

AGU & AGI SURVEY OF NEW GEOSCIENCE MASTERS CLASS OF 2006



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HIGHLIGHTS

- Recent geoscience masters recipients worked throughout the economy, although most focused their job searches on the private sector and government.
- Two-thirds of newly-employed geoscience masters recipients worked in the geosciences and over 90% reported finding employment within the scientific enterprise.
- Half of all newly employed geoscience masters recipients worked in the private sector, with about 40% of them in the oil and gas industry and an equal number in environmental firms.
- Masters recipients employed in oil and gas were the most likely to report working in the geosciences (96%) and they received the highest starting salaries.
- The two other major employers of recent geoscience masters were academe and the government.
- Most new geoscience masters recipients used informal channels and electronic sources for their job searches.

INTRODUCTION

This report describes the initial employment during the spring of 2007 of geoscientists who earned their master's degree during the preceding academic year. The master's degree serves as the primary degree of professional employment in the geosciences in a wide range of industries, such as energy and resources companies and environmental consulting firms. The term geoscience is used throughout the report and refers to a broad range of fields in Earth, atmospheric, ocean, and space sciences (see Appendix for list of fine fields). The report is based on a survey of geoscience masters whose degrees were awarded between May 2005 and December 2006 and who remained in the U.S. after earning their degree. The Appendix provides a detailed description of how the survey was conducted.

NEW GEOSCIENCE MASTERS

THE MOST REWARDING ASPECT OF MY JOB IS:

"Impacting people's lives in a positive manner."

"There are always new and varied projects to be worked on and the position provides interaction with a large array of professionals."

"Applying my graduate studies in a practical setting."

- Geoscience masters working in Government, Class of 2006

Among respondents to this survey, one quarter of new masters degree recipients continued their education at another department. A few of them chose to continue graduate-level education in fields unrelated to geosciences (Table 1). This study focuses on the employment of new master's degree recipients and, thus, these 53 respondents were removed from the remaining analyses.

Half of the new masters who responded to the survey entered the workforce full-time. Most graduates were able to quickly continue with academic or professional endeavors, with only 13 respondents reporting that they were not working and seeking employment at the time of the survey.

Employment Status	Number
Primarily working	117
Primarily students	84
continued in another department	53
stayed in same department	31
Not working, seeking employment	13
Not working, not seeking employment	4
Did not complete survey	17
Total Respondents	235

There are geoscience employment opportunities across the economy for graduates with master's degrees. Half of recently employed graduates entered the private sector. Of the graduates who work in the private sector, about 40% went into the oil and gas industry and an equal number worked for environmental firms. About one-quarter of recent masters degree recipients took government jobs and an equal number were employed in academe, often in technical or research support positions (Table 2).

	Number	%
Private Sector		51
Industry - Oil and Gas	24	
Industry- Environmental	23	
Other Industry	10	
Self Employed	2	
Academe		24
4-year College or University	11	
University Affiliated Research Institute	10	
Other Academic Institution	7	
Government		22
Regulatory Government	6	
Government Research	8	
Government Forecasting	5	
Other Government	7	
Non Profit & Other		3
Non-profit Research Institute	3	
Broadcast Meteorology	1	
Total Respondents	117	

New geoscience masters were able to find employment within the science and engineering enterprise. Nearly two-thirds (64%) of new masters reported that they were working in the geosciences and nearly 30% were employed in another science field (Table 3). Nearly all of the new masters working in the oil and gas industry said that they were in the geosciences as were a very large majority of masters employed in government. Interestingly, only about 60% of those employed by environmental firms reported that they were working in the geosciences with nearly 40% categorizing their work as other science.

	Employment Sector				Total
	Oil & Gas	Pot. Perm Any gov't	Environment	All other	
	%	%	%	%	%
Geoscience	96	81	57	41	64
Other Science	0	8	39	50	28
Non-Science	4	11	4	9	8
Total Number	24	26	23	44	117

Footnote: All other includes academe, other private sector, non-profit, and any other.

