Statistics on Astronomy Workforce

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Sources of Data

- Collected by AIP
- Collected by NSF and can be compiled by AIP
  - Above data not ordinarily published by AIP and provided by request to the demographics study group
  - Generally, any data shown for astronomy are also available for physics
  - Data in this talk are not updated; shown for example only
- Collected from AAS members by Demographics Committee
  - 2 surveys, 2013 and 2016
  - Another planned in 2018
- Longitudinal Survey of Astronomy Graduate Students (funded by NSF)

AIP data
or federal data compiled by AIP

- Degrees awarded
- Data on faculty (AIP only)
- Data on initial outcomes of recent PhDs, including # postdocs, number employed, etc.
- Data on long-term employment available from a separate study I'll discuss later and possibly from NSF
- Data on students, including grad students (not shown today)

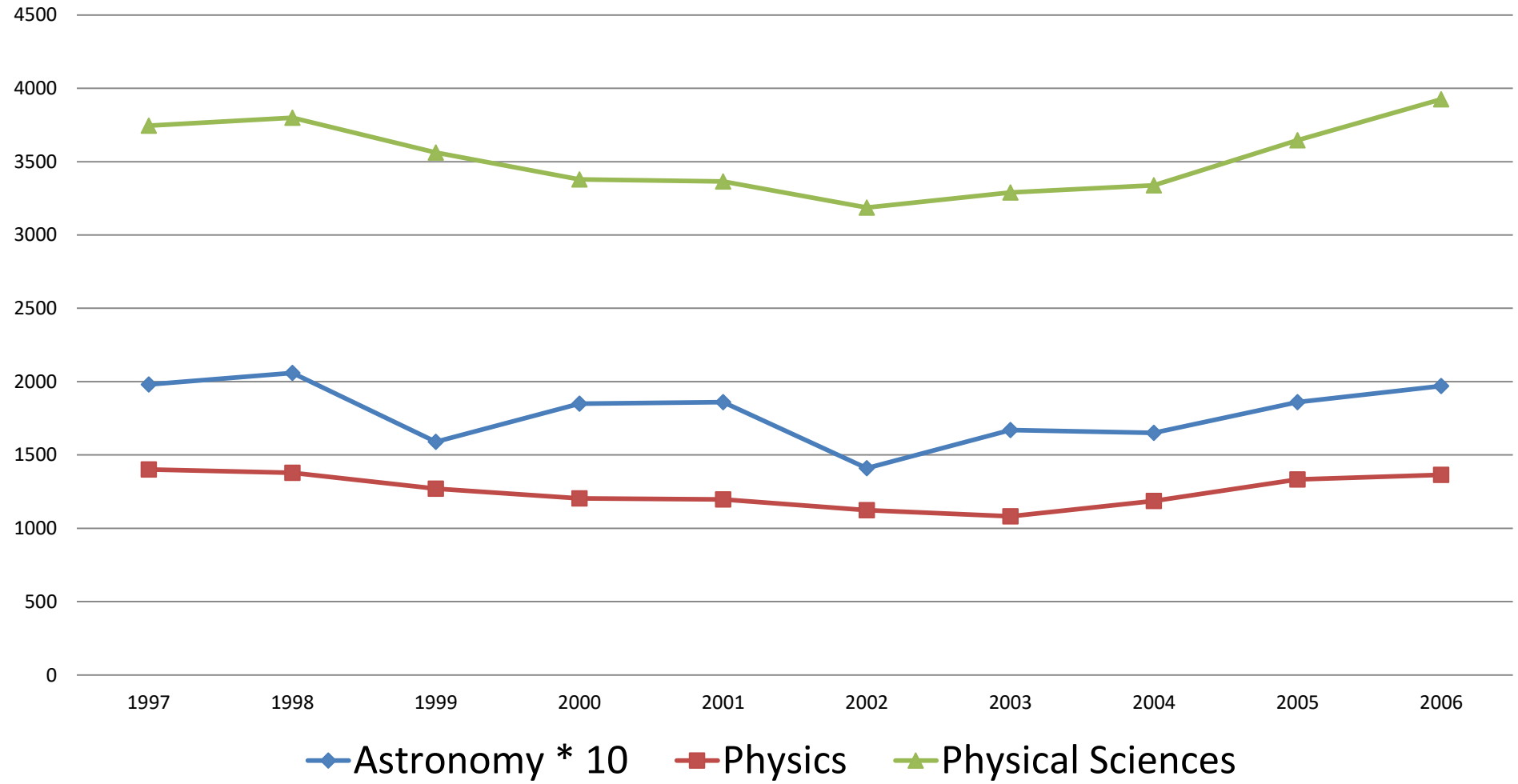
Data on degrees

- Number of PhDs, masters, and bachelors for multiple years and for astronomy, physics, and all physical sciences
  - By gender
  - By citizenship
  - By ethnicity
  - By subfield
  - Median age at PhD
- Number of departments offering astronomy degrees

