

MS PHD'S Initiative Purpose & Background

MS PHD'S was established with a goal of providing professional development experiences to facilitate the advancement of minorities committed to achieving outstanding Earth system science careers. In order to accomplish this goal, the MS PHD'S initiative sponsors programs that provide minorities with:

- increased exposure to Earth system science community, via participation in scientific conferences, mentoring relationships and virtual community activities
- professional skills (e.g. grantsmanship, research, communication, teaching, etc.) development opportunities
- information regarding future funding, education and career opportunities and resources
- networking opportunities with established Earth system science researchers and educators
- membership within a virtual community that facilitates networking with and collaboration among peers, junior- and senior-level researchers and educators.

MS PHD'S Initiative Rationale

Academic Preparation

Underrepresented Minority Earth System Science Doctoral Degree Recipients: African Americans, Hispanics, and Native Americans represent approximately 24 % of the U.S. population (Mervis, 1999). Of the 30,914 doctoral degrees awarded by U.S. institutions in 1998, only 5.1 %, 4.2 % and 0.6 %, were awarded to African Americans, Hispanics and Native Americans, respectively (NSF, 1999). The portions of doctoral degrees awarded to minorities in the Earth system science are even smaller (Table 1).

Table 1. Proportion of the the U.S. earth system science doctoral degrees awarded to minorities in 1998 (NSF, 1999).

Earth System Science Discipline	African American	Hispanic	Native American
Life Sciences	3.2%	4.0%	0.41%
Physical Sciences	2.2%	2.6%	0.45%
Earth, Atmospheric and Marine Sciences	1.6%	2.8%	0.50%

Earth system scientists possess academic degrees spanning a broad spectrum of science and engineering disciplines. As a consequence of this interdisciplinary nature, it is difficult to determine the exact number and percentage of minority Earth system science doctoral degree recipients. **Over a twenty-two year period (1975-1997), minorities accounted for less than 10 % of individuals receiving science and engineering doctoral degrees (NSF, 2000). Additionally, from 1980-2000, less than 200 minorities (< 4 %) received doctoral degrees from geoscience departments at US institutions (AGI, 2001a) (Fig. 1, Table 2).** These statistics do not yield exact values regarding representation of minorities with Earth system science doctoral degrees. However, they do clearly indicate a need for additional efforts designed to increase the number of minority Earth system science doctoral degree recipients with knowledge and necessary skills to make valuable contributions to this field.