Salary data on recent geoscience masters are somewhat limited. Data on economic sectors with too few respondents or too much variability do not provide a reliable indicator of industry standards for starting salaries.

The oil and gas industry has both the highest average salary and the highest typical salary range for recent geoscience masters graduates. Overall, government positions earn slightly less than jobs with environmental firms (Table 4). It is important to note that about half (11 of 23) of the recent masters who were working in environmental jobs had been employed for a year or more prior to earning their masters degree. Since we are assessing initial employment salaries, their salaries were excluded, and consequently there were insufficient data to report reliable typical salaries for the environmental sector.

Table 4. Starting Salaries for New Geoscience Masters, Class of 2006				
	Average Salary \$	Median Salary \$	Typical Salary \$	Masters N
Oil and Gas	81,300	82,500	76,000 to 87,400	21
Environmental Firm	47,500	45,500	*	12
Any Government	46,200	45,000	39,500 to 50,700	22

Footnote: These data are based on full-time employed masters. They do not include individuals who worked full-time for 12 or more months prior to earning their degree.

Typical Salary Range is the middle half of all reported salaries, i.e. one-quarter of the salaries are less than and one-quarter are more than the typical salary range.

*There were too few respondents to report reliable salary range.

A significant majority of masters reported using various knowledge and skills often or extensively in their daily employment. Cognitive skills like problem solving were cited the most often and knowledge of one's research field was used the least often by new masters in the workplace (Table 5).

Oil and gas is a demanding field requiring the application of broad geoscience and finer field knowledge as well as management and technical skills. In fact, new masters working in the oil and gas industry were the most likely to report that they often use knowledge of their research field. Masters employed in environmental firms made the least use of broad geoscience and research field knowledge, a finding that is consistent with the large proportion of these masters who reported that they were working in other sciences. However, masters in environmental firms did report often using cognitive skills and management skills. The high overall percentages indicate the usefulness of the knowledge and skills learned by geoscience masters in their jobs.

Table 5. Knowledge and Skills Used by New Geoscience Masters in their Current Job, Class of 2006						
	Percent Reporting Often or Extensively					
	Cognitive Skills %	Mgmt Skills %	Technical Skills %	Broad Knowledge of Geoscience %	Research Field %	New Masters N
Oil and Gas	100	79	79	71	69	24
Environmental Firms	82	78	70	52	39	23
Any Gov't	77	77	77	65	54	26
All Other	84	71	67	68	43	44
Overall	85	75	70	65	49	117

Footnote: All other includes government non-postdocs, temporary academe, and non-profit.

Respondents were asked to indicate their opinions on a 5-point scale from "extensively" to "not at all". This table represents the percent of respondents who selected the two most positive responses.

HOW DO NEW GEOSCIENCE MASTERS RATE THE STATE OF THE JOB MARKET?

THE MOST REWARDING ASPECT OF MY JOB IS:

"All of it! Applying my skills and knowledge, while climbing a steep learning curve. Interacting creatively with colleagues."

"I enjoy exploring for energy and getting paid well to do it."

"I love the work I do. It's challenging and keeps me thinking."

-Geoscience masters working in Oil & Gas, Class of 2006

More than twice as many recent masters rated the job market as good or excellent compared to the number who rated it as bad. Perceptions of the state of the job market are influenced by many factors. Those new master's degree recipients who are successful in landing a satisfying job are more likely to rate the job market positively. This section identifies some of the features of initial employment that appear to be related to positive job market ratings.

Salary is a strong predictor of how a new geoscience masters rates the job market (Table 6). Those who rated the job market as being bad or fair had, on average, starting salaries that were far lower than those who rated the job market as good or excellent.