Example slides

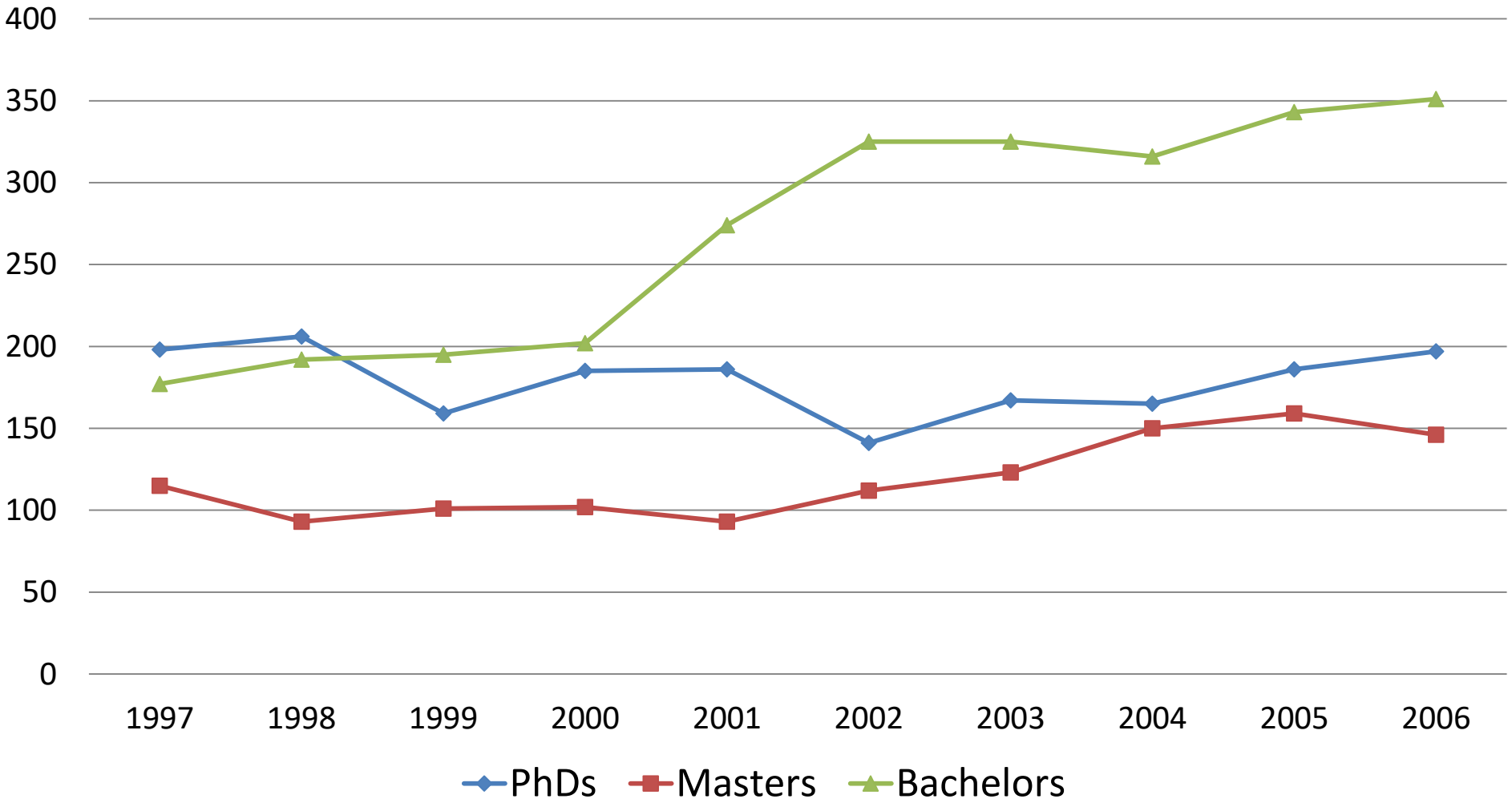
- Data in this talk were provided for previous decadal survey and have not been updated for today's talk.
- These data can be updated if the committee requests them for the upcoming survey.
- Focus today should be on what we can provide, not on the results themselves.

PhDs 1997-2006



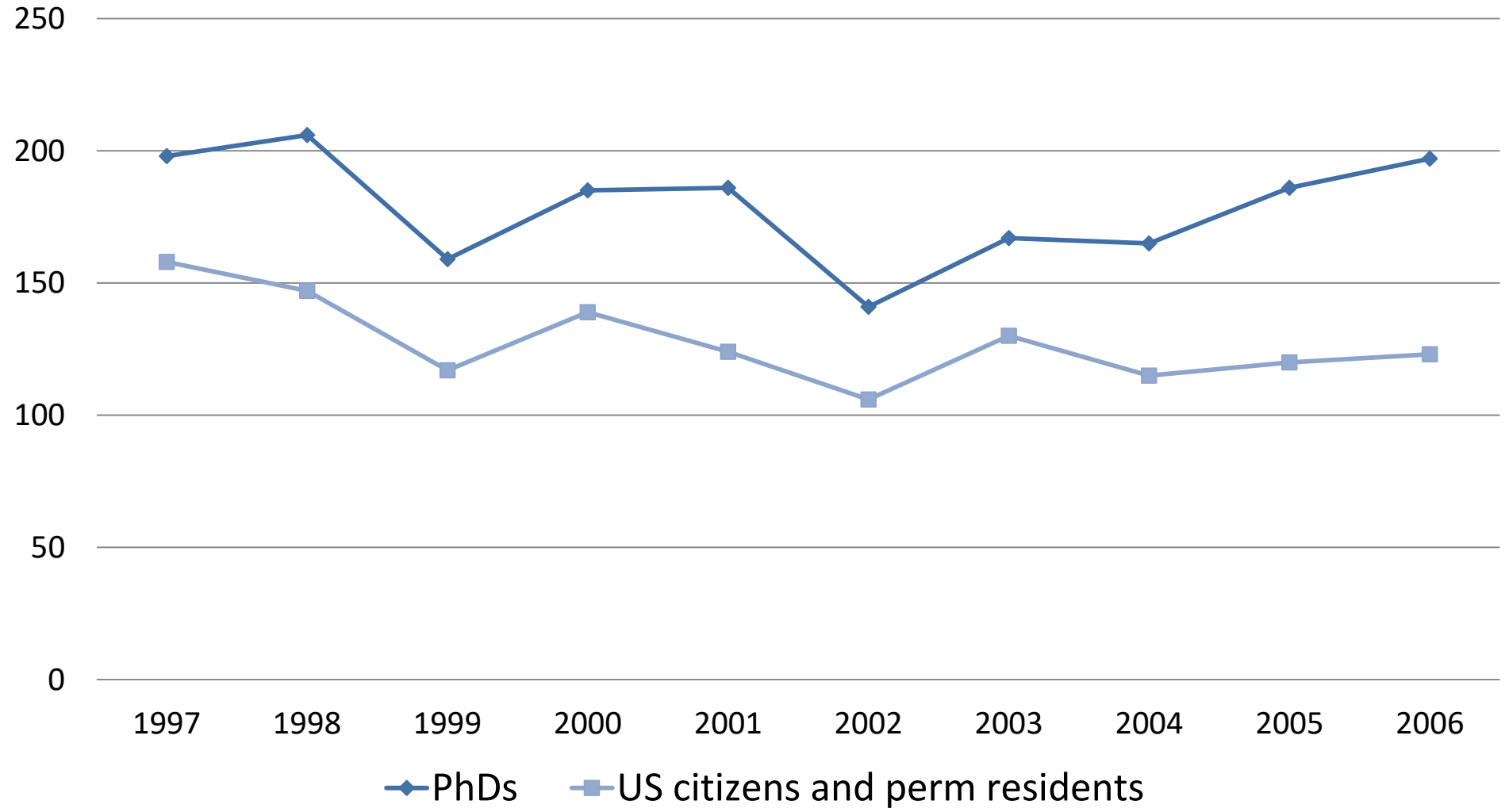
Source: National Science Foundation Survey of Earned Doctorates

