Careers for Graduates of SES
(emphasis on geosciences careers)
What Careers Might be Possible?

Careers using your technical knowledge and skills directly

• education
• energy industry
• engineering firms
• environmental consulting firms
• government agencies
• insurance and investment
• media
• mining industry
What Careers Might be Possible?

Careers using your technical knowledge less directly

Business
Law
Media
Medicine
Public policy
Statistics for atmospheric and space sciences

(doesn’t include teaching professors) from Department of Labor
Aquatic Sciences Careers

• Job opportunities in aquatic science exist for individuals with all levels of education. Employers include State and Federal government offices and laboratories, public policy universities, industries, magazines, book publishers, television, radio, legal firms, and environmental societies.

In general, there is more competition for jobs in marine biology than there is in aquatic physics, math, modeling, chemistry and geology.
Aquatic Sciences Careers

• Earnings depend on educational background, experience, assigned responsibilities, area of specialization, the size, type, and geographical location of the employing institution, and years of service. An individual with a bachelors degree and no experience may find employment with the federal government at GS-5 (current range is $25,347 to $32,952) to GS-7 (current range is $31,397 to $40,818) levels, depending on college grades. Those with a Ph.D. degree generally earn from $40,000 to $90,000 per year, and can be more than $100,000/year for senior scientists or full professors.
Atmospheric scientists hold about 8,800 jobs in the United States. An additional several hundred people teach atmospheric science and related courses in college and university departments of meteorology or atmospheric science, physics, earth science, or geophysics.

Federal Government is the largest single employer of civilian meteorologists, accounting for about 37 percent. The National Oceanic and Atmospheric Administration (NOAA) employs most Federal meteorologists in National Weather Service stations throughout the Nation; the remainder of NOAA's meteorologists work mainly in research and development or management. The U.S. Department of Defense employs several hundred civilian meteorologists. In addition to civilian meteorologists, hundreds of Armed Forces members are involved in forecasting and other meteorological work. Others work for professional, scientific, and technical services firms, including private weather consulting services; radio and television broadcasting; air carriers; and State government.
Focus on Some of the Technical Careers

ergy industry:
  ✓ Geologists, geophysicists, geochemists work in exploration and production of hydrocarbons, and in environmental management

engineering firms:
  ✓ hydrologist/hydrogeologist; geoengineer; oceanographer

environmental consulting:
  ✓ hydrogeologist; biogeochemist; geophysicist

education:
  ✓ K-12 teaching; college or university research & teaching; informal education (museums)
Focus on Some of the Technical Careers

government agencies:
  ✓ U.S. and state geological surveys; NOAA; NCAR; EPA; BLM; national park service; forest service; state environmental conservation; state oil/gas regulatory agencies; etc
  ✓ hydrologist/hydrogeologist; geologist/geophysicist/geochemist; atmospheric scientist; physical oceanographer; biological oceanographer

media:
  ✓ broadcast meteorologist; science writer

mining:
  ✓ geologist; biogeochemist; hydrogeologist
Competitive Starting Salaries for Geoscience Graduates

Starting Salaries for New Geoscience BS or BA, 2007

Most Bachelors recipients employed by environmental and hydrology industry

Average first-year salary (in 2007) $31,366

Comparison to other science B.S./B.A. recipients’ 2007 starting salaries:
  • Chemistry $32,500
  • Life Sciences $31,258

American Geological Institute
14 December 2007
## Competitive Starting Salaries for Geoscience Graduates

### Starting Salaries for New Geoscience Masters, 2007

<table>
<thead>
<tr>
<th>M.S.</th>
<th>Average Salary</th>
<th>Median Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Gas</td>
<td>81,300</td>
<td>82,500</td>
</tr>
<tr>
<td>Environmental Firm</td>
<td>47,500</td>
<td>45,500</td>
</tr>
<tr>
<td>Any Government</td>
<td>46,200</td>
<td>45,000</td>
</tr>
</tbody>
</table>

### Starting Salaries for New Geoscience PhDs, 2007

<table>
<thead>
<tr>
<th>Ph.D.</th>
<th>Average Salary</th>
<th>Median Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postdoc – Academe</td>
<td>43,100</td>
<td>42,000</td>
</tr>
<tr>
<td>Postdoc - Government</td>
<td>55,200</td>
<td>53,000</td>
</tr>
<tr>
<td>Potentially Perm. Academe</td>
<td>51,900</td>
<td>52,500</td>
</tr>
<tr>
<td>Private Sector</td>
<td>72,600</td>
<td>71,000</td>
</tr>
</tbody>
</table>
College Graduate Workers in Petroleum Industry

