MIAMI
UNIVERSITY
OXFORD OHIO

DEPARTMENT OF GEOLOGY

A Self-Assessment

submitted to the

Program Review Committee

October 10, 2003

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INTRODUCTION AND OVERVIEW

A Brief History of the Department

The subject of geology first found its way into the Miami curriculum as early as 1835 as a component of "Natural History" courses. The Department of Geology at Miami was established in 1920 and the first **B.A.** degree was awarded in 1922. The first **M.S.** degree was awarded in 1931, and a cooperative **Ph.D.** program with The Ohio State University was established in 1962. In the late 1960's the Department relocated to its current home in the then newly constructed Shideler Hall and established a stand-alone Ph.D. program. The first independent Ph.D. degree in Geology was awarded in 1972, the **M.A.** degree was begun in 1987, and the **B.S.** degree was introduced in 2002. Since 1920, the Department has had eight Chairs, and since 1996, three different individuals have borne that responsibility.

The Department, including the Doctoral Program, was last reviewed in the fall of 1996. Thus, **the current review covers academic years 1996/97 through 2002/03 (and corresponding fiscal years), including faculty and student scholarly contributions and funding successes from September 1, 1996 through September 1, 2003.** The Department has not had full-time tenured or tenure-track faculty presence on the Hamilton or Middletown branch campuses during this review period, but has maintained a full-time visiting faculty position on the Hamilton Campus since Fall 2001. The branch campuses offer all of the Geology Miami Plan Foundation courses; thus, data on these course enrollments are included in this review. In keeping with a new procedure for assessing Miami Plan contributions in concert with Academic Program Review, a Miami Plan Course Assessment document, focusing on data from the Oxford campus, is provided under separate cover.

Summary of 1996 Program Review

> "The Department of Geology is an excellent department demonstrating the balance between undergraduate and graduate program emphasis and teaching and research commitment that reflects the ideal that Miami University seeks to achieve in its doctoral departments."

The full reports of the 1996 Internal and External Program Review Teams are provided as an addendum to the appendices. Selected excerpts from these reports are included below in order to provide a context for the current review.

> "With the exception of the apparent conflict between the demands placed on the faculty by the Miami Plan for Undergraduate Education and their commitment to graduate education, most of the problems which came to the attention of the reviewers should be easily remedied."
>
> "Compared to other departments of comparable professional activity, the space available to the Department is small (about 2/3 of space available at WSU) and appears to be only marginally adequate for current research activities. It seems to us that there is a need to provide quality, readily accessible storage space on or near campus to free up more room for research activities."
>
> "The only question in the reviewers' minds concerning program viability has to do with the program's 'production' of Ph.D.'s being close to the State of Ohio's mandated (?) minimum. Note we address this issue only because it appears to be an issue and a benchmark in the statewide review process."
>
> "In comparison with other, comparable Ph.D. granting geology departments, the teaching loads of the Department faculty are quite high."

> "We urge the administration to consider some additional relief (as suggested below under Teaching Loads and Distribution) in order to effectively advance the graduate programs of the Department and to avoid faculty burnout."

Specific programmatic concerns expressed fall primarily in the following categories, with references to the sections of this document where we address these concerns.

- Upper-level undergraduate and graduate course offerings *[Program Quality]*
- Development of student writing and presentation skills *[Program Quality]*
- Formal undergraduate student advising *[Program Quality]*
- Student/Instructor ratio in Capstone field course *[Program Quality]*
- Graduate student recruiting methods *[Program Quality, Viability, Ph.D. Review]*
- Number of Ph.D. students *[Program Viability, Ph.D. Review]*

Department Missions

The Department's missions are broadly defined to reflect our strong commitments to the integration of high quality teaching and internationally prominent research at all levels, to recognize and respond to the continuing evolution of Geology as an interdisciplinary science, and to promote awareness of the role that Geology plays in modern society.

Mission of Miami Plan Contributions. At the level of Miami Plan Foundation courses the mission of the Department is to provide non-majors with a diverse and high quality selection of introductory courses that address Earth processes and the relationships between humankind and the natural environment. These goals are carried forward in the Geology Thematic Sequence options where students are provided with opportunities to investigate, in greater depth, modern approaches to understanding these complex processes and relationships.

Mission of the Baccalaureate Program. The mission of the undergraduate programs is to provide a high-quality education in a scholarly environment that enables graduates to be successful in careers and graduate school.

Mission of the Graduate Programs. The mission of the Master's degree programs in Geology is to prepare a student for continuing education at the doctoral level or a professional career in the geological sciences. The mission of the Ph.D. program is to have all graduates attain peer status in quality and productivity of scholarship with departmental faculty and other successful Ph.D. scientists in their respective fields.

Programs and Curricula

The Department offers programs and curricula leading to the A.B., B.S., M.A., M.S., and Ph.D. degrees in Geology, a minor in Geology, and "Oceanography" and "The Water Planet" thematic sequences, and curricula in support of an A.B. degree with teacher licensure in earth science, a B.S. degree in Education in earth science education, and the newly established co-major in Environmental Science. The undergraduate programs are detailed in ***Appendix 1***.

Geology Majors and Minor

The undergraduate program is designed to provide flexibility with respect to student interests and career planning in the context of a strong geology core background. To accomplish this, the Department has maintained and revised the curriculum structure adopted in 1995 and recently has

added the Bachelor of Science degree option. Both the A.B. and B.S. options contain a common set of core requirements followed by a choice of course emphasis ("tracks") in either Environmental or Solid Earth sub-disciplines (***Appendix 1***). The Geology Minor is designed to afford students an opportunity to focus on aspects of geology that best compliment their interests and primary major.

Graduate Programs

The Department offers three graduate degrees: a non-thesis M.A., a research thesis-based M.S., and the Ph.D. in Geology. The Master's degree is the professional degree in Geology. The M.S. and M.A. degree programs are designed to prepare students for continuing education at the doctoral level or a professional career in the geological sciences, typically in industry, government, consulting firms, or earth science education. The basic requirements of these degree programs are summarized below.

Master of Arts. A minimum of 18 semester hours of graduate-level coursework in Geology and an additional 12 semester hours of graduate-level coursework outside the Department are required. Students must take courses from at least four different Geology faculty members to assure a certain breadth of education experience. Successful completion of an oral comprehensive examination emphasizing geological knowledge is required for graduation.

Master of Science. Minimums of 24 semester hours of graduate-level coursework plus six semester hours of thesis research are required. Students must take courses from at least four different Geology faculty members to assure a certain breadth of education experience. Students must pass a combined oral thesis proposal/oral comprehensive examination by the end of their second semester in residence. A written thesis and successful oral defense of the thesis are required for graduation.

The Doctoral Program is described in detail at the end of this document. The Ph.D. is a research degree, thus depth of study of an individual topic is emphasized. The basic requirements for the Ph.D. in Geology are summarized below.

Doctor of Philosophy. Minimum of 60 semester hours beyond the M.S. degree or its equivalent, of which 15 semester hours must be in graduate-level coursework in Geology or a related discipline. Before the end of the second year of study, students must show competence in four areas of study as demonstrated in written comprehensive examinations. These examinations are followed by an oral examination based on defense of a topic distinct from the dissertation research focus, and a written and oral presentation of the dissertation prospectus. The program culminates in the defense of a dissertation based on original research.

Other Curricular and Program Contributions

The Department currently offers five Miami Plan Foundation courses on all three campuses, four of which are lecture courses that also serve as potential entry points into the Geology major, minor, or thematic sequences (GLG 111, The Dynamic Earth; GLG 121, Environmental Geology; GLG 131, Geology and Gemstones; GLG 141, Geology of US National Parks). The fifth Geology Miami Plan Foundation course is a stand-alone laboratory course (GLG 115.L, Understanding the Earth) that also is a required course for Geology majors and minors. The Department also offers two Thematic Sequences, "Oceanography" and "The Water Planet", and is an active participant in the recently initiated Environmental Science co-major. The Capstone course for all Geology majors is Field Geology (GLG 411, 6 credit hours). This course is run as a summer workshop (separately budgeted) at the Miami University Geology Field Station in Dubois, WY. Summer 2003 marked the 57th consecutive year that the Department has operated a "Geology Field Camp".

Personnel

Substantial changes in Department personnel have taken place since the last review. These changes, and the current Department profile, are summarized in ***Appendix 2***.

Faculty Profile

The 1996 Program Review Team (PRT) stated, "This department is in a stage of transition brought about by a number of factors". The first factor on their list was the continued trend of replacing retiring faculty with "very research-active new members". The PRT report went on to state, "In an effort to provide new faculty with the time to develop their research programs, senior faculty who are mid-career and optimally productive in their scholarship have taken on increased instructional responsibility. Balancing these roles brought about by their success will require innovative approaches and adjustments by the Geology faculty and support from the University if they are to maintain the excellence they have achieved in recent years".

At the time of the last review, the Department was in the midst of one tenure-track search, was preparing for one early retirement, and had absorbed a drop from 10.75 tenured or tenure-track faculty FTEs on the Oxford Campus (pre-1995) to 9.75 FTEs. The resignation of one Assistant Professor effective June 1999 precipitated a tenure-track search, which resulted in an appointment effective January 2000. At the same time, the Chair assumed the responsibilities of Associate Dean of the College, necessitating the hire of a temporary Visiting Assistant Professor effective August 1999 and the appointment of an Interim Chair. The full retirement of one Professor in June 2000 lead to yet another successful tenure-track hire effective August 2000. The sudden resignation of one Professor effective June 2000 again precipitated a tenure-track search. This search was not successfully completed until Spring 2002. Furthermore, an internal Chair search was conducted in 2000, with the current Chair beginning his appointment in January 2001. Throughout this time period the Department received substantial support from the Administration to allow rapid replacement of faculty who retired or resigned, and specific assistance from the College to allow for the hiring of visiting faculty, but also realized a net decrease in faculty FTE from 9.75 to 9.2. With the recent departure of the previous Chair from his position as Associate Dean and his assumption of the duties of Dean of the Graduate School and Associate Provost for Research and Scholarship (0.2 FTE in Geology), the Department is in the process of searching for a tenure-track faculty member. This addition will bring the Department FTEs to 10.2 starting Fall 2004.

The Department obviously has remained in a "stage of transition" during the current review period. Among the challenges created by this transition has been the loss or effective loss of mid-career faculty who were very active in the supervision of Ph.D. students. Nonetheless, we have continued to recruit high quality, research-active geoscientists into open tenure-track positions, and their positive impacts on graduate student recruiting are beginning to fully be realized. Three of the four (one resignation) tenure-eligible faculty have been granted tenure and promotion to Associate Professor during this review period, with one also advancing in rank to Professor. The current full FTE faculty profile is three Professors, two Associate Professors, and four Assistant Professors. Our 0.2 FTE Professor continues to teach a required majors course, a long-time affiliate Professor is involved in on- and off-campus academic year and summer geology courses/workshops, and an Emeritus Professor co-supervises (in collaboration with the Department of Zoology) two terms of the summer workshop "Environmental Science for Elementary School Teachers".

All tenured and tenure-track faculty members hold terminal degrees and all have Graduate Level A standing. Three of the four current visiting faculty members hold terminal degrees, with the fourth holding multiple Master's degrees. In keeping with the course set prior to the last review, the research interests and, therefore, teaching expertise of our faculty members fall into two broad areas, ***Geochemistry*** and ***Crustal and Surficial Processes***.

Faculty Leaves and Off-Campus Appointments

As of Spring 2003, all tenured faculty members were either granted one-semester research leaves, related appointments, or both during the review period. The related appointments include one Associate Professor who is teaching full-time for two years (AY 2002/03 and AY 2003/04) on Miami's campus in Luxembourg, and one Professor who served a one-year stint (1998) as a Program Director at the National Science Foundation. Two tenure-track faculty members received on-campus assigned research appointments to free time for laboratory and research program development.

