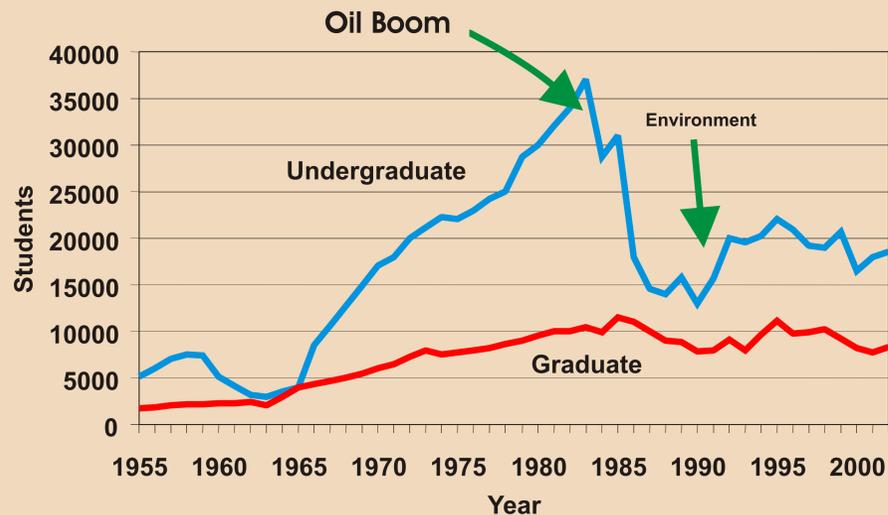


Metrics of Geoscience Disciplinary Health

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1. Historical Drivers in Geoscience Enrollments

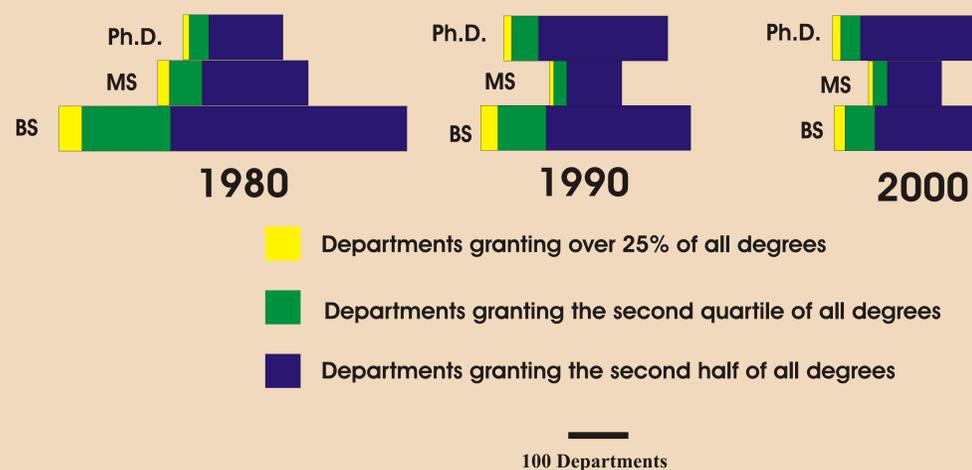
What are the historical drivers of geoscience enrollment. Through most of the tracked history, the health of the extractive industries was key students responded rapidly to perceived job opportunities. With the collapse of the petroleum and mining markets in the 1980s, two avenues entered into the geosciences environmental studies and theoretical or "pure" geoscience (ala plate tectonics). These were bolstered by a recession in the early 1990's, only to have been built on false pretenses. The geosciences now have a disconnect between the nature of the produced student and employment opportunities which has led to diversification of employment opportunities, and thus driven the geosciences nearly into lock-step with the other physical sciences. However, the fortunes of all sciences and engineering are under substantial pressure given the dot-com drain and a substantial decrease in reliance of science for economic growth, rather a focus on technology and its applications.



3. Departmental Diversity Issues

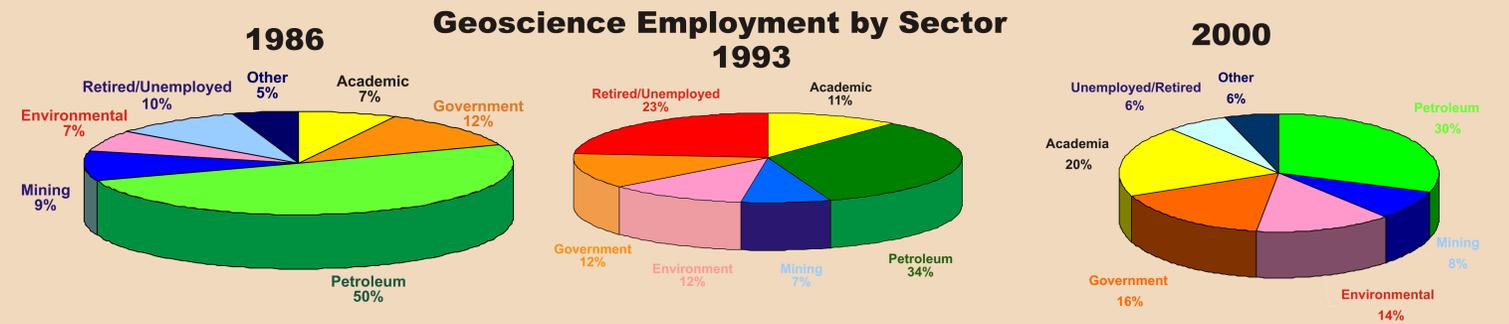
Since 1980, the diversity of departments granting the majority of the geoscience degrees in the United States has fallen sharply. Most significant is the contraction of departments actually granting thesis-based Master's degrees. At the Bachelors and Master's level, fewer than 50% of all departments grant a degree in a given year. At the Doctoral level, this rate is much higher, approximately 75%.

