

External Review

**Geology Program
Department of Geosciences and Natural Resources
College of Arts and Sciences
Western Carolina University**

February 8, 2008

Reviewers

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I. Introduction

a. Visit by the Review Team

The external members of the review team arrived late Thursday afternoon, February 7, and departed Saturday morning, February 9.

b. Meetings Conducted by the Review Team

Thursday evening:

- Dinner with several members of the geology faculty

Friday:

- Brief meeting with Mark Lord, Head of Geosciences and Natural Resources
- Breakfast meeting with Provost Carter
- Meeting with the geology faculty
- Meeting with Dean Ford and Associate Deans Butcher and Michelsen
- Tour of facilities conducted by Mark Lord
- Lunch meeting with students and alumni of the Geology Program
- Meeting with untenured geology faculty
- Meeting with the entire geology faculty
- Meeting with Melissa Margo, Director of Office of Assessment
- Work meeting for members of the review committee
- Dinner meeting with several members of the geology faculty
- After dinner work meeting for members of the review committee

II. Analysis of Program

The courses and requirements of the geology program are traditional. However, other geology programs at different universities commonly have more requirements, such as attendance at a summer field camp, and a year of chemistry, a year of physics, and a year of mathematics beyond college algebra and trigonometry. Clearly the WCU Geology Program has reduced the required hours relative to many other programs. This reduction in requirements may cause problems for students when applying for graduate school, but is beneficial for recruiting geology majors, student scheduling, graduation rates, and timely graduate for students.

The exceptional teacher/scholars who constitute the geology faculty are the program's major asset. They are active researchers who are committed to the teacher-scholar model and engagement with their students. The opportunities for student research range from the required capstone course to individual faculty members encouraging students to join them on their research projects. Students remarked that they enjoyed reading research papers, doing research, and making presentations.

Class sizes, from introductory courses to courses for majors, are small, and students commented that they enjoy the small classes and the individual attention they receive from the faculty. The students feel that the faculty truly care about them. Due to infrequency of course offerings or inadequate advising, on some occasions students took courses without the proper prerequisite courses. But even then, students remarked that the faculty gave them extra help so that they could make it through the courses. Because most of the majors' courses have few prerequisites and faculty are willing to help students who enroll in their courses without adequate prior coursework, students are able to graduate in a timely manner. Most of the students who graduate from the department successfully enroll in graduate school or obtain employment in the field. Overall, the program seems to be right on target with the mission and goals of the university.

III. Analysis of Faculty

a. Qualifications

The members of the Western Carolina University geology faculty are exceptionally well qualified for their positions. Unlike some regional universities, Western Carolina's geology faculty members have diverse educational backgrounds and experiences. The institutions represented by the doctorates are geographically extensive, represent a range of sizes, and include both public and private universities. When degrees at all levels are considered, the 8 tenure-track faculty members hold degrees from 16 different institutions. At least five faculty members have professional experience outside of academia. They have worked for state and federal geological surveys, with the petroleum industry, in national government laboratories, for the military, and in private business. Members of the faculty have worked on projects throughout the country and in a number of places around the world. This range of experiences can only have a positive impact on their teaching.

b. Resources and Support

Processes and procedures for rank, tenure, and promotion decisions - The Department of Geosciences and Natural Resources Management has produced a set of guidelines and procedures for the annual evaluation of faculty, their tenure, promotion, and reappointment. Although we find these guidelines clear, the program's untenured faculty members expressed concern about both the expectations of them and the process. These concerns appear to be linked to a recent case in which an untenured person was not reappointed. In addition, they sense a change in priorities at the institutional level and are uncertain about how these changes will be implemented. Furthermore, no tenure decision has been made in the Department during the time that any of the currently untenured professors have been on the faculty. A level of apprehension is always present for untenured faculty and the concerns expressed by the geology faculty do not appear to be particularly acute.

The two outside reviewers do observe that having two formal reviews each year seems excessive and does little to quiet the untenured faculty's concerns. With an annual review and a formal reappointment review every 12 months, personnel policies and practices are never far from their minds.