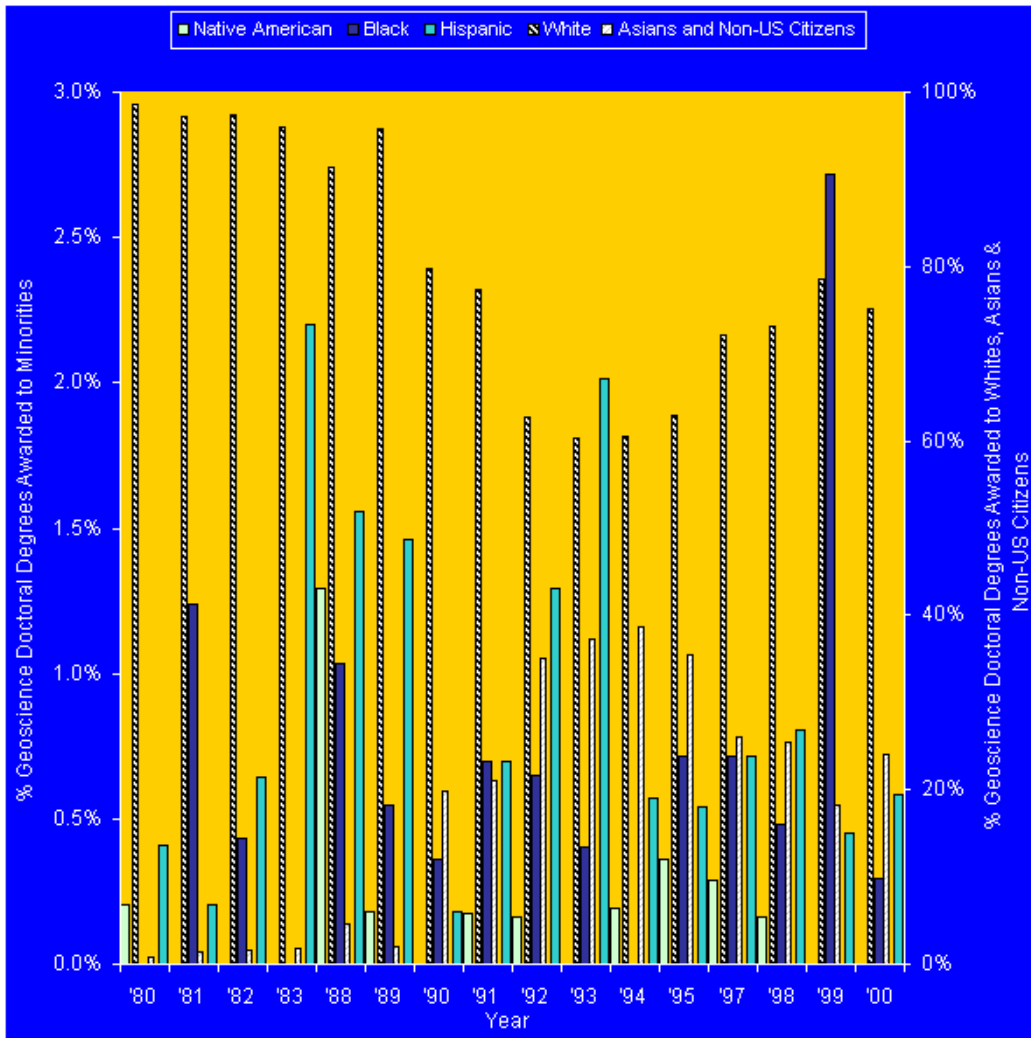


Fig. 1. Percent doctoral degrees awarded from 1980 to 2000 by geoscience departments, classified by ethnicity and race (AGI, 2001a). Race and ethnicity data were not collected for 1984-1987, and 1996.

Table 2. Doctorate Degrees Granted by Geoscience Departments from 1980 to 2000 (AGI, 2001a). Race and ethnicity data were not collected for 1984-1987, and 1996.

	'80	'81	'82	'83	'88	'89	'90	'91	'92	'93	'94	'95	'97	'98	'99	'00
Black	0	6	2	0	4	3	2	4	6	2	0	4	5	3	12	1
Hispanic	2	1	3	7	6	8	1	4	8	10	3	3	5	5	2	2
Native American	1	0	0	0	5	1	0	1	1	0	1	2	2	1	0	0

Underrepresented Minority Geoscience Bachelors and Masters Degree Recipients: Although the number of geoscience bachelors and masters degrees awarded from 1980 to 2000 to underrepresented minorities is quite large compared to the doctoral degrees awarded in the same time span, the percentage to the total bachelors and masters degrees conferred are disturbingly similar. From 1980 to 2000 underrepresented minorities received less than 6 % and 4 % of all geoscience bachelors degrees and masters degrees conferred, respectively (AGI, 2001) (Figs. 2 and 3, Tables 3 and 4).

The ratios between the numbers of geoscience degrees conferred at the masters and doctoral level versus the bachelors level are similar for both white and underrepresented minority students. Between 1980 and 2000, the average number of geoscience masters degrees awarded to underrepresented minority students was 38.1 % of the number of geoscience bachelors degrees awarded to that same demographic (35.1 % for white students) (AGI, 2001). Over the same time span, the number of geoscience doctoral degrees conferred to underrepresented minority students was 9.5 % of the number of geoscience bachelors degrees awarded (12.0 % for white students) (AGI, 2001). A significant increase in the number of geoscience bachelors degrees awarded to underrepresented minorities would seemingly produce a substantial increase in the number of advanced geosciences degrees awarded to underrepresented minorities.

