Final Report - 1998
Academic Program Review
Department of Geology

1. Review Process

The Department of Geology prepared a Self Study following program review guidelines. An External Review Committee visited the campus, reviewed the Self Study documents, and interviewed the Geology Department’s personnel, students, and University administrators. The External Report and the Self Study were reviewed by the Program Review Committee. This document reflects the Program Review Committee (PRC) findings and recommendations.

2. Highlights of the Self-Study

2.1. The Department and Its Mission

The Department of Geology's primary missions are to provide the highest quality undergraduate and graduate education; to advance research and scholarship in the geological sciences; and to provide service to the profession, university, and community.

2.2. The Faculty and Its Organization

At present, the faculty of the Department consists of nine full-time members, three members on Supplemental Retirement Program (SRP), and one full-time temporary member. The Vice-Provost for Undergraduate Studies and Dean of Undergraduate Studies is also a Professor in the Department but does not have a teaching commitment to the Department. Two of the faculty have a 50% commitment because of joint appointments with the Center for Materials Science; one has a 25% commitment because of a joint appointment with Environmental Studies (ENVS); and the Chair has a 50% teaching commitment because of his administrative responsibilities. Thus the total current FTE instructional faculty is 9.75. The rank distribution of the nine full-time faculty, who all hold doctorate degrees, are two Full Professors, three Associate Professors, and four Assistant Professors. Four are tenured and five are on tenure-track status. There is good balance in the age distribution of the full-time faculty. Two of the tenured or tenure-track faculty are female.

During the period from 1989 to 1998, faculty losses due to retirements and resignations totaled eight, while faculty gains totaled six. Considering that three retired faculty are still on SRP, the Department will have regained their pre-1989 faculty numbers, although this is still below the 12 FTE recommended by the external reviewers in the previous Five-Year Plan.

The Department’s structure is a traditional one, with a Chair, a Curriculum Committee, a Promotion and Tenure Committee, a Merit Committee, an Honor and Awards Committee, and an Assessment Committee. There is, however, no Advisory Committee to the Chair.
2.3. Staff

The current staff of the Department consists of a Secretary 2 and a Staff Geologist. At the start of the evaluation process there was a Typist 2, who has retired and has not yet been replaced. The Department has made use of work-study students, but this solution was ineffective because of mixed quality of work. It should be noted that there is no staff member whose primary responsibility is maintaining the varied computer and laboratory equipment of the Department. The maintenance of the computer equipment have been done by the staff geologist and faculty.

2.4. Program Offerings and Interdisciplinary Commitments

The Department offers the Bachelor of Science (BS) and Bachelor of Arts (BA) in Geology, and three specializations at the Bachelor's level in Paleobiology, Geochemistry, and Geophysics. Each of these specializations is suited for students who plan on a professional career in geology or who intend to pursue graduate studies. With the possible exception of the Paleobiology specialization, which is the only one in the nation, the undergraduate degree programs are not well known at the national level. Furthermore, the BA degree is underutilized because of its similarity with the BS degree. One of the goals proposed in the Self Study is to restructure the BA degree program to make it more appealing to students with different interests. At the graduate level, the Department offers a Masters of Arts in Teaching (MAT) and a Masters of Science (MS) in Geology. The latter program is considered unique because of its emphasis on geographic information systems (GIS) and remote sensing aspects in environmental geology, and possesses excellent computational facilities. The MAT degree program was not discussed in detail in the Self-Study.

The Department is involved in interdisciplinary programs through teaching introductory and advanced Environmental Science courses, providing instructional and equipment support to the Center for Materials Science, and contributing to the Center for International Programs by serving as a data repository and by providing GIS and remote sensing expertise.
2.5. Students and Curricular Aspects

Demand and Employment

Instructional demand for Geology courses remains high, especially in the introductory courses. SCHs have increased from 6300 in 1993-94 to almost 8600 in 1996-97. Geology expects that additional sections would fill. The limiting factors preventing them from offering additional sections are space as well as graduate students to teach the laboratory portions of these courses.