Table 6. Salaries by Job Market Ratings for New Geoscience Masters, Class of 2006

Job Market Rating	Average \$	Typical Range \$	N
Bad	45,500	39,000 - 51,000	12
Fair	47,500	38,400 - 55,200	36
Good	61,700	44,500 - 63,800	28
Excellent	83,400	*	6

Footnote: These data are based on full-time employed Masters. They do not include individuals who worked full-time for 12 or more months prior to earning their degree.
 Typical Salary Range is the middle half of all reported salaries, i.e. one-quarter of the salaries are less than and one-quarter are more than the typical salary range.
 *There were too few respondents to report a reliable salary range.

The extent to which a position is related to the geosciences is also a strong indicator of how a respondent rates the job market. Only 56% of graduates giving the market a bad rating reported that their job was related to their field. By contrast virtually every new masters who rated the job market as good or excellent also reported that their work was closely related to the geosciences (Table 7).

Table 7. Ratings by Job Relation to Field for New Geoscience Masters, Class of 2006				
Percent Reporting Often or Extensively				
	Excellent	Good	Fair	Bad
	%	%	%	%
Related	100	97	73	56
Not-related	0	3	27	44
Total Number	6	31	44	16

A similar trend emerges in qualitative data about the extent to which their position is challenging and the extent to which their work is rated as appropriate for someone with a master's level education. Only half of new masters who rated the job market as bad classified their positions as challenging. Comparatively, virtually all of those who rated it as good or excellent classified their positions as challenging. Similarly, virtually all of those who rated the job market as good or excellent reported that their work was appropriate for someone with a master's degree. Those who rated the market as bad were far less likely to report that their positions were masters-level (Tables 8 & 9).

Table 8. Ratings by Job Challenge for New Geoscience Masters, Class of 2006				
Job Market Rating				
	Excellent	Good	Fair	Bad
	%	%	%	%
Challenging	100	84	75	50
Not Challenging	0	16	25	50
Total Number	6	31	44	16

Footnote: "Challenging" includes respondents who answered "Extremely Challenging" and "Challenging" on a 5 point scale. "Not Challenging" includes respondents who answered "Somewhat Challenging" and "Not Very Challenging".

Table 9. Ratings by Job Appropriateness for New Geoscience Masters, Class of 2006				
Job Market Rating				
	Excellent	Good	Fair	Bad
	%	%	%	%
Appropriate	100	94	73	69
Not Appropriate	0	6	27	31
Total Number	6	31	44	16

Footnote: "Appropriate" includes respondents who answered "Definitely Appropriate" and "Appropriate" on a 5 point scale. "Not Appropriate" includes respondents who answered "Somewhat Appropriate" and "Not Very Appropriate".

THE MOST REWARDING ASPECT OF MY JOB IS:

"I learn new things on a regular basis. I am challenged to find solutions to problems that are related but never the same. Solving the problem is a good feeling."

"Seeing a project through from start to finish."

-Geoscience Masters in Environmental Firms, Class of 2006

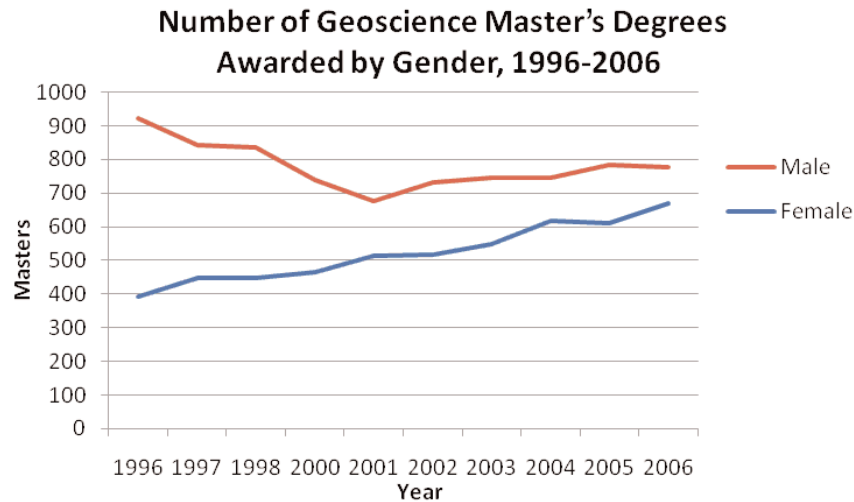
In previous reports on the initial employment of new geoscience Ph.D.s, job market ratings were analyzed against the time spent looking for employment. For new geoscience masters, the relationship between the two is weak, and time spent looking for employment is not a strong predictor of how a graduate rated the job market. Over 75% (73 of 97) of new working masters spent less than 4 months seeking employment. Irrespectively of how long it took to find work, a minority (17%) of masters rated the job market as being bad (Table 10).