Petroleum Workers: Field of Highest Degree

- Business: 34%
- Engineering: 19%
- Geosciences: 11%
- Geosciences - Science: 5%
- Geosciences - Engineering: 6%
- Other: 22%
- Liberal Arts: 4%
- Marketing: 2%
- Math: 1%
- Policy: 1%
- Science: 6%

American Geological Institute
Geoscience Currents, No. 10, 2008

National Survey of College Graduates, 2003
2007 salaries for geoscientists in the petroleum industry

2007 Geological Salary Survey

<table>
<thead>
<tr>
<th>YEARS EXPERIENCE</th>
<th>HIGH</th>
<th>AVERAGE</th>
<th>LOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>$95,000</td>
<td>$82,800</td>
<td>$58,000</td>
</tr>
<tr>
<td>3-5</td>
<td>145,000</td>
<td>107,800</td>
<td>80,000</td>
</tr>
<tr>
<td>6-9</td>
<td>153,000</td>
<td>121,100</td>
<td>99,000</td>
</tr>
<tr>
<td>10-14</td>
<td>155,000</td>
<td>119,800</td>
<td>100,000</td>
</tr>
<tr>
<td>15-19</td>
<td>185,000</td>
<td>151,600</td>
<td>101,000</td>
</tr>
<tr>
<td>20-24</td>
<td>260,000</td>
<td>167,400</td>
<td>134,000</td>
</tr>
<tr>
<td>25+</td>
<td>200,000</td>
<td>162,800</td>
<td>130,000</td>
</tr>
</tbody>
</table>

Average Salary by Degree

<table>
<thead>
<tr>
<th>YEARS EXPERIENCE</th>
<th>B.S.</th>
<th>M.S.</th>
<th>PH.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>$72,300</td>
<td>$86,600</td>
<td>$95,000</td>
</tr>
<tr>
<td>3-5</td>
<td>91,000</td>
<td>97,500</td>
<td>145,000</td>
</tr>
<tr>
<td>6-9</td>
<td>99,000</td>
<td>134,500</td>
<td>105,200</td>
</tr>
<tr>
<td>10-14</td>
<td>102,000</td>
<td>120,000</td>
<td>155,000</td>
</tr>
<tr>
<td>15-19</td>
<td>101,700</td>
<td>172,500</td>
<td>134,900</td>
</tr>
<tr>
<td>20-24</td>
<td>157,000</td>
<td>159,000</td>
<td>202,500</td>
</tr>
<tr>
<td>25+</td>
<td>164,500</td>
<td>159,800</td>
<td>176,700</td>
</tr>
</tbody>
</table>
College Graduate Workers in Mining Industry

Mining Workers: Field of Highest Degree

- Geosciences: 23%
- Geosciences - Science: 12%
- Engineering: 11%
- Business: 33%
- Other: 14%
- Science: 4%
- Policy: 1%
- Math: 4%
- Marketing: 5%
- Liberal Arts: 5%

American Geological Institute
Geoscience Currents, No. 10, 2008

National Survey of College Graduates, 2003
College Graduate Workers in Basic Research in all U.S. Sectors

3% geosciences

American Geological Institute
Geoscience Currents, No. 10, 2008

National Survey of College Graduates, 2003
Is a Science of Earth System/Geological Sciences Graduate a common or rare species? (How many of you are competing for employment?)

American Geological Institute
Geoscience Currents, No. 6, 2008
In eyes of industries that need to hire geoscientists, you ARE a rare species!

from October 2008 GSA convention

AAPG International Conference and Exhibition, October 2008

P5. Perspectives on an Emerging Workforce Crisis in Geology: Assessing a Looming Irony