The total number of Geology majors is about 75, while the graduate student population is approximately 25. Graduates of the BS and BA programs generally pursue graduate studies in other universities, although those with strong computer and quantitative skills are able to find immediate employment. Among the graduate applicants, several took their undergraduate studies at BGSU. Graduates of the MS program generally find immediate employment, while a minority of them pursue a Ph.D.

Assessment

The Department has an operational assessment program for the undergraduate and graduate students. Assessments are based on determining if students have acquired specified learning outcomes. For instance, the undergraduate majors are expected to have core knowledge in the geological sciences, and this is assessed through course grades, term papers, and selected projects from the six-week Field Geology course held in the Western US. They are also expected to gain quantitative (including computer) and communication skills, which are assessed through evaluation of reports, projects, and papers. In the assessment plan for the graduate program, the MS thesis serves as a primary vehicle for assessing the student’s general problem solving skills, general geologic knowledge, quantitative knowledge and communication skills.

One of the sources of materials for the assessment of undergraduate majors is the written reports from the six-week field camp course. Two major observed deficiencies of the students from these assessments are that (a) the students did not seem to make connections between the materials from different classes and had trouble integrating concepts across the curriculum; and (b) the quantitative and written skills were not up to the standards that the faculty desired. These deficiencies motivated a major goal of the Self Study, which is to develop and add sophomore-level courses in quantitative methods and communication skills.
Graduate Students

The Self Study reports difficulties in recruitment of graduate students due to graduate assistantship stipends that are not competitive with other schools. The Department argues that an increase in the amount of graduate stipends is necessary to attract and recruit more and better quality graduate applicants. In order to make their program more attractive to students, the Department intends to add a natural resources emphasis.

2.7. Resources and Cost/Revenue Analysis

The Self Study finds that: (1) By 1995, when the Department increased the total SCH taught, it began to rely on non-budgeted sources to cover operating expenses; (2) The Department's operating budget has not changed substantially over the evaluation period ($55,000 - $57,000, not including OBOR equipment funds or fees for field camp, which were included as “income” in Institutional Research figures), although equipment maintenance costs have increased; (3) New faculty hires require start-up funds averaging $40,000/hire, with this amount currently shared equally by the Department, the College, and Research Challenge; (4) Compared to national figures, faculty salaries are low. Furthermore, salary compression is leading to faculty dissatisfaction; (5) University support for computer maintenance has been minimal; (6) Because Geology’s classes are counted within the highest State subsidy class possible, the Department produces much more than it consumes’. The PRC notes however that the expenditures used by the Geology Department in their cost/revenue analysis did not include other support costs such as utilities, building maintenance, etc., and so was not persuasive.

2.8. Teaching Loads and Scholarly Productivity

Since 1990, the Department has offered an average of 905 SCH/FTE per year. Its faculty have also taught the first true distance learning course, and have received a Master Teacher Award and eight nominations for this award. The Self Study did not mention whether the Department has a differential teaching load policy, so it is not known if the teaching was distributed evenly among individuals. However, according to the Self Study, when compared with national data on Faculty Workload and Productivity, the overall teaching load of the Department’s faculty is more than the average teaching load of faculty in other Geology departments in the country in any classification grouping. During the same time period, the faculty published 98 refereed papers, which translates to approximately 1.5 per faculty per year. External funding over the same time period totaled $500,000. Service load for this department appears to be at an appropriate level for a masters’ level department.
2.9. Proposed “Five-Year” Plan

For reasons unclear to the PRC, the Geology Self Study produced a Five-Year Plan, rather than a Seven-Year Plan as called for. The primary focus of the Department’s Five-Year Plan is the undergraduate program. Second-level priorities are the graduate program and community outreach. The changes and goals in the undergraduate program are: (1) to improve student recruitment and retention by modifying introductory laboratory courses; (2) to improve students’ quantitative and communication skills by instituting sophomore-level courses focusing on those skills; and (3) to develop an integrated curriculum emphasizing an Earth System Science philosophy. The revised curriculum would include three year-long sequences of core courses, one dealing with Mineralogy, Petrology, and Geochemistry; a second dealing with Sedimentology, Stratigraphy, Surficial Processes, and Geomorphology; and a third dealing with Structural Geology, Tectonics, and Geophysics; (4) greater faculty involvement in the core curriculum; (5) addition of a research component to the undergraduate program; and (6) revitalization of the BA degree by restructuring it to be more appealing to students with varied interests.

