

Demographics Survey of 2013 US AAS Members

Summary Results

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OVERVIEW – Who was Surveyed

The sample consisted of 2,523 AAS members in the United States. Members who lived outside of the U.S. were not included in the survey.

Of respondents, 66% were full members, 17% were junior members, 9% were associate members, and 7% were emeritus. This distribution was similar to the distribution of the entire sample, which was comprised of 64% full members, 20% junior members, 9% associate members, and 7% emeritus. Data were collected beginning in January 2013 and closed in March 2013. The overall response rate was ~ 63% with 1,583 respondents.

HIGHLIGHTS

- Nearly all US AAS members have earned or are en route to earning their PhD (Table 1). The majority (71%) have earned their highest degrees in the fields of astronomy or astrophysics (Table 4).
- AAS members' careers are largely concentrated in academe at universities and 4-year colleges, which employed over half (58%) of US AAS members with PhDs (excluding current postdocs). Of these, just over half are tenured and an additional 16% are eligible for future tenure (Tables 7-8).
- Excluding current postdocs, about 9% of US AAS members classified their employment status as temporary (Table 6). Many were visiting and adjunct professors, research assistants, or working contract jobs with finite durations.
- Data indicate that over time, proportionally more astronomy PhDs have taken postdocs and, on average, are in their postdoctoral positions for longer durations (Table 9).
 - Of members who are retired and earned PhDs, 46% reported taking a postdoc with a median cumulative duration of 2 years.
 - Of those currently employed who earned PhDs, 77% reported taking a postdoc with a median cumulative duration of 4 years.
- Employer type, postdoc experience, sex, and years since degree had statistically significant impacts on the average salaries of AAS members (Table 16).
- Members viewed insufficient funding resulting in job scarcity and competition, career instability, and work-life balance issues as pressing challenges to the field of astronomy (Appendix).

RESULTS

US AAS MEMBERS – Academic Experience and Employment Status

Table 1 – Highest Degree Earned

Highest Degree Earned by US AAS Members, 2013		
	%	N
PhD	81	1286
Master's	12	187
Bachelor's	6	90
No college	1	13
Other	-	7
Total		1583

- 204 respondents (13%) were currently enrolled in a degree program
 - 64% of bachelors were currently students
 - 65% of masters were currently students
 - All but one respondent who selected “no college” were students
- Practically all (99%) respondents who were currently students indicated that they aspire to earn their PhD when asked “what is the highest degree you are planning to obtain?”

Table 2 – Year of Degree

Year of Degree of US AAS Members with PhDs, 2013			
	25 th percentile	Median	75 th percentile
Year of PhD	1979	1992	2003

- The median year that AAS members with doctorates earned their degrees was 1992.
- A quarter of respondents with PhDs earned their degrees in or after 2003.

Table 3 – Country of Degree

Country of Degree of US AAS Members with PhDs, 2013		
	%	N
In the U.S.	84	1072
Outside of the U.S.	16	210
Total		1282

Table 4 – Field of Degree

Field of Degree of US AAS Members, 2013		
Field	%	N
Astronomy or astrophysics	71	1109
Physics	31	490
Planetary science	2	22
Engineering	2	25
Math	1	32
Something else	3	48
Total*		1564

*The sum of percentages exceeds 100 because respondents were asked to check all that apply.

- The vast majority of AAS member respondents earned their degrees in astronomy, astrophysics, or physics
- Common engineering subfields included electrical, mechanical, and aerospace.
- Write-in responses for “Something else” were nearly all scientific fields, with the most common being chemistry, space science, geophysics, and astro-geophysics.

Table 5 – Employment Status

Employment Status Of US AAS Members, 2013		
	%	N
Employed, full-time	81	1117
Employed, part-time	8	104
Not employed	12	159
Total		1380

- Of those not employed, the majority (84%) were retired. The remainder were split between those seeking employment (n=14) and those choosing to be out of the workforce (n=11).

Table 6 - Employment Type

Employment Type of US AAS Members, 2013		
Position type	%	N
Potentially permanent	78	952
Temporary	22	261
Total		1213

- On the questionnaire, the phrase ‘no specific end date’ defines potentially permanent and the phrase ‘has a specific end date’ defines temporary.
- Of the respondents in temporary positions, 59% (n=155) were currently in postdoctoral positions.
- Other temporary positions included visiting and adjunct professors, research assistants, and contract jobs.