John Holfbrook and Kevin Bohacs, Presiding

<table>
<thead>
<tr>
<th>Paper #</th>
<th>Start Time</th>
<th>Title</th>
<th>Authors/Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>121-1</td>
<td>8:00 AM</td>
<td>Anatomy of a Department Closure: When Workforce Needs and Administrative Priorities Meet the Worst Case Scenario</td>
<td>HOLBROOK, John and LOWELL, Gary. Dept. of Earth and Environmental Sciences, The Univ of Texas at Arlington, TX 76019-0249, <a href="mailto:holbrook@uta.edu">holbrook@uta.edu</a></td>
</tr>
<tr>
<td>121-2</td>
<td>8:15 AM</td>
<td>Supply and Demand Vectors of the Next Generation Geoscientists</td>
<td>KEANE, Christopher M., American Geological Institute, 4220 King St, Alexandria, VA 22302, <a href="mailto:keane@agiweb.org">keane@agiweb.org</a></td>
</tr>
<tr>
<td>121-3</td>
<td>8:30 AM</td>
<td>The 21st Century Geoscience Workforce: Global Opportunities and Challenges in the Energy Industry</td>
<td>SUMMA, Lori L., Supervisor, Global Geoscience Recruiting, ExxonMobil Exploration Company, P.O. Box 4778, Houston, TX 77210-4778, <a href="mailto:lori.l.summa@exxonmobil.com">lori.l.summa@exxonmobil.com</a> and LOUDIN, Michael O., Manager, Global Geoscience Recruiting &amp; Development, ExxonMobil Exploration Co, 2333 Benman Dr, Houston, TX 77092</td>
</tr>
<tr>
<td>121-4</td>
<td>8:45 AM</td>
<td>Cultivating the Next Generation Geoscience Workforce - The View from NSF</td>
<td>KARSTEN, Jill and PATINO, Lina C., Directorate for Geosciences, National Science Foundation, 4201 Wilson Blvd, Arlington, VA 22230, jkarsten@ NSF.gov</td>
</tr>
<tr>
<td>121-6</td>
<td>9:00 AM</td>
<td>Perspectives on An Emerging Workforce Crisis in Geology: Assessing a Looming Irony - the Minik Perspective</td>
<td>Game Demo: FREEMAN, Leigh W., General Manager, Downing Teal Inc, 650 S Chen Street, Suite 525, Denver, CO 80248, <a href="mailto:Lfreeman@downingteal.com">Lfreeman@downingteal.com</a></td>
</tr>
<tr>
<td>121-6</td>
<td>9:15 AM</td>
<td>The Academic Dimension of a Geoscience Workforce Crisis</td>
<td>FEISS, P., Geoffrey, Office of the Provost, College of William and Mary, The Brafferton, P.O. Box 8795, Williamsburg, VA 23185, <a href="mailto:pgfiel@wm.edu">pgfiel@wm.edu</a></td>
</tr>
<tr>
<td>121-7</td>
<td>9:30 AM</td>
<td>Consulting Engineering Geology Workforce Crisis: Making Do and Limiting Liability</td>
<td>KEATON, Jeff R. and MUNRO, Rosalind. MACTEC Engineering and Consulting, Inc, 5650 E Sloston Ave, Los Angeles, CA 90040, <a href="mailto:rmunro@mactec.com">rmunro@mactec.com</a></td>
</tr>
<tr>
<td>121-8</td>
<td>9:45 AM</td>
<td>Thoughts on the Future of Higher Education in Public Research Institutions, with Particular Reference to the Rocky Mountain West</td>
<td>PARRISH, Judith Totman, Dept. of Geological Sciences, Univ of Idaho, P.O. Box 443022, Moscow, ID 83844, <a href="mailto:jaertotman@uidaho.edu">jaertotman@uidaho.edu</a></td>
</tr>
<tr>
<td>121-9</td>
<td>10:00 AM</td>
<td>The Future GeoEnvironmental Workforce - Will There Be Enough Talent?</td>
<td>POWERS, Richard M., BCI Engineers &amp; Scientists, Inc, P.O Box 5487, Lakeland, FL 33807-5487, <a href="mailto:powers@cbcieng.com">powers@cbcieng.com</a></td>
</tr>
<tr>
<td>121-10</td>
<td>10:15 AM</td>
<td>Geoscience Departments and the Workforce: Bringing Together Student Interests and Industry Needs</td>
<td>MANDUCA, Kathryn A., Science Education Resource Center, Carleton College, 1 North College St, Northfield, MN 55057, <a href="mailto:cmanduca@carleton.edu">cmanduca@carleton.edu</a>, MACDONALD, R., Houston, College William &amp; Mary, P.O Box 8795, Williamsburg, VA 23187-8795, FEISS, P., Geoffrey, Office of the Provost, College of William and Mary, The Brafferton, P.O. Box 8795, Williamsburg, VA 23165, RICHARDSON, Randall M., Department of Geosciences, University of Arizona, Gould Simpson 251T Tucson, AZ 85721-0077, BRALOWER, Timothy J., Department of Geosciences, Pennsylvania State University, 503 Dake Building, University Park, PA 16802, BYLES, Carolyn H., School of Geogical and Earth Sciences, McMaster University, 1280 Main Street West, Hamilton, ON L8S 4K1, and CARLAND, Carol J., Science Education Resource Center, Carleton College, Northfield, MN 55057</td>
</tr>
<tr>
<td>121-11</td>
<td>10:30 AM</td>
<td>Career Paths for the 21st Century Geologist - Petroleum Industry Trends, Technologies and Challenges</td>
<td>YIELDING, Cindy, BP, 200 WestLake Park Blvd, Houston, TX 77079-2604,</td>
</tr>
</tbody>
</table>