Motivated partly by changing societal needs, the Department proposes to introduce in the graduate program a natural sciences emphasis dealing with the exploration and management of natural resources such as water, petroleum, minerals, natural fuel, etc. This is a natural extension of the environmental science emphasis initiated in the previous Five-Year Plan. It will also take advantage of the strength in GIS, remote sensing, and information management, and will build upon the emerging emphasis in industrial minerals and materials science.

To be more effective in its mission of serving the University, the community, and the state, the Department intends to disseminate geoscience information on earthquakes using the Web and the seismic station. Databases related to the geosciences will also be made available through the Internet. Finally, the Department intends to develop outreach to the school system.

The Self Study proposes three faculty positions. The desired specializations of the proposed hires are Paleobiology / Global Change, Exploration Geophysics and Minerals Exploration / Mineral Economics. A network administrator is requested to maintain the Department’s computer systems and internal network. The Self Study requests an increase in the Department’s operating budget of approximately $10,000 per year to support undergraduate student research, and for equipment needs and maintenance. Finally, they request three additional half-time graduate assistantship positions, in addition to an increase in the amount of the graduate stipends.
3. Results of Previous Review

The primary objective of the previous review, which was initiated in 1989, was building an emphasis in Environmental Geology. This emphasis exploited the Department’s strengths in GIS, remote sensing, and computer applications. Of the specific recommendations made by the two external reviewers of that Plan, some have been fulfilled, such as the institution of the emphasis in environmental geology. A number of recommendations, however, have not been implemented. There has been no increase in the quality of the graduate students entering the program; the number of publications and external grants has not increased; the Department did not create an advisory or executive committee; and the Department has not provided evidence that it has implemented a system of differential teaching loads. The previous External Review Team also suggested that the University allow the Department to maintain a faculty strength of about 12 FTE, but since 1989 this target level has not been achieved.

4. External Review Findings

This year’s External Review Team found the Department was well-equipped relative to similar Geology departments, and had outstanding computer facilities. The External Review Team praised the faculty for their teaching, their commitment to liberal education, and for their innovative research. However, they also noted that research productivity varied among the faculty, and that proposal writing was low-to-average compared to similar departments in the country; at the same time the External Review Team recognized the existing difficulties in acquiring these highly competitive grants from federal agencies such as the National Science Foundation. They further noted that the Department’s strength in remote sensing and GIS could be exploited to improve the success of research proposals to external agencies. They also found that the Department had a strong and effective leader in the current Chair, and partly attributed the existing camaraderie and excellent working atmosphere to the Department’s leadership.

The External Review Team, which found the Five-Year Plan to be comprehensive, well done, realistic, and bold, was supportive of the three sequences in the majors’ curriculum, and made some minor recommendations for improvement. They consider the emphasis on GIS and remote sensing to be a strength of the Department. The External Review Team was supportive of the request for additional graduate student assistantships, as it was of the department’s request for new faculty lines. They went so far as to suggest an accelerated schedule for hiring. The External Review Team felt that the faculty positions currently shared with the Center for Materials Science and the Center for Environmental Programs were working satisfactorily, although they did not get a sense of enthusiasm from the faculty concerning these relationships.

With respect to the undergraduate curriculum, the External Review Team considers the field camp course in the western states a strong capstone to the program. They suggested creating an optional laboratory for GÉOL 101, and
were concerned about negative reports about GEOL 105 from students. They felt that laboratories were too large, at 23-25 students per laboratory class, and suggested that the Department look into the possibility of student internships in governmental agencies and businesses.

The External Review Team was supportive of the Department’s request for a computer technician and believes that just one secretary for this Department is too few. Finally, they found faculty salaries, especially at the junior level, were on the low range, and felt that if this problem is not addressed, it could lead to retention and morale problems.

