

# MEMO

**TO:** College of Arts & Sciences Academic Affairs Committee  
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**FROM:** Department of Earth Science

**DATE:** 15 Apr 05

**RE:** Response to G&ES Challenge of B.A. in Environmental Geoscience

## Challenge 1: Program duplication

“The proposed program duplicates the current ESCI major and overlaps with the Environmental Studies major in G&ES.... The proposal states that some of their students would like to study the environment more broadly, but still with a solid geological grounding. [They] can already do this, by taking an Environmental Studies major... [and] a minor in ESCI...”

### ***Response to challenge that the proposed program duplicates the existing ESCI program:***

The proposed program is designed for students who want to study Earth Science, but have different career goals from our B.S. students, and therefore wish to obtain a more liberal education in the geosciences, with an emphasis on environmental issues.

Many institutions nationwide offer both B.S. and B.A. degrees in the various sciences, including Chemistry, Physics, Biology, Geology/ Earth Science, and the more specific Environmental Geoscience. Relevant to the present discussion are those programs offering both B.A. and B.S. degree options either in Geology / Earth Science or in Environmental Geoscience. We specifically compared other institutions that offer both a B.A. and B.S. degree option for science programs, as well as those offering only the B.A. option. The survey revealed clearly that for science B.A. degree options, the requirements are similar to the B.S., but with fewer cognates and supporting sciences than the companion B.S. degree, thereby allowing students more flexibility for additional courses that complement their goals. The two programs are not generally designed to be entirely different, but rather as different *degree options* for students with different career and/or academic goals.

***Two key differences*** distinguish the existing B.S. in Earth Science from the proposed B.A. program. Both relate to the nature of a Bachelor of Arts degree. First, the proposed program requires completion of a minor. This is not true of the B.S. program, which instead requires the completion of 25 hours of supporting science and mathematics courses, effectively precluding the student from taking a formal minor.

The second key difference is the larger number of elective requirements for the B.A., most of which must be chosen within the area of environmental geoscience. Many courses in the existing ESCI program are—and long have been—within the field of environmental geoscience. A side-by-side comparison of the existing B.S. to the proposed B.A. degree option ([Appendix A](#)) reveals the clear and marked differences between the programs.

**Response to challenge that the proposed program overlaps the Envi. Studies program:**

The challenge indicates that an Environmental Studies major + ESCI minor is equivalent to our proposed B.A. On the contrary, the proposed B.A. program in Environmental Geoscience is not a replacement or substitute for Environmental Studies, and the courses, requirements, and outcomes overlap very little if at all. A side-by-side comparison of the two program options (Appendix B) demonstrates the significant divergence.

Further, the B.A. program in Environmental Geosciences is not for students who want to, in general, “study the environment more broadly,” as the challenge document suggests. The challenge posits this as our goal, but does not accurately reflect the proposal. *The proposed program is for students who want a solid foundation in the discipline of environmental geosciences, so that this knowledge can be used in other careers (or for other academic interests), rather than in the professional practice of geoscience.* Note that “Environmental Geoscience” is *not* the same as Environmental Studies, nor is it the same as Environmental Science. Environmental Geoscience is a field unto itself—an area of specialization within Geology / Earth Science. This is clearly evident from the existence of peer-reviewed journals published in this specific area of study, including:

- *Environmental and Engineering Geoscience*, published by the Association of Engineering Geologists (now undergoing a name change to the Association of Engineering **and Environmental** Geologists)
- *Environmental Geology*, published by Springer
- *Environmental Geosciences*, published by the American Assoc of Petroleum Geologists

Justifiably, there long has existed some overlap between the programs in G&ES and ESCI: both programs, after all, are related to our connection with the earth. The focus in G&ES, according to published catalogue descriptions of the programs and courses, is on issues of population, policy, planning, and management. The focus in ESCI, however, is on earth materials and earth processes, and the scientific investigation of these.

## **Challenge 2: Program lacks necessary breadth**

A. “[The proposed program] does not provide the necessary breadth students will need to prepare them for the potential careers referred to by the ESCI proposal.”

**Response:** We do not claim to completely prepare students specifically and directly as lawyers, businesspeople, journalists, or politicians. The individual student would choose a minor or second major to help them with specific career or academic interests, *or* would continue their education/training (for example, in law or medical school) after their undergraduate degree. They may receive academic advising on their chosen career in consultation with appropriate departments or through the dean’s office’s pre-law or pre-health initiatives.

