UNIVERSITY OF WYOMING

**College of Arts and Sciences**
Dept. 3254• 1000 E. University Avenue• Room 114, A&S Building • Laramie, WY 82071
Phone (307) 766-4106 • fax (307) 766-2697 • e-mail: asdean@uwyo.edu • www.uwyo.edu/as

29 July 2016

**MEMO**

**TO:** Kate Miller
Provost/VPAA

**FROM:** Paula M. Lutz
Dean, Arts and Sciences

**RE:** Program Review for Geology & Geophysics' B.A. in Geology and Earth Sciences—Dean's recommendation

The B.A. in Geology and Earth Sciences has had 4-5 graduates per year over the past five years, with eighteen majors at present. This degree is currently required for the subject matter degree in secondary education/Earth Science but there have been no students in that program in the last five years.

The curriculum in this program overlaps with other degrees in the department. There are no required courses for this B.A. that are not also required for their other degrees. In that sense, it is 'no cost.' This is the 'less quantitative' option for a bachelors in G&G. It does maintain the link with secondary education and selective double majors (business/economics, pre-law).

The Department of Geology & Geophysics has one of the top research programs at UW and an excellent national ranking based primarily on graduate research ($2.5M/year in external funding over the past five years). Their primary undergraduate degree, the B.S. in Geology, is strong. Could these B.A. students do as well in the B.S. in Geology curriculum and achieve their goals? How many bachelors degrees should the department run with its heavy focus on research and graduate work?

Although this is a 'no-cost' program, three bachelors programs in this department seem unnecessarily complex to administer and advise. It is the Dean's recommendation that the department examine its three bachelors programs and create several options or tracks within the B.S. in Geology that would encompass these B.A. students and the B.S. in Environmental Geology and Geohydrology.

ACADEMIC PROGRAM REVIEW – GEOLOGY & GEOPHYSICS

1. *Program*: BA – Geology & Earth Sciences

2. *Level*: Undergraduate

3. Department of Geology & Geophysics, College of Arts & Sciences

4. *Head*: Paul Heller, 766-3386, heller@uwyo.edu (modified by acting head Carrick Eggleston, carrick@uwyo.edu, 307-233-2312

5. *Program productivity*:

A. The program has been on the books for many years. Over the past eight years it typically has 15 to 18 students enrolled in it, with about five to eight students graduating every year (Figure 1). The program is also required for students in the secondary education program concentrating in earth sciences. I do not have that data.

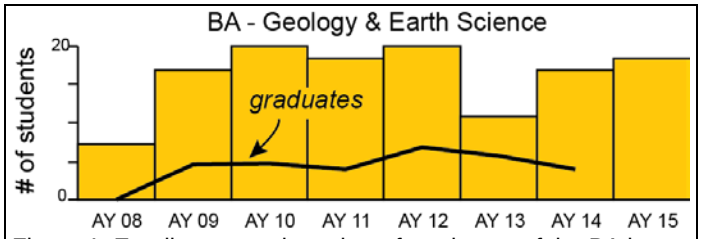

Figure 1. Enrollments and number of graduates of the BA in Geology and Earth Sciences in the past 8 years. Data from OIA and registrar's office.

B. The program has 18 majors at the present time (Figure 1). Our long-term expectation is that, at this enrollment, we will graduate about 4-5 students/year.

6. P*rogram quality*:

A. There is no accreditation in this field.

B. Credentials of Faculty:

| Name | Status | Highest Degree | Discipline |
|---|---|---|---|
| Erin Campbell-Stone | APL | Ph.D. | Geology |
| Brad Carr | APR | Ph.D. | Geophysics |
| Michael Cheadle | Faculty | Ph.D. | Geophysics |
| Po Chen | Faculty | Ph.D. | Geophysics |
| Mark Clementz | Faculty | Ph.D. | Geology |
| Ellen Currano | Faculty (25%) | Ph.D. | Geology |
| Janet Dewey | APR | M.S. | Geology |
| Ken Dueker | Faculty | Ph.D. | Geophysics |
| Carrick Eggleston | Faculty | Ph.D. | Geochemistry |
| B. Ron Frost | Faculty | Ph.D. | Geology |
| Carol Frost | Faculty | Ph.D. | Geochemistry |
| Dario Grana | Faculty | Ph.D. | Geophysics |
| Paul Heller | Faculty | Ph.D. | Geology |
| W. Steve Holbrook | Faculty | Ph.D. | Geophysics |
| Robert Howell | Faculty | Ph.D. | Planetary Sciences |
| Neil Humphrey | Faculty | Ph.D. | Geology |
| Barbara John | Faculty | Ph.D. | Geology |
| John Kaszuba | Faculty | Ph.D. | Geochemistry |
| Subhashis Mallick | Faculty | Ph.D. | Geophysics |
| Brandon McElroy | Faculty | Ph.D. | Geology |
| James Myers | Faculty | Ph.D. | Geology |
| Andrew Parsekian | Faculty (75%) | Ph.D. | Geophysics |
| Cliff Riebe | Faculty | Ph.D. | Geology |
| Bryan Shuman | Faculty | Ph.D. | Geology |
| Ken Sims | Faculty | Ph.D. | Geochemistry |
| Susan Swapp | APR | Ph.D. | Geology |
| Ye Zhang | Faculty | Ph.D. | Geology |

II. *Demographics:* In terms of ethnicity, I am unsure what you mean. But if you are talking about race, we have three Asians (including Indian) and the rest are white. The faculty is 74% male and 26% female.