Graduate Assistants and Teaching Associates

Graduate Assistants (M.S., M.A.) and Teaching Associates (Ph.D.) are responsible for instruction in the laboratory sections of our majors' and non-majors' courses, including many off-campus, field-based workshop courses. The number of graduate award positions allocated to the Department of Geology has remained unchanged (18±1) since the early 1990's.

Staff Profile

The Geology faculty and students are assisted in their mission by one full-time Administrative Assistant, one full-time Accounting Associate, one full-time Geochemistry Laboratory Technician (Ph.D. in Geology), and one full-time (interim) Museum Manager (Ph.D. in Geology). The Department's long-time Museum Curator retired in December 2001 and we took this opportunity to rethink the role of this support position. The current Interim Museum Manager is responsible for the day-to-day operations of the Karl E. Limper Geology Museum, for curation of museum holdings, and for the coordination of educational outreach activities. He also contributes to the Department's teaching mission through annual offerings of Miami Plan Foundation courses. The Department recently has expanded its support and research staff by adding one Research Associate (ABD), with two additional Research Fellows scheduled to arrive over the next few months. In addition, a Senior Program Assistant joined the Department in February 2003 as part of the relocation of the Geological Society of America Bulletin Editorial Office to Miami.

Infrastructure

The Department of Geology is housed in the 36-year-old Shideler Hall. Geology oversees the utilization of 57 rooms and sub-rooms on the basement, ground floor and second floor levels of the building. The Department of Geography occupies most of the second floor of Shideler Hall. Included in Geology-controlled space are sixteen faculty/staff offices, four graduate student offices, two teaching laboratories, a student computer laboratory, three general-purpose research laboratories, and twenty specific use research laboratories, including labs designed to house instrumentation. Two rooms in Hughes Hall also house instrumentation used most heavily by Geology faculty, staff, and students. The continued addition of new, research-active faculty has required creative reallocation of room use away from office, specimen storage, and teaching space in favor of new instrumentation, chemistry clean room, geomicrobiology, and stable isotope geochemistry research laboratories.

Benchmarking and Department Goals

The Department emphasizes the integration of teaching and research at all levels. Moreover, the research activities of our undergraduate students are intimately linked with the research programs of our graduate students and are made possible, in part, by external funding secured for graduate-level research.

In order to forward the Department's mission and goals in the context of the First in 2009 Strategic Vision and to address issues raised by the 1996 PTR, we identified two sets of "Geology"

programs with which we will compare our programs and from which we endeavor to gain insights into ways we might improve (see below).

Peer Programs. These were chosen based on the comparative quality of both their undergraduate and graduate (M.S. and Ph.D.) geology programs; their national rankings both at the University and Department level; their comparative size (number of faculty); their status as state funded schools; and their commitment to internationally recognized research, undergraduate education, and the successful integration of the two.

- University of Delaware (Department of Geology)
- University of Pittsburgh (Department of Geology and Planetary Science)
- State University of New York at Buffalo (Department of Geology)
- University of Illinois at Chicago (Department of Geological Sciences)

Aspirational Programs. These were chosen based on similar criteria used for Peer Institutions but with the recognition that additional faculty with internationally recognized research programs and the funding and infrastructure that comes with increased numbers increases their overall scholarly productivity and recognition.

- Dartmouth College (Department of Earth Sciences)
- State University of New York at Stony Brook (Department of Earth and Space Sciences)
- University of California at Davis (Department of Geology)
- Washington University (Department of Earth and Planetary Sciences)

Appendix 3 summarizes the three areas of the Department initially targeted for improvement through the benchmarking process; the interest and participation of our graduate students in professional activities outside the classroom, the number of applicants to our graduate programs, and the number of undergraduate geology majors. Comments pertaining to progress in these areas are included in the appropriate sections below.

PROGRAM QUALITY

Curriculum

As outlined in the section **Programs and Curricula** above, the curriculum is designed to serve the needs of the University community, to attract interest in the geological sciences, to implement the missions of the respective Geology degree programs, and to enforce the synergy between teaching and scholarly activity. Additional breadth, depth, and rigor has been infused into the curricula to insure contemporaneity of our programs in a disciplinary context and in the context of "First in 2009" Goals 3 and 4.

Rigor, Breadth and Contemporaneity of the Curriculum

Undergraduate Programs. The goals, structure, and course requirements (***Appendix 1***) for the undergraduate programs previously have been summarized. We here focus discussion on the A.B. and B.S. degree programs, which have in common the essential "core" and choice of "emphasis" structure initiated in 1995. We have maintained this structure but with substantial updates to the "core" requirements, and with a much expanded choice of "emphasis" (400-level) electives. The latter directly addresses one of the 1996 PRT concerns, and is a natural outgrowth of the infusion of new faculty and their ongoing integrated teaching and research program development, and of new research directions taken by more senior faculty. The expansion of our course offerings across the curriculum is apparent from ***Table A5.1***. This expansion retains a focus on the "Solid Earth" and "Environmental" undergraduate curricular emphases in the context of the Department's two defined

research emphases, Geochemistry and Crustal and Surficial Processes, while recognizing the growing interdisciplinary nature of the geosciences (e.g., Global Climate Change and Geomicrobiology).

Direct comparisons were drawn between our undergraduate program and those at other Ohio institutions in 1996, enforcing the reorganization of our curriculum structure, then in its infancy. Similar comparisons were recently attempted, but focusing on Ph.D. granting Ohio universities and our eight "Benchmarking" institutions. Not surprisingly, a far greater diversity of degree programs and requirements exists today than in the mid-1990s, thus rendering direct course-by-course comparisons difficult at best. This exercise does, within the context of faculty resources, illustrate that the evolution of our undergraduate curriculum, particularly the addition of the B.S. program that places additional emphasis on cognate sciences and independent research, is reflective of general national trends. This assertion is further substantiated by a comparison of our requirements and general academic emphases to the results of two recent national surveys (AGI/Louisiana State University, 2000 and AAPG, 2003). For example, the data presented in ***Table A4.1*** illustrate that we currently provide specific courses in nine of the twelve sub-disciplines receiving significant survey response. Moreover, the recently released AAPG Report on the Status of Academic Geoscience Departments lists the top six national academic program strengths as Stratigraphy, Environmental, Hydrology, Inorganic Geochemistry, Structural Geology, and Geophysics, all but one of which (Geophysics) are fully represented within our programs. The Department is in the process of responding to this deficiency in that we currently are conducting a tenure-track search for a Solid Earth Geophysicist. We recognize that a second area requiring attention is Historical Geology/Paleontology/Biostratigraphy. In response to this we have been working with the Hamilton Branch Campus administration to secure a new tenure-track line to address this need.

Graduate Programs. The general goals, structure, and requirements for the three graduate programs previously have been summarized. Many of the specific course and academic program strength comments provided above also apply to the graduate programs. Increased breadth and depth in 400-level courses also provides additional opportunities for our graduate students at the 500-level. Specific additions to the graduate curriculum at the 600- and 700-levels also have been made since the last review (***Table A5.1***), and more are in the planning stages. With these additions comes a greater emphasis on current research directions and techniques that reflects the very research active profile of our faculty. Certainly the contemporaneity and quality of the Ph.D. program must be judged on the scholarly achievements of the faculty and students involved. These data are contained elsewhere in this document. In addition to these obvious measures, the Department requires that all doctoral students, in concert with their advisor, seek and obtain external funding in support of their dissertation research. All but one of our recent doctoral students have met this requirement. Furthermore, the Department requires that a scholar external to the University serve in a formal capacity on all dissertation final examination (defense) committees.

Class Sizes and Opportunities for Faculty/Student Interaction

The information summarized below is for the Oxford Campus only (***Appendices 5 and 6***). Detailed reviews of our Miami Plan contributions are contained in the Miami Plan Course Assessment document and include descriptions of methods employed to effectively engage students in the large class format common to our 100- and 200- level lecture courses (***Tables A4.2, A4.3***).

Foundation Courses. The four lecture courses, GLG 111, 121, 131, and 141, and one laboratory course, GLG 115.L, offered by the Department are in great demand. These courses have enrolled more than **16,500 students in 344 sections** over the past seven years, an **average of nearly 2,360 students per year**. In order to satisfy this demand while simultaneously weathering the challenges of a "transitional" faculty profile, 60% of our lecture-based Foundation courses have been taught by visiting faculty and staff over the past seven years, and the average size of the lecture sections has

risen from approximately 90 to approximately 100 due to the addition of sections with a maximum enrollment of 180-200 students. The potential future need for an increase in lecture class size reluctantly was identified by the 1996 PRT in the context of increasing the Department's course offerings in the major while continuing to satisfy the tremendous demand for Geology Foundation courses. Fortunately we have been able to retain class sizes in the GLG 115.L laboratory of 18-20 and have met increased demand by adding additional sections.

200-Level Elective and Thematic Sequence Courses. The three courses GLG 205, 207, and 244 enrolled over 1,350 students in 20 separate sections during this review period. The average enrollment per section is 68. This primarily is derived from GLG 207 and 244, whereas GLG 205 has an average enrollment of 18 and features a discussion-oriented classroom format.

Geology Core Curriculum Courses. The five on-campus courses GLG 201, 211, 301, 322, and 357 enrolled 588 students in 32 separate sections during this review period. Enrollment in these courses is limited to 40 students/section in order to promote and enhance professor-student interaction and to maximize the laboratory experience associated with all but GLG 211. The average enrollment per lecture section is 18, and the student/instructor ratio in laboratory sections ranges from 9:1 to 4:1, not including the frequent presence of the faculty member. It is within the laboratory components of these courses and associated field trips where the greatest direct student/faculty/instructor interactions are designed to occur. The Geology Capstone experience, GLG 411 (Field Geology), also is a required core course. This course is offered once per year in the summer and has yielded an average enrollment of 25 students over the past seven summers. In response to concerns raised by the 1996 PRT regarding the high student/faculty ratio in this course, we initiated a program to employ graduate student instructors for the field course. This has proved extremely beneficial to the program and the graduate students, and decreased the student/instructor ratio from 25:1 in 1996 to between 8:1 and 5:1 subsequently. Direct student/faculty/instructor interactions occur almost continually throughout this intensive five-week, off-campus course.

400/500-Level Emphasis and Elective Courses. These courses provide depth of study for Geology majors and minors and enroll undergraduate and graduate students from numerous programs across campus. In the current review period, 600 students enrolled in 51 sections of GLG 4xx/5xx, yielding an average of 12 students per section. A number of these courses have formal, scheduled laboratory sections where student/instructor/faculty interactions in the field and/or laboratory are commonplace. Others incorporate short hands-on laboratory experiences into selected class meeting times. In response to concerns raised by the 1996 PRT, most of these courses now include a substantial component of abstract/paper writing, literature reading discussion, and student presentations.

Graduate Courses. All 600- and 700-level lecture/seminar courses are small (3-10 students). All of these integrate lectures, hands-on activities, problem solving, abstract/paper writing, discussions of current scientific literature, and student presentations to varying degrees. The writing and presentation components again address one concern raised by the 1996 PRT.

Student Opportunities Outside the Structured Curriculum

Formal classroom instruction is as important in Geology as any other discipline. On the other hand, as a field- and laboratory-based science, special opportunities are necessary for students in the field setting and in small group or individual study in the laboratory. The Department is particularly active in this arena with some examples provided below.

