Student and Faculty Employment Attitudes in the Geosciences 2006

Report by the American Geological Institute, Geoscience Workforce
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Report by Margaret Anne Baker
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A growing portion of decision makers in academia, private industry, and government are concerned about shortages in the science, engineering, and technology (SET) workforce. This heightened awareness is in part to several reports released in the last year looking at that nation’s competitiveness in the global market. For years, the geosciences have been aware of the need to increase the number of students entering the pipeline, but the recent upswing in the world’s commodities market and impending retirement of a generation of geoscientists has increased this pressure. There are serious questions about who will fill these positions.

Representatives from the petroleum industry have indicated that they will need to replace over 50% of their geoscience technical workforce within the next ten years, a level that represents close to 40,000 jobs. There are similar reports for all sectors of the geoscience workforce, with more jobs currently available for geoscience graduates at all levels than applicants to fill them. Despite this wealth of geoscience jobs, few students are applying and taking these positions. The current production of geoscientists from US colleges and universities that are considered part of the potential employment pool, namely graduates with master's and doctorates, is about 1,200 per year. In hopes of better understanding the careers decisions being made by current geoscience students, the American Geological Institute conducted a survey from March to April 2006 to document the attitudes of students and academic advisors of the professional pathways for geoscientists.

A total of 1358 students and 558 advisors responded to the survey from at least 262 schools. Based on the domain name of the emails provided, the students and faculty represent a wide range of schools and geographic locations. Both students and advisors were asked to select employment sectors in which they would seek employment or in which they would recommend that a student actively consider:

- a. State/Local Government
- b. Federal Government
- c. Environmental Industry
- d. Mining Industry
- e. Petroleum Industry
- f. Academia
- g. K-12 Education
- h. High-Technology/Communications
- i. Finance
- j. General Business
- k. Continue Education/PostDoc
- l. Other
- m. Look outside of geosciences

Students were also asked what degree they were currently pursuing and what year they expect to graduate. Advisors were also asked to provide the highest degree offered by their department. Copies of the survey instruments are available in Appendix B.
Faculty
The 558 responding faculty represent a wide range of schools. There does not appear to
be any significant difference in the opinions of advisors based on highest degree awarded
or geographic location. Table 1 shows the responses of faculty based on the highest
degree awarded by their department and the overall attitude of advisors towards the 13
career pathways.

Table 1  Attitudes of Faculty Respondents by Highest Degree Awarded

<table>
<thead>
<tr>
<th></th>
<th>BA/BS</th>
<th>MA/MS</th>
<th>Ph.D.</th>
<th>All Advisors</th>
</tr>
</thead>
<tbody>
<tr>
<td>State/Local Government</td>
<td>79%</td>
<td>75%</td>
<td>67%</td>
<td>72%</td>
</tr>
<tr>
<td>Federal Government</td>
<td>70%</td>
<td>64%</td>
<td>66%</td>
<td>67%</td>
</tr>
<tr>
<td>Environmental Industry</td>
<td>96%</td>
<td>95%</td>
<td>84%</td>
<td>89%</td>
</tr>
<tr>
<td>Mining Industry</td>
<td>41%</td>
<td>40%</td>
<td>36%</td>
<td>38%</td>
</tr>
<tr>
<td>Petroleum Industry</td>
<td>65%</td>
<td>68%</td>
<td>69%</td>
<td>67%</td>
</tr>
<tr>
<td>Academia</td>
<td>64%</td>
<td>54%</td>
<td>77%</td>
<td>68%</td>
</tr>
<tr>
<td>K-12 Education</td>
<td>82%</td>
<td>61%</td>
<td>63%</td>
<td>67%</td>
</tr>
<tr>
<td>High-Technology/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communications</td>
<td>15%</td>
<td>23%</td>
<td>23%</td>
<td>18%</td>
</tr>
<tr>
<td>Finance</td>
<td>5%</td>
<td>6%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>General Business</td>
<td>10%</td>
<td>10%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Continue Education/PostDoc</td>
<td>71%</td>
<td>51%</td>
<td>59%</td>
<td>60%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
<td>11%</td>
<td>6%</td>
<td>8%</td>
</tr>
<tr>
<td>Look Outside of geosciences</td>
<td>16%</td>
<td>9%</td>
<td>19%</td>
<td>16%</td>
</tr>
</tbody>
</table>

Students
Of the 1358 students who responded to the survey, more than half (772) are seeking
BA/BS degrees. Graduates students are roughly split between MA/MS (316) and Ph.D.
(267) seekers. Table 2 and Figure 1 show the percent of students who would consider
different career pathways by degree level. The three most preferred career pathways,
regardless of education level, are Federal Government (64%), State/Local Government
(63%), and the Environmental Industry (61%). Students were significantly less interested
in non-environmental private sector careers, with the two next most preferred career
pathways being academia (48%) and continuing education (43%).

