

Current Statistics on Women in Indian Astronomy



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Special Thanks to

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Outline



- Introduction – Why statistics ? Why monitor ?
- Statistics from Astrophysics Institutes in India
- Comparison with the rest of the world – IAU, AAS statistics
- Results from recent studies – AAS CSWA, arXiv: 1402.1952
- Summary

Why Statistics



- Approximately one fifth of professional astronomers are women, and the field continues to attract women and benefit from their participation.
- However, the data show that women are still less likely to advance than their male colleagues.
- Future progress toward parity demands that the field evaluate itself periodically and implement changes based on the latest demographic data and the most successful solutions.

The Pasadena Recommendations for Gender Equality in Astronomy



Guiding Principles

- Women and men are equally talented and deserve equal opportunity.
- Full participation of men and women will maximize excellence in the field.
- The measure of equal opportunity is outcome, *i.e.*, gender equity will have been attained when the percentage of women in the next level of advancement equals the percentage in the pool.
- Long-term change requires periodic evaluation of progress and consequent action to address areas where improvement is necessary.

Ratio of Female Faculty members in Indian Research Institutes

1. Indian Institute of Astrophysics (IIA)

http://www.iiap.res.in/people/personnel_faculty

Total = 52

Female = 11

Ratio = 21.1% (2014) 22.6% (2013)

2. Indian Institute of Science (IISc) - Astrophysics

<http://www.physics.iisc.ernet.in/people-faculty.php>

Total = 5

Female = 1

Ratio = 20%

3. Raman Research Institute (RRI) - Astrophysics

http://www.rri.res.in/aa_members.html

Total = 12

Female = 2

Ratio = 16.7%

4. National Center for Radio Astrophysics (NCRA) - TIFR

<http://www.ncra.tifr.res.in/ncra/people/academic>

Total = 17

Female = 2

Ratio = 11.8%

5. Aryabhata Research Inst. of observational sciences (ARIES)

<http://www.aries.res.in/people/scientists/>

Total = 24

Female = 2

Ratio = 8.3%

6. Tata Institute of Fundamental Research (TIFR) – Astro

<http://www.tifr.res.in/~daa/staff.html>

Total = 18

Female = 1

Ratio = 5.6%

7. Inter-University Center for Astron. & Astrophysics (IUCAA)

<http://www.iucaa.ernet.in:8080/iucaa/jsp/N-People.jsp>

Total = 21

Female = 1

Ratio = 4.7%

8. Physical Research Laboratory (PRL)

<http://www.prl.res.in/>

Total = 8

Female = 0

Ratio = 0%

Ratio of Female PhD students in Indian Research Institutes (2013)



1. Tata Institute of Fundamental Research (TIFR) – Astro

http://www.tifr.res.in/~daa/staff.html#aca_gs

Total = 14

Female = 5

Ratio = 35.7%

2. Indian Institute of Astrophysics (IIA)

http://www.iiap.res.in/people/personnel_students.htm

Total = 56

Female = 17

Ratio = 30.3%

3. Physical Research Laboratory (PRL)

<http://www.prl.res.in/>

Total = 7

Female = 2

Ratio = 28.6%

4. Aryabhata Research Institute of observational sciences
(ARIES)

<http://www.aries.res.in/people/rs/>

Total = 25

Female = 7

Ratio = 28%

5. Raman Research Institute (RRI) - Astrophysics

http://www.rri.res.in/aa_members.html

Total = 2

Female = 1

Ratio = 50%

6. Inter-University Center for Astronomy & Astrophysics
(IUCAA)

<http://www.iucaa.ernet.in:8080/iucaa/jsp/N-People.jsp>

Total = 28

Female = 4

Ratio = 14.3%

7. National Center for Radio Astrophysics (NCRA) - TIFR

<http://www.ncra.tifr.res.in/ncra/people/academic>

Total = 18

Female = 2

Ratio = 11.1%

8. Indian Institute of Science (IISc) – Astrophysics

<http://www.physics.iisc.ernet.in/people-students.php>

Information not up to date - indicates 1 male student only

Statistics from Delhi University

Reference:

http://www.du.ac.in/fileadmin/DU/Events/Gender%20Audit%20Report_892010.pdf

(Records primarily from 2007-2008)