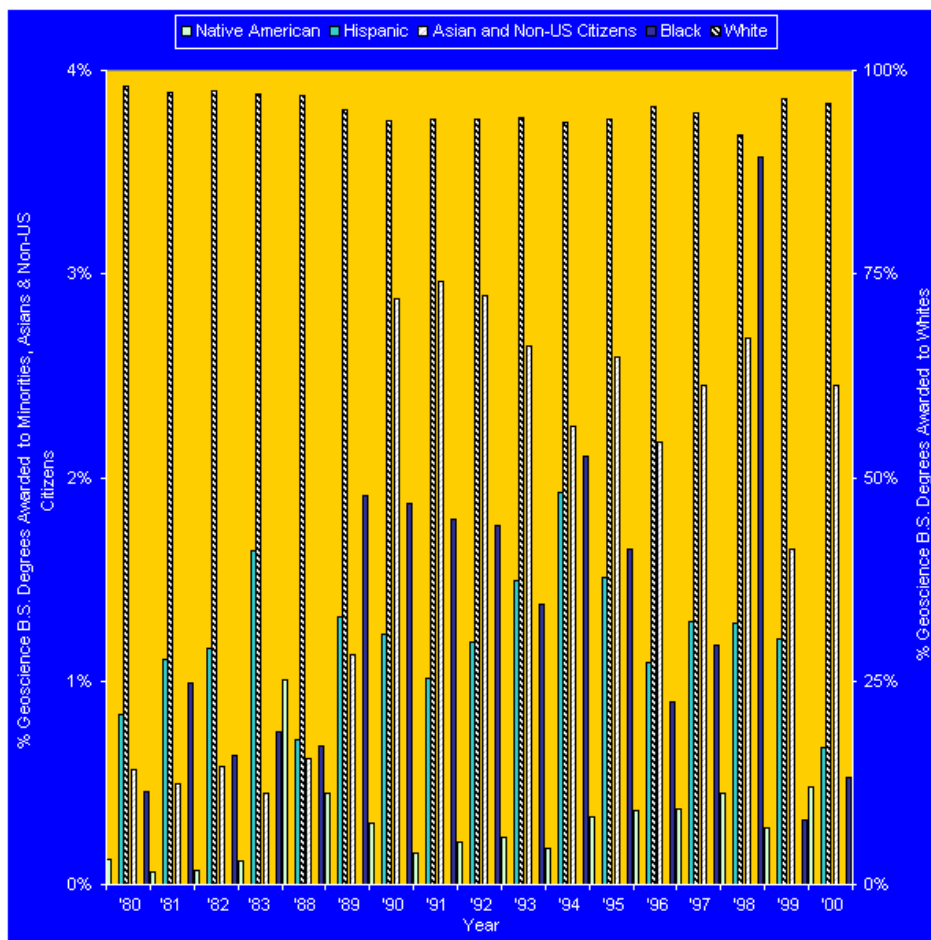


Fig. 2. Percent bachelors degrees awarded from 1980 to 2000 by geoscience departments, classified by ethnicity and race (AGI, 2001a). Race and ethnicity data were not collected for 1984-1987.

Table 3. Bachelors Degrees Granted by Geoscience Departments from 1980 to 2000 (AGI, 2001a). Race and ethnicity data were not collected for 1984-1987.

	'80	'81	'82	'83	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00
Black	30	68	46	40	21	51	50	46	59	48	71	59	42	51	120	8	11
Hispanic	55	76	84	87	22	35	33	26	40	52	65	54	51	56	43	30	14
Native American	8	4	5	6	31	12	8	4	7	8	6	12	17	16	15	7	10