Library holding and access - The number of journal subscriptions for the discipline is minimal. Major sub-disciplines are unrepresented (e.g., sedimentology) and several major journals (e.g., the Transactions of the American Geophysical Union) are missing. The absence of such journals would be of greater concern if the geologists had a graduate program. In addition, some of the shortcomings are addressed by electronic access to journals and interlibrary loan, both of which are said to be excellent. These resources allow the faculty necessary access to current research sufficient to pursue their own scholarship.

Access to lab space and technological and other resources - When the newly renovated space is opened the Geology Program will have truly excellent laboratory space, far better than all but a few undergraduate programs and equal to many programs offering master's degrees.

Control over use of the space is an issue. Apparently a number of the new laboratories can be assigned to classes outside the Department by the registrar. Geological research typically involves samples of earth materials, maps, images, and other graphical material that cannot be gathered up at the end of each day without sacrificing efficiency. Furthermore, research laboratories often contain instruments and other apparatus that should not be disturbed.

The only space deficiency noted was the lack of a room for use as an undergraduate workspace. Few undergraduate students spend the amount of time in their departments that geology students do. Whether studying mineralogy or petrology specimens or collaborating on structural geology assignments, good geology students spend many hours in their department. This is not only where they work on their projects, but also where they bond to their major, the faculty, and to each other.

The possibility of a graduate program was a topic in nearly every discussion the reviewers had with the programs faculty, students, and college and university administrators. Whether the graduate degree was in geology or included several programs under the general umbrella of environmental science, the new facilities available to the geology faculty will be one of the program's major assets. No doubt some space would need to be reconfigured somewhat for graduate student offices and research labs, but that should not be a significant problem.

One area of the university's operations that is seen as a problem for the faculty's research effort is the Office of Research Administration. The general sentiment seemed to be that the ORA provides little in the way of service and frequently was more of a stumbling block. PIs report that they must recreate internally the records that should be maintained by this office in order to have accurate budget data. The external reviewers are aware of

similar complaints at other institutions where research has not been historically a major part of the campus culture. Given how active the geology faculty has been in securing external funding, they have had a greater opportunity than many faculty members to encounter problems.

c. Teaching, Research/Creative Activity, and Service

Teaching - The most valuable evidence of quality teaching was found in what the students and alumni had to say about their professors. Without exception, those who met with the external reviewers were pleased with their educational experiences within the Geology Program. They praised the faculty for the extraordinary amount of time they are willing to spend with students.

The close connection between faculty and students is in some part a result of the small size of most of the upper division classes. None of these classes had an average enrollment larger than 22 students in Fall 2006. Classes of this size are essential for the faculty to conduct the goal of using research projects and inquiry based learning.

The untenured faculty expressed some concern about the course load distribution. The data provided in Appendix 4.3 show, for example, that during the most recent semester reported (Fall 2006) the student credit hour production was distributed as follows:

Tenured faculty (4)	304 SCH	19%
Untenured faculty (4)	731 SCH	46%
Not tenure track (1)	546 SCH	35%

These figures must, however, be considered in light of the fact that three of the four tenured professors have significant administrative assignments.

An issue for every member of the faculty is the lack of recognition for the time devoted to directing undergraduate research.

Research/Creative Activity - The faculty members' professional competence is attested to by their record of publication and their ability to attract external funding to support their research programs. The eight members of the faculty have produced more than 130 peer reviewed journal articles, books, and monographs. Papers presented at professional meetings number in the 100s. Data in Appendix 4.2 documents nearly \$2,000,000 in awards since 2002. A quick review of the faculty CV's indicates that during their careers, the total amount of grant funding probably exceeds \$5,000,000. Furthermore, with the single exception of the newest member of the faculty, every one has received some externally funded support for their research.

Service - A review of the CVs included in the appendix produced an impressive list of service activities distributed among the geology faculty. Service activity occurs at the department, college, and university levels. All members of the faculty serve as academic

and research advisors for their majors. Professional service accomplishments are scattered throughout the faculty.

IV. Analysis of Operational Facilities and Budget.

As noted above the facilities that the program has to meet its educational mission are exceptional! On the other hand the budget is woefully low in its support of the program. By way of comparison, the budgets for the Department of Geosciences and Natural Resources at Western Carolina University, the Department of Geology and Geography at Georgia Southern University, and the Department of Geology at Grand Valley State University, all strictly undergraduate departments, are shown below.