Students at Under Graduate Level

Medical Science: $997/2161 = 46\%$

Mathematical Sciences: $3522/5591 = 63\%$

Science: $7901/13427 = 59\%$

Students at Post Graduate Level

Medical Science: $601/1345 = 45\%$

Mathematical Sciences: $814/1273 = 64\%$

Science: $1387/2234 = 62\%$

Students doing PhDs

Medicine: $36/74 = 49\%$

Mathematical Sciences: $238/418 = 57\%$

Science: $420/778 = 54\%$

Faculty Members

Lecturers

2005-2006: $74/156 = 47\%$

2007-2008: $78/164 = 48\%$

Readers

2005-2006: $96/248 = 39\%$

2007-2008: $107/254 = 42\%$

Professors

2005-2006: $69/258 = 27\%$

2007-2008: $70/251 = 28\%$

International Astronomical Union (IAU)



- Number of Members

Male	Female	Total
8895	1702	10597

- % of Members

Male	Female
83.94	16.06

India

M=214, F=21

M = 91.06%, F = 8.94%

M* = 2.22%, F* = 0.20%

*(vs Total IAU Membership)

Reference: <http://www.iau.org/administration/membership/individual/distribution/#table1>



AAS Committee on the Status of Women



For information about the above images, click [here](#).

[Contact members and associates of the CSWA](#)

[CSWA Climate Site Visits for Astronomy Departments - Policy and Procedures](#)

[Official information from the AAS](#)

Publications

- [AASWomen](#)
- [Women in Astronomy Blog](#)
- [STATUS](#)
- [Facebook page](#)
- [Follow us on Twitter](#)
- [Baltimore Charter](#)
- [Pasadena Recommendations](#)
- [Strategic Plan 2009](#)
- [Annual Reports](#)

[Advice](#)

About the Committee on the Status of Women in Astronomy

What's New:

October 2013 - The CSWA is sponsoring a survey on two-body careers in astronomy. Whether or not you are partnered, you are invited to take the survey [here](http://www.surveymonkey.com/s/CSWATwoBodyCareers):

October 2013 - At the 223rd AAS meeting near Washington, DC, the CSWA will present a Town Hall describing the results of the CSWA Demographics Survey 2013. Since 1992, the CSWA has been conducting demographics surveys of major astronomy departments and divisions since 1992 to track the representation of women across the field. Discussion about the implications for policy in our field will be invited. Organizer: A. Meredith Hughes. Tuesday, January 7, 2014, 12:45 PM to 1:45 PM.

Presentation slides available [here](#).

August 2013 - At the 223rd AAS meeting near Washington, DC, CSWA and the AAS Committee on the Status of Minorities in Astronomy (CSMA) will co-sponsor a special session entitled, "The Proper Use of GRE Scores for Enhancing Diversity and Excellence in Astronomy Graduate Programs." The session is scheduled for for Wednesday, January 8, 2014, 10:00 to 11:30 AM.

January 2013 (updated) - At the 221st AAS meeting at Long Beach, CA, CSWA sponsored a special session on Monday, January 7, 2013, from 2:00 to 3:30 PM entitled, "Family Leave Policies and Childcare for Graduate Students and Postdocs." Speaker list and other details [here](#). The presentation slides are now posted in PDF [here](#).

June 2012 - At the 220th AAS meeting in Anchorage, AK, the CSWA sponsored a Town Hall with presentation, "[Introduction to Astronomical Bullying](#)" by Joan Schmelz (slide show, PDF, 1.8 MB)

June 2012 - Members of CSWA and CSMA collaborated on a description of the status of women of color in astronomy and recommendations for improvement, for a [National Academies-sponsored conference](#).

June 2012 - A new segment has been added to our Advice page: [Section 9, Suggestions for Serving on a Scientific Organizing Committee](#). Thanks to Nancy Brickhouse and others for composing it.

AAS
CSWA
tenured
faculty

no
assistant
professors
etc.

