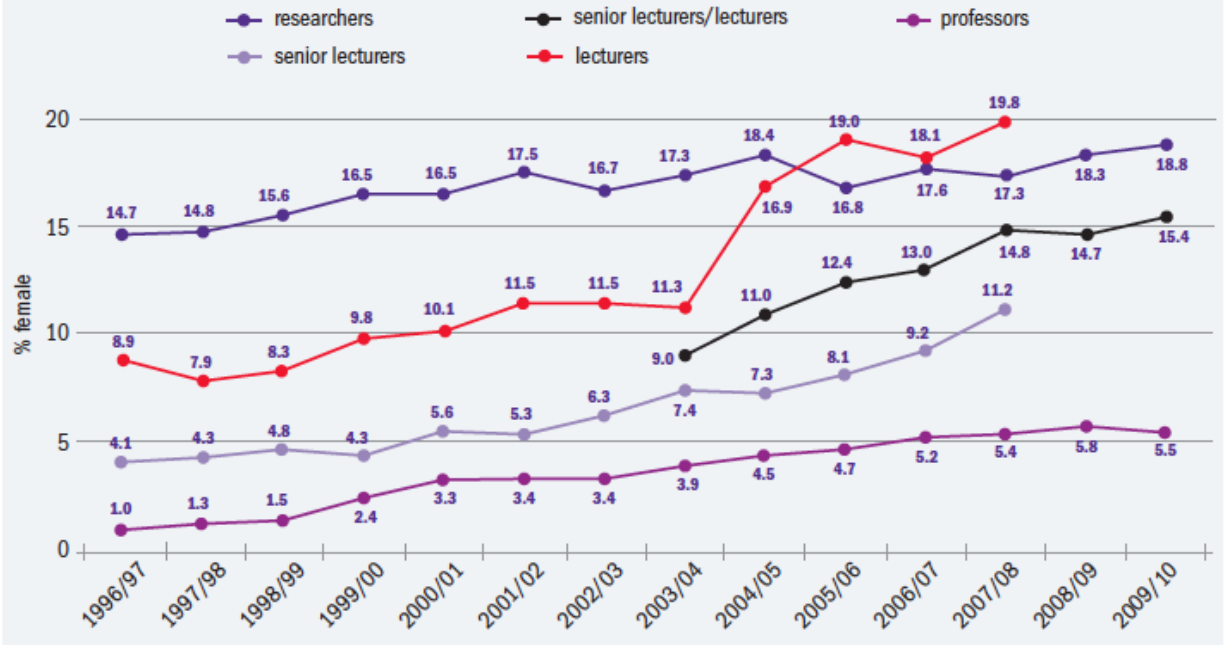
Women receive fewer scholarly awards and more service awards than would be expected based on the proportion of female PhDs and full professors in a field.

UK data

- 2003-2009: W physics rose: 13% →16%
- % of W drops as academic rank increases:
  - 1 W Prof for every 10 W S.Lect.
  - 1 M Prof for every 3 M S. Lect.

- 2003-2009: physics PhD rose by 20%, while W PhD fixed at 22%

Figure 3: Proportion of staff that is female in the physics cost centre at each grade 1996/97 to 2009/10



(From IoP *Academic Physics Staff/Students in UK Higher Education Institutions* 2012)

European astro data

France:
- CNRS: 26% women
- CNRS medals: gold 0%, silver 14%, bronze 25%
- French Academy of Science: 10% women

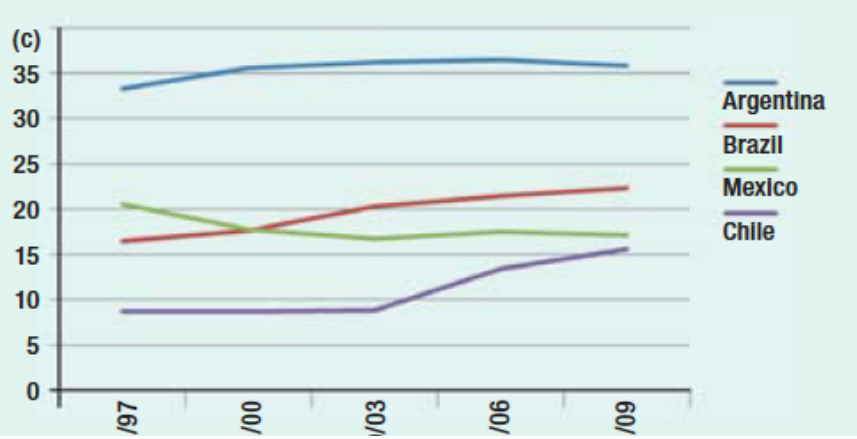
European Southern Observatory (2005):
- 18.7% women staff
- 3.4% women top level

UK astro women:
- 22% postdocs
- 10% lecturers
- 4% profs

(*IAU Women in Astronomy, Catherine Cesasky, 2009)*

International Astronomical Union (IAU) data

Latin America
- Argentina – 36% women
- Brazil – 22%
- Chile – 17%
- Mexico – 16%