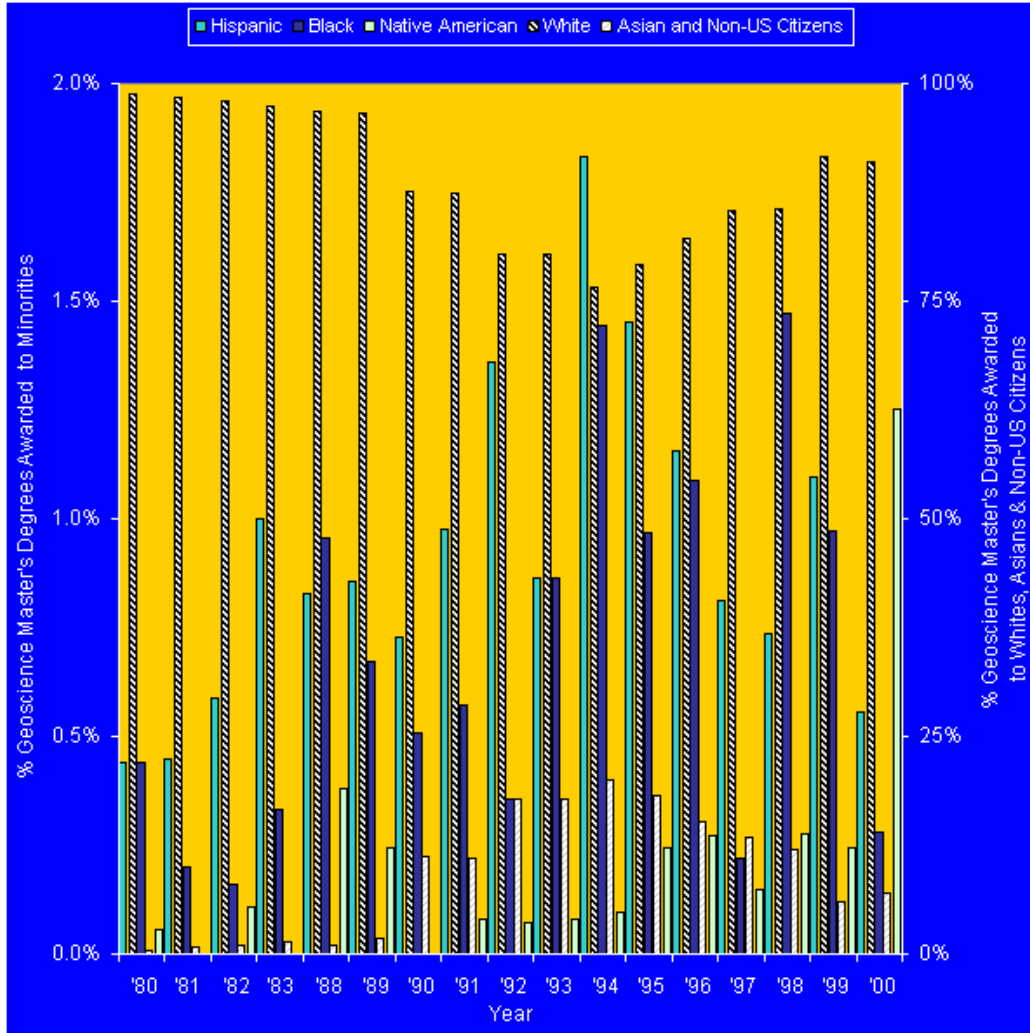


Fig. 3. Percent masters degrees awarded from 1980 to 2000 by geoscience departments, classified by ethnicity and race (AGI, 2001a). Race and ethnicity data were not collected for 1984-1987.

Table 4. Masters Degrees Granted by Geoscience Departments from 1980 to 2000 (AGI, 2001a). Race and ethnicity data were not collected for 1984-1987.

	'80	'81	'82	'83	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00
Black	8	4	3	4	15	11	7	7	5	11	15	12	16	3	16	8	2
Hispanic	8	9	11	12	13	14	10	12	19	11	19	18	17	11	8	9	4
Native American	1	0	2	0	6	4	0	1	1	1	1	3	4	2	3	2	9

Additional efforts must be made to encourage underrepresented minorities to pursue advanced degrees, particularly in Earth system science. Such efforts should be made, not only to create an interest in Earth system science, but also to sustain this interest and encourage the full participation of underrepresented minorities in this field.

Career Decisions

Geoscience Employment Opportunities: In 1997, underrepresented minorities constituted less than 5 % of all earth scientists, geologists, and oceanographers (Table 5, NSF 2000). These numbers directly correlate to the graduation rates of underrepresented minorities in geoscience fields. This shortfall, coupled with the increased focus toward global diversity, should translate into increased opportunities for minorities with advanced degrees in geoscience. We anticipate that as the number of minority geoscience degree recipients increases, the number of minorities fully engaged in the geosciences professional community should also increase.



Table 5. Scientists and engineers in the U.S. labor force, by occupation, race/ethnicity, and highest degree: 1997 (NSF, 2000).