Number of Astronomy Degrees



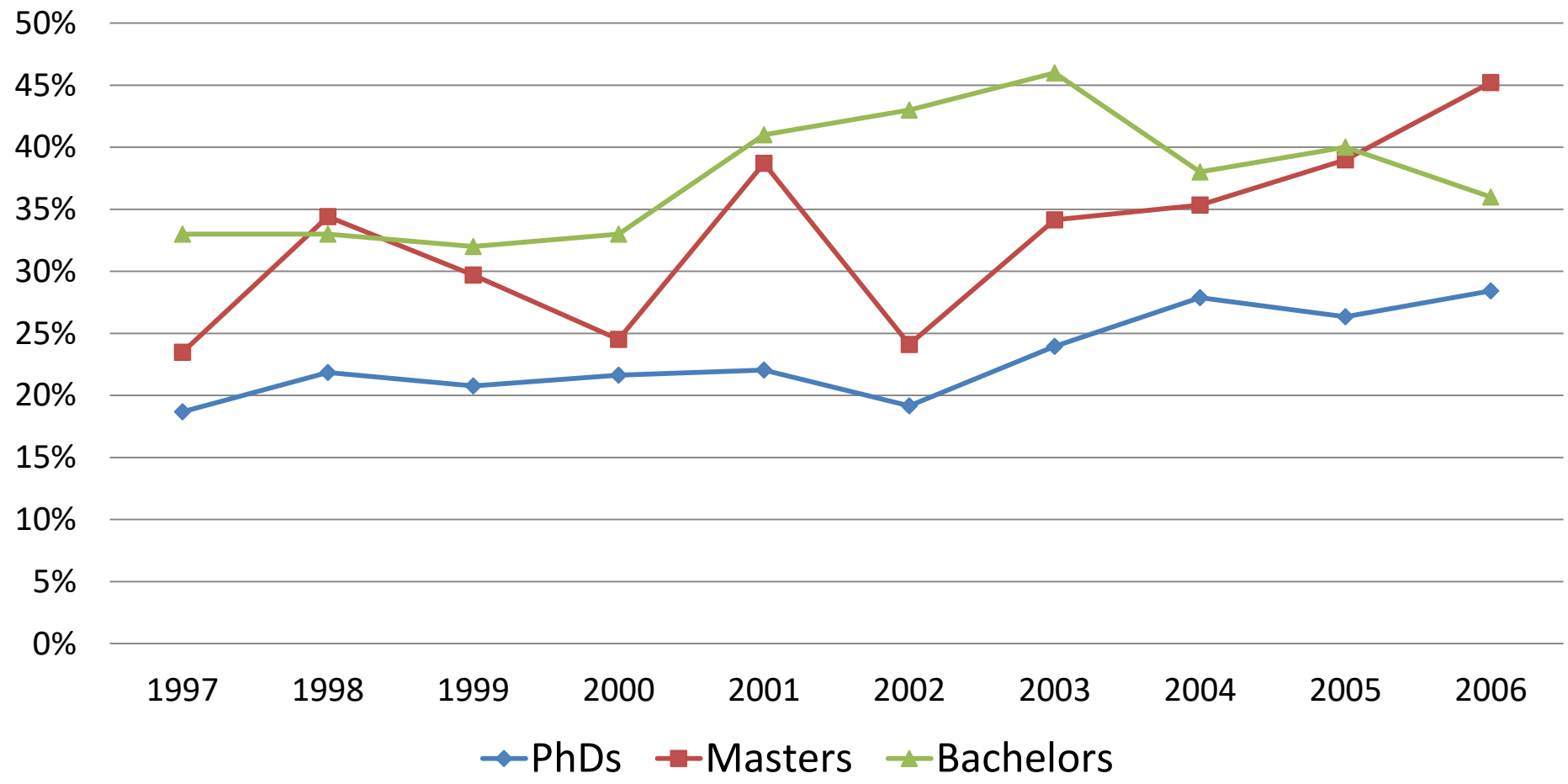
Source: National Science Foundation Survey of Earned Doctorates, last updated for Jan 2010 talk

PhDs in Astronomy by Citizenship



Source: National Science Foundation Survey of Earned Doctorates

Percentage of Astronomy Degrees Earned by Women



Source: National Science Foundation Survey of Earned Doctorates

Number of Astronomy Degrees Earned by African Americans and Hispanics, 1997-2006

	All Astronomy	African Americans (US citizens)	Hispanics (US citizens)
PhDs	1790	11	35
Masters	1194	11	20
Bachelors	2700	25	60

Cells contain ten-year totals

PhDs—National Science Foundation Survey of Earned Doctorates.
Masters—National Center for Education Statistics
Bachelors—American Institute of Physics Enrollments and Degrees Survey

Data on faculty members

- Number of astronomy faculty members in astronomy and physics departments
- In stand-alone astronomy departments
  - Number of faculty by tenure status
  - Number retired and number who left
  - Number of new faculty
    - By tenure status
    - Previous position and employer
    - PhD earned in US or outside
    - Year of PhD
    - Gender
    - ethnicity