Despite the marketability of a master’s degree, many of these students are more interested
in entering the public sector rather than the private sector job market. The top six career
pathways for master students include: State/Local Government (67%), Federal
Government (67%), Environmental Industry (61%), Academia (45%), Petroleum
Industry (42%), and Continuing Education (34%). Ph.D. students show an even stronger
pull towards the public sector, with Academia (81%) as the clear preferred career path.
Other preferred career pathways for Ph.D. students include employment in the Federal
Government (60%), a PostDoc position (53%), and employment in State/Local
Government (49%). Undergraduate geoscience students show a similar preference in
potential career paths, with the largest percent (69%) considering a career in the
Environmental Industry. This preference for undergraduate students may be in part due
to the availability of entry-level jobs in this sector.
The preference of public sector over private sector jobs does not change significantly between student who will be entering the job market in the coming year and those that are several years from entering the workforce. Figure 2 shows this trend for the entire student population and does not change significantly depending on the student’s degree. One exception to this general trend is that students within a year of graduating are slightly more likely to consider a career in the Petroleum Industry than students with several years before receiving their degree.

Table 2  Attitude of Students Graduating within One Year

<table>
<thead>
<tr>
<th></th>
<th>BA/BS</th>
<th>MA/MS</th>
<th>Ph.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 yr</td>
<td>&gt;1 yr</td>
<td>1 yr</td>
</tr>
<tr>
<td>State/Local Government</td>
<td>67%</td>
<td>66%</td>
<td>70%</td>
</tr>
<tr>
<td>Federal Government</td>
<td>64%</td>
<td>63%</td>
<td>66%</td>
</tr>
<tr>
<td>Environmental Industry</td>
<td>71%</td>
<td>68%</td>
<td>60%</td>
</tr>
<tr>
<td>Mining Industry</td>
<td>31%</td>
<td>29%</td>
<td>19%</td>
</tr>
<tr>
<td>Petroleum Industry</td>
<td>33%</td>
<td>34%</td>
<td>49%</td>
</tr>
<tr>
<td>Academia</td>
<td>36%</td>
<td>38%</td>
<td>42%</td>
</tr>
<tr>
<td>K-12 Education</td>
<td>28%</td>
<td>29%</td>
<td>24%</td>
</tr>
<tr>
<td>High-Technology/Communications</td>
<td>7%</td>
<td>9%</td>
<td>7%</td>
</tr>
<tr>
<td>Finance</td>
<td>3%</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td>General Business</td>
<td>10%</td>
<td>11%</td>
<td>7%</td>
</tr>
<tr>
<td>Continue Education/PostDoc</td>
<td>41%</td>
<td>44%</td>
<td>32%</td>
</tr>
<tr>
<td>Other</td>
<td>14%</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Look Outside of geosciences</td>
<td>21%</td>
<td>13%</td>
<td>23%</td>
</tr>
</tbody>
</table>
Part of this trend may be related to the career advice that these students receive from faculty advisors, many with limited direct exposure to private industry careers. This limited exposure may reduce the number of students that have had access to non-academic experiences either through internships or collaboration with other sectors during their degrees. A future survey should inquire about the age of master’s students in comparison to Ph.D. students. For master’s students who came directly out of an undergraduate program, there is a good chance that most of these students have only been exposed to an academic career path and may be part of the reasoning behind the limited number of master’s students seeking private sectors careers.

![Figure 2](image.png)

**Figure 2** Comparison of all students within one year of graduation and those students more than one year away from graduating.

This limited interest by students to enter non-environmental private sector careers is problematic. These industries are projected to continue to grow over the next several years as industrializing nations increase their demands for raw materials and energy. An increased global demand for raw materials means that these industries will be hiring geoscientists to replace retiring workers and possibly to expand exploration and development capacity. The other career pathways, such as academia and government agencies, are expected to be focused purely on replacement of retirees. If there are not sufficient geoscientists to fill these position from the U.S. applicant pool, companies and institutions are likely either to fill these positions with foreign-trained geoscientists or to hire more engineers/non-geoscience technical workers.
Comparison of Students and Advisors
There appears to be a significant difference between the career pathways that advisors suggest and student interest in pursuing these careers. For example, 89% of advisors suggest a career path in the environmental sector and only 61% of all students would consider this career. When the student figure is further broken down based on degree, only 39% of Ph.D. students would consider working in the environmental sector. This low percent may be due to Ph.D. students feeling overqualified for positions that they see geared toward geoscientists at a much earlier stage in their career. Undergraduates show the most interest in the environmental sectors at 69% and 61% of students pursuing a master’s degree would consider this career.

Another surprising difference between advisors and students are related to interest in K-12 Education. Two-thirds of advisors say that they would suggest K-12 Education as a career path, but only 26% of all students would pursue a career in K-12 Education. This trend is surprising given few physical science departments have a history of promoting K-12 Education as a career pathway.

![Figure 3](image-url)

**Figure 3** Comparison of the attitude of advisors to suggest given careers paths and students’ interests in pursuing these careers.