Occupation	Total	White	Asian/ Pacific Islander	Black	Hispanic	American Indian/ Alaskan Native
All degrees						
Physical & Other Related Scientists	289,400	243,400	28,400	8,400	7,900	1,000
Earth Scientists, Geologists & Oceanographers	69,800	63,000	3,600	1,100	1,900	300
Earth Scientists, Geologists & Oceanographers	24.1 %	25.9 %	12.7 %	13.1 %	24.1 %	30.0 %
Bachelor's						
Physical & Other Related Scientists	134,000	115,800	8,100	5,500	4,100	500
Earth Scientists, Geologists & Oceanographers	35,600	33,000	1,200	600	700	100
Earth Scientists, Geologists & Oceanographers	26.6 %	28.5 %	14.8 %	10.9 %	17.1 %	20.0 %
Master's						
Physical & Other Related Scientists	70,100	58,100	8,000	1,600	1,900	300
Earth Scientists, Geologists & Oceanographers	23,400	20,700	1,300	400	1,000	100
Earth Scientists, Geologists & Oceanographers	33.4 %	35.6 %	16.3 %	25.0 %	52.6 %	33.3 %

	Doctorate					
Physical & Other Related Scientists	84,900	69,100	12,300	1,400	1,900	200
Earth Scientists, Geologists & Oceanographers	10,700	9,200	1,100	100	300	100
Earth Scientists, Geologists & Oceanographers	12.6%	13.3%	8.9%	7.1%	15.8%	50.0%

Occupational Options for Geoscientists: While some may believe that a degree in geosciences has limited marketability, reports have shown geoscientists work in a wide variety of fields and industries (Table 6). Educating students about wide-ranging geoscience employment opportunities should encourage them to strongly consider pursuing geosciences as a field of study. The MS PHDS initiative is a vehicle, by which academic and professional interests will be encouraged and even more importantly, sustained to facilitate the full participation of underrepresented minorities in Earth system science.

Table 6. Occupations of Individuals with their Highest Degree in the Earth Sciences (NSF, 1993).

Occupation	Bachelor's	Master's	Doctorate	Total
Accountants, Auditors, & other Financial Specialists	900	-	-	900
Accounting Clerks & Bookkeepers	250	-	-	250
Aerospace Engineers	50	-	50	100
Agricultural & Food Scientists	150	50	-	200
Anthropologists	-	50	-	50
Architects	400	-	-	400
Artists, Editors, Entertainers, Public Relations, Writers	600	-	-	600
Astronomer	150	-	-	150
Atmospheric & Space Scientists	50	50	200	300
Bio/Life Technicians	150	-	-	150
Biological Science Professors	-	-	50	50
Biological Scientists	-	50	-	50
Chemical Engineers	150	50	-	200
Chemistry Professors	-	-	150	150
Chemists, Except Biochemists	500	200	50	750
Civil Engineers	200	-	50	250
Clergy	150	-	-	150
Computer Engineers, Hardware	50	-	150	200
Computer Engineers, Software	900	-	-	900
Computer Programmers	1,500	400	-	1,900
Computer Scientists, Except Systems Analysts	-	250	-	250
Computer Systems Analysts	350	150	-	500
Construction Trades, Miners, & Well-Drillers	2,000	50	-	2,050
Diagnosing & Treating Health Practitioners	600	-	-	600
E&E, Indus., & Mechanical Engineering Technicians	1,100	100	-	1,200
Earth Science Professors	150	1,000	2,900	4,050
Electrical & Electronics Engineers	100	-	150	250

Elementary School Teachers	600	150	-	750
Environmental Engineers	2,100	800	350	3,250
Farmers, Foresters & Fishermen	2,100	800	-	2,900
Food Preparation & Service Workers	600	-	-	600
Forestry & Conservation Scientists	-	500	-	500
Geologists	20,000	15,000	6,000	41,000
Health Technologists	50	150	-	200
Industrial Engineers	450	-	-	450
Information Systems Scientists & Analysts	150	450	-	600
Insurance & Real Estate Sales	3,900	-	-	3,900
Lawyers & Judges	-	-	200	200
Logical Skipped	20,000	6,000	2,700	28,700
Marine Engineers or Naval Architect	50	-	-	50
Materials & Metallurgical Engineers	350	150	-	500
Mechanics & Repairers	800	200	-	1,000
Medical Science Professors	-	-	150	150
Mining & Geological Engineers	450	100	50	600
Oceanographers	150	50	100	300
Operators	600	50	-	650
Other Administrative	1,600	-	-	1,600
Other Biological & Life Scientists	200	-	50	250
Other Computer & Information Science Occupations	1,500	-	-	1,500
Other Engineering Technicians	2,000	-	-	2,000
Other Engineers	900	150	-	1,050
Other Health Occupations	50	-	-	50
Other Management Related Occupations	1,500	900	200	2,600
Other Marketing & Sales Occupations	900	100	150	1,150
Other Mathematical Scientists	100	-	-	100
Other Natural Science Professors	50	-	700	750
Other Occupations	2,900	200	-	3,100
Other Physical & Related Scientists	600	150	300	1,050
Other Professors	-	50	400	450
Other Service Occupations, Except Health	2,700	200	-	2,900
Petroleum Engineers	200	50	-	250
Physical Science Technicians	600	50	-	650
Physicists	50	200	50	300
Physics Professors	-	-	50	50
Precision Production Occupations	200	-	200	400
Protective Service Workers	900	-	-	900
Psychologists	50	-	-	50
Registered Nurses, Pharmacists, & Therapists	150	-	-	150
Sales Engineers	250	-	-	250
Sales Occupations, Commodities	1,100	100	-	1,200
Sales Occupations, Retail	1,600	100	200	1,900
Secondary School Science Teachers	2,400	1,600	-	4,000
Secretaries, Receptionists	600	-	200	800