Table 10. Ratings by Length of Job Search for New Geoscience Masters, Class of 2006

Months	Job Market Rating			
	Excellent %	Good %	Fair %	Bad %
Zero	67	29	29	13
1-3	33	45	46	56
3+	0	26	25	31
Total Number	6	31	44	16

REPRESENTATION OF WOMEN IN THE GEOSCIENCES

Over the past twenty years, the gap between the number of men and women earning master's degrees in the geosciences has shrunk. From 1996 to 2001, fewer men earned master's degrees each year, while the number of women earning masters grew. Since 2001, there has been an overall increase for both men and women, with a higher growth rate for women.



Source: NSF IPEDS. MS data includes earned MS en route to a Ph.D. in the same department, those who left a PhD program with a MS, & those earned MS in MS only program. Geoscience includes Atmospheric and Earth sciences and Oceanography.

Over the last decade, women have been earning masters in each major field of geoscience: solid earth, atmospheric and oceanography. In fact, according to the National Science Foundation, more women now earn masters in oceanography than do men (Table 11).

		Two Year Averages	
		1996 and 1997	2005 and 2006
Geology and Solid Earth	Male	658	609
	Female	326	505
Oceanography	Male	75	49
	Female	53	71
Atmospheric Science	Male	150	122
	Female	39	64

Source: NSF IPEDS

Of the 99 employed new masters who reported their gender, 55 were men and 44 were women. There are small differences in the employment sectors in which men and women took jobs. More males went into government, and more females found work outside of government, oil and gas, or environmental firms. Males and females were equally likely to go into the oil and gas industry (Table 12).

	Female %	Male %
Any Gov't.	18	29
Oil and Gas	25	24
Environment	11	14
All Other	46	33
Total Number	44	55

Footnote: "All other" includes academe, other private sector, non-profit, and all other.

Encouragingly, survey results revealed few gender disparities in the educational and employment experiences of survey respondents. Overall, there was no significant difference in salary by gender. Males earned slightly higher average salaries than women (2.9%), and typical salary ranges were nearly identical (Table 13). In light of the number of respondents, this 2.9% difference is not statistically significant.

	Average \$	Typical Salary \$	N
Female	53,350	40,000-65,500	33
Male	54,900	40,000-66,000	51

Footnote: These data are based on full-time employed masters. They do not include individuals who worked full-time for 12 or more months prior to earning their degree.

Typical Salary Range is the middle half of all reported salaries, i.e. one-quarter of the salaries are less than and one-quarter are more than the typical salary range.

Women rated the job market lower than men, with only 27% of women rating it good or excellent compared to 47% of men (Table 14). It is not entirely clear what factors influenced this difference. However, the data suggest that women who are less challenged in their positions are more likely to give a bad rating than are men. Also, among our respondents, more women are employed part-time than men (4 to 1), which may contribute to lower job market ratings.

Table 14. Ratings of Job Market by Gender for New Geoscience Masters, Class of 2006

	Job Market Rating				Total Number
	Bad %	Neutral %	Good %	Excellent %	
Female	23	50	23	4	44
Male	11	42	40	7	53

When asked if they would change anything about their graduate training, geoscience masters most often reported a desire to have taken more technical courses in other departments. Few masters would have taken more time off before or during their studies. Though most of the differences between men and women are not significant due to the comparatively small number of respondents, overall, women would change more about their education. On average, women selected 1.3 things they would change compared to men who, on average, selected 1.1 things they would change (Table 15).