III. *Grants*: OIA data, shown in Figure 2, only goes through 2013. New grants in 2013 came to $1,334,899.

C.

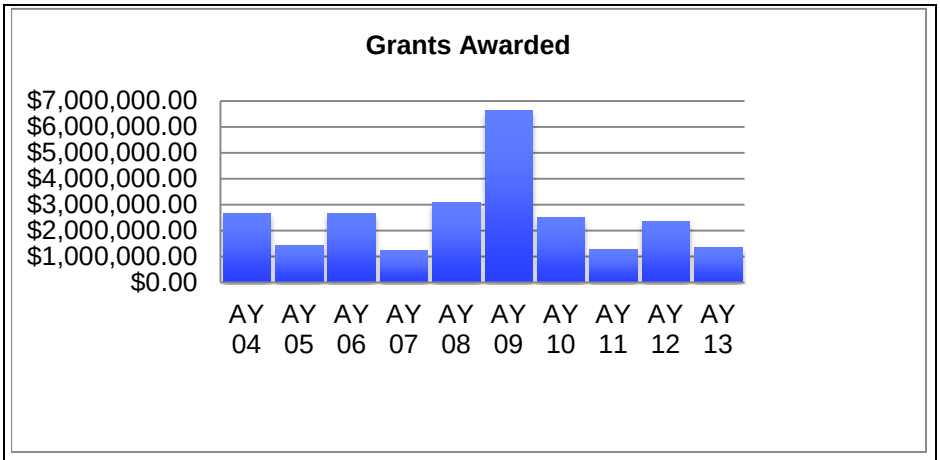


Figure 2. Annual grants awarded to the Dept. of Geology & Geophysics over past 10 years. Data from OIA.

*Program Reputation*:

I. Our department has been ranked 42 (second quartile) in the most recent (2014) U.S. News and World Report ranking of Earth Sciences departments. This is tied with Purdue University, University of Miami and University of Utah.

II. This year we had 301 applicants to our graduate program, a number that has slowly been increasing. Based on past years records, of these we will interview c. 25-30. Of those we will likely make c. 15-20 offers. Our recent history indicates that between 50-75% of students who are made offers will accept.

On the undergraduate side, enrollments both nationally and at the University of Wyoming (Figure 3), follow the price of a barrel of oil. Our long-term trends follow national trends for undergraduates, but have an increasing trajectory compared to national trends.

D. *Curriculum*: BA in Geology and Earth Sciences

**Required:** Any Geol. 1000-level class; Geol 2000 (Geochemical Cycles); Geol 2010 (Mineralogy); Geol 2020 (Petrology); Geol 2080 (Field Geology); Geol 2100 (Stratigraphy and Sedimentation); Geol 4820 (Capstone); Life 1010 (General biology); Chem 1020 (General Chemistry I); Phys 1110 (General Physics); Math 1405 (Trigonometry) or Math 1450 (Algebra/Trig). **Plus six of the following:** Atsc 2000 (Meterology) or Geog 3450 (Weather and Climate); Econ 2400 (Economics of the environment); Geog 3010 (Landsforms and soils); Geol 2050 (Principles of Paleontology); Geol 2070 (Oceanography); Geol 3005 (Principles of Geophysics); Geol 3400 (Geologic Hazards); Geol 3500 (Global Change); Geol 3600 (Earth and Mineral Resources); Geol 3650 (Energy: A geological perspective); Geol 4444 (Geohydrology);

Geol 4490 (Geochemistry); Geol 4610 (Structural Geology and Tectonics); Geol 4835 (Applied/Exploration Geophysics); Pols 4051 (Environmnetal politics and admin); Soil 4120 (Genesis, morphology, classification of soils); Econ 4400 (Environmental economics) or Econ 4410 (Natural resource economics). **Plus:** 12 hours of electives with advisor consultation, at least 6 hours of which must be taken outside of the Dept of Geology & Geophysics.

E. Only offered on main campus.

F. *Quality of Assessment Plan*: BA in Geology and Earth Sciences Program.

Assessment of our Bachelor's degrees are all centered on mathematical competency – all of our undergraduate students to become more mathematically literate. We have added more computational and quantitative components to our course work and so we expect to see an improvement in student competency during their time in our program. To monitor student improvement we administer a math exam to our students in a required sophomore level class (Geol 2000) and in a required senior class (Geol 4280). The test includes questions in 14 categories.