	WCU	GSU	GVSU
Size	14 faculty*	13 faculty* 1 lab coordinator 1 part-time adjunct	10 faculty* 3 staff** 2 part-time adjunct
Operational	\$15,851	\$38,715	\$41,804
Faculty Travel	4,000	7,800	9,500
Student Support	1,700	6,240	13,928
Equipment		9,000	4,500
Total	\$21,551	\$61,755	\$69,732

* tenure track

** affiliate faculty, lab coordinator, visiting faculty

V. Summary of Program Strengths and Suggestions for Improvement

a. General Impressions of the Program

The Geology Program is an outstanding program in which the faculty have developed a teacher-scholar model with a research capstone requirement for all students. This is an excellent fit for the QEP. The faculty have developed a strategy of teaching/research that emphasizes environmental geology and surficial processes, have helped establish the recently-founded “Institute of Watershed Research and Management”, have very successfully obtained large amounts of external funding, and have a superb publication record, all in part because of this strategy. This, in turn, has allowed the faculty to work very successfully with undergraduate students involving them in meaningful research

projects that result in most students presenting at professional meetings and, ultimately, obtaining employment in the field.

The success of this time-intensive, teacher-scholar model hinges on the dedicated, dynamic faculty who spend countless hours working with the students on investigative projects in the classroom, laboratory, and field. These efforts have paid off as evidenced not only by the success of their students and alumni, but also by the high esteem in which they hold the faculty.

b. Areas of Strength

- Excellent, energetic faculty who are very involved in investigative teaching and research with students.
- Faculty have an outstanding publication record, especially for an undergraduate program.
- Faculty have been very successful in obtaining external funding, especially for an undergraduate program.
- Faculty have an excellent rapport with students.
- Outstanding facilities, especially in terms of teaching and research laboratories, but also in terms of equipment and instruments.
- All students do research as their capstone experience and most give presentations at professional meetings.
- Students obtain in-depth training in environmental geology/hydrology.
- Engaged, successful students, most of whom attend graduate school or obtain employment in the field.
- Loyal, successful alumni.
- A strategy in which the faculty have specialized in environmental geology/surficial processes, allowing them to accomplish much of the above.
- WCU is in an excellent location for a geology program with abundant field opportunities at its doorstep.

c. Suggestions for Improvements

Recruiting More Majors - Although the faculty have made great progress in increasing their majors, they may be able to improve the numbers by trying a number of initiatives:

- Increasing the number of students in stimulating, introductory courses
- Making titles of introductory geology courses sound more exciting rather than descriptive, especially for the "Methods" course
- Consistently sending a young, dynamic "recruiter" into introductory courses
- Encouraging (via extra credit?) introductory students to attend talks given by alumni or other dynamic speakers during Earth Science Week or other appropriate times
- Using geology majors as recruiters
- Developing an AP exam and working with local earth science teachers (preferably alumni) who will funnel students to the WCU Geology Program
- Providing a small scholarship to high school students who enroll at WCU and major in geology.

Curricular Changes – Although the faculty have developed a strong curriculum, it could be strengthened in a number of ways to more closely match that of the majority of geology departments across the nation (see attached paper):

- Work to educate the administration that geology is by its very nature an encumbered major requiring many credits of mathematics and cognate sciences in order to properly prepare students for admission to graduate school and for a professional career in geology.
- Work to educate the administration in regards to typically low student/faculty ratios in elective geology courses nationwide. For example, at Grand Valley State University elective courses like geochemistry and geophysics typically have 4-5 students in them.
- Either require a year of mathematics beyond college algebra and trigonometry, a year of chemistry, and a year of physics, or more strongly and clearly recommend each for graduate-school-bound students. Although this recommendation is stated on the degree check sheets, students report that they do not understand their importance until they apply for graduate admissions.
- GIS should be emphasized as an important skill for all geology majors. GIS should be listed as a suggestive elective in the geology concentrations. The university should consider creating a formal minor in GIS, a program that would be worthwhile for students in many disciplines.