5. Program Review Committee Determinations

The PRC recognizes the Department’s important contributions and strong commitment to liberal and geoscience education. The PRC also notes the Department’s contributions to interdisciplinary units in the University such as the Center for Environmental Programs and the Center for Materials Science, and note that this is an avenue for future development. The Department’s assessment program is more sophisticated than many on campus at this time, and was used very effectively to inform the Department’s Self Study. The PRC encourages the Department to continue its efforts in assessment, its tradition of having faculty teach introductory courses, and its plan to upgrade the research experience of undergraduates. The Department is perceived to have a strong and effective leader in its current Chair, who has helped create a positive work environment. The Department is well-equipped and possesses excellent computing resources.

However, the PRC also notes some potential problems in the Department, which must be addressed in order to continue and improve on the Department’s successes. Of considerable concern is that faculty research productivity and the level of external support are low compared to similar departments. Also, there are perceived deficiencies in some aspects of the curriculum. The PRC finds that the SCH production of the Department is not excessive. However, the PRC is concerned about potentially low faculty salaries and salary compression; faculty workload unrelated to their primary responsibilities such as maintaining computer equipment; unequal research productivity without commensurate rewards; departmental operating budgets; the number of graduate assistantship positions; the amount of graduate assistantship stipends; and the number of faculty FTEs.

The PRC finds the Self Study’s excessive focus on SCH production to be a detraction from the more important aspects of the Self Study, such as the proposed curricular changes in the undergraduate and graduate programs. Furthermore, the Cost/Revenue Analysis appears to be inaccurate because it did not take support functions into account (e.g. buildings and grounds, utilities, public safety, student services, etc.).

The Department’s relationship with the Center for Environmental Programs and the Center for Materials Science was not adequately addressed in the Self
Study. Also, the Self Study glossed over some curricular matters. For example, there was no discussion concerning the Masters of Arts in Teaching (MAT) program, and the possible impact of the proposed changes in the core courses on the undergraduate degree specializations was not addressed.

The Self Study could have provided more details in its description of the proposed changes in the undergraduate curriculum. For example, the proposed quantitative and communications skills courses were not described in detail, and it is not evident whether the Department explored if existing courses in other University units could satisfy these needs. Similarly, the proposed three year-long sequences were described in rather general terms. Would the Department do away with existing courses that deal with topics that are to be included in the one-year core sequences? Issues of timing of the sequences and credit for team teaching need to be addressed as well.

The PRC supports the External Review Team’s recommendation that students do internships in government and/or businesses. The PRC is also in agreement with the External Review Team’s suggestion for improvement of undergraduate courses. In particular, the conceptual content of GEOL 105 should be reviewed, and the possibility of offering a laboratory in GEOL 100 should be examined. Similarly, the PRC was persuaded by arguments in favor of a natural resources emphasis in the graduate program.

The Geology Department made good use of assessment in the program review process. The assessment process at the undergraduate level has some obvious strengths, including the field course. Assessment at the graduate level is not as far along.

The PRC finds the proposed hiring plan to be lacking in focus in terms of the research expectations of the proposed hires. A more thorough examination of the Department’s relationships with the Center for Environmental Programs, the Center for Materials Science, and some of the existing doctoral-granting departments in the University would be productive in setting an interdisciplinary context for the research specializations of the proposed hires. Such an interdisciplinary context would provide the program with a unique character, and more importantly, increase the chances of attracting top-notch quality faculty members. The fact that the Department does not have a doctoral program, and is unlikely to have one in the next seven years, is an unavoidable limitation. The PRC is of the view that the Department may not be in a prime position to attract faculty possessing high research potential and capable of competing successfully for external grants, unless the potential hires are given the opportunity of directing research of doctoral students. As a possible solution to this problem, the PRC recommends that the Department develop agreements with existing doctoral programs, allowing new (and continuing) faculty in Geology to direct dissertation research of students in the Biological Sciences, the Photochemical Sciences, or the collaborative doctoral program with the University of Toledo in Physics. Collaborations with the Materials Science Program and with the Environmental Programs are similarly encouraged.
The PRC finds the requested yearly increase of approximately $10,000 for the Department’s operating budget to be incompletely documented. The Department’s request for additional classroom spaces is also incomplete, and raises questions about space use in the department.