Number of Faculty Members in Astronomy

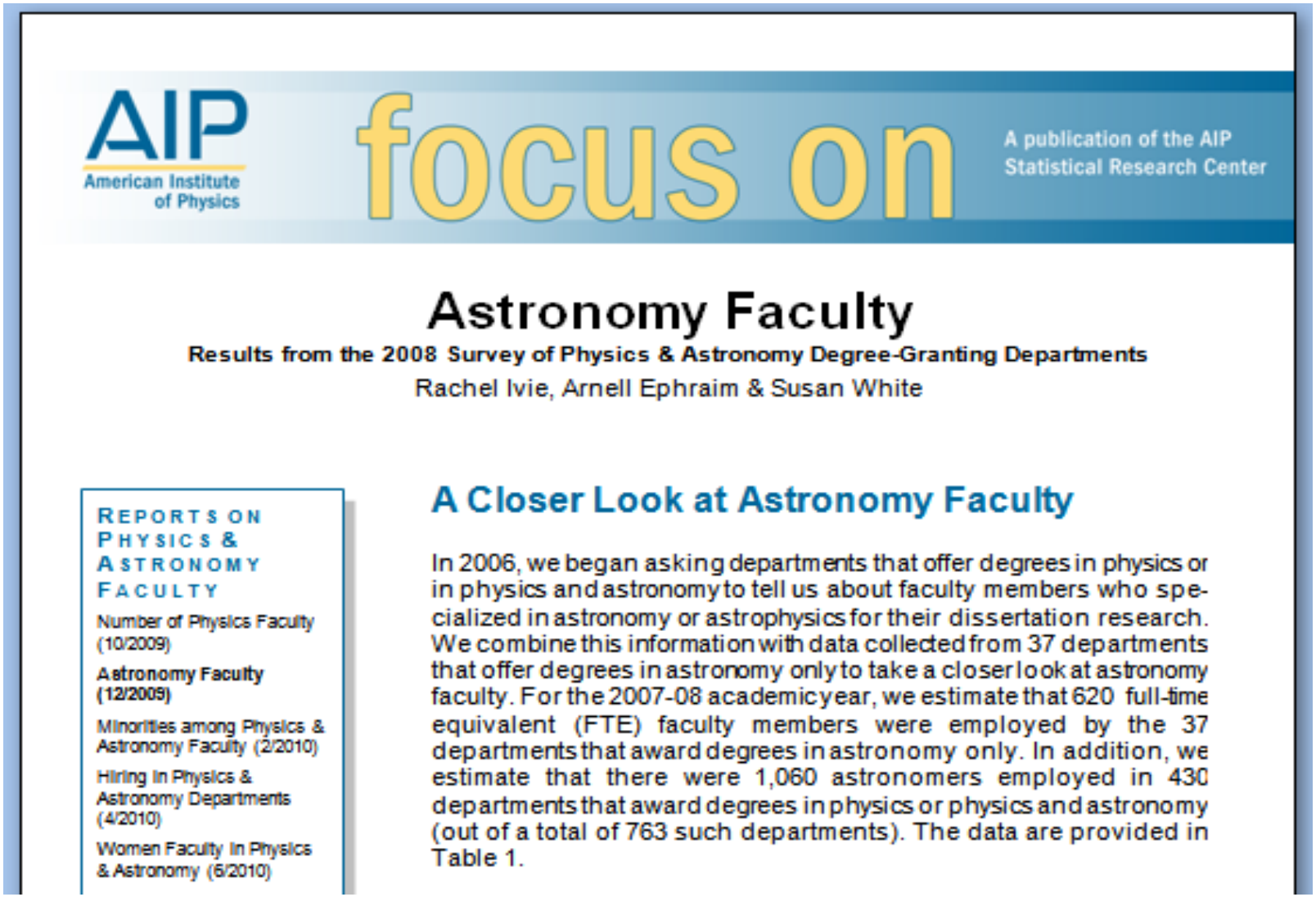
	2006	2008
Astronomy Only Departments	580	620
Astronomers in Physics Departments	1020	1060

Source: AIP Academic Workforce Survey

Percent of Full-Time Equivalent Faculty Employed in Temporary or Non-Tenure Track Positions: Astronomy and Physics Departments, 2008

Degrees Awarded by Department	%
Astronomy only	22
Physics or Physics & Astronomy (PhD)	13
Physics or Physics & Astronomy (Master's)	20
Physics or Physics & Astronomy (Bachelor's)	20

Source: AIP Academic Workforce Survey



AIP American Institute of Physics

focus on

A publication of the AIP Statistical Research Center

Astronomy Faculty

Results from the 2008 Survey of Physics & Astronomy Degree-Granting Departments

Rachel Ivie, Arnell Ephraim & Susan White

REPORTS ON PHYSICS & ASTRONOMY FACULTY

Number of Physics Faculty (10/2009)

Astronomy Faculty (12/2009)

Minorities among Physics & Astronomy Faculty (2/2010)

Hiring in Physics & Astronomy Departments (4/2010)

Women Faculty in Physics & Astronomy (6/2010)

A Closer Look at Astronomy Faculty

In 2006, we began asking departments that offer degrees in physics or in physics and astronomy to tell us about faculty members who specialized in astronomy or astrophysics for their dissertation research. We combine this information with data collected from 37 departments that offer degrees in astronomy only to take a closer look at astronomy faculty. For the 2007-08 academic year, we estimate that 620 full-time equivalent (FTE) faculty members were employed by the 37 departments that award degrees in astronomy only. In addition, we estimate that there were 1,060 astronomers employed in 430 departments that award degrees in physics or physics and astronomy (out of a total of 763 such departments). The data are provided in Table 1.

http://www.aip.org/statistics

More AIP faculty data

- Women and minority faculty members in stand-alone astronomy departments
  - Number of minority faculty members in 2016
  - Number of women by rank in 2014 (will collect again in 2018)
  - Number of minority faculty by gender in 2016

Astronomy Faculty Members who are Under-represented Minorities, 2008

	Number		
	African Americans	Hispanic Americans	Total, all races
Astronomy Only Departments	5	12	620
Physics Departments	190*	278	9200

*95 of these work at HBCUs.

Source: AIP Academic Workforce Survey

Faculty Members Who are Women

	2006 %	2008 %
Astronomy Only Departments	17	17
Physics Departments	13	12
Astronomers in Physics Departments	NA	18