Social Workers	200	-	-	200
Statisticians	-	50	-	50
Surveying/Mapping Technicians	800	150	-	950
Surveyors	400	-	-	400
Teachers, Other Subjects	50	-	-	50
Teachers, Social Science	-	150	-	150
Teachers-Pre-Kindergarten Kindergarten	400	-	-	400
Theology Professors	-	50	-	50
Top Mid-Level Managers	10,000	2,400	700	13,100
Transportation Material Moving	1,100	-	-	1,100
Total	98,850	33,450	16,500	148,800

Career Choice Trends of Underrepresented Minority Geoscience Doctoral Degree Recipients: In 2001, the American Geological Institute (AGI) reported a decreasing trend in the number of ethnic minority (defined as Asian, Black, Hispanic and Native American) geoscience doctoral degree recipients electing to pursue careers in academia, research institutions, and government (federal and state) agencies. This same report indicated an increasing trend in the number of ethnic minority geoscience doctoral degree recipients deciding to pursue careers in K-12 education (AGI, 2001b). These trends over the last three years (1999-2001), combined with the above data indicate a strong need for specific recruitment efforts that result in a significant increase in the number of minority Earth system scientists pursuing careers in academia.

Underrepresented Minority Geoscience Tenure-track Faculty: In 1997, less than 10 % of the science and engineering tenure-track faculty at US four-year institutions were classified as underrepresented minorities (NSF, 2000) (Table 7). This percentage has remained fairly constant from 1967 to 1997. If the recent trend of minorities electing to pursue careers outside of academia continues to increase (see above), it is highly likely that the future percentage of minority tenure-track science and engineer faculty will be even smaller. Clearly efforts must be made to not only encourage minorities to pursue doctoral degrees, particularly in Earth system science, but to also retain persuade them to remain in academia after graduation. The MS PHDS initiative is a vehicle by which interests of minority Earth system scientists will be encouraged and even more importantly supported by peers to facilitate their full participation in academia.

Table 7. Science and Engineering Tenure-Track Faculty at 4-year institutions, by rank, years since doctorate, percent total by race/ethnicity: 1997. Totals are rounded to nearest hundred. Details may not add to total because of rounding (NSF, 2000).

Years since doctorate and rank	Percent Total by Race/Ethnicity			
	Total	Black, non-Hispanic	Hispanic	American Indian/Alaskan Native
Total	143,200	3 %	3 %	0.3 %
Professor	65,100	2 %	2 %	0.5 %
Associate professor	41,600	3 %	3 %	0.5 %
Assistant professor	36,500	4 %	4 %	0.3 %
Less than 10	43,400	4 %	4 %	
Professor	1,400	7 %		
Associate professor	11,600	3 %	5 %	
Assistant professor	30,400	4 %	4 %	0.3 %
10 to 19	42,600	3 %	3 %	

Professor	17,200	2 %	3 %	
Associate professor	20,500	3 %	3 %	0.5 %
Assistant professor	4,900	4 %	2 %	
20 to 29	41,700	2 %	2 %	
Professor	32,900	2 %	2 %	0.6 %
Associate professor	7,700	4 %	3 %	
Assistant professor	1,000			

Sponsors and References



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