Workshops. During this review period the Department offered 78 workshops, encompassing 27 different courses. These courses typically meet during the summer and academic year breaks, and range from one to five weeks in duration and from local lab and field experiences to distant domestic and foreign field experiences. A complete list of the workshop offerings since AY96/97 is provided

in ***Appendix 7***. Most of these opportunities would not be possible within the standard academic budget, thus the **over $1.4M in income generated by the workshops directly supports and makes possible these unique and enriching experiences**. Moreover, involvement of undergraduate and graduate students from other universities across the country (***Table A7.2***) provides our students with valuable new perspectives and serves as a recruiting mechanism for our graduate programs.

Field Trips. With the generous support of our alumni through the Wayne D. Martin Field Fund, course related and individual student field experiences continue to play a major role in the education of our students.

Internships. The Department and our students remain very active and successful in this arena, with 21 undergraduate and 11 graduate students participating in internships or visiting research appointments with the petroleum industry and federal, state, and private organizations and institutions (***Table A9.3***). These opportunities are driven by student interest and initiative, and are enhanced by our alumni network and faculty/staff research activity and contacts.

Honors Courses. The Department has offered four courses designed for the University Honors and Scholars Program; "The Geology of Ohio", "Introduction to Earth Issues Through Song", "The Mediterranean" (currently active; includes one-week international field experience), and a special honors section of the GLG 115 laboratory (currently active). These courses have yielded presentations at the National Conference for Undergraduate Research and new Geology majors.

Independent Study. During this review period 95 undergraduate students have participated in independent study (GLG 177, 277, 340, 377, 477, 480; ***Table A5.2***), undertaking field and/or laboratory research under the supervision of a Geology faculty member. The independent study format also provides a logical mechanism to involve our graduate students (particularly our Ph.D. students) in the mentoring process, a practice that has proven very successful. Undergraduate student accomplishments derived from the independent study experiences are discussed below in the section on **Student Accomplishments and Career Paths**. A substantial proportion of graduate instruction commonly is undertaken as independent study (GLG 700, 790, 850; ***Table A5.2***).

Other. A variety of additional activities are designed to involve and engage students. Examples include the annual Department Seminar Series that brings geoscientists to campus approximately every other week, the fall Limper Lecture Series, sponsored by the Geology Museum as part of our outreach efforts, and the social and professional activities associated with the student-run Miami University Geological Society (MUGS). In addition, as one of the actions taken in an effort to "increase the interest and participation of our graduate students in professional activities outside the classroom" (Benchmarking Plan #1; ***Appendix 3***), we successfully initiated a weekly, fall semester graduate student organized seminar series open to all faculty, staff, and students in the department.

Teaching Effectiveness

Faculty members teach all courses save for laboratory sections. Department alumni rate the overall quality of teaching as high, and students consistently rate our courses as highly effective. One faculty member recently received a CELT Teaching Excellence award and the CAS Distinguished Educator Award and another recently received the Benjamin Harrison Medallion. One of our graduate students received a CAS Graduate Student Teaching Award in 1997 and another formally was recognized for "Outstanding Contributions to Field Education". These achievements directly address "First in 2009" Goal 2.

The Department requires for all lecture, lecture/lab, and stand-alone laboratory courses to be evaluated using either the CAS evaluation instrument or a recently modified Department of Geology

version of this instrument. In both cases, an "Overall Instructor Rating" (OIR) is provided, with a maximum numerical value of 4.0. The numerical evaluation instruments are supplemented for probationary faculty with extensive peer review of all courses by more senior Geology faculty or by faculty outside the Department. In addition to the formative information provided by the peer evaluation process, probationary faculty are encouraged to attend seminars and workshops organized, for example, by CELT. Furthermore, graduate students teaching the stand-alone introductory laboratory course (GLG 115.L) meet weekly, under the supervision of a "senior" Head TA and/or a faculty member, to discuss teaching pedagogy and course content. Graduate students responsible for instruction in the laboratory sections of more advanced Geology courses receive direct mentoring from the faculty member responsible for the course. The assessment information summarized below is for the Oxford Campus only (see also ***Appendices 5 and 6***).

Foundation Courses. This category includes the four lecture courses, GLG 111, 121, 131, and 141, and one laboratory course, GLG 115.L. The average OIR for all lecture sections is 2.9 (/4.0), and for sections taught by the permanent faculty the **average OIR is 3.1**. This value is the same as that achieved during the previous review period and as that achieved by the graduate student instructors in the GLG 115.L laboratory course during the current review period.

200-Level Elective and Thematic Sequence Courses. The courses GLG 205, 207, and 244 predominantly are taught by permanent faculty members, and received an **average OIR of 3.0**.

Geology Core Curriculum Courses. The five on-campus courses GLG 201, 211, 301, 322, and 357 predominantly are taught by permanent faculty members, and garnered an **average OIR of 3.3**. The Geology Capstone experience, GLG 411 (Field Geology), also is a required core course. Since decreasing the student/instructor ratio in this course responses have been very positive as reflected in an **average OIR of 3.4** from 1999 through 2003.

400/500-Level Emphasis and Elective Courses. Permanent faculty members predominantly teach these courses. Since the last review these courses garnered an **average OIR of 3.4**.

Graduate Courses. Teaching effectiveness in these courses largely is tied to the research activity of the faculty. For courses designated at the 600-level, the mean response to the query on **overall instructor effectiveness was 3.8**. It should be noted that the teaching in these courses, as well as in the bulk of the "core" and "emphasis" courses, is particularly enhanced by externally funded equipment and facilities linked to the overall research activity within the Department.

As part of our efforts to keep alumni connected with the Department, in 2002 we undertook surveys of our undergraduate and graduate alumni, and queried them on various aspects of our program. The results of these surveys are germane to many aspects of this review, and thus are included as the final ***Appendices*** (***15 and 16***) of this document. The respondents indicate very high regard for the teaching efforts of the Geology faculty, as undergraduate alumni rate the quality of teaching as high (4.6/5.0) and graduate alumni concur (4.5/5.0).

The 1996 PRT expressed concerns regarding the advising of undergraduate majors. We have addressed these concerns by arranging meetings between new majors and the Chair and Chief Departmental Advisor, by substantially clarifying the undergraduate curricular requirements, and by taking a more proactive approach to insure that student-advisor pairs have the opportunity to interact on a more regular basis.

Student Recruiting and Quality

Undergraduate Programs

Geology, as a discipline, is poorly represented in high school curricula, thus undergraduate majors predominantly are recruited from within. In a typical year, fewer than five entering first-year students declare Geology as their major, thus we must rely on the large enrollments in our

Foundation courses to attract students into our programs. During the past seven years we graduated 104 majors and 81 minors and maintained an average of 51 majors and 29 minors per year, with the bulk declaring the major/minor in the second or third year.

For Oxford Campus majors enrolled in the program as of the fall semester 2003, average high school ACT scores are 25 and the average current GPA is 3.0. The mean GPA for our graduating Geology majors over the past seven years is 2.98, with a range from 2.03 to 3.97. The mean GPA for the upper 10% of this group is 3.83. Based on these statistics, the quality of our entering and graduating students has remained virtually unchanged as compared to the previous review period. The following information pertains to Geology A.B./B.S. graduates during the current review period: eighteen on the Dean's List, one on the President's List, one Provost's Scholar, three *summa cum laude*, four *magna cum laude*, six *cum laude*, one with University Honors, and three with Department Honors.

As part of the Benchmarking effort we identified undergraduate student recruitment as an area needing attention, and solicited input from a number of institutions to determine a set of best practices. It was clear that everyone contacted was suffering similar problems considering an overall national drop in geoscience enrollments. It is apparent that our approaches of offering diverse and topically interesting Foundation courses, maintaining involvement in the University Honors and Scholars Program and interdisciplinary endeavors such as the Environmental Science co-major, maximizing involvement in College and University sponsored recruiting activities, expanding our electronic advertising, and expanding our outreach efforts to local/regional school districts are in line with strategies employed by our colleagues.

Graduate Programs

With decreasing enrollments in all sectors of the geosciences over the past seven years, hence increased competition for quality students, recruitment of graduate students has posed a challenge. Inquiry and enrollment data are presented and discussed below under the **Program Viability** section, thus we focus here on quality issues. The Department, in part due to faculty size and the broad base of faculty commitments, has long maintained a selective admission policy driven by the desire to link prospective applicants with prospective advisors prior to acceptance. In effect we have a pre-application process whereby the majority of inquirants are "discouraged" from applying early in the process, and those that do formally apply essentially have been "pre-accepted". The essence of this strategy was praised by the 1996 PRT, but the actual recruiting methods employed were labeled as "diffuse". As a result, we specified graduate student recruiting as a target for improvement (Benchmarking Plan 2) and queried a number of other Geology programs as to their recruiting strategies. We subsequently have adopted a more focused approach that includes (1) individual faculty networking and networking based on alumni contacts (the primary method previously utilized), (2) recruiting booths at national meetings, (3) targeting regional colleges/universities for faculty visits/seminars, and (4) enhanced web presence and updated bulk mailings. While too early to declare success, we are coming off the best recruiting year in quite some time (13 new students).

Overall graduate student quality, as judged by GPA and cumulative GRE score (Quantitative + Analytical + Verbal) at the time of admission has remained essentially unchanged since approximately 1991. By example, 22 M.A./M.S. and 11 Ph.D. students entered our programs during the four-year period between 2000 and 2003 with average GPAs of 3.1 and 3.4, respectively, and average cumulative GRE scores of 1783 and 1812, respectively. For the more extended period from 1996 to the present, 86% of those students entering our program have either completed their degree (47%) or are "in progress" (39%). This marks a modest 6% improvement in retention since the last program review.

The listing below indicates the institutional origins of recent students entering our graduate programs, with bolded institutions representing those of entering Ph.D. students and bolded-italicized institutions representing those of entering M.A./M.S. and Ph.D. students.

Allegheny College	Hamilton College	***Southern Illinois University***
Alvernia College	Hanover College	**SE Missouri State University**
Ashland University	**IUPUI**	University of Akron
Asian Inst. of Tech. – Thailand	Juniata College	University of Chicago
Bridgewater State University	Marietta College	University of Cincinnati
Brigham Young University	***Miami University***	University of Idaho
Cambridge University	Morehead State University	University of Iowa
China Univ. of Geosciences	**Nanjing University**	**University of Pune, India**
China Univ. of Sci. & Tech.	Norbert College	**University of Punjab, Pakistan**
Chinese Academy of Sciences	Northern Kentucky University	**University of Rochester**
Franklin & Marshall College	Peking University	Utah State University

Student Accomplishments and Career Paths

Geology students have acquired $124K in research funding, and authored or co-authored 30 peer-reviewed scientific articles and 166 abstracts of conference presentations. The vast majority of our graduates have pursued graduate study or geoscience careers.

Undergraduate Programs

In addition to the academic accomplishments cited above as measures of student quality, our undergraduate students actively are involved in scholarly endeavors. For example, 95 undergraduate majors, minors, and thematic sequence students have enrolled in over 175 separate independent study courses (GLG 177, 277, 340, 377, 477, 480) over the past seven years, including ten Undergraduate Summer Scholars. These students are supported in their research efforts by funding and facilities derived from the research activities of our faculty and graduate students and by extramural and MU sourced student funding opportunities. Such opportunities have provided 19 students with 26 research awards totaling $49K (***Table A8.1***). This total does not include direct Department support for field- and laboratory-based research. In addition, four students have been supported directly by supplements (REU) to active faculty NSF awards. The direct outcomes of this student research activity are six authored or coauthored publications and 50 abstracts of local, regional, national, and international conference presentations (***Table A8.2***). This is a substantial increase from the previous review period (15 total contributions). Internship and visiting research appointments also afford important research and hands-on professional training opportunities. Twenty-one of our Baccalaureate students have participated in such endeavors (***Table A9.3***).