Table 15. What New Geoscience Masters Would Change About Their Graduate Education, Class of 2006

	Women %	Men %
More technical courses in other depts.	33	22
Advisor	20	16
Institution	15	14
Field	15	12
Research project	14	12
More non-science courses	13	18
Time off before	7	6
Time off during	1	2
Other	14	12
Nothing	24	22

Footnote: Respondents were permitted to check all that apply.

JOB SEARCH

Geoscience masters made use of a variety of job search methods to find employment. Searches were concentrated in the private sector and government and, to a lesser extent, academe, non-profit, and all other. Given the option to check all that apply, respondents selected 2 sectors on average, suggesting that masters were somewhat flexible in which sectors they sought employment (Table 16).

Table 16. Employment Sectors in which New Geoscience Masters Looked for Employment, Class of 2006

Sector	Number
Private Sector	68
Government	64
Academe	41
Non-profit and Other	27
Total Number	99

Footnote: Respondents were permitted to check all that apply.

Over half of geoscience masters want to work in the private sector or academe 10 years after they earn their degree. Nearly a quarter of graduates reported that they were not sure in which sector they wanted to be working in 10 years (Table 17). Compared to how new working masters are actually distributed throughout the economy, there are currently more masters working in the private sector than would like to be in 10 years. The percent of masters desiring positions in academe, government, and non-profit sectors in 10 years was similar to their initial employment (Table 2).

Table 17. Employment Sectors Desired in 10 years by New Geoscience Masters, Class of 2006

Sector	Master's %
Private Sector	29
Academe	24
Government	17
Non-profit and Other	7
Not sure	23
Total Number	98

Footnote: Respondents were permitted to check all that apply.

Masters are selective about the jobs they want and restrict their job searches for several reasons. A large proportion of new masters reported restricting their search, with 81% having tailored their search based on personal preferences and only 15% claiming they did not restrict their search at all. On average, masters reported that they restricted their search for 3 reasons. After personal preference, geography and type of employment were the next two most cited reasons (Table 18). Masters took into account where they wanted to work, both in terms of location and sector of the economy, in their job search.

Table 18. How New Geoscience Masters Restricted Their Job Search, Class of 2006

Restriction	Master's %
For personal preference	81
To certain geographic areas	78
To certain sectors of employment	67
For family reasons	44
Other	32
Did not Restrict	15

Footnote: Respondents were asked to indicate "yes" or "no" for each item. This table represents responses of "yes".

Taking advantage of informal channels and electronic sources, such as email listservs and online job recruitment sites, were the two most often used job search methods cited by masters. About 40% of masters reported using mentors or advisors as job search resources (Table 19). However, quite a few masters were disappointed with the career advice they received from their advisors and reported that, if they could do it over again, they would have changed their advisor (Table 15). Society resources were used by a relatively small number of graduates. On average, masters used 2 or more search methods in looking for employment

Table 19. Job Search Methods Used by New Geoscience Masters, Class of 2006

Method	Number
Informal channel	59
Electronic sources	48
Mentor or faculty advisor	39
Met employer through former job	27
Society meeting	19
Society publication	16
Other	23
Total number	99

Footnote: Respondents were permitted to check all that apply

Some job search methods were considered to be more effective than others by new geoscience masters. Masters reported that informal channels were the most effective job search method followed by electronic sources and faculty advisors (Table 20).

Method	Master's %
Informal channel	33
Electronic source	24
Mentor or faculty advisor	14
Met employer through former job	9
Society meeting	2
Still seeking employment	2
Other	15
Total number	91

Career planning assistance for masters is largely provided by advisors and secondarily through individual departments (Table 21). Twenty-one percent of masters reported societies as being helpful in career planning. The level of career planning assistance provided does not necessarily translate into help getting an actual job. For instance, while 40% of masters found advisors helpful in career planning, only 14% cited them as the most effective job search resource.