A
Portion
Of the
Table

% Women	# Women	# Men	University	Department (discipline)	Joint Appts.	Updated
55.6	5	4	Indiana Univ.	Astronomy		Oct 18, 2013
40.0	2	3	Univ. of Missouri – Columbia	Physics & Astronomy (astronomy)		Oct 18, 2013
40.0	2	3	Gemini Obs.	Astronomy		Oct 17, 2013
40.0	2	3	Univ. of New Mexico	Physics & Astronomy (astronomy)		Oct 17, 2013
38.1	8	13	Univ. of Minnesota	Minn. Inst. for Astrophysics		Oct 17, 2013
37.5	3	5	Yale Univ.	Astronomy		Oct 17, 2013
33.3	4	8	Univ. of Washington	Astronomy		Oct 17, 2013
33.3	3	6	Univ. of Wisconsin Madison	Astronomy	[NA]	Oct 17, 2013
33.3	3	6	New Mexico Tech	Physics		2011
29.2	3.5	8.5	Caltech	Astronomy	[Included]	Oct 17, 2013
28.6	2	5	Univ. of Toledo	Physics & Astronomy (astronomy)		Oct 17, 2013
27.3	3	8	Columbia Univ.	Astronomy		Oct 17, 2013
26.7	4	11	UCLA	Physics & Astronomy (astronomy)		Oct 17, 2013
25.0	1	3	Case West. Res. Univ.	Astronomy		Oct 17, 2013
25.0	2	6	New Mexico State	Astronomy		Oct 17, 2013
23.1	3	10	Princeton Univ.	Astrophysical Sciences	[NA]	Oct 17, 2013
23.1	3	10	Boston Univ.	Astronomy		Oct 18, 2013
22.7	5	17	UCSC	Astronomy & Astrophysics		Oct 17, 2013
22.2	2	7	Lowell Obs.	Astronomy		Oct 17, 2013
22.2	1	3.5	Michigan State	Physics & Astronomy (astronomy)	1 at 0.5	Oct 24, 2013
21.4	3	11	MIT	Astrophysics		Oct 17, 2013
21.1	15	56	NASA Goddard	Astrophysics	[NA]	Oct 17, 2013
20.8	5	19	Univ. of Arizona	Astronomy		Oct 17, 2013
19.4	3	12.5	Ohio State	Astronomy	2 at 0.25	Oct 24, 2013
18.2	2	9	UMass Amherst	Astronomy		Oct 17, 2013
16.7	1	5	Univ. of Iowa	Physics & Astronomy (astronomy)		Oct 17, 2013
15.4	2	11	Univ. of Florida	Astronomy		Oct 17, 2013

American Astronomical Society



- Indiana University leads the pack with 50% women on the tenured faculty, but some other institutions are still in the single digits. The average is 15.1%, with a standard deviation of 10.6%.
- For comparison, 18% of full members of the AAS are women.
- Reference: http://www.aas.org/cswa/percent_tenured.html

This and next 2 slides are borrowed from talk on AAS Committee on the Status of Women in Astronomy (CSWA) webpage - <http://www.aas.org/cswa/>

CSWA Town Hall: Portrait of a Generation of Women in Astronomy

A. Meredith Hughes
Wesleyan University

With thanks to: Karen Kwitter, Johanna Teske, Brian Morsony, Julia Kamenetzky, Steph LaMassa, Karly Pitman

Changes with time 1: Seniority

Rank	% Women 1992	% Women 1999	% Women 2003	% Women 2013
Grad student	22	26	30	34
Postdoc	17	20	22	28
Assistant Prof (total/faculty/research)	17/--/--	18/--/--	15/20/10	27/27/27
Associate Prof (total/faculty/research)	10/--/--	14/--/--	20/21/19	20/21/19
Full Prof (total/faculty/research)	5/--/--	7/--/--	9/9/9	14/15/11

Fraction of female assistant professors has nearly doubled in the past ten years

Fraction of female associate professors has not budged. Why?

Take-home Messages

Good news: In the last decade, universities have on average been recruiting and retaining women into assistant professor positions at rates approximately consistent with their representation at junior levels (with appropriate caveats).

Morally ambiguous news: In the last decade, there is some evidence that the currently highest-ranked (NRC) institutions have been slower to promote and retain women than mid- to lower-ranked institutions. Research track is still more male-dominated.

Unfortunate news: Departments appear to have become more polarized in their recruitment/retention of women. On which end of the spectrum does your department lie?