Building on their experiences at Miami, our Baccalaureate graduates are very successful in their pursuit of post-graduate education and geoscience careers. Data from the CAS and our own alumni surveys are available for 64% of our graduates since fall 1996 (***Appendix 9***). These data indicate that 52% of the responding graduates continued their education, 15% pursued careers in the private environmental sector, and 7% pursued careers with federal/state geoscience organizations, as compared to national statistics (AGI 2001 Report on the Status of Academic Geoscience Departments) for these same categories of 26%, 21%, and 10%, respectively. The graduate and professional schools attended by our students are listed in ***Table A9.2***.

Graduate Programs

The students enrolled in our three graduate degree programs (M.A., M.S., Ph.D.) are very active and successful in scholarship and successful in their chosen career paths. Nine Ph.D. students

and 15 M.S. students have received a combined 61 research grants totaling nearly $75K (***Table A8.1***). All but one of the Ph.D. students enrolled in our program over the past seven years successfully obtained funding for their research activities. Moreover, 15 Ph.D. and 35 M.S. students have authored or coauthored 29 publications and 116 abstracts of regional, national, and international conference presentations (***Table A8.2***). This marks a substantial increase from the previous review period (73 total contributions). Internship and visiting research appointments also have afforded important additional research and hands-on professional training opportunities for our graduate students. Eleven of our graduate students have participated in such endeavors, including visiting research appointments at Los Alamos National Laboratory and the Carnegie Institution of Washington (***Table A9.3***).

Career path information is available for 26 of the 29 graduates from our M.A. and M.S. programs, and for the six Ph.D. graduates over the past seven years. These data are detailed in ***Appendix 9***. For M.A./M.S. graduates the top four post-graduation paths at the national level are the private environmental industry (35%), continuing their education (17%), the oil and gas industry (12%), and federal/state geoscience organizations (8%). In the same order, 19%, 19%, 12%, and 15% of our graduates have chosen these paths. Those choosing to continue their education have done so at Miami University, California Institute of Technology, Purdue University, and the University of California at Davis. Statistical comparisons are not warranted for our Doctoral graduates considering the modest number, but 50% (3) have gone on to academic/post-doctoral research positions directly following graduation.

Faculty Accomplishments

Geology faculty have generated $3.9M in extramural and $366K in MU-sourced funding, edited four books/volumes, contributed over 160 refereed articles/chapters, 20 articles/reports, and 300 abstracts of conference presentations, and served the Federal, State, College, University, and Professional communities in a variety of ways.

Summaries of specific faculty scholarship and the full *curriculum vitae* of the current Geology faculty are provided under separate cover. All data presented herein include only those activities and outcomes for the period 9/1/96 (or MU hire date) through 9/1/03. Simply stated, faculty scholarship, productivity, and service accomplishments have increased since the previous review, yet the full-time faculty FTE count has not increased. In explaining our choice to focus the Department in two research areas, Geochemistry and Crustal and Surficial Processes, our 1996 self-study stated, "Indeed, we believe that we are the paradigm for geology departments of the future; larger programs that attempt to cover *all* subdisciplines of geology will undoubtedly face difficulties in the future as enrollment and funding uncertainties place severe constraints on such large programs". We firmly believe that the recent successes validate our model and speak to the importance of focusing faculty recruiting efforts and internal support and infrastructure improvement strategies in ways that build on existing strengths and that provide collaborative opportunities between these strengths.

Scholarship

The over $3.94M in extramural funding generated for basic research ($1.45M), undergraduate research ($19K), earth science education ($828K), equipment and facilities ($1.5M), and "other" ($140K; administrative and special conference funding) equates to $394K per faculty member and $56K/year/FTE using an average of 10 full-time faculty FTE (***Appendices 10 and 14***). The latter figure is nearly double that for the previous review period. It is noteworthy that 75% of the equipment awards were derived from collaborative efforts amongst Department faculty (± other faculty), that the education awards involve collaborations between Geology and Zoology faculty, and that numerous research awards involve internal and external collaborations. Of the $366K in MU

sourced funding acquired, $137K is in support of a recent multi-departmental nanoscience initiative funded through the President's Academic Enrichment Fund program.

Complimenting the strong Faculty funding record over the past seven years is substantial research productivity as measured by the publication of 129 refereed journal articles, 36 refereed book/volume chapters, 24 scientific reports, >300 abstracts of conference presentations, and editorship of four books/research volumes. This productivity also outpaces that of the previous review period. Considerable cross-disciplinary collaborations, within department, university, and external, are represented and Department faculty have authored/co-authored seven papers in *Nature* and *Science* (two contributions prior to faculty arrival at MU). Two Geology faculty recently were recognized for their scholarly achievements; one through receipt of the MU Benjamin Harrison Medallion, and another through receipt of the MU Distinguished Scholar Award and election as a Fellow of the Geological Society of America and of the Geological Society of London.

Professional Service

The Department faculty have extensively been involved in a wide variety of professional service activities commensurate with their rank and scholarly visibility. The details are provided in the accompanying document containing short faculty biographical sketches and full *curriculum vitae*. One activity that brings substantial visibility to the Department is the recent move of the Geological Society of America Bulletin editorial office to Miami University in concert with one of our faculty assuming editorship of this prestigious journal. A sampling of recent intramural and extramural service activities is provided below.

Selected Examples of Intramural Service:

University Student Affairs Council
University Divisional Appeals Committee
University Summer Reading Program
Committee on Faculty Research
CAS Committee for Review of Chairs & Program Directors
Univ. Senate Awards & Recognition Committee
University Senate Executive Committee
Liberal Education Council
University Science Education Committee
Chair, various Divisional/Univ. search committees
University Chemical Safety Committee
Sigma Xi Awards Selection Committee
CAS Grievance Committee; Curriculum Committee
IES Fellow; IES Executive Committee
Environmental Science Co-Major Committee
Instrumentation Laboratory Advisory Committee
"First in 2009" Coordinating Council
CAS Committee on Women & Minorities
CAS Teaching Partners Program Mentor
CAS Science and Math Education Committee
Internal Program Review Committees (CHM, ZOO)
Diversity Seminar facilitator (multiple)
Minorities in Math, Science & Engineering Program

Selected Examples of Extramural Service:

Reviewers of >200 proposals for various agencies
Reviewers of >180 manuscripts for various journals
Editor, *Geological Society of America Bulletin, Rocks & Minerals Magazine*
Assoc. Editor, *Tectonophysics*, *American Mineralogist, Canadian Mineralogist, J. Geol. Soc. Lon., J. Geosci. Education, Turkish Jnl. Earth Sci., GSA Bulletin*
Program Director, NSF – EAR
NSF – EAR Review Panels (2)
NSF Human Origins Initiative Advisory Panel
NSF Graduate Fellowship Review Panel
NATO Collaborative Program Review Panel
American College Testing Advisory Panel
NAGT – various panels/committees
MSA – various committees/offices held
International Geologic Correlation Program Committees
Organizer/Convener, GSA Penrose Conference
Organizer/Convener, GSA Pardee Keynote Symposium
Convener, various GSA & AGU theme/special sessions
Organizer/Convener, Geology of Bahamas Conference
Organizer, Symposium on Mediterranean Geodynamics
Convener, MSA Short Course and GSA special session
International Geol. Congress Organizing Committee
Butler County Aquifer Protection Committee
Butler County Groundwater Committee
Ohio Geology Advisory Board
OH-KY-IN Regional Groundwater Committee
City of Oxford Environmental Commission
Vice President Cincinnati Mineral Society
Cincinnati Mineral Show Committee

Recent Resource Additions

The aspirations of the Department exceed the financial resources provided by the College and University, as it should be with any productive department. The Department has been able to maintain and expand its resource holdings through extramural funding sources, including extramural research and equipment grants and alumni support.

The changing Department demographics, including two tenure-track hires during AY 95/96 and four tenure-track hires since the last Program Review, has led to substantial resource additions via faculty start-up packages, institutional matching funds for equipment purchases and associated laboratory renovations, and most significantly, the $3.9M in extramural funding acquired by the faculty. Since fall 1996, three major state-of-the-art research instruments have been acquired via NSF grant awards; a CCD-detector single crystal diffractometer, a multi-collector thermal ionization mass spectrometer, and a low-vacuum scanning electron microscope with x-ray fluorescence and electron diffraction capabilities. In addition, four new research laboratories have come on line, and other rooms and laboratories have substantially been redesigned to accommodate the expanding teaching and research needs of our faculty and students.

Two additional important resource additions are noted, one intramural and one extramural. In response to growing concerns and direct evidence in support of these concerns, the Graduate School increased graduate stipends effective August 2003. For Geology, these increases are 25% and 11% for Teaching Associates (Ph.D.) and Graduate Assistants (M.A., M.S.), respectively. These increases, particularly in the Ph.D. stipend, should greatly assist our future recruiting efforts. We also have continued to benefit from a very supportive alumni group. Contributions to our five endowed accounts, including the recently established Baldwin Frontiers in Geology Distinguished Lecture fund, total $187K since January 1997, with additional unspecified contributions of $24K. The net result of our alumni generosity is a considerable return of funds to the department each year that is used for student and faculty enrichment activities. For example, the most recent aggregate distribution from endowed funds to the Department was $23,520, approximately 44% of the FY 03/04 College allocation in the combined supplies and services categories of our operating budget.

PROGRAM VIABILITY

The First in 2009 Strategic Vision

The above data and discussions provide clear evidence that the Department is engaged in activities that continue to successfully forward its missions in the context of the University mission as articulated in the goals of the First in 2009 Strategic Vision. ***Selected examples*** in support of this statement are provided, with additional specific activities highlighted in the sections to follow.

Goal 1: Strengthen the Academic Qualifications of Entering Students. We have implemented and continue to explore different and more focused methods of undergraduate and graduate student recruitment in an attempt to reach a wider, more diverse audience, and we offer courses designed specifically for the University Honors and Scholars Program.

Goal 2: Strengthen the Academic Quality of New Faculty and the Academic Support for All Faculty. We continue to hire tenure-track faculty with expectations for the development of dynamic, integrated, disciplinary and cross-disciplinary teaching and research programs, and successfully mentor them through the tenure and promotion process. Faculty members published >160 peer-reviewed articles and >300 abstracts of conference presentations over the past seven years.

Goal 3: Develop a curriculum for the 21st Century. We recently developed a B.S. degree program, strengthened upper-level undergraduate and graduate course offerings through the addition of 12 new courses, and strengthened our Baccalaureate core and emphasis requirements, and continue to offer unique learning opportunities through off- and on-campus workshop courses.

Goal 4: Strengthen Academic Standards and Enrich Campus Intellectual and Cultural Life. We established a new annual distinguished lecture that provides opportunities for the Miami and outside communities to interact with a leading scholar in the geosciences and routinely host visiting national and international scholars and lecturers from diverse cultural and scientific backgrounds. In addition, 97 Geology students have published 30 peer-reviewed scientific articles and 166 abstracts of conference presentations over the past seven years.

Goal 5: Increase the Diversity of the Faculty, Staff and Student Body. We have expanded the education and outreach roles of the Karl E. Limper Geology Museum and have implemented additional on- and off-campus student recruiting methods (See also *Goal 1* and *Goal 4*).

Goal 6: Enhance the Campus, Buildings and System. We recently have established six new or substantially modified research laboratories and acquired new state-of-the-art instrumentation in support of research and teaching.

Goal 7: Strengthen the University Revenue Base. Geology Faculty and students have generated over $4M in extramural funding in support of research and teaching activities, and alumni contributions to our five endowed accounts total $187K since January 1997.

Goal 8: Improve Benchmarking with Peer Institutions. We established a clear set of plans and expected outcomes and progress toward these outcomes has been achieved (see ***Appendix 3***).