The 2003 report on Earth and Space Science Ph.D.s includes a section on job search methods and useful sources for information on career planning. In Table 7 of this report, the students were asked about the influence of their advisor on getting their initial employment and advisors were listed as being useful resources if the job was either in academia or a PostDoc. None of the resources listed, with the exception of informal
channels, were useful for the full range of career pathways available to students. These results coupled with the results of this survey suggest that there is a need for improved communications with students at all stages of the pipeline about potential careers. Internships and collaborative projects provide students with connections beyond their department. There are also several electronic sources specific for geoscience-related jobs, but currently these sources are primarily advertising jobs overseas.
Appendix A

Responding Departments:

Angelo State University
Arkansas Tech University
Auburn University
Austin Peay State University
Baylor University
Beloit College
Bemidji State University
Binghamton University
Bloomsburg University
Boise State University
Boston College
Boston University
Bowdoin College
Bowling Green State University
Brevard College
Bridgewater State College
Brigham Young University
Brigham Young University, Idaho
Bryn Mawr College
Bucknell University
Buffalo State College
California Institute of Technology
California State Polytechnic University
California State University, Bakersfield
California State University, Chico
California State University, East Bay
California State University, Long Beach
California State University, Northridge
California State University, Pomona
California State University, San Bernardino
California State University, Stanislaus
California University of Pennsylvania
Carleton College
Central Connecticut State University
Central Michigan University
Central Missouri State University
Central Washington University
Clemson University
Colby College
Colgate University
College of Charleston
College of William & Mary
Colorado College
Colorado School of Mines
Colorado State University
Columbia University
Cornell College
Cornell University
Dartmouth College
DePauw University
Dickinson College
East Carolina University
Eastern Connecticut State University
Eastern Illinois University
Eastern Kentucky University
Edinboro University of Pennsylvania
Emporia State University
Florida Atlantic University
Florida International University
Fort Hays State College
Fort Lewis College
Franklin and Marshall College
Fullerton College
Georgia Institute of Technology
Georgia Southern University
Georgia Southwestern State University
Grand Valley State University
Hardin-Simmons University
Harvard University
Hobart & William Smith Colleges
Hofstra University
Hope College
Humboldt State University
Idaho State University
Indiana State University
Indiana University / Purdue University, Fort Wayne
Indiana University / Purdue University, Indianapolis
Indiana University, Bloomington
Iowa State University
James Madison University
Juniata College
Kansas State University
Keene State College
Kent State University
La Salle University
Lake Superior State University
Lawrence University
Lehigh University
Long Island University
Louisiana State University
Macalester College
Mansfield University
Marshall University
Massachusetts Institute of Technology
Miami University
Michigan Technological University
Middlebury College
Millersville University
Millsaps College
Minnesota State University, Mankato
Mississippi State University
Missouri State University
Montana State University
Montana Tech of the University of Montana
Montclair State University
Moravian College
Murray State University
New Jersey City University
New Mexico Institute of Mining and Technology
New Mexico State University
North Dakota State University
Northeastern Illinois University
Northeastern University
Northern Arizona University
Northern Illinois University
Northland College
Northwest Missouri State University
Northwestern University
Ohio Wesleyan University
Occidental College
Ohio State University
Ohio University
Old Dominion University
Appendix B

STUDENT SURVEY

The American Geological Institute is conducting a brief survey of the professional employment pathways that geoscientists take through their career. To this end, we are interested in the areas that you expect to look for professional employment following completion of your education.

We would appreciate your considering the following questions. As a thank-you, we are holding two drawings from participant responses, one for a copy of the new 5th Edition of the Glossary of Geology, and another for a 1-year subscription to Geotimes magazine.

1. If you were considering professional employment today, what employment sectors would you seek employment opportunities in? Check all that apply
   a. State/Local Government
   b. Federal Government
   c. Environmental Industry
   d. Mining Industry
   e. Petroleum Industry
   f. Academia
   g. K-12 Education
   h. High-Technology/Communications
   i. Finance
   j. General Business
   k. Other
   l. Look outside of geosciences

2. What is the current degree you are pursuing? BA/BS  MA/MS  Ph.D.

3. What year do you expect to graduate?

If you wish to be entered in the drawing, please provide us your Email address
ADVISING SURVEY

The American Geological Institute is conducting a brief survey of the professional employment pathways that geoscientists take through their career. To this end, we are interested in the areas that students would be advised to look for professional employment following completion of their education.

We would appreciate your completing the following questions. As a thank-you, we are holding two drawings from survey responses, one for a copy of the new 5th Edition of the Glossary of Geology, and another for a 1-year subscription to Geotimes magazine.

If you are or were to be advising students about professional employment, which employment sectors would you recommend that they actively consider? Please check all that apply.
   a. State/Local Government  
   b. Federal Government  
   c. Environmental Industry  
   d. Mining Industry  
   e. Petroleum Industry  
   f. Academia  
   g. K-12 Education  
   h. High-Technology/Communications  
   i. Finance  
   j. General Business  
   k. Continue Education/PostDoc  
   l. Other  
   m. Look outside of geosciences

2. What is the highest degree offered by your department? BA/BS  MA/MS  Ph.D.

If you wish to be entered in the drawing, please provide us your Email address