Source: AIP Academic Workforce Survey

Percent of Faculty Positions in Astronomy Only Depts. Held by Women

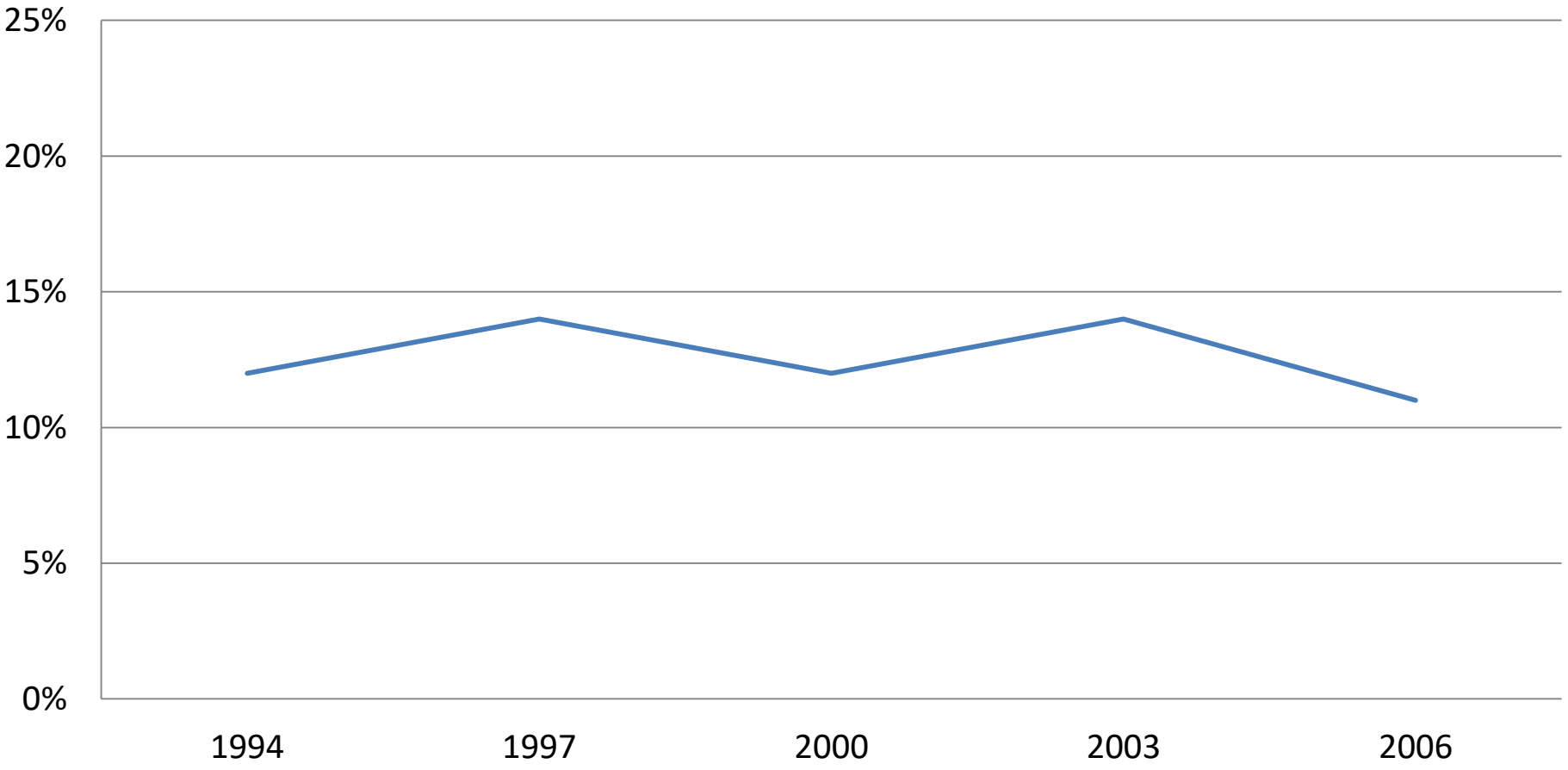
Academic Rank	Year 2003	2006
Full professor	10	11
Associate professor	23	24
Assistant professor	23	28
Instructor / Adjunct	15	15
Other Ranks	15	21
Overall	14	17

Source: AIP Statistical Research Center

Data on employment of new PhDs

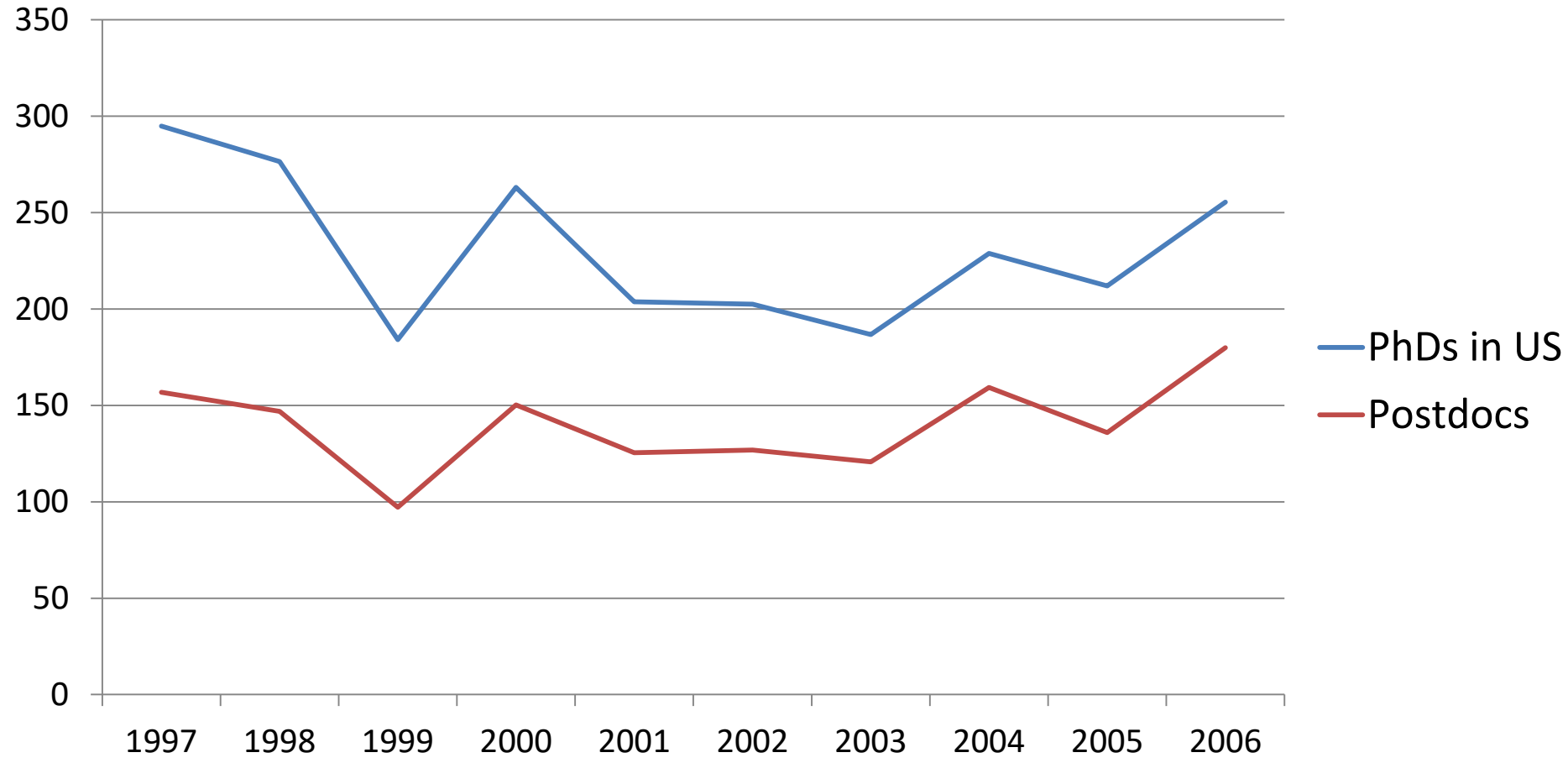
- Number of new PhDs employed
  - as postdocs
  - in various subfields
  - type of job, such academic, private sector, government
  - skills used on the job
  - whether degree is appropriate background for job
  - time spent looking for employment
  - method of dissertation (theory v. observation)
  - By gender
  - By citizenship