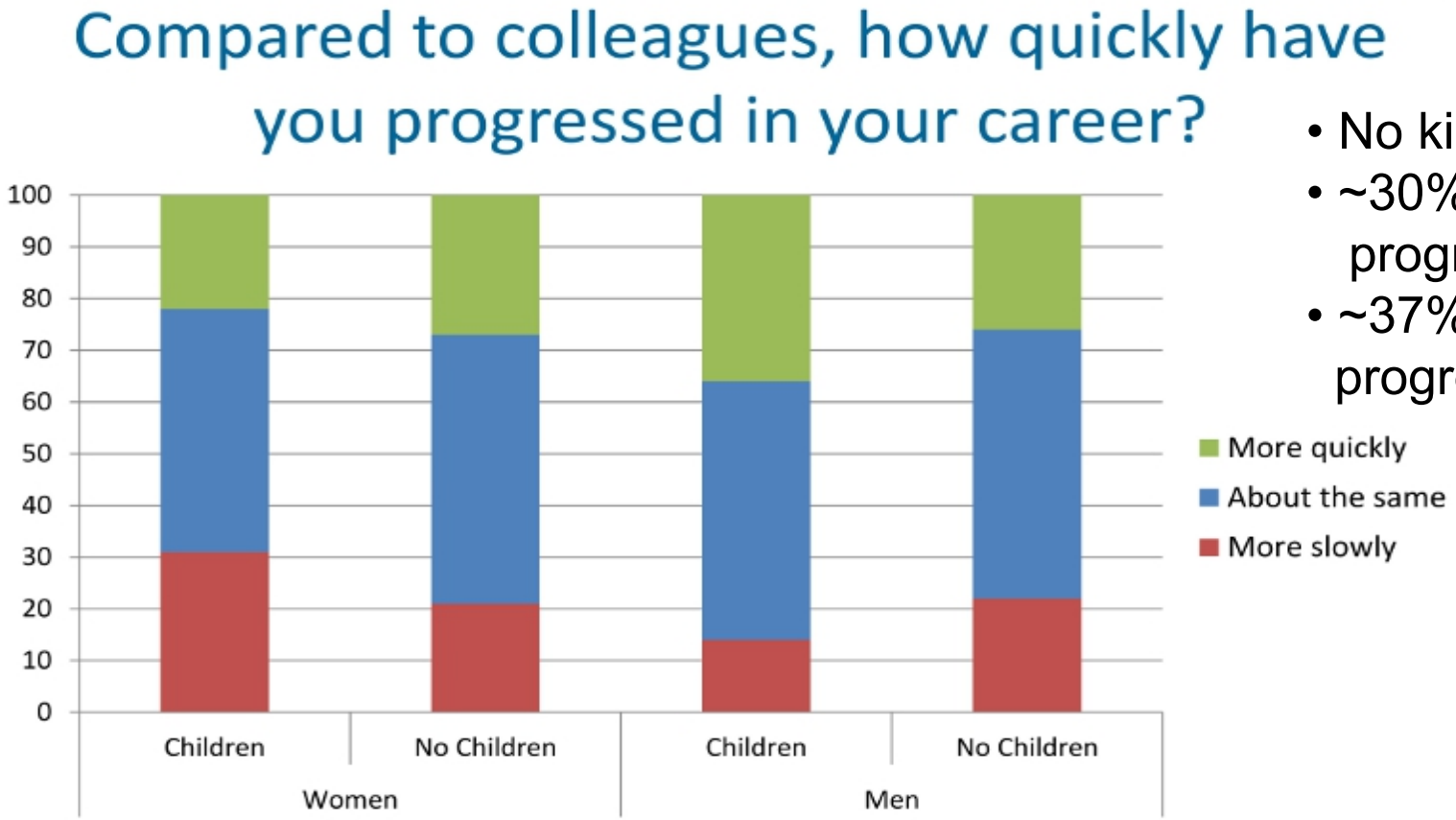
Asia
- Japan – 5.8%
- China – 15 %

IAU membership: 15% women

- USA – 13% (N=2687, 25% of IAU)
- UK – 13%
- Canada – 13%
- Australia – 15%

(*IAU WG Women in Astronomy 2012)*

International data : career + family



- No kids: no gender effect
- ~30% women with kids progress more slowly
- ~37% men with kids progress more rapidly

(3rd IUPAP International Conference of Women in Physics, 2008. ~15,000 respondents from 130+ countries.)

International data : career + family

34

How did your work or career change because you are a parent?

	Women	Men
I chose a less demanding or more flexible work schedule	39	20
I changed my employer or field of employment	7	4
I spent significantly less time at work	35	18
I was more productive and efficient at work	29	15
My career or rate of promotion slowed significantly	34	9
I became a stay at home parent	6	1
My work or career did not change significantly	**32**	**65**

- 68% women's careers affected by family (cf. 35% men)
- 35% W spend lots less time at work (cf. 18% M)
- 34% W career progress slowed (cf. 9% M)
- 29% W more productive (cf. 15% M)

(3rd IUPAP International Conference of Women in Physics, 2008. ~15,000 respondents from 130+ countries.)

(5) Plans for Future Data Collection

- NCA decadal plan demographics survey
  - Stay tuned! ***[!! Can we collect summary data annually!]***
- WiA Chapter collects ASA ASM statistics:
  - gender stats of participants, speakers, invited speakers, LOC/SOC
- Plus:
  - ASA prize winners (and student ASM prizes)
  - ASA council members
  - ASA membership

See http://asawomeninastronomy.org/statistics/