Women in Italian astronomy (arXiv: 1402.1952)

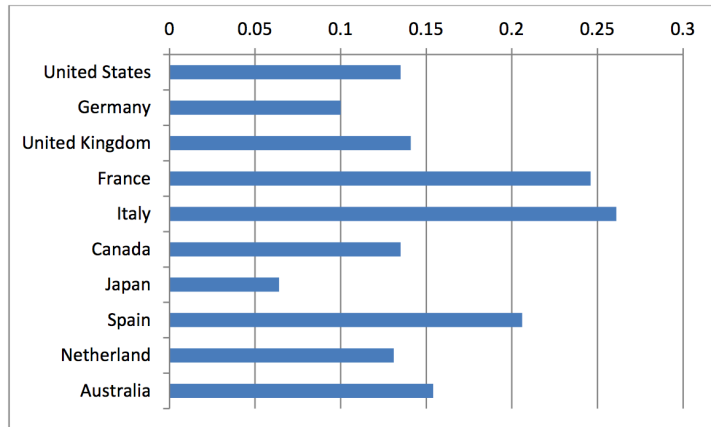


Figure 3. Fraction of women among IAU members of the ten most productive countries in astronomy

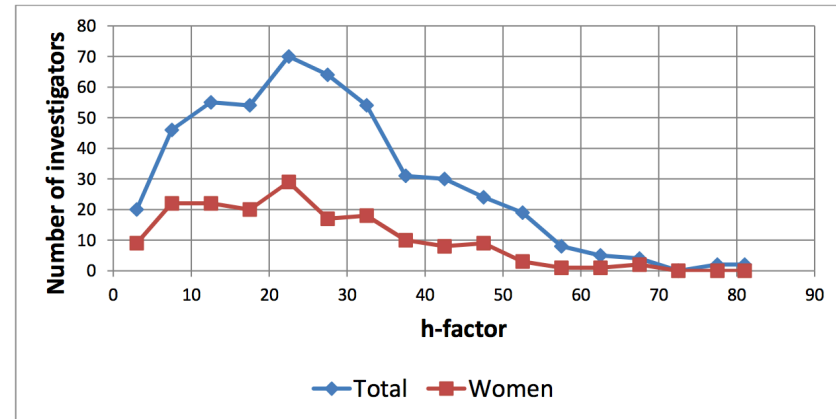


Figure 5. Distribution of h-factor for Italian astronomers, and for women astronomers in particular (Source: ADS; updated at March 2013)

- >26% of Italian IAU members are women: this is the largest fraction among the world's leading countries in astronomy.
- Within INAF, fraction of women is - 36% for Assistant Professors, 17% for Associate Professors, and 13% for Full Professors.
- Women make up only 15% among the 100 most cited astronomers working in Italy, a percentage which is however twice that over all Europe. However, 40% of the Best astronomy PhD Theses have been awarded to female students over the last 20 years.
- We conclude that implicit sex discrimination factors probably dominate over explicit ones and are still strongly at work.

Unconscious bias



- ***What is unconscious bias?***

Psychologists tell us that our unconscious biases are simply our natural people preferences. Biologically we are hard-wired to prefer people who look like us, sound like us and share our interests. We use these processes very effectively (we call it *intuition*) but the categories we use to sort people are not logical, modern or perhaps even legal.

- Project Implicit - <https://implicit.harvard.edu/implicit/>

Schemas: Non-conscious Hypotheses

- Schemas are expectations or hypotheses about the characteristics of a person based on their group membership.
- Schemas influence our judgments of others (regardless of our own group).
- Schemas influence group members' expectations about how we will be judged.



Schemas...



Are widely shared within a culture

- Both men and women hold them about gender.
- Both U.S. whites and people of color hold them about race/ethnicity.
- Schemas about people in different jobs or disciplines.
- People are often not aware of them.

Schemas are...

- Applied more under circumstances of:
 - Ambiguity (including lack of information)
 - Stress from competing tasks
 - Time pressure
 - Lack of critical mass

When do Schemas Result in Unconscious **Bias**?



When the schema for a type of candidate and the schema for an outcome conflict:

- Hiring
- Evaluation
- Fellowship
- Award
- Promotion

Summary



- We need more statistics at all the different levels of employment – students, postdocs, junior/senior faculty.
- Statistics must be monitored over time to assure gender equity. The AAS has now been doing this for >20 years.
- “Gender equity will have been attained when the percentage of women in the next level of advancement equals the percentage in the pool.”
- We (men & women) need to check for our implicit/unconscious biases.