Percentage of PhDs from Astronomy Only Departments who Left U.S. Upon Graduation



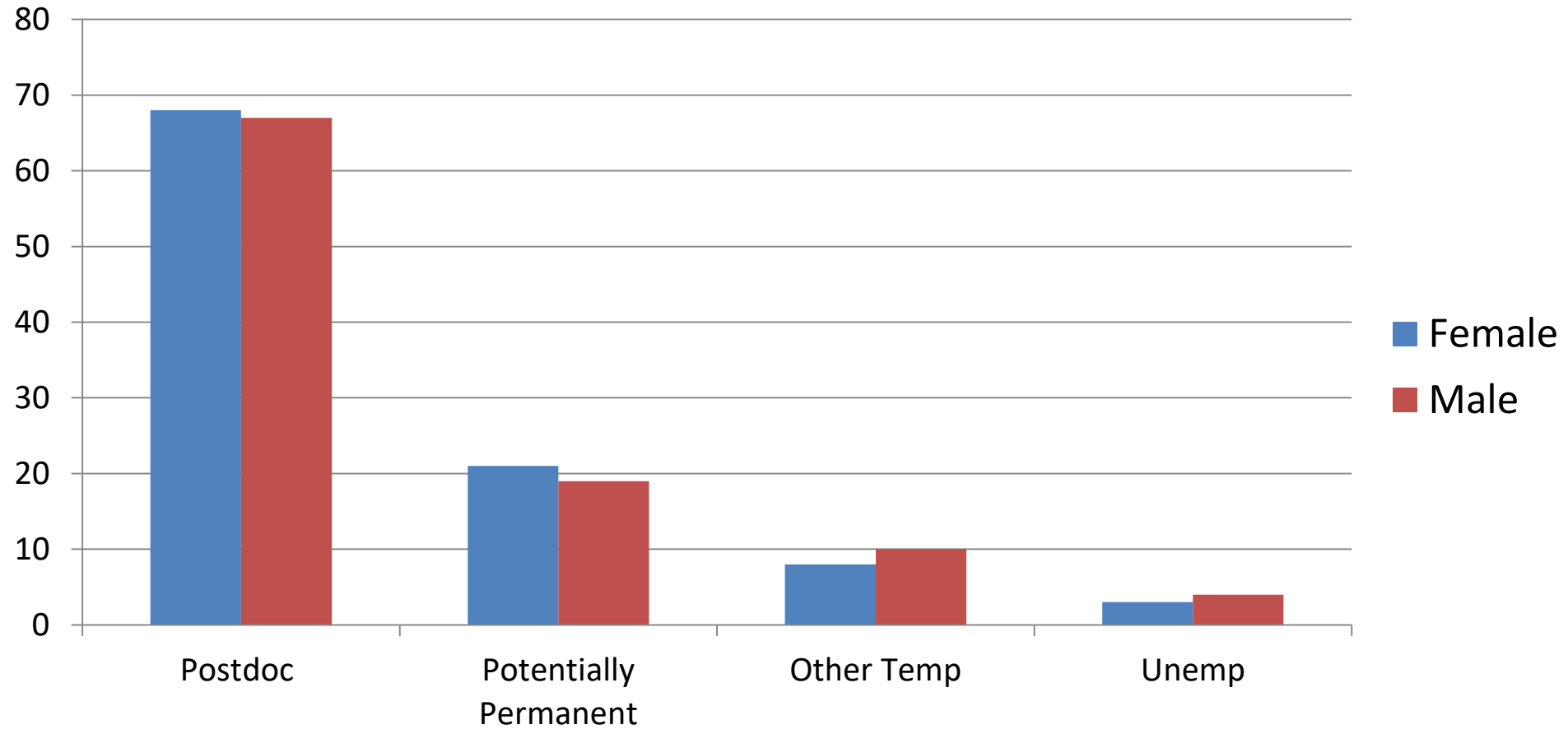
Source: AIP Initial Employment Survey

Number of astronomy and astrophysics PhDs who remain in US and number of these who took postdocs



Source: AIP Initial Employment Survey

New astronomy and astrophysics PhDs who take postdocs, by gender, 2005 and 2006.



Source: AIP Initial Employment Surveys

Facts about Astronomy & Astrophysics PhDs (in 2010)

- 70 (+/- 10) % are US citizens or permanent residents
- 10-15% leave the US after getting their PhDs (meaning 85-90% are seeking employment in the US)
- In recent years, 60-70 % go straight into postdocs.

Source: NSF Survey of Earned Doctorates and AIP Initial Employment Survey

AAS Demographics Committee

- Collected by AIP in 2013, 2016, planned for 2018
- From a random sample of AAS members in the US (statistically representative)
- Covers education, employment, postdocs, and demographics

AAS Demographics Survey

- Education and Employment Status
  - Table 1 – Highest Degree Earned
  - Table 2 – Year of Degree
  - Table 3 – Country of Degree
  - Table 4 – Field of Degree
  - Table 6 - Employment Type
  - Table 6b – Employment Type and Sector
  - Table 7 - Current Employer
  - Table 8 – Academic Status

Current Employer of US AAS Members with PhDs, 2016		
	Total	
Employer or Sector	**%**	**N**
University or 4-year college	55	523
Govt. lab or research facility	16	155
Observatory	9	84
Research Institute	8	78
Industry	3	32
Other govt.	2	19
Self-employed	1	5
2-year college	1	8
Planetarium or museum	1	7
Secondary school	-	2
Other	3	27
Total	*100*	*940*

AAS Demographics Survey

- Postdocs and Careers
  - Table 10 – Desired Employer of Postdocs
  - Table 11 – Current Employer of Former Postdocs
  - Table 12 – Postdoc Experience by Employer
  - Table 13a - Main Activity in Current Job: Respondents not in Postdocs
  - Table 13b - Main Activity in Current Job: Respondents in Postdocs
  - Table 14 - Time Allocation in Current Job: Respondents not in Postdocs
  - Table 15 – Primary Areas of Interest
  - Table 15b – Primary Areas of Interest by Gender
  - Table 16 – Funding Sources for Salaries
  - Table 17 – Funding Sources for Research and Education Projects
  - Table 18 – Variables Impacting Salaries