Contributions to the University

Contributions to the Miami Plan

As previously indicated, the Department currently offers **five Miami Plan Foundation** courses, **two Thematic Sequences**, and **one Capstone** course. On the Oxford campus alone the MPF courses enrolled more than **16,500 students in over 344 sections** over the past seven years, an **average of nearly 2,360 students per year**. This exceeds the average of 2,150 students per year during the previous review period. An additional 1,000 to 2,000 students per year enroll in the Geology MPF courses offered on the branch campuses (***Appendices 6 and 11***). Approximately 340 students completed the two Geology Thematic Sequences, *Oceanography* and *The Water Planet*, and 88 Miami undergraduate students have taken the Capstone *Field Geology* course.

Contributions to the Education of Students in Other programs

The large enrollments in our Miami Plan offerings illustrate that the Department contributes substantially to the education of students across the university. An examination of the declared majors for students enrolled in three of our MPF courses (six sections) during AY 02/03 indicates that between 40 to 50 different majors are represented from all divisions within the university. Similarly, 35 different majors are represented in the **337 students that completed the two Geology Thematic Sequences**; the majors with the highest representation are Business (23%), Teacher Education (15%), Zoology (8%), Architecture (7%), Art (6%), and Physical Education, Health, and Sports Studies (5%). Moreover, 32 Geology Minors were attracted from initial participation in the Thematic Sequences; these students represent eleven different majors from CAS, SBA, EAP, SFA, and SIS. In the broader context, the Geology Minor has attracted students with majors in over 30 different disciplines; the majors with the highest representation are Zoology (18%), and Accountancy, Botany, Finance, Geography, Journalism, Marketing, and Psychology (5-6% each).

Geology's impacts extend beyond the Miami Plan offerings and Minor. For example, GLG 201 (Mineralogy) is one of numerous GLG courses taken by students in the School of Education and Allied Professions, as well as being popular with Chemistry & Biochemistry majors. The newly introduced Environmental Science co-major has the discipline of Geology as one of its

underpinnings, and Geology faculty have extensively been involved in the first-year seminar course associated with this new program (GLG 175). Upper-level cross-listed courses (***Appendix 5***), for example Geomorphology and Geomicrobiology, attract numerous students from outside the Department. Furthermore, the upper-level courses, Introduction to Hydrogeology, Groundwater Flow Modeling, and Contaminant Hydrogeology, all experience substantial participation from students enrolled in the Institute for Environmental Science (IES). Last, but certainly not least, not only do many of the workshop courses offered by the Department (***Appendix 7***) attract students from across the university community, but they also attract students from institutions around the country.

Contributions to Campus Intellectual Life and Earth Science Education

Among the numerous contributions are the weekly to bi-weekly Department seminars and the annual Baldwin Frontiers in Geology Distinguished Lecture that bring geoscientists to the campus for public and disciplinary lectures and faculty/student interactions. Similarly, the annual fall Limper Geology Museum Lecture Series, designed for the general public, attracts participation from across campus and from local school districts. The Limper Geology Museum, through its outreach efforts and interactions with other University museums, provides a resource for in and out of class intellectual pursuits and for local earth science educators and their students. Over the past two years we have begun to focus efforts on ways to more closely interact with the surrounding primary and secondary education communities, including faculty and graduate student visits to local schools, surveys of local schools to better understand their needs and the ways we may assist, and increased publicity for the Museum's resources and activities. Moreover, the Department has continued to provide enriching experiences for Ohio educators (563 over the past seven years) via the "Environmental Science for Elementary Teachers" summer workshop.

The Department also has been active in bringing international geoscientists to campus as visiting scholars. Three recent scholars from China, one from Turkey (Fulbright Research Fellow), and one from Russia (Visiting Havighurst Center Professor in Geology) have enriched the University community with their scientific contributions and diverse cultural perspectives.

Geology Student Enrollments

The total annual Geology student credit hours (SCH) display an overall increasing trend from 1997-2003 on all three campuses (***Table A11.1, Figure A11.1***). For the Oxford Campus, similar increases in SCH/Faculty FTE and Student FTE/Faculty FTE, particularly over the past two years, are recorded (***Table A11.3, Figure A11.2***). For the Oxford Campus alone, the average SCH for the current review period (9,171) marks a **17.5% increase** from the previous review period (***Table A11.2, Figure A11.4***). The increases reflect primarily the demand for Geology MPF courses on all campuses. These demands create substantial staffing pressures on all campuses. For the Oxford Campus, these pressures are enhanced by faculty demographics and our strong commitment to upper-level instruction, research activities, and service. For the Hamilton Campus, where substantial increases in demand exist, these pressures have facilitated the recent establishment of a full-time Visiting faculty appointment, and certainly justify our pursuit of a new tenure-track Geology line.

Undergraduate Programs

At the time of the last Program Review, Geology undergraduate enrollments nationwide were at a short-term high. Commensurate with this national trend, our major count peaked at approximately 80. These numbers, coupled with our human and infrastructure resources, caused the 1996 PRT to suggest placing a cap on the number of Geology majors. This measure was not necessary since our enrollments began to decline in step with substantial national drops in geoscience enrollments (***Appendix 12***). The geosciences have a history of fluctuating enrollments that reflect actual changes and perceived opportunities in the evolving employment sectors. The national trend

reflects an approximate 42% decline in enrollments between 1997 and 2001, whereas our enrollment (majors + minors) declined by less than 30% during the same period. Considering this nationwide trend it is encouraging that we have maintained a similar annual average number of majors and minors in our program during the current review period (51 and 29, respectively) compared to the previous review period (57 and 24, respectively), while slightly increasing the average number of degrees granted for majors and minors from 11 and 10, respectively, to 15 and 12, respectively. Moreover, as summarized in **Student Accomplishments and Career Paths** above, our graduates have been very successful in securing graduate and geoscience employment positions

In response to the declining enrollment, we identified undergraduate student recruitment as a target in our Benchmarking plans and have initiated internal and external outreach measures to enhance the Department's visibility on campus and the visibility and vitality of the earth sciences in the greater community. We hope to effect a change that will increase the number and diversity of entering first-year students with declared interests in Geology from the recent number of approximately two per year, but recognize that we must continue to emphasize "recruiting from within" from our heavily enrolled MPF courses and Thematic Sequences, and from courses offered for the University Honors and Scholars Program and the Environmental Science co-major.

Graduate Programs

Since fall 1996, over 1,430 student inquiries regarding our graduate programs were received with 180 (12.5%) of these students encouraged to complete the formal application process (see comments in **Student Recruiting and Quality** above). We typically seek to fill between five and fifteen funded openings per year; these numbers fluctuate due to faculty demographic changes, the availability of extramurally funded research assistantships, and student degree progress. **On average**, we received 23 applications per year (6 Ph.D. and 17 M.S./M.A.), enrolled eight new students per year (2 Ph.D. and 6 M.S./M.A.), maintained a graduate student enrollment of 20 per year (7 Ph.D. and 13 M.S.), and graduated five students per year (1 Ph.D. and 4 M.S./M.A.). The average time in program for our M.A., M.S. and Ph.D. students is 1.2, 2.7, and 5.3 years, respectively. The graduate positions (teaching) allocated to the Department have remained the same (18±1) since prior to 1991, thus growth in the graduate programs is achieved only through addition of research positions; we do not accept students without funding. Typically two to six students per year are supported via research assistantships and we often utilize students pursuing graduate degrees in education (EAP) and environmental science (IES) as teaching assistants and to assist in outreach programs. Data on the distribution and status of students entering our graduate programs over the past seven years are summarized in ***Table A13.1*** and ***Figure A13.1***.

The nationwide enrollments in geoscience graduate programs have declined commensurate with the undergraduate trends. The main impact of this on our graduate programs has been a decline in inquiries mirroring the national trend (***Figure A13.2***). Our applications and enrollments have remained relatively constant; we believe that this reflects favorably on our recruiting strategies and recent attention to more focused and proactive methods in response to the 1996 PRT comments. An increase in institutionally-allocated graduate positions, as suggested by the 1996 PRT, certainly would provide added flexibility in the growth of our graduate programs as new research-active faculty are hired and compete for positions from the existing pool. Yet, the overall size of our programs currently is limited by faculty workload and inadequate infrastructure. Three additional graduate students will enter our programs in January 2004, at which time we will have consumed **all** available office space in Shideler Hall.

Faculty, Staff, and Students

The existing human resources provide a critical mass in support of the Department missions and goals, yet the current tenured and tenure-track faculty plus graduate teaching assistants/fellows cannot alone satisfy the demand for Geology courses while continuing to forward the overall Department and University missions.

The budgeted FTE (faculty + graduate) have remained virtually unchanged (***Appendix 14***) for over ten years, yet all measures of teaching, research, and service activity and productivity have increased. A number of factors are responsible: the addition of teaching *and* research active tenure-track faculty, the activity of tenured faculty, the additional laboratory teaching responsibilities and scholarly productivity of our graduate students, the presence of active visiting faculty members, and the enhanced logistical, teaching, and research contributions of our classified and unclassified staff.

While the Department remains steadfast in its commitment to the further enhancement of our growing contributions, we invite "some additional relief … in order to effectively advance the graduate programs of the Department and to avoid faculty burnout." (1996 PRT report). The Department has taken measures to address this by providing opportunities for faculty leaves, by maintaining three- to four-course and two- to three-course teaching loads (exclusive of independent study/thesis/dissertation advising and summer courses) per year for tenured and tenure-track faculty, respectively, by providing a two course teaching load for entering faculty during at least the first year in residence, and by providing release time for special educational and scholarly endeavors. The current search for a Solid Earth Geophysicist and continued provision for visiting faculty are positive steps that will provide us with opportunities to maintain and enhance our programs.

Diversity Issues

The Department is committed to the University's mission to increase diversity on campus. Our expanding student recruiting and educational outreach activities have the goal of increased diversity as a component of their focus. We recognize that there remains much to be accomplished, particularly considering that the geosciences as a "discipline" in the United States historically have been underrepresented with respect to females and to U.S. citizens and permanent residents belonging to racial/ethnic minority groups. The following data, representing current enrollees and recent Geology graduates, reinforce the challenges ahead.

	Male	Female	Racial/Ethnic Minority	Foreign
Current A.B./B.S. (n=37)	57%	43%	8%	8%
Current M.A./M.S. (n=13)	31%	69%	0%	15%
Current Ph.D. (n=9)	78%	22%	0%	67%
MU GLG 96-03 All Degrees (n=140)	60%	40%	2%	3%
National Data 96-01All Degrees	63%	37%	4%	5%

Income and Expenditures

The Department of Geology is very economically viable. The Department has among the highest ratios of income/expenditures in the Ph.D.-granting science departments, and the lowest cost/student FTE within the same peer group.

A detailed summary of Department budgetary information is provided in ***Appendix 14***. The Department of Geology Oxford Campus ratio of income/expenditures steadily has increased from

2.52 in FY 97/98 to 4.26 in FY 02/03, yielding an **average I/E ratio of 3.29**. This is substantially higher than the 2.32 average for the previous review period. For the period FY 97/98 to FY 99/00, where comparable data are available, Geology (2.67) is second only to Microbiology (2.87) in average I/E ratio (BOT = 2.10, CHM = 2.40, ZOO = 2.10). A similar peer group comparison of cost/student FTE for the period FY 97/98 to FY 02/03 (Oxford) illustrates that **Geology has the lowest average ($2,803) cost/student FTE** (BOT = $4,252; CHM = $3,992; MBI = $2,850; ZOO = $4,773). Coupled with the extramural funding attracted by the Department and the continued growth of our endowed funds, these data provide strong evidence of the Department's economic viability.