The PRC sees a need for regular research seminars. Such seminars will enhance faculty-student interactions, and encourage research activity among all constituents.

All indications are that the Geology Department possesses excellent equipment. The PRC sees a need for more detailed planning for equipment maintenance, replacement, and sharing. The Department should establish collaborations inside and outside the University to make specialized equipment available to other scientists.

The PRC deems the current program review cycle an opportunity for the Department to reexamine the appropriateness of forming an Advisory Committee to the Chair.

6. Recommendations

The PRC has reviewed the Self Study and the External Team Report and makes the following recommendations.

**Academic Year 1998-1999**

**Department**

1. Convert the Five-Year Plan into a Seven-Year Plan to make it consistent with the seven-year review cycle envisioned by the University. The revision should incorporate the suggestions and recommendations of the External Review Team and the PRC. The revised plan should be submitted to the Dean of the College of Arts and Sciences on or before the start of Spring Semester 1999. In the revision, particular attention should be given to the following issues:

   a) specific details in the proposed changes in the undergraduate program and the graduate program;

   b) impact of the curricular changes in the undergraduate program on the three undergraduate degree specializations;

   c) viability of the Master of Arts in Teaching (MAT) program, with a separate, written report to the Graduate Dean concerning recommendations for this program;

   d) details of the proposed quantitative and communications skills courses; and determining if other departments have existing courses that could meet the Department of Geology’s needs;
e) consideration of the possibility of internships for undergraduate and graduate students in business and government agencies;

f) focus for the research expectations of the proposed hires, including plans for collaboration with existing doctoral-granting departments in order to be able to direct Ph.D. work;

g) a detailed accounting of where the requested yearly increases in departmental operating budget will be utilized; and

h) timelines in the Plan to coincide with the seven-year period.

2. Design and implement appropriate corrective measures in GEOL 101 and GEOL 105. Specifically, the conceptual content of Geology 105 should be reviewed and alternative pedagogies should be considered. The feasibility of instituting an optional laboratory portion for Geology 100 should also be examined. The suggestion of the external reviewers to have sections for Geology 104/105 designated for “majors only” should also be considered.

3. By Fall 1998, the Department should meet with existing doctoral-granting units and/or Centers in the sciences to explore the possibility of allowing future Geology faculty hires to direct Ph.D. dissertations. Tenure of the proposed hires should reside in the Department of Geology. A preliminary plan for the research specialties of future hires, taking account of potential collaborative relationships, should be developed by Fall Semester 1999. Furthermore, the Department should explore avenues to improve its collaborative relationships with the Center for Materials Science and the Center for Environmental Programs.

4. Starting Spring semester of 1999, there should be a regular research seminar for faculty and graduate students.

5. Develop the first year-long sequence proposed in the Plan, for implementation by Fall, 1999. Furthermore, resolve the issues of timing and assigning of faculty credits pinpointed by the external reviewers.

6. The number of proposals for external research grants should increase.

7. The Department should develop a policy for assigning differential teaching loads in consideration of the research productivity of the faculty. Faculty with higher productivity should get lower teaching loads, and those with lower productivity should be assigned higher teaching loads. Such differential teaching loads should be assigned by Fall, 1999. The Department should furthermore incorporate in their Merit Document the process by which merit ratings will be assigned for faculty with different teaching loads.

8. The Department should work with the Dean of the College of Arts and Sciences and the Vice Provost for Technology and Chief Information Officer to resolve the existing problem in the Department of maintaining and managing the internal computer network. Satisfactory resolution of this problem will
release some faculty from performing maintenance work, and allow them to concentrate on their scholarly activities.

**College and University**

9. If the Department makes appropriate response to the above recommendations, the PRC recommends that the Dean consider the allocation of one tenure-track faculty position to the Department of Geology.