Multiple paths may lead to the same career. For example, some (but not all) students interested in environmental law enter law school with a solid understanding of a *specific* area of study, such as environmental geoscience, to bring a wider set of skills to that field. Students interested in international development, science journalism, or regulatory careers related to minerals and health require more depth of understanding of earth materials and processes as these relate to the environment.

B. “To give students knowledge of the environment and working approaches to solutions of environmental problems, a multidisciplinary, problem-oriented major is needed.”

**Response:** Geoscience by its nature, and the environmental aspects of geoscience even more so, are problem-oriented, multidisciplinary studies which promote critical thinking. In addition, a strong working knowledge of earth science, particularly if focused on the environmental geoscience areas, in itself constitutes “knowledge of the environment” which is a tool for developing “solutions [to] environmental problems.”

The National Science Foundation, in its *Directorate for Geosciences*, has this to say about specific knowledge of earth science as a means for addressing environmental problems:

“The knowledge gained and the services provided by earth scientists help society cope with its environment in many ways. Their knowledge about the structure and chemical composition of the earth’s crust helps us locate resources that sustain and advance our quality of life.

“Understanding the forces in the crust and the natural processes on the surface allows us to anticipate natural disasters such as volcanoes and earthquakes, and reduce their damaging effects on civilization.

“Observing civilization’s negative impacts on geologic environments, such as damaging mining practices or improper waste disposal, gives us information to correct such practices and design more benign procedures for the future.

“Finally, a comprehensive perception of planetary physics will allow us to anticipate major changes in global environmental conditions and control or acclimate to those changes.”

Environmental problems are indeed complex, and it is true that approaches from many fields are necessary. It is not necessary, however, for one person to have direct knowledge/ training in all of those fields. What is needed are people who have knowledge in specific areas and who also are able to work with and relate to people with other types of expertise.

In fact, information from “The Complete Guide to Environmental Careers in the 21<sup>st</sup> Century”, published by the Environmental Careers Organization, confirms that “people who combine science with non-science degrees (e.g., law, business, communications, and policy) are extremely competitive in all sectors.” Charlie Anderson, vice president of a national consulting firm told job seekers at a 1998 workshop that, “We prefer people with science and engineering backgrounds. We like to know that they have a strong technical base.” The report urges interested students to combine interdisciplinary work within a traditional science major. “A person with a B.S. in chemistry may take many of the same courses as an environmental science graduate, however when the time arrives to look for a job, the person is a chemist and that still counts for something.”

### **Challenge 3: Program does not meet the stated goals**

A. “The proposal suggests that a single 300-level major course will suffice” for students to meet performance criteria ... “to write a meaningful scientific paper.”

**Response:** This is a misreading of the proposal, which does not suggest that a student’s learning outcomes from the proposed program will be met by a single 300-level course. The assessment

plan (already in place in the ESCI program) includes a *student portfolio* as the instrument of assessment to measure success of the program. The portfolio requirement for “a scientific paper OR paper/ project applying principles of Environmental Geoscience to another discipline” *may be met, it is suggested*, by a paper/ project produced in “any 300-level major or minor course...” Note that the program requires far more than “a single 300-level course.”

B. “The proposed program will not be able to meet performance criteria with a community service project without a multi-disciplinary background...[and] courses in a non-science discipline”.

**Response:** It is quite possible for our students to engage in community service projects without multidisciplinary academic training. They already can and do engage in such activities. Moreover, “community service project” in our proposal refers only to one suggested—not required—vehicle for students to produce the required portfolio element.

C. “Without taking social science courses beyond General Education requirements, students will not be able to make informed decisions about land use, the use of resources, and the environment.”

**Response:** The challenge assumes that we wish to train students to make decisions on issues related to population growth and/or redistribution. If this were the case, the challenge’s assertion might have some validity: we do not expect to educate students in this area. But a degree in Environmental Geoscience *will* prepare a student to address the *geological aspects* of land use, resource development, and impact on the environment that are geologically related.

D. “The proposal provides no evidence that the proposed degree will prepare students for multiple careers or life-long learning.”

**Response:** Agencies including the National Science Foundation, the National Research Council, and others have reaffirmed the value of studying Earth Science. The geosciences require dealing with large systems and incomplete data sets, which develops critical thinking skills; this is an important component of fostering life-long learning.

The Environmental Careers Organization statements support our position that a B.A. in Environmental Geoscience (with similar requirements to its companion program, the B.S. in Earth Science, but with a specific focus on the environmental aspects of the science and with more flexibility for student options) will be favorably viewed by potential employers in a variety of environmental areas. This liberal arts & sciences degree is designed to give a solid foundation in the discipline of environmental geosciences, while allowing students to combine their interest in this discipline with their intentions for any of a wide variety of careers.