Future Plans and Concerns

The Department of Geology is a high quality, extremely active and productive, economically viable unit. We have reached a faculty configuration where the most senior members are teaching, research, *and* service active mid-career scientists. These demographics, the high expectations that we have of our students and ourselves, and the high demands placed on Geology by the university community provide substantial challenges as we look to the future. Our vision for the future is simply stated; to achieve no less than the highest levels of student learning and education, student and faculty professional development and scholarly activity, and academic and disciplinary service in an engaging, collegial, and diverse environment. The Department has set a course, as evidenced by the activities and accomplishments detailed in this document, to forward this vision. National and international scholarly visibility have been achieved by a majority of the faculty; our goal now is to cultivate that individual visibility in to even greater programmatic visibility in the context of our strengths in ***Geochemistry*** and ***Crustal and Surficial Processes***. While the focus of this goal is directed at the graduate programs, enhancement of student quality and scholarship in these programs will enhance the scholarly atmosphere of the entire Department and the educational and scholarly opportunities of our undergraduate students. In order to achieve our broader vision and this directed goal, we propose a number of actions and cite a number of concerns that must be addressed.

Actions

- The Department will continue to recruit tenure-track faculty with expectations for the development of dynamic, integrated, disciplinary and cross-disciplinary teaching and research programs, and will continue to utilize its human resources in ways that recognize and capitalize on individuals' strengths and current professional interests.
- The Department will continue aggressively to seek extramural funding in support of education and research activities, and equipment and facilities enhancements.
- The Department will attempt modestly to increase the size of its graduate programs from an average of 20 students per year to approximately 25 students per year and to achieve a graduate student population composed of at least 50% Ph.D. students.
- The Department will attempt to increase the number of research and technical support staff in an effort to promote enhanced scholarly productivity while maintaining its commitment to teaching and professional service.
- The Department would like to move forward, within the next five years, with three new Oxford Campus faculty hires above and beyond the current search and any line provided for the Hamilton Campus. We envisage this request as a "cluster hire" over a two-year period, with one line devoted to attracting an internationally prominent mid-career scholar, and two lines devoted to attracting early career scientists with exceptional promise. These hires would capitalize on and enhance our current strengths in ***Geochemistry*** and ***Crustal and Surficial Processes***, and will provide the critical mass required to elevate our programs to the next level.

Concerns

- First and foremost, the Department cannot assume sole responsibility for affecting future positive change; thus, it seeks continued support from the College and upper Administration.
- To continue to be able to provide high quality field and laboratory experiences for our undergraduate students, most notably the Capstone *Field Geology* experience, and to adequately supplement new faculty start-up packages, the Department needs new financial resources. Endowed funds certainly will continue to assist, but should not be the primary resource.
- In order to foster growth in the graduate programs and in faculty/student scholarly activities while simultaneously meeting the demands placed on our Miami Plan courses and programs and the demands of a rigorous Baccalaureate curriculum, we must continue to receive assistance in the form of visiting faculty positions.
- Sustaining higher numbers in our graduate programs, particularly increasing the proportion of Ph.D. students, cannot rely solely on the successes of extramural funding. An issue as of yet unaddressed from the 1996 review is the need to restore some component of the institutionally funded graduate positions taken away from Geology prior to 1991. We specifically request additional Teaching Associate (Ph.D.) positions. But, where will we put these new students (see below)?
- Increasing the number of research and technical support staff absolutely is critical and cannot rely solely on the successes of extramural funding. **Without additional technical staff we will be unable to support new major instrumentation; this situation equates to a loss of opportunity to keep pace with state-of-the-art research.**
- In response to strong urging from the 1996 PRT, the Department was allocated suitable storage space in Upham Hall for the relocation of curated Museum collections and research specimens previously stored at the old Nike missile base west of town. This new space has allowed us to completely free-up one room in Shideler Hall; a room that will be used to address the research laboratory needs of the Solid Earth Geophysicist (current search). With the conversion of this room into a research laboratory, we will totally have exhausted the space available to us in Shideler Hall. **In other words, no additional space equates to no additional flexibility that, in turn, hinders our ability to implement important actions such as those listed above.**
- Shideler Hall is an old building in need of considerable attention, yet it continually has been passed over in favor of other building renovation or construction projects. As a consequence, we have been placed in a position necessitating, for example, [1] investment of substantial start-up funds for infrastructure improvements, and [2] investment of departmental funds to equip University controlled lecture rooms with the technology needed to teach effectively. We continue to do our part wherever possible to improve an antiquated infrastructure, but we have reached the point where substantial institutional efforts must take over.

THE DOCTORAL PROGRAM

It is appropriate to reiterate a statement from our 1996 Self-Study; one that was endorsed by the 1996 PRT and that applies today: "… we believe that we are the model for the geology department of the future in that we specialize in two areas only at the doctoral level, and maintain a small but active doctoral program in those areas of repute among the faculty".

Information on the basic structure, mission, quality, and viability of our Doctoral Program is included in earlier sections of this review, particularly the scholarly activities and accomplishments of Department faculty and students. Below we address specific items either not covered earlier, or that merit additional discussion.

Program Faculty

All tenured and tenure-track faculty members in the Department currently have Level A graduate standing. All nine of the full FTE faculty members currently advise graduate students, and five currently have Doctoral students in their research groups. All but one (most recent hire) of the ten active faculty members has advised Ph.D. students during this review period. As previously emphasized, our faculty expertise, hence the focus of the Ph.D. program, resides in two areas, ***Geochemistry*** and ***Crustal and Surficial Processes***. During the past seven years we have maintained these foci and have fostered substantial synergy and collaboration among faculty and students in these areas, leading to enhanced field and laboratory research opportunities for our graduate students. In the context of our program foci and the cross-disciplinary aspects of the geological sciences and of our Department, the graduate faculty research emphases are summarized below, with specific sub-disciplinary emphases listed in ***Appendix 2***.

Geochemistry	***Crustal and Surficial Processes***
Hailiang Dong, Assistant Professor	Mark Boardman, Professor
William Hart, Professor	Brian Currie, Assistant Professor
John Hughes, Professor	Yildirim Dilek, Professor
John Rakovan, Assistant Professor	Jonathan Levy, Associate Professor
Elisabeth Widom, Associate Professor	Jason Rech, Assistant Professor

Program Graduates

Six students have been graduated with the Ph.D. since the last Program and Doctoral Review. Two additional students, both currently employed in academia, will graduate by May of 2004. The average time in Ph.D. program of these students is 5.3 years compared with a national average of 5.9 years (see reference in table below). Out of context, the production of, on average, one Ph.D. graduate per year (same as previous review period) seems modest at best. This issue was raised by the 1996 PRT and remains a target for improvement in our ongoing efforts to increase the overall size of the graduate programs and the proportion of Ph.D. students enrolled (**Future Plans and Concerns** section above). Our rather static enrollment of Doctoral students (average 7/year) and production of Doctoral degree holders (average 1/year) since 1996 must be viewed in the context of [1] the overall national trend of decreasing enrollments in geoscience graduate programs since the mid-1990s (***Table A13.2***), [2] the Department demographic changes, and [3] the proportion of Ph.D. degrees awarded in the geosciences as compared to other sciences both at the national and local levels. The table below illustrates data pertinent to the third contextual point.

Percent National and Miami University Ph.D. Degrees Awarded, 1996 – 2003 [1]

NSF Defined Discipline	National, 1996	National, 2001	MU, 1996-2003
Geosciences	3.8%	3.4%	3.1%
Biological Sciences	48.4%	49.5%	34.6%
Chemistry	18.2%	17.2%	23.0%
Psychology	29.6%	29.9%	39.2%

Note [1]**:** National data from Science and Engineering Doctorate Awards: 2001 (NSF, October 2002); percentages are of totals for disciplines listed, which are science disciplines offering Doctorates at Miami University.

We believe that these data support the viability of our "small but active doctoral program" model while at the same time supporting the need for modest growth in our Doctoral program.

The initial career paths of the six Ph.D. graduates since 1996 and the two students nearing completion are: postdoctoral fellowship/research appointments at Miami University, the University of California at Davis, and the University of Toronto; tenure-track faculty positions at Saint Joseph's College (IN) and Universidad Autonoma de Baja California Sur (Mexico); remote sensing specialist with U.S. Environmental Protection Agency contractor; research hydrogeologist with a private environmental consulting firm; and self-employed IT professional. The status of only one of these individuals has changed; he currently is out of the profession due to a severe disability. Three of our graduated students have maintained productive academic research activities and have thus far published ten peer-reviewed journal articles since their departure from our program.

Four of the six Ph.D. graduates responded to our alumni survey (***Appendix 16***). The average of these responses for selected questions is provided below (5 = agree strongly, 4 = agree somewhat).

- My graduate degree in geology is important in my present occupation: **5.0**
- My Miami graduate education did a good job of preparing me for my present occupation: **5.0**
- Overall, I was very satisfied with my individual student-advisor interactions: **5.0**
- Overall the professional quality of the geology faculty is high: **4.8**
- The geology faculty show concern for the students as individuals: **4.5**
- The environment in Miami's geology department is stimulating and conducive to research: **4.5**
- Overall, I rate my graduate education as highly satisfactory: **5.0**

Program Vitality

The vitality of our Ph.D. program intimately is linked with the overall research activities of the Department and is fueled by the continuing influx of extramural research funding and the recent addition of new laboratories and state-of-the-art instrumentation. The sub-disciplinary specialties and varying technical expertise of the graduate faculty members foster an environment conducive to dialogue and faculty/student interactions beyond the individual research group. The introduction of three new upper-level courses, GLG 633 (Extensional Tectonics), GLG 723 (Advanced Sedimentology), and GLG 770 (Advanced Isotope Geochemistry), and the frequent offering of established 600- and 700-level courses (***Table A5.2***), provide ample in-class interdisciplinary, active learning and discussion opportunities to compliment the research focus of our Ph.D. program.

Additional educational and scholarly opportunities and expectations exist within and outside the conventional classroom and research laboratory. Many of these previously have been highlighted, but selected activities particularly relevant to our Ph.D. program are emphasized below.

- Weekly to bi-weekly Department seminar series; formal research presentation by a guest scientist and opportunities for student interactions with the visitor.
- Short (one week) and long (full semester) term domestic and international visiting scholars; these visitors participate in seminars and student/faculty research activities.
- Weekly (fall semesters) graduate student organized departmental seminars featuring research, instrumentation, and funding opportunity presentations and discussions by faculty and Ph.D. students.
- Off- and on-campus academic year and summer workshop courses (***Appendix 7***); graduate students serve as instructors or teaching assistants for a number of these courses, and one course, *Teaching Field Geology*, specifically is designed to provide advanced M.S. and Ph.D. students with field teaching experience.
- Long before formal programs were instituted at the University to encourage Doctoral student mentoring of undergraduate research, we forwarded expectations that our Ph.D. students would serve as mentors to M.S. and A.B./B.S. students in the field and in the lab. Our Doctoral students have met these expectations and deserve substantial credit for the scholarly accomplishments of their graduate and undergraduate student colleagues.
- Doctoral students are encouraged to pursue data acquisition not possible via in-house facilities through arrangements at other institutions where they also are provided with opportunities to interact with leading scientists in their sub-discipline.
- Doctoral students are required to have either published or accepted for publication at least one peer-reviewed article prior to graduation (***Table A8.2***), and must have as a member of their final examination committee a scholar from outside the Miami community.
- Doctoral students are expected to generate extramural funding in support of their research efforts (***Table A8.1***).

The planned modest growth in size of our Ph.D. program will only enhance the program's vitality, productivity, and visibility.