- Require a field geology course (of the kind typically taught during the summer), at least for the Solid Earth Concentration. This would not only strengthen that concentration, but it would also help differentiate it from the Environmental Hydrology Concentration. Currently there is no real difference between the two. If the field geology course is not required for both of these concentrations, it should be more strongly and clearly recommended for graduate-school-bound students.
- In order to help finance students to go to field camp and provide other scholarships, endowed scholarship funds should be established. However, even without such funding, we note that WCU tuition is very low and that most of the students graduate with little to no debt compared to the majority of university students across the country. If the students must take out a student loan to pay for a field geology course, that is not too much to ask since it is an investment in their future.
- Require students taking courses without the proper prerequisites to do remedial study rather than take time out of courses to review materials.
- Work with registrar to assure that students are not allowed to take courses for which they do not have the appropriate prerequisites.
- Make students aware of summer research opportunities, internships, field camps, graduate school, and job opportunities using as many venues as possible (website, e-mail, postings in area where students congregate, class announcements). Repeatedly encourage them to apply.
- A graduate (master's level) program in environmental science should be seriously considered. The geology program has the facilities and most (but certainly not all) of the faculty needed to contribute to such a program. If a M.S. degree is developed, assure that all faculty are comfortable with the decision. Consider carefully the effects of a M.S. program on the undergraduate program.

Additional Resources – The faculty have done an outstanding job obtaining external funding, but some areas of the program warrant additional resources.

- To facilitate support of the QEP, the budget needs to be increased dramatically for this department of 14 active faculty members. Increased funding for travel to professional meetings and transportation for student field trips is especially needed.
- The geology program needs a technician to care for the field equipment, instrumentation, and laboratory supplies. These are essential functions that are now performed by faculty with no reward and at a real cost to the time available for instruction and scholarship.
- Find new transportation arrangements (a bus) to permit field trips. Current restrictions on van use impose a significant burden on personnel to have enough qualified drivers for field trips.

- Work with administration to obtain funding to pay undergraduate teaching assistants to help in labs and keep specimens and equipment organized. This is excellent experience for the students and will help free up valuable faculty time for other tasks.
- Work with the administration to establish funding that provides summer stipends for undergraduate researchers.
- Provide a centrally located room where geology students can congregate; post graduate school, field camp, internship, and summer research opportunity announcements; keep their belongings such as research project materials and books; and study and work on class projects together.
- In order to better support the teacher-scholar model, provide geology majors access via key cards to the building, student work space, and necessary laboratories so that the students can do their course work and research after hours.
- IT needs improvement - faculty should receive new computers on a three-year rotation.
- Work with the administration to develop a system by which faculty receive credit or compensation for the substantial amount of time they spend advising undergraduates doing research projects, a fundamental part of the program's curriculum. Guidelines that other schools use may be obtainable from surveys made by members of the Council on Undergraduate Research (CUR).
- Especially the untenured faculty should investigate the benefits of becoming active in CUR as it can be an excellent aid for obtaining funding and other resources.

Outreach and Assessment – Although the faculty do utilize their alumni somewhat and have an assessment plan in place, these areas could be strengthened in a number of ways:

- Maintain closer contact with alumni (newsletters, picnics, conferences, e-mails, website) and make better use of them (fund raising, advisory committee, internships, guest speakers/recruiters, assessment).
- Add a Senior Survey for graduating students to the assessment plan already in place.
- Assess research capstone with before and after questions/survey on research methodology and professional goals, as well as surveys of alumni 2, 5, and 10 years out.
- Take advantage of the "Building Strong Departments in the Geosciences Program" operated by the Science and Education Resource Center at Carleton College. This program is a particularly valuable source of information about what other programs are doing with assessment issues.

VI. Summary of Recommendations

Although we listed numerous items the faculty could undertake in order to make an already strong program even stronger, we have four major recommendations:

(1) increase the number of majors, which will allow the offering of upper-level courses more frequently and remove most of the problems students now face in planning a logical path through the curriculum and still graduating in a timely manner; (2) for at least graduate-school-bound students, increase required cognate mathematics and science courses and require field camp in order to alleviate some of the students' problems in applying to graduate schools; (3) increase funding, mostly from the administration, but also tap funding sources such as alumni to set up endowed scholarship funds; and (4) better utilize alumni for a variety of purposes and strengthen the assessment plan.