Funding Sources for Salaries of US AAS Members 2016		
	% Receiving Funding	**Average % of Total Funding**
College/University	46	89
NASA	42	71
NSF	19	48
DOE	4	70
DOD	4	78
Foundation/Grant/Donors	3	69
Private Employer/Clients	3	70
Foreign Funding	1	73
Other Government	1	76
Smithsonian	1	100
AAS	-	85
Other	6	71
Total N		*1017*

AAS Demographics Survey

- Demographics and Family
  - Table 20 – Gender
  - Table 21 – Marriage or Partnership Status
  - Table 22 – Members with Children
  - Table 23 - Relocated with a Spouse or Partner
  - Table 24 – Disabilities
  - Table 25 – Ethnicity
  - Table 26 - Sexual Orientation and Transgender Status
- Challenges facing the field of astronomy

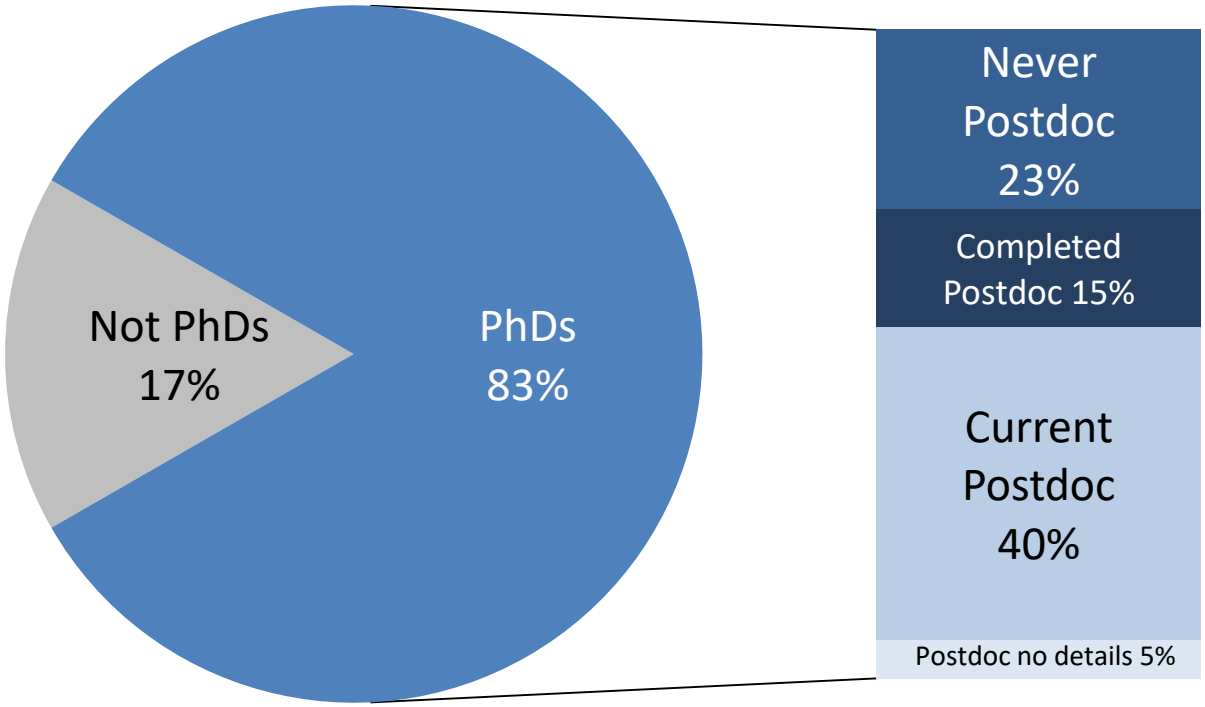
Relocated with a Spouse or Partner
US AAS Members, 2016

	Female %	Male %	Total %
	Born before 1983		
Yes	36	12	17
No	54	81	75
N/A	10	7	8
	Born 1983 or after		
Yes	12	8	10
No	48	53	51
N/A	40	39	39

Longitudinal Survey of Astronomy Graduate Students

- Originally a collaboration between AAS and AIP
- Funded by NSF Astronomy Directorate
- Data collected from people who were in grad school in 2006-07
- Always collected from same group of people
- Collected in 2007-08, 2012-13, and 2015
- Main purpose to document and explain differential attrition by gender
- Has other data available, such as number in this group remaining in field