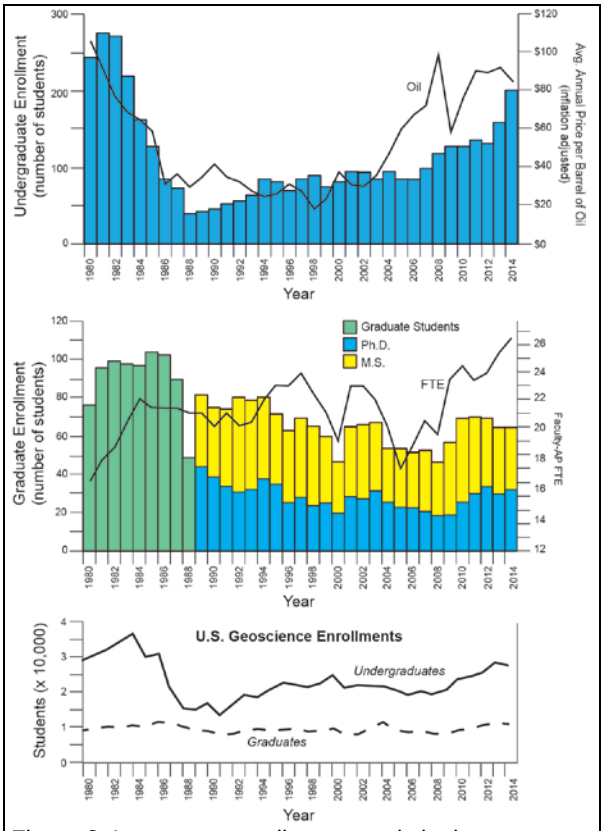


Figure 3. Long-term enrollment trends in the Department of G&G since 1980. Top: Undergraduate enrollment compared to price per barrel of oil (adjusted for inflation) (2014 data from department numbers). Middle: Graduate enrollment compared to number of FTE faculty positions (including APs). Bottom: U.S. geoscience enrollment trends. Data comes from OIA, UW Catalogs, American Geologic Institute and *inflationdata.com*.

G. *Strategic Plan*:

This program was first created back when UW did not have any environmental science offerings. It fulfilled several functions. Firstly, the BA program is less mathematical than our BS programs and allowed more courses to be taken from outside our department. The program is intended for students who do not seek to become professional geologists, but instead are interested in careers where some Earth Science expertise is needed along with other strengths. These might include BLM or Forest Service jobs, along with jobs in compliance. A good example is environmental compliance jobs in our state's energy industries; auther CME has visiting coal mines with a compliance officer who needs to understand policy, Earth Science, some reclamation biology, and company operations simultaneously. Students in this major might also be looking for a career that requires a basic working knowledge of geosciences so that they could digest and communicate geology to the general public (e.g., national parks). BA

majors might also work for government land planning offices, secondary education, or be involved in synthesizing various disciplines needed in writing environmental impact statements done by geological consulting agencies. Students might take the degree as a double major – such as with economics, if they wish to go into energy business – or as a pre-law degree if they want to go into environmental law.

The BA in Geology and Earth Science is also a path taken by some students in secondary education following the Earth Science Education/Geology program. These students are effectively double majors. We have had some problems with how the program was being administered in the College of Education, however, and we are seeking to revamp both the BA degree program (see below) as well as its relationship to the CoE secondary education program. It is worth reiterating that we have high school geoscience classes in our state, and others, and that a secondary education aspect of the program should not be ignored.

I want to emphasize that we are in the midst of rethinking the purpose and specifics of this degree program. We had decided last year to revamp the BA this year; at present, the idea that has gained traction among the faculty is to make this a non-calculus but "more-math" pathway; that is, instead of requiring calculus, we would require statistics and other quantitative courses more suited to the target student audience and less to the "straight science" requirements of professional geologists. By revitalizing the BA degree program in this way, we also hope to focus the program toward its target student audience and thus attract a few more students into the BA. Until we complete the restructuring, we anticipate that there will continue to be about 20 students a year moving through the program, with a graduate rate of five to eight per year. The program has no required courses that are not also required by our other degrees. As such, removal of the program should not have any savings impact in terms of elimination of under-enrolled classes that are only taught because they are required by this degree alone.

7. *Mission Centrality* –

Our BA in Geology and Earth Sciences feeds directly into UW's STEM initiatives, including both the UW Science and Engineering Initiatives. We view the degree as being more integrative than our BS degrees, and so is suitable for students to work in geoscience-related fields, other than professional geologist. These include: secondary education, land planning, environmental consulting and environmental and energy law and business. Finally, the program supports Environment and Natural Resources Program.

Academic Program Review: **Geology BA Geology & Earth Sciences**

**Section 8 – Cost**

a) Ratio of student credit hours per FTE (AY 2014/15): **270.3**

b) Direct instructional expenditures (FY 2015): **$3,822,890**

i) Per student FTE: **$16,344**

ii) Per total degrees awarded: **$109,225**

iii) Non-personnel expenditures / total academic FTE: **$8,834**

c) Course enrollment (AY 2014/15)

i) Classes falling under university minimums: **4**

ii) Lower-division courses falling under university minimums: **0**

e) Research expenditure per tenure-track FTE (FY 2015): **$95,046**