Program Demand

As previously described, the Department receives large numbers of inquiries for our graduate programs (1,435 since 1996) and pre-selects students who subsequently are encouraged to make formal application based on a match with faculty interests and on the number of available funding positions. Data do not exist to indicate the proportion of total inquiries attributable to our Ph.D. program. We received 180 formal applications to our graduate programs between 1996 and 2003, 48 (27%) of which were for the Doctoral program; 38 (79%) of these applicants were extended offers, with 18 (46%) accepting. Those students turning down our offer did so primarily in favor of offers from Carnegie Doctoral/Research Extensive institutions (e.g., California Institute of Technology, University of Illinois at Champaign-Urbana, Yale University) or changes in short-term career or personal plans. For the years 2000 through 2003, the average GPA and average cumulative GRE score (Quantitative + Analytical + Verbal) of Doctoral applicants are 3.39 and 1881, respectively. During this same time period 50% of our applicants were from foreign institutions; the greatest percentage from highly regarded institutions in the Peoples Republic of China. As summarized below, it is apparent that the demand for and faculty focus (i.e., changing demographics) on our Ph.D. program has increased since the 1996 to 1999 period.

	2003	2002	2001	2000	1999	1998	1997	1996
Total Applications	26	17	31	17	15	22	16	36
Ph.D. Applications	10	7	9	6	1	5	3	7
Percent Ph.D.	38.5%	41.2%	29.0%	35.3%	6.7%	22.7%	18.8%	19.4%
Offers made/accepted	8/5	5/1	5/3	6/2	1/1	5/1	3/1	5/4

We are coming off of the most successful Doctoral student recruiting year (2003) in quite some time. Five factors primarily are responsible for this: [1] enhanced international visibility of our program as new faculty become more established, [2] more proactive recruiting measures, [3] increased "research assistant" positions due to extramural and intramural funding, [4] recently increased graduate recruitment funds provided by the Graduate School, including the Graduate School Academic Achievement Supplement, and [5] recently increased Doctoral stipend levels. We have found that a very important component of our recruiting strategy is bringing prospective candidates to campus, a practice generally possible for only North American candidates. Inevitably, these students leave with an even more positive impression of the program and supporting facilities, and prospective advisors have an opportunity to judge the "appropriateness" of a particular student for her/his research group specifically, and the Department more generally.

Program Interactions

Geology Doctoral students routinely interact and collaborate with students or/and faculty and staff from the Departments of Chemistry and Biochemistry, Geography, Mathematics and Statistics, and Microbiology, and from the Institute of Environmental Sciences, the University Libraries (Center for Information Management), and the University Electron Microscopy Facility. For example, since 1996, Geology faculty and Ph.D. students have been involved in various collaborative research endeavors resulting from or leading to seven multi-department/program intramural and extramural research and instrumentation awards, and the establishment of the Miami University Center for Nanotechnology. In recognition of the growing interdisciplinary requirements of geology as a discipline, Geology Ph.D. students frequently enroll in courses offered by the departments named above, as well as others. Moreover, Department faculty members maintain laboratory facilities and offer field and laboratory workshop courses that provide educational and research opportunities for graduate students from the various science, mathematics, and engineering programs across campus, and for graduate students from a number of other institutions, most notably Wright State University and the University of Cincinnati.

Off-campus collaborations also substantially enhance the opportunities available to our graduate students. The examples are numerous, ranging from access to research facilities to international research activities and collaborative research supported by multi-institution research grant awards. Some of these opportunities are cited below.

- Research facilities at, for example, Argonne National Laboratory, Brookhaven National Laboratory, Carnegie Institution of Washington, Franklin & Marshall College, Los Alamos National Laboratory, Pacific Northwest Research National Laboratory, Univ. of Arizona, Univ. of Kentucky, Univ. of Michigan, and U.S. Geological Survey.
- International research via established relationships with scientists, institutions and government organizations in, for example, Albania, Argentina, Austria, the Bahamas, Chile, China, Ethiopia, Haiti, India, Japan, Jordan, Portugal (Azores), Tibet, Turkey, and Russia.
- North American collaborative research in addition to the above named research facilities with, for example, Boise State Univ., Bucknell Univ., New Mexico Institute of Mining

and Technology, Princeton Univ., SUNY at Stony Brook, Univ. of California at Berkeley, at Davis, at Santa Cruz, University of Illinois at Chicago, and University of Maryland.

Program Access

Our graduate programs receive inquiries and applications from students throughout North America and the World, and enroll students from a diverse array of backgrounds and locations (see institution list on page 12). Domestic applicants (n=16) to our Doctoral program over the past four years typically are from institutions in the eastern one-half of the United States, including University of Alabama, Central Michigan University, Florida Atlantic University, Georgia State University, IUPUI, Kent State University, Miami University, University of Michigan, University of Notre Dame, University of Rochester, Southeast Missouri State University, and Southern Illinois University. Foreign applicants over this same time period (n=16) are from institutions in Canada, China, India, Thailand, and Turkey. The home nations of recent graduates from our Doctoral program include Canada, China, Ethiopia, Mexico, Pakistan, Taiwan, and the United States. It is apparent that our Doctoral program possesses a strong international human resource component leading to ethnic and cultural diversity. Establishing racial/ethnic diversity in the applicant pool of U.S. citizens or permanent residents is a far greater challenge considering national disciplinary demographics. For example, of the 464 U.S. citizen or permanent resident Ph.D. graduates in the geosciences (earth, atmospheric, ocean) during 2001, racial/ethnic minorities represent only 1.5% of the total, and women represent 34.9% of the total. The demographics of our current in-house Ph.D. student body are 33% U.S. citizens (no racial/ethnic minorities) and 67% foreign citizens (5 East Asian, 1 West Asian), and 22% Female.

We anticipate that our Doctoral program will begin to attract greater attention from the western one-half of the United States as the reputation and visibility of the program continues to grow. We are now actively recruiting at national conferences such as those sponsored by the Geological Society of America and the American Geophysical Union to accompany the visibility afforded by our growing network of domestic and international collaborators.

Assessment Mechanisms

The most obvious assessment criteria for a Doctoral program are the scholarly productivity of its faculty and students, the success of its graduates, and feedback from graduates on the effectiveness of the program. All of these criteria have been addressed in earlier sections of this document.

Various internal assessments of faculty and doctoral students are ongoing; formal course evaluations, student progress reports at the end of each semester, and annual faculty evaluations. Formal course evaluations for laboratory sections taught by Ph.D. students primarily are used in a formative manner. Student progress reports, submitted to the Chair, are used to gather student accomplishment data and also to assure that students are making satisfactory progress toward their degree. Annual assessments of faculty performance are made by the Department Promotion and Tenure Committee plus the Chair in the case of tenure-track faculty, and by only the Chair in the case of tenured faculty. The Chair makes annual faculty salary recommendations; these are based partly on Graduate program activities and research productivity.

In addition to periodic surveys of our alumni, all graduating students fill out an exit interview questionnaire prior to meeting with the Chair to discuss strengths and weaknesses of their educational experience. The exit interview process provides important information to assist the Department in addressing student needs and in making necessary programmatic modifications.

Changes Resulting from the Previous Review

The primary concerns raised by the 1996 PRT were [1] the breadth of courses available, [2] the faculty teaching loads, and [3] the modest size of our Ph.D. program. As previously indicated, the first concern has been addressed via the addition of new faculty and their development of additional courses at the 500-, 600-, and 700-levels. The second concern remains a difficult issue considering the faculty size and demographics, the intense demand for Geology Miami Plan courses, and our ongoing commitment to teaching across the Baccalaureate, Master's and Doctoral programs. The use of visiting faculty has allowed us to provide some relief, at least for early career faculty as they develop their research programs and laboratories. Moreover, an emphasis on development of 400/500-level courses allows us to simultaneously address certain needs in the undergraduate and graduate programs. The issue of Doctoral program size has been discussed above. While we have not yet been able to fully address this due to faculty transition and national geoscience enrollment patterns, we substantially have increased the Department's visibility and recruiting presence leading to increased applicant pools over the past four years and to an excellent recruiting year in 2003. The addition of one new faculty member effective August 2004, and the suggested three-faculty "cluster hire" (**Future Plans and Concerns** section above), provides a clear vision on how all three concerns should be further addressed in the near future.

APPENDICES

Appendix 1: Degrees and Programs

A.B. and B.S. Degrees in Geology

Core Requirements. (29 hours)
1. Any 100-level GLG lecture course (MPF)(3)
2. GLG 115.L Understanding the Earth Lab (MPF)(1)
3. GLG 201 Mineralogy (4)
4. GLG 211 Chemistry of Earth Systems (3)
5. GLG 301 Sedimentology and Stratigraphy (4)
6. GLG 322 Structural Geology (4)
7. GLG 357 Igneous and Metamorphic Petrology (4)
8. GLG 411 Field Geology (6; capstone course)

B.S. additional requirements:
1. additional 400-level course(s) (4 hrs.)
2. research project
   a. GLG 477; 480; or equivalent (3-4 hrs.)
   b. public presentation
3. second semesters of Chemistry, Math, and Physics

Emphasis Requirements. Complete one Emphasis

Environmental Emphasis (10 hours)
GLG 401 Global Climate Change (4)
GLG 402 Geomicrobiology (3)
GLG 408 Introduction to Hydrology (4)
GLG 428 Groundwater Flow Modeling (4)
GLG 454 Geomorphology (4)
GLG 482 Contaminant Hydrogeology (4)
GLG 491 Geochemistry of Natural Waters (3)
GLG 496 Isotopes in Environmental Processes (3)

Solid Earth Emphasis (11 hours)
GLG 416 Carbonate Depositional Systems (5)
GLG 417 Chemistry of Earth's Interior (3)
GLG 427 Isotope Geology (3)
GLG 430 Mineral Surface Geochemistry (3)
GLG 432 Clays and Clay Mineralogy (3)
GLG 450 Basin Analysis (3)
GLG 454 Geomorphology (4)
GLG 492 Global Tectonics (4)

Related Hours Requirements. (13-16 hours)
Chemistry:
CHM 137, 144 College Chemistry/College Chemistry Lab (4, 2) or
CHM 141, 144 College Chemistry/College Chemistry Lab (3, 2)
Math:
MTH 151 or 153 Calculus I (5, 4)
Physics:
PHY 171 College Physics (3) and PHY 183 General Physics Lab (1) or
PHY 181 Physical World (4) and PHY 183 General Physics Lab (1)

Total Hours Required:

52-56 for A.B. Degree

73-78 for B.S. Degree

Minor in Geology

A minimum grade point average of 2.25 is required for all courses in the minor. No courses may be taken credit/no-credit. This minor is not available to majors in geology or earth science education. Courses must be selected from currently offered Geology courses; substitutions may be made with approval of the department. Total Credit Hours: 18.

There are three tiers of program requirements:
1. Any 100-level GLG lecture course (MPF)(3); and
2. GLG 115.L Understanding the Earth Lab (MPF)(1); and
3. Complete the 18 semester hours with courses at the 200-level or above. At least one course must be at 300-level or above.

Thematic Sequences in Geology

Oceanography; TGLG-1

This sequence provides students with an appreciation of the critical importance of the oceans to the functioning of our planet; Earth. Oceans dominate the surface area of the earth, and they are critical to the maintenance of a habitable planet (i.e. the water cycle, climate control, oxygen composition of the atmosphere, etc.). The sequence will examine what we know about the oceans and how the oceans are an integral part of the Earth's ecology. In the final tier of the sequence, students will explore, first hand, the ways that we study the oceans.

There are three tiers:

1. GLG 111 The Dynamic Earth (MPF)(3), or GLG 121 Environmental Geology (MPF)(3); or GLG 141 Geology of National Parks (MPF)(3); **and**
2. GLG 244 Oceanography (3); **and**
3. GLG 414 Coastal Ecology of the Bahamas (summer only – off campus) or GLG 413 Tropical Marine Ecology (summer only – off campus).