10. The PRC recommends that the Dean of the Graduate College consider allocating one additional graduate assistantship position to the Department of Geology, to begin Fall, 1999. This appointment would help achieve a “critical mass” in the graduate student population, and the additional student will assist in the teaching of introductory undergraduate courses.

11. Instruct the Director of Capital Planning to perform a space audit of the Department of Geology to determine the efficiency of space use, including laboratories, offices, and classrooms.

12. Subject to the Department being able to provide convincing justification, the College should consider an appropriate increase in the Department’s operating budget, to take effect on or before Academic Year 1999-2000.
13. Examine the appropriateness of having an elected Advisory Committee to the Chair. If deemed appropriate, the Department should amend the Department’s Governance Documents in time to have the Advisory Committee in place at the start of Fall Semester, 2000. The Department should also consider mechanisms for graduate students to consult regularly with the Chair concerning matters pertaining to the graduate program.

14. The PRC recommends that an analysis of faculty salaries be undertaken, including a consideration of the impact of salaries on the Department’s ability to attract and retain quality faculty. It is recommended that an analysis of individual faculty salaries relative to individual performance, market conditions, and individual career stage be undertaken, and that requests for appropriate market adjustments be made to the Dean of the College of Arts and Sciences. Given the potential importance of this on faculty retention, recommendations for adjustment should be made by the end of Spring Semester, 2000.

15. Evidence should be available that submission of external grant proposals have increased.

16. Depending on whether there are existing quantitative and communication skills courses available in other departments that will serve the needs of the Department of Geology, the Department should incorporate these courses or an equivalent “tools” course in the curriculum.

17. The first year-long core sequence should be introduced. The second year-long core sequence should be developed.

18. The Department should have evidence of an enhanced research productivity, either through submitted manuscripts and/or published papers. The research seminars in the Department should also be continuing.

19. The assessment plan should be evaluated and additional assessment activities should be undertaken, particularly at the graduate level, throughout the review period. Reports should be made yearly to the Dean and to the Vice Provost for Academic Affairs regarding assessment activities.

College/University

20. The Dean of the College of Arts and Sciences should examine the revised Seven-Year Plan. The Dean should develop recommendations, with an implementation timeline, based on the department’s revised plan.

21. The Dean of the College of Arts and Sciences, should examine the rationale and justification presented in the revised Seven-Year Plan for the requested faculty hires of the Department. Particular attention should be paid to the
intended research specialties of the proposed hires and whether they will collaborate with existing Ph.D.-granting departments, to determine the viability of granting the Department additional faculty positions.

22. The granting of additional faculty positions should be contingent on the faculty of the Department of Geology making good progress on the recommendations above, including evidence of actively seeking extramural funding.

23. The Dean of the Graduate College should study the issue of increasing the stipends of Graduate Assistants in the Department of Geology. We recommend that the Graduate Dean consult with the Department to decide on a funding level that is competitive with peer institutions.

**Academic Years 2000-2006**

**Department**

24. The Department should begin implementing the revised recommendations of the Dean, referred to in recommendation 20, above.

25. By Academic Year 2005-2006, the Department should commence its preparation for the next program review.

**College/University**

26. By Summer 2000 or Fall 2000, the Dean of the College of Arts and Sciences should study the requests for faculty salary adjustments which the Department should have submitted by Spring 2000, and subject to availability of resources, make the appropriate actions.

27. The Dean of the College of Arts and Sciences, in consideration of the justifications provided in the Revised Plan, and subject to available resources, should decide on whether to grant the request of the Department for two additional tenure-track faculty positions. These requests should be considered only if the faculty of the Department have provided evidence that it has responded appropriately to the recommendations in this report, including actively seeking extramural funding.

28. The Dean of the Graduate College, in consideration of available resources, and subject to the Department showing evidence of actively seeking extramural funding, should decide on whether to allocate two additional graduate assistantship positions to the Department. The timing of these allocations should be determined in the Revised Plan.

*The Department of Geology should report annually to the Dean of Arts & Sciences, with a copy to the Provost, on the implementation of these recommendations.*