Table 7 - Current Employer

Current Employer of US AAS Members with PhDs, 2013		
Employer or Sector	%	N
University or 4-year college	58	508
Govt. lab or research facility	14	124
Observatory	9	77
Research Institute	8	74
Industry	4	32
Other govt.	2	18
Self-employed	1	9
2-year college	1	10
Planetarium or museum	1	6
Secondary school	-	2
Other	2	13
Total		873

Includes full-time employed respondents with PhDs excluding current postdocs.

- AAS members’ careers are largely concentrated in academe at universities and 4-year colleges, which employed over half (58%) of AAS members with PhDs.

Table 8 – Academic Status

Academic status of US AAS Members working in Universities, 2013		
Status	%	N
Tenured	55	277
Tenure-track	16	82
Soft money	14	70
Long term (but not tenured)	11	56
Other	4	22
Total		507

The data represent respondents employed full-time at universities and 4-year colleges, excluding postdocs.

- Of AAS members working fulltime at universities and 4-year colleges, over half have achieved tenure status, with an additional 16% on track to be eligible for tenure.
- An additional 11% reported having jobs that were not tenured but were long-term.
- The “other” category was comprised of respondents in temporary positions, like visiting professorships and finite, often three-year, contracts.
- Only respondents working in academe were asked about their tenure status. However, respondents employed in other sectors of the economy may also earn tenure.
- “Soft money” was not defined on the questionnaire, so respondents identified themselves as soft money.
 - Two-thirds of respondents on ‘soft money’ considered their positions to be potentially permanent.

EMPLOYMENT – Postdocs and Careers

Table 9 – Postdoctoral Experience

Postdoctoral Experience by Groups of US AAS Member, 2013		
Group	Took Postdoc %	Median Duration (years)
Current postdocs	-	3*
Employed, with PhD	77	4
Retired, with PhD	46	2

*Current postdocs' duration is ongoing.

- Members who are currently working in postdoctoral positions (n=155) had a median degree year of 2010. Half of these respondents have been working in postdoctoral positions for at least 3 years, and one-quarter are 5 years or more into their cumulative postdoc experience.
- The median salary of current postdocs was \$56,000.
- Of respondents who earned doctorates and were currently employed, 77% took a postdoctoral position after earning their PhD (n=755). The median number of years of cumulative postdoc experience for this group was 4 years.
- Members who have retired had a median degree year of 1969. Only 46% of retired members who had earned PhDs took a postdoc (n=55). Retired members' median duration of postdoc experience was 2 years.
- These data suggest trends in the postdoc experience of doctorates with astronomy degrees: Over time, proportionally more astronomy PhDs have taken postdocs and, on average, are in their postdoctoral positions for longer durations.

Table 10 – Desired Employer of Postdocs

Desired Employer of US AAS Member Postdocs, 2013		
Desired Employer or Sector	%	N
University or 4-year college	63	98
Research Institute	22	34
Govt. Lab or research facility	5	7
Observatory	3	5
Planetarium or museum	3	4
Industry	1	2
Self-employed	1	1
Other	2	4
Total		155

Table 11 – Current Employer of Former Postdocs

Current Employer of US AAS Members who took Postdocs, 2013		
Employer or Sector	%	N
University or 4-year college	59	443
Govt. Lab or research facility	12	93
Research institute	9	69
Observatory	9	67
Industry	3	20
Other govt.	2	14
Self-employed	2	14
Planetarium or museum	-	3
Other	3	24
Total		747

Excludes current postdocs.

- There were slight differences in the distribution of the types of employers desired by current postdocs (Table 10) and the distribution of current employers of AAS members who had taken postdocs (Table 11).
 - The proportion of postdocs who would like a job at a research institute (22%) is larger than the proportion of AAS members with postdoc experience who worked in research institutes (9%). In other words, jobs at research institutes were more popular than the reality.
 - Jobs in academics are also slightly more popular (63%) than reality (59%).
 - On the other hand, jobs at government research facilities are less popular (5%) than the reality (12%).

Table 12 – Postdoc Experience by Employer

Postdoc Experience by Employer Type of US AAS Members, 2013		
Employer or Sector	Took a postdoc	N
	%	
University or 4-year college	78	571
Observatory	74	91
Research Institute	70	98
Govt. Lab or research facility	66	142
Self-employed	56	25
Industry	47	43
Other	46	28
Total*	71	1054

Excludes current postdocs. Employer categories with N < 25 are excluded from the table but included in the totals.