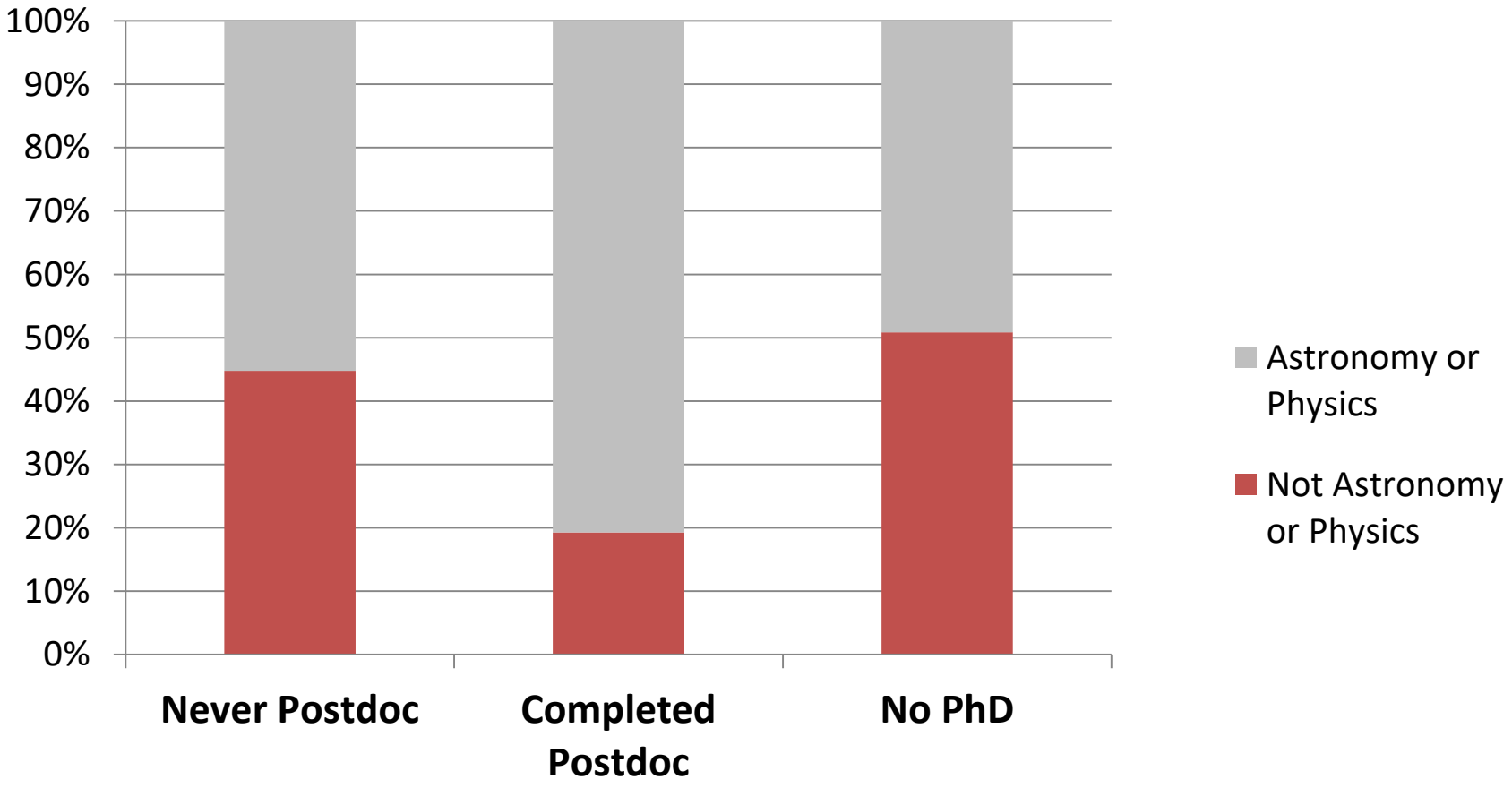
OUTCOMES OF THOSE WITH PHDS, 2012-13



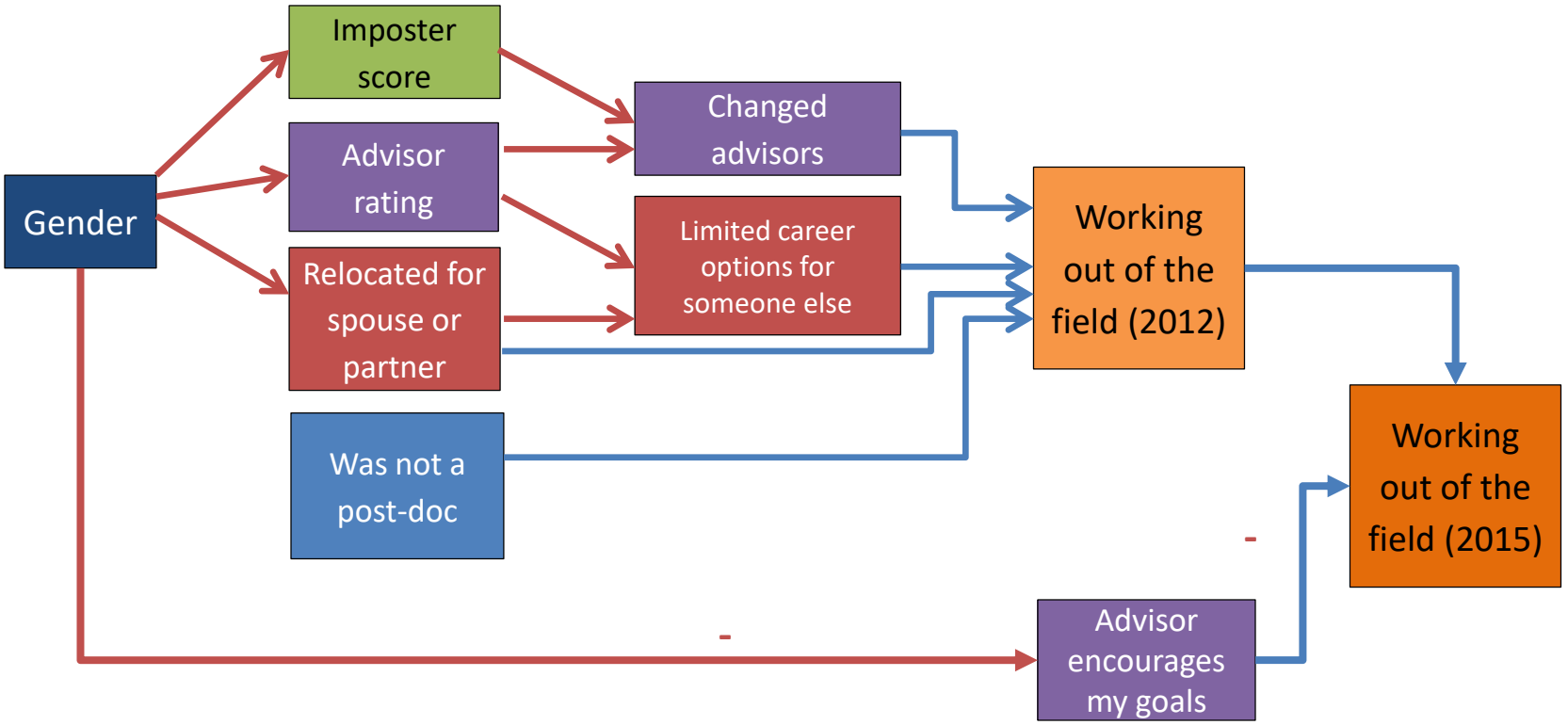
FIELD OF EMPLOYMENT, 2012-13

	Never Postdoc	Completed Postdoc
Astronomy	38%	70%
Physics	18%	11%
Medical or Health	8%	5%
Hardware	7%	4%
Engineering	2%	4%
Earth Science or Geology	8%	4%
Business and Finance	9%	2%
Education, formal and informal	2%	2%
Software	7%	0%
Other	2%	0%
	100%	100%

WORKING OUTSIDE ASTRONOMY, 2012-13



THE INDIRECT EFFECTS OF GENDER ON WORKING OUT OF FIELD 2012 & 2015



Visit http://www.aip.org/statistics

For more information

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