	Helpful Advice %
Advisor	40
Department	27
Society	21
University	15
Total number	98

Footnote: Helpful Advice includes respondents who answered "Extremely Helpful" and "Helpful" on a five-point scale.

Almost 8 out of 10 new geoscience masters reported belonging to scientific and professional societies. Only 21% reported not belonging to at least one of the societies listed. On average, new geosciences masters who are members of any society belonged to two societies (Table 22).

Society	Number
AGU	81
GSA	58
AAPG	31
AMS	31
SEG	18
ASLO	8
Other	61

APPENDIX

In 2002, AGI completed a study of geoscience masters degree programs with support from the Sloan Foundation, but no subsequent focused studies exist. This prompted the surveying of masters degree recipients in the class of 2006 as part of the American Geological Institute (AGI) and the American Geophysical Union (AGU)'s annual study of Ph.D.s.

AGI and AGU have collected data on recent Ph.D.s in the geosciences from the classes of 1996 through the present. In 1996 and 1997, the survey was conducted as part of a multidisciplinary effort coordinated by the Commission on Professionals in Science and Technology (CPST) and supported by the Alfred P. Sloan Foundation and the National Science Foundation (NSF). Since 1998, AGI and AGU have continued this effort and evolved the survey to provide a more complete picture of geoscience graduates. Data collection and analyses are performed by the Statistical Research Center (SRC) of the American Institute of Physics.

With only one year of data for master's degree recipients, the analysis in this report is constrained and mostly descriptive. Also, this study was intended to follow masters who left their department after earning their degrees, not those en route to earning a Ph.D. in the same department. Examination of the data revealed 84 respondents who were not in this target group; 31 stayed in the same department, and 53 earned their masters en route to earning a Ph.D. Subsequently, their data were excluded from analyses. This study encompasses a broad range of fields in the Earth, atmospheric, ocean, and space sciences (See Appendix).

HOW THE SURVEY WAS CONDUCTED

Between February 2007 and May 2007, requests were sent to 331 U.S. geoscience graduate departments asking them to provide contact information for their recent graduates. Three initial contacts by email asked department chairs to submit information on a webpage created and maintained by the SRC on their secure server. Departments who did not submit online were sent a mailing with a paper submission form. Combining online and paper submissions, about 200 departments responded.

In conjunction with contacting department chairs, AGU sent a mailing to its student members asking those who recently graduated to volunteer to participate in the study. The American Meteorological Society (AMS) sent a similar request to its student members. We received a combined total of about 340 graduates' names from the requests of these two societies.

In total, contact information was collected for 744 masters and 410 Ph.D.s. Between May 2007 and October 2007, these graduates were contacted directly, initially by email and then with a paper mailing, and asked to answer questions about their education, employment, and demographics. All responses were collected through an online survey created and maintained by the SRC. After data verification, there were data for 235 masters who earned their degree between May 2005 and December 2006 and remained in the United States.

FINE FIELDS IN THE GEOSCIENCES

CATEGORY	SUBFIELDS
Atmospheric Science	Atmospheric Science Meteorology Climate Studies Global Earth System Science
Hydrology and Environmental Science	Hydrology Water Resources Soil Science Geomorphology
Oceanography	Physical, Chemical, and Biological Oceanography Sea Floor Processes Marine Geology Ocean Engineering Coastal Science Fisheries
Solid Earth Geology	Paleontology Sedimentology Stratigraphy Structural Geology Tectonics Rock Mechanics Paleoscience Glaciology
Chemical Earth Science	Volcanology Petrology Mineralogy Geochemistry
Solid Earth Geophysics	Seismology Economic Geology Exploration Geophysics Other Solid Earth Geophysics
Space Science	Planetary Science Space Physics Aeronomy Astronomy
Other Science and Engineering	Engineering Computer Science Science Education Other Science Public Policy