- Of respondents working in universities and 4-yr colleges, about 78% had taken a postdoc.
- Those who had taken postdocs comprised 66% and 70% of respondents working in government labs and research institutes, respectively.
- Of those working in industry, only about half took a postdoc.

Table 13 - Main Activity in Current Job

Main Activity in Current Job Of US AAS Members, 2013				
Activity	University, 4-year college		All other sectors	
	%	N	%	N
Teaching	31	208	5	26
Devising, conducting observations	25	165	23	124
Theory, N-body simulations	13	90	7	36
Instrumentation, telescope design	6	42	12	65
Data visualization, mining	6	41	9	46
Education or public outreach	4	24	5	29
Management, administration	3	21	11	57
Multiple activities	3	23	1	7
Data analysis	2	12	3	16
Laboratory astrophysics	1	6	2	10
Other research	1	7	1	7
Software, IT	-	3	6	31
Other	4	26	16	86
Total		668		540

Includes current postdocs.

- Management, administration, software, IT, data analysis, and other research were added based on their frequency in the write-in responses of those who originally selected “Other”.
- Of those who wrote in multiple activities as their main activity, many specified “research and teaching”.
- Several respondents in the “Other” category described their main activity as “support”, presumably providing technical expertise for an instrument or technology.
- As expected, those who reported teaching as their main activity were concentrated in universities and 4-year colleges. On the other hand, management or administration were cited as one’s main work activity by a larger proportion of those employed in all other sectors (11%) than by those working in higher education (3%).

Table 14 - Time Allocation in Current Job

Time Allocation in Current Job of US AAS Members, 2013		
Activity	Average Pct. of Time Spent on Activity	Respondents Doing this Activity %
	University, 4-yr college (All other sectors)	
Research (includes writing proposals, articles and books, and attending colloquia)	44 (43)	95 (83)
Teaching (class, lab time, and prep, office hours, other student contact related to teach or advising)	40 (29)	75 (21)
Service activities (TAC, proposal reviews, advisor committees)	11 (10)	73 (55)
Education & public outreach	9 (16)	51 (38)
Management	18 (33)	43 (47)
Observatory/mission support/instrument commission	26 (46)	24 (49)
Other	35 (57)	5 (14)
Total	661 (536)	

Includes current postdocs.

- Overall, about nine-in-ten AAS members spent some of their time on research activities. Of those who reported doing research, the mean percentage of time spent on research was about 44%.
- A greater proportion of AAS members employed by universities or 4-year colleges reported spending time on teaching, service activities, and education and public outreach than those employed in other sectors of the economy.
- Conversely, respondents from other sectors accounted for larger proportions and on average spent more time on management and activities involving observatories, mission support, and instrument commission than their colleagues in higher education.

Table 15 – Primary Areas of Interest

Primary Areas of Interest of US AAS Members, 2013		
	%	N
Star formation & evolution	30	378
Galaxy formation & evolution	24	294
Cosmology	20	252
Solar systems, planetary science	19	240
Interstellar medium	19	238
Astronomy education	18	229
Exoplanets	18	223
Galactic structure and stellar pop.	17	209
Supernovae, GRBs, high-energy phenomena	16	195
Active galactic nuclei	15	191
Clusters of galaxies, large-scale structure	13	156
Heliophysics	8	104
Astrobiology	8	95
Other	20	246
Total		1247

The sum of percentages exceeds 100 because respondents were asked to check all that apply.

- On average, respondents selected 2.5 primary areas of interest.
- Star formation & evolution and galaxy formation & evolution were the most common areas of interest.
- Of 13 provided response choices (excluding “other”), 10 areas of interest were selected by at least 15% of respondents.

Table 15b – Primary Areas of Interest by Sex

Primary Areas of Interest of US AAS Members with PhDs by Sex, 2013				
	Male		Female	
	%	N	%	N
Star formation & evolution	30	281	31	88
Galaxy formation & evolution	23	216	26	73
Cosmology **	22	209	14	39
Solar systems, planetary science	19	178	20	57
Interstellar medium *	20	188	15	42
Astronomy education	18	167	21	58
Exoplanets	18	166	20	56
Galactic structure and stellar pop.	18	166	14	40
Supernovae, GRBs, high-energy phenomena **	17	156	11	32
Active galactic nuclei	15	143	16	46
Clusters of galaxies, large-scale structure	13	123	11	32
Heliophysics	9	82	7	19
Astrobiology	8	72	7	20
Other	21	195	16	46
Total		944		280

** Indicates a male-female difference with statistical significance at $\alpha < .05$

* Indicates a male-female difference with statistical significance at $\alpha < .1$

The sum of percentages exceeds 100 because respondents were asked to check all that apply.