Source: GeoRef, AGI Departmental Surveys



2. Historical Drivers in Geoscience Employment

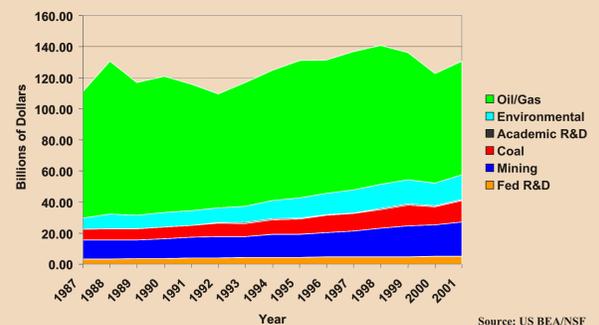
Employment has historically responded just like enrollments (actually the other way around!) The extractive industries drove nearly 50% of employment, but following the collapse in the 1980's dropped to current levels around 30% of total employment. Government, environment and academia actually remain smaller players in the employment field. Of particular note is the static state of environmental employment of geoscientists. This is largely driven by the fact that geoscientists are best trained to address site characterization issues and not the actual remediation process. After the initial surges of SuperFund projects in the 1980s and early 1990s, most major characterization efforts are now complete, leaving limited opportunities for new job growth for geoscientists. This is further complicated by the leverage the engineering community has gained against the geoscientists through licensing requirements, often leaving engineers with no geoscience background approving the work of the geologists on a project. Continued resistance within the geoscience community to broad licensing and the almost certainly required academic department certification has spelled poor long-term prospects for the geosciences in the environmental sector. Today we are not finding the best geoscience graduates that are willing to pursue non-academic careers are moving either into the petroleum industry (35%) or non-geoscience specific high-tech fields (24%). However, this must be tempered at the Ph.D. level with over 50% of newly minted geoscientists now pursuing Post-Does, with over half perceiving a poor job market and no desire to pursue job opportunities outside of academe.



4. The Geoscience Economy

One metric which AGI is beginning to analyze is the potential for a "Geoscience Economic Indicator." One can work through the data used to develop the Gross National Product and isolate many of the geosciences primary functions which result in economic activity. The largest issue in this discussion is the complexities of scaling, as can be seen in the chart.

The Geoscience Economy



Discipline	Job Growth Rate (2000-2010)
Medical scientists	4.5
Biomedical Engineering	2.9
Atmospheric/space scientists	1.5
Health and safety Engineering	-4.4
Agricultural/food scientists	-5.0
Astronomers/physicists	-5.0
Biological scientists	-5.0
Chemists	-5.0
Conservation scientists	-5.0
Environmental scientists	-5.0
Foresters	-5.0
Geoscientists	-5.0
Hydrologists	-5.0
Materials scientists	-5.0
All other physical scientists	-5.0
Agricultural Engineering	-8.7
Aerospace Engineering	-9.1
Chemical Engineering	-9.2
Petroleum Engineering	-9.6
Mechanical Engineering	-10.1
Nuclear Engineering	-10.2
Mining and geo Eng	-10.3
Natural sciences managers	-13.4
Civil Engineering	-15.4
Materials Engineering	-16.4
Industrial Engineering	-17.5
Marine Engineers Engineering	-19.4
All other engineers	-20.7
Engineering managers	-22.3

Source: Federal Science & Engineering Outlook (2003)

5. The Future of the Geosciences

The US Department of Commerce does not provide a pretty picture of the future of the sciences in the U.S. Just like many manufacturers of the previous generation, automation is cutting at the core of employment opportunities in the sciences. The geosciences are not spared this problem. Likewise, the geosciences faces a growing global workforce for the resources industry, a mature and stable environmental sector now dominated by engineering companies, and a declining commitment in science research funding by government. These structural problems will require substantial creativity to be overcome by the discipline. Many of the sciences are moving to Professional Science Masters programs and are retooling their undergraduate programs to be more "liberal science" in order to provide a strong, general education in the framework of their discipline.