Petroleum industry workforce challenges are clear. Some 55 percent of oil and gas industry personnel are within 10 years of retirement and the industry faces a 10- to 15-percent deficit in skilled manpower by the year 2010. This is a critical concern with regard to executing the mega-projects required to meet global petroleum demand. To address these concerns, a special forum will convene Monday afternoon during the conference. The forum will be organized in two parts. First, panelists will frame their key issues and proposed solutions in 10-minute opening statements. Second, a moderated discussion will take place wherein panelists will expand on their issues and proposed solutions to assure availability of an adequate workforce. An outstanding group of experts with broad understanding of the petroleum industry and geoscience workforce issues will participate in the forum.
In eyes of industries that need to hire geoscientists, you ARE a rare species! therefore, excellent opportunities

✓ to gain first employment
✓ to be paid a high salary, even as a starting employee
✓ to select between multiple job offers
✓ for internship positions, which will allow you to make informed choices
✓ for advancement

Trickle-down effects: if industry is hiring large percentage of graduates, those of you who don’t want industry jobs will find little competition for positions in other employment sectors.
Aside: Why are the numbers of students who selected a Geoscience major so variable through time?

IN 2007 IN USA
< 2000 MS+PhD
~2700 B.A./B.S.

American Geological Institute
Geoscience Currents, No. 6, 2008
Why were enrollments so variable?
Number of jobs available was influenced by prices of natural resources.

U.S. Energy Information Administration
http://tonto.eia.doe.gov/dnav/ng/hist/n9190us3m.htm
Will a close tie of resource prices to number of employed geoscientists remain true during your career?

Yes, to some extent. National and international economic trends are tied to prices of natural resources, and those economic trends influence employment in all sectors.

No, to some extent. With global population growth, greenhouse gas issues, scarcity of water resources, and fossil fuels costly, geoscientists who understand the Earth System will be needed in many new employment niches.
Degree necessities for common career choices:

Energy industry: M.S. or Ph.D.

Hydrogeology: M.S.

Environmental consulting or engineering firms:
   B.S./B.A. for a field sampling position;
   M.S. for broader responsibilities

K-12 teaching: teaching credential

College or university teaching: Ph.D.

Media: B.S./B.A; M.S.

Government agency:
   B.S./B.A. (few);
   M.S./Ph.D. (wide variety of responsibilities)

Mining -- M.S. for exploration; B.S. to sit a drill rig and describe core

*Those with PhD’s work in all of these fields.*
What about College & University Geoscience Faculty Positions?

Roughly 800 of the nation’s Geosciences faculty members will retire in the next 10 years – you could replace them!

American Geological Institute
Geoscience Currents, No. 12, 2008
How do you get one of those Geoscience Faculty Positions?

Necessity: PhD degree

Troden Paths
Go directly from BS/BA to MS/PhD degree, then
• industrial work experience for a few years, or
• post-doctoral work experience for 1-3 years, or
• directly to faculty position at a teaching-focused college

Earn MS,
• then work a few years, then return to graduate school with
  set of experiences to draw from to earn PhD
• may or may not need a time of post-doctoral experience

Roughly 800 of the nation’s Geosciences faculty members will retire in the next 10 years – you could replace them!
Career Choices of *Recent* EAS BS/BA graduates

*Immediately* after graduation, Classes of 2001-2004

Geological Sciences & Science of Earth System*
  
  Graduate study 42%
  Employment 42%
  Other 16%

Atmospheric Sciences\textsuperscript{T}
  
  Graduate School 34%
  Employment 43%
  Other 23%

*81% reporting
\textsuperscript{T} 70% reporting
Long Term Career Choices of EAS
BS/BA, MS & PhD graduates

Long-term career activities

Geological Sciences
Oil & Gas 34%
Hydrology and Environmental Geology 32%
Government 27%
Education 45%

Atmospheric Sciences
Professional meteorology 77%
Education 18%