- Men and women were equally likely to express interest in most areas.
- However, there was strong statistical evidence that men were more likely than women to express interest in the areas of (1) cosmology and (2) supernovae, GRBs, high-energy phenomena.
- There was slight statistical evidence that disproportionately more men than women expressed interest in the area of interstellar medium.

Table 16 – Variables Impacting Base Salaries

Variables Impacting Base Salaries of US AAS Members with PhDs, 2013		
Variable	Average Additional \$	Level of Significance
Working at a Government Lab	31,399	***
Working at a Research Institute	24,188	***
Working in Industry	21,357	***
Having taken a postdoc	5,303	*
Being Male	4,529	*
Each additional year since earning PhD	1,646	***

***p-value < .01 *p-value < .1 . Data include respondents who have earned PhDs and are full-time employed excluding postdocs. N=744 for this table.

- Regression analysis on the base salaries (not including bonuses, overtime, or additional compensation for summertime teaching or research) of full-time employed AAS members estimates the average increase in salary due to a given variable compared to average salaries in the absence of that variable. The variables dealing with employer type are compared to the salaries of those employed at universities or 4-year colleges. We controlled for employer type, postdoc experience, sex, and years since PhD.
- The regression equation constant (or intercept) was just over \$56,500. This represents the theoretical average salary in the absence of all variables (i.e. the average salary of all females working at universities with no experience since earning their PhDs who did not take postdocs).
- For illustrative purposes, we can use this model to predict the average salary of all males who earned their PhDs 10 years ago, took postdocs, and work at a government lab:

$$56,500 + 4,529 (\text{male}) + 10 \text{ years} \times 1,646 + 5,303 (\text{postdoc}) + 31,399 (\text{gov't lab}) = \$114,191$$
 - It is worth noting that this represents the average salary of a group of AAS members; salaries for individuals within the group will vary above and below this average.
- There was strong statistical evidence ($\alpha < .01$) of the effect of working at a government lab, a research institute, or in industry and the effect due to the number of years since respondents earned their highest degrees. The evidence was less strong ($\alpha < .1$) of the positive effect (one-tailed test) on salary of taking a postdoc and being male.
- On the whole, female respondents had fewer years of experience than their male counterparts. The average effect of sex on salary exists even controlling for this difference.
- 1,135 respondents answered the salary question. Table 16 includes only those who have PhDs, are not postdocs, answered the other questions in the model tested, and work full-time for one of the employer types included in the model.

Table 17 – Encouraging the Pursuit of an Astronomy Career

Encouraging the Pursuit of an Astronomy Career By Groups of US AAS Members, 2013					
	Student %	Current Postdoc %	Employed %	Retired %	Total %
Definitely or Probably	71	49	73	82	70
Possibly	26	41	23	14	25
No or Don't Know	3	10	4	4	5
Total	189	154	942	133	1546

Employed includes only full-time employed.

- Overall, AAS members responded in the affirmative when asked “Would you encourage interested and talented young people to pursue a career in astronomy?”
- Respondents currently in postdoctoral positions were noticeably less positive, with only half responding definitely or probably, compared to students and those currently employed at around 70% and retired members at 82%

AAS MEMBERS – Demographics and Family

Several tables describing demographic and family-related issues are presented by sex and age group. Age groups are split between those born prior to 1980 (79% of respondents) and those born in 1980 or after (21% of respondents). There were just about 3 male respondents for every female respondent.

Table 18 – Sex

Sex of US AAS Members by Age Group, 2013			
	Born before 1980 %	Born 1980 or after %	Total %
Male	79	60	73
Female	21	40	25
Other	-	-	-
Prefer not to respond	-	-	1
Total	1191	321	1512

- The proportion of female respondents who were born in 1980 or after (40%) is larger than those born before 1980 (21%). This aligns with the recent historical increase in the participation of women in the field of astronomy.

Table 19 – Marriage or Partnership Status

Marriage or Partnership Status of US AAS Members by Sex and Age Group, 2013			
Has been married or in a similar relationship	Born before 1980 %	Born 1980 or after %	Total %
Male	91	46	83
Female	84	41	70
Total	1167	317	1484

- Slightly more males than females are married or in similar relationships.
- As expected, marriage rates are much higher for both males and females in the older cohort (near 90%) than the younger cohort (under 50%).

Table 20 – Members with Children

US AAS Members with Children by Sex and Age Group, 2013			
Has children	Born before 1980 %	Born 1980 or after %	Total %
Male	70	12	60
Female	49	4	34
Total	1167	317	1484

- Compared to their male counterparts, a smaller proportion of female AAS members had children.
- Of members with children, about 3% reported ever using the childcare facilities at AAS meetings. However, the survey did not collect data on how many members with children attended AAS meetings and therefore had the opportunity to make use of childcare facilities.

Table 21 - Relocated because of a Spouse or Partner

Relocated because of Spouse or Partner US AAS Members, 2013			
	Female %	Male %	Total %
Born before 1980			
Yes	32	12	16
No	54	81	75
N/A	14	7	9
Born 1980 or after			
Yes	10	6	8
No	55	62	59
N/A	35	32	33

- Overall, eighty-one percent of those who selected “N/A” when asked “Have you ever relocated because your spouse or partner relocated?” have never been married or in a similar relationship.
- Overall, about 14% of AAS members reported relocating because their spouse or partner relocated.
- Female AAS members had a higher incidence of relocating because of their spouse or partner than men.
 - At the time of the survey, 14% of women and 7% of men (9% overall) maintained a residence in a different location from their spouses, partners, or children in order to work or study.
 - Fifty percent of women and 37% of men reported having limited their career options because of someone else, i.e., a partner, children or other family member.
 - These types of family issues were described in the verbatim comments about challenges facing the field of astronomy (*Appendix*).

Table 22 – Disabilities

Disabilities among US AAS Members, 2013		
Disability	%	N
I am deaf or have serious difficulty hearing	1	21
I am blind or have serious difficulty seeing even when wearing glasses	0	2
I have serious difficulty walking or climbing stairs	1	14
None of the above	96	1472
Prefer not to respond	2	26

- Most AAS members did not report any disabilities.

Table 23 – Ethnicity

Ethnicity of US AAS Members, 2013		
Ethnicity	%	N
White	84	1290
Asian or Asian American	8	123
Hispanic or Latino	3	47
Black or African American	1	20
American Indian or Alaska Native	0	6
Native Hawaiian or other Pacific Islander	0	1
Other	2	37
Prefer not to respond	4	62

Sum of percentages exceeds 100 because respondents were asked to check all that apply

- 3.4% of respondents checked more than 1 ethnicity.

Table 24 - Sexual Orientation and Transgender Status

Sexual Orientation and Transgender Status of US AAS Members, 2013		
	%	N
Heterosexual or straight	89	1351
Gay or lesbian	2	29
Bisexual	1	19
Transgender	0	3
Prefer not to respond	7	113

APPENDIX: Challenges facing the field of astronomy

Respondents were asked “What do you view as the most significant challenge the field of astronomy is facing in the areas of employment and/or career development?” Nearly all respondents (N=1360) contributed a response. The following were the most common themes.

- Lack of funding, particularly federal funding, resulting in too few available permanent positions, specifically tenured faculty positions at top-tier research institutions, for the number of qualified applicants. Additionally, funding that is awarded may be too concentrated in too few projects.
 - New PhDs having to invest years in multiple, low-paying postdocs to be more competitive for permanent positions.
 - A lack of awareness, resources and support to pursue careers outside of those that have typically been available to PhDs in astronomy and related fields. Some respondents questioned to what degree specialized skills for careers in astronomy apply to high-tech jobs in the private sector.
- This highly competitive job market being disruptive to family and personal life. Respondents emphasized the stresses of multiple geographic relocations, feeling insecure about their long-term job stability, the struggle to support a family on a postdoc salary, and the challenge for dual-scientist couples to find work together. More than a few wrote specifically about personal stress or their spouse’s stress in choosing whether or not to have children and/or the timing of when to have children, given some particularly turbulent early career experiences.
- More than a few respondents wrote about the challenge of ensuring equal opportunity and representation for women and minorities in the field of astronomy. Often these comments related to the particular challenge of women balancing careers and family.