The Water Planet; TGLG-2

Provides an introduction to the essential role water plays in supporting life on Earth, including the origin of water, its physical/chemical characteristics, how these characteristics combine to make life possible on the continents and in the oceans, and details concerning the hydrologic cycle. Also introduces the economic, legal and political ramifications of water use in the U.S.

There are three tiers:

1. GEO 121 Introduction to Physical Geography (MPF)(3), or GLG 111 The Dynamic Earth (MPF)(3), or GLG 121 Environmental Geology (MPF)(3); or GLG 141 Geology of National Parks (MPF)(3); **and**
2. GLG 244 Oceanography (3); **and**
3. GLG 207 Water and Society (3), or GEO 425 Hydrogeography (3), or GLG 408 Introduction to Hydrogeology (4), or ZOO 463 Limnology (3).

Environmental Science Co-Major

This interdisciplinary course of study provides a broad-based environmental science background and prepares students to pursue a wide variety of career paths or post-graduate degrees. The term "co-major" is unique and indicates that students must be concurrently enrolled in and must complete another major at Miami University. There is no specific degree designation for the co-major; students receive the degree designation of their primary major. The general co-major requirements are provided below; please refer to The Miami Bulletin 02/04, p. 93 for additional details.

1. Complete a major in one of the divisions of the university
2. Biological Science (4 semester hours)
3. Physical Science (8 semester hours)
4. Statistics (3-4 semester hours)
5. Social Science (6-7 semester hours)
6. Environmental Science (9-11 semester hours)
7. Practicum and Synthesis (3-5 semester hours)

Appendix 2 : Faculty and Staff - Then and Now [1]

As of Fall 1996	As of Fall 2003
A Dwight Baldwin, Jr. Professor **(t 6/00)** hydrogeology, environmental geology	Mark R. Boardman Professor [2] carbonate sedimentology, low-temp. geochemistry
Richard R. Beck Asst. Professor **(s 6/99)** stratigraphy, tectonic sedimentology	Brian S. Currie Assistant Professor **(1/00)** tectonic sedimentology, stratigraphy
Mark R. Boardman Professor carbonate sed., low-temp. geochemistry	Yildirim Dilek Professor ***(7/03)*** structural geology, tectonics
Yildirim Dilek Asst. Professor structural geology, tectonics	Hailiang Dong Assistant Professor **(8/00)** geomicrobiology, geochemistry, nanoscience
William K. Hart Professor igneous petrology, volcanology	William K. Hart Professor, Chair [3] igneous petrology, volcanology
John M. Hughes Professor, Chair mineralogy, crystallography	John M. Hughes Professor [4] mineralogy, crystallography
Jonathan Levy Asst. Professor hydrogeology, environmental geology	Jonathan Levy Associate Professor ***(7/00)*** [5] hydrogeology, environmental geology
Larry Mayer Professor **(s 6/00)** geomorphology, tectonics	John F. Rakovan Assistant. Professor **(1/98)** geochemistry, mineralogy, nanoscience
Elisabeth Widom Asst. Professor isotope geochem., igneous petrology	Jason A. Rech Assistant Professor **(8/02)** geomorphology, Quat. geology, stable isotopes
	Elisabeth Widom Associate Professor ***(7/03)*** isotope geochemistry, igneous petrology
Search (Rakovan hired) geochemistry	Search Asst. Professor. solid earth geophysics
Wayne D. Martin Prof. Emeritus sedimentology, field geology	Wayne D. Martin Professor Emeritus sedimentology, field geology
Robert G. McWilliams Prof. Emeritus earth science education, field geology	Robert G. McWilliams Professor Emeritus earth science education, field geology
R. Hays Cummins Affiliate Prof. paleontology, climate change	R. Hays Cummins Affiliate Professor paleontology, climate change
J. Christopher Haley Vis. Asst. Prof. **(d 6/97)**	Paul Holm Visiting Assistant Prof. **(8/97)**
Steven Schafersman Vis. Asst. Prof. **(d 12/99)**	Kathryn Kilroy Visiting Assistant Prof. **(8/02)**
	David Kuentz Visiting Instructor **(8/03)**
	Andrew Webber Visiting Asst. Prof. (MUH)**(8/03)**
	Darin C. Snyder Research Associate **(8/02)**
	Searches (2) Research Fellow
Joe Marak Museum Curator **(t 12/01)**	Kendall Hauer Interim Museum Manager **(1/02)**
John P. Morton Geochem. Technician	John P. Morton Geochemistry Technician
Cathy Edwards Admin. Secretary	Cathy Edwards Administrative Assistant
Teresa Kolb Senior Acct. Clerk	Teresa Kolb Accounting Associate
	Carol Eddy-Dilek Adjunct Asst. Prof. **(7/97)**
	Susan Flowers Senior Program Asst. **(2/03)**

Note [1] : Bolded dates are re**t**irement/re**s**ignation/**d**eparture (1996 col.) and appointment (2003 col.) dates; bolded-italicized dates are effective dates of current faculty rank (if different than 1996).

Note [2] : Acting Chair from 7/99 through 12/00.

Note [3] : NSF Program Director 1/98 through 12/98; Chair beginning 1/01.

Note [4] : Associate Dean, College of Arts and Science beginning 7/99; Dean of the Graduate School and Associate Provost for Research and Scholarship beginning 1/03.

Note [5] : Teaching on Luxembourg campus for AY 2002-03 and 2003-04, replaced by Kilroy.

Appendix 3: Department of Geology Benchmarking Plans

Plan #1

Outcome: **Increase the interest and participation of our graduate students in professional activities outside the classroom.**

Changes/Actions:

1. Initiate a weekly graduate student organized seminar series open to all faculty, staff, and students in the department – graduate students will present and lead discussions on a topic of research interest, including, but not limited to, their individual research efforts.
2. Greater participation of graduate students in the Miami University Geological Society (established geology club) – graduate students will act as mentors to our majors and facilitators for MUGS sponsored activities.
3. Formalize graduate student and faculty outreach to local school districts (see also Plan #3) – graduate students will coordinate these efforts with the Limper Geology Museum and will organize visits to schools.

Oversight and Evaluation: While the entire department will be involved with these efforts, the chair, director of graduate studies, MUGS advisor, and museum manager, in conjunction with representatives from the M.S. and Ph.D. programs (these students also attend faculty/staff meetings), will initiate and oversee the above. Self-assessment by the graduate students at the end of each semester, and formal evaluation of the graduate students by the faculty as a whole at the end of each semester are the primary evaluative mechanisms.

Plan #2

Outcome: **Increase the number of applicants to our graduate programs.**

Changes/Actions:

1. Target regional undergraduate geology/earth science programs for recruiting – arrange and sponsor talks by our faculty at such institutions.
2. Enhance advertising of our graduate programs in society and professional organization media outlets, at national and international professional conferences, and via upgrades to the department's website.
3. Investigate and initiate development of an on-campus "geology undergraduate research conference" that will involve participants from regional colleges and universities – this is a long-term plan that may not materialize in 2002-03.

Oversight and Evaluation: All geology faculty and staff will be involved with these efforts. Progress will not be immediate, thus short term evaluation will be difficult, but will include monitoring graduate student inquiries and identifying the main source of information that attracted a particular student to our programs. Data compilation will be the responsibility of the department administrative assistant and the director of graduate studies.

Plan #3

Outcome: **Increase the number of undergraduate geology majors.**

Changes/Actions:

1. Increase the diversity of 100- and 200-level courses on the Oxford and Hamilton campuses – in 2002-03 we plan to offer a new course in "geology and gemstones" on the Oxford campus and a new course in "historical geology" on the Hamilton campus.
2. Strengthen departmental participation in the Honor's Program and the Environmental Science Co-major, and offer a first-year seminar course in geology.
3. Organize an in-house "symposium" for first and second year students to include discussions of career, field travel, and research opportunities in geology, and student-led tours of the geology department – invite all students enrolled in 100-level geology courses each semester.
4. Formalize graduate student and faculty outreach to local school districts (see also Plan #1) – graduate students will coordinate these efforts with the Limper Geology Museum and will organize visits to schools.

Oversight and Evaluation: Geology faculty, staff, and students will be involved with these efforts, with the chair, chief departmental advisor, and museum manager responsible for organizational issues. Progress will not be immediate, thus short term evaluation will be difficult, but will include monitoring entering students with declared interests in geology and the school systems from which they derive, monitoring the number of new majors gained from specific 100- and 200-level courses, and identifying the main reason(s) that a particular student chose geology as a major. Data compilation will be the responsibility of the department administrative assistant and the chief departmental advisor.

Appendix 4: The Undergraduate Core Curriculum in Context

Table A4.1: Key Courses/Subjects in a Geology Core Curriculum

Course	National Survey [1]	MU Geology
Mineralogy	82%	Core requirement
Petrology	77%	Core requirement
Structure	74%	Core requirement
Sed/Strat	64%	Core requirement
Historical	57%	Not Currently Offered [2]
Physical	52%	GLG 111,121,131,141
Field Geology	40%	Capstone requirement
Paleontology	37%	Not Currently Offered [2]
Geomorphology	32%	Emphasis elective
Geophysics	30%	Not Currently Offered [3]
Geochemistry	27%	Core requirement
Hydrogeology	12%	Emphasis elective

Table A4.2: Key Concepts for an Introductory Geology Course

Concept	National Survey [1]	MU GLG [4]
Plate Tectonics	94%	100%
Rock Cycle	71%	100%
Time/Scale of Earth Processes	66%	100%
Surface Processes	63%	100%
Mineralogy	46%	88%
Earth System Science	39%	25%
Structural Geology	33%	75%
Environmental Geology	22%	56%
Resources	20%	69%
Earth History	20%	88%

The MU foundation courses, GLG 111, 121, 131, and 141, are grouped in the percentages listed.

Table A4.3: Organization of Classroom Time in Introductory Geology Courses

Category	National Survey [1]	MU GLG [4]
Lecture	79%	75%
Discussion	10%	14%
Projects/Group Work	5%	3%
Presentations	3%	4%
Other	3%	4%

The MU foundation courses, GLG 111, 121, 131, and 141, are grouped in the percentages listed.

Note [1] : Data from a recent national Geology curriculum survey (*Geotimes*, v.26, no.11, 2001, p.19; *EOS*, v.41, no.48, 2000, p.304; www.geology.lssu.edu/survey/html). Percentages in Tables A4.1 and A4.2 are of survey respondents indicating that a particular course, subject, or concept is an essential component of a Geology curriculum and in Table A4.3 of the average distribution of classroom time indicated by survey respondents.

Note [2] : Seeking approval for a tenure-track position on the Hamilton Campus in these areas; aspects are covered in the required GLG 115.L lab course and the elective course GLG 205.

Note [3] : Currently searching for a tenure-track Solid Earth Geophysicist.

Note [4] : Results of an internal survey conducted during AY 02-03 (visiting and permanent faculty). See above for explanation of percentages.

Appendix 5: Geology Course Offerings

Table A5.1: Available Courses - Then and Now [1]

As of Fall 1996		As of Fall 2003 [2,3]	
111	Dynamic Earth	111	Dynamic Earth
115L	Understanding the Earth	115L	Understanding the Earth
121	Environmental Geology	121	Environmental Geology
141	Geology of US Natlional Parks	141	Geology of US Natlional Parks
201	Mineralogy (L)	201	Mineralogy (L)
207	Water & Society	207	Water & Society
211	Chemistry of Earth Systems	211	Chemistry of Earth Systems
244	Oceanography	244	Oceanography
311	Field Geology		*Modified and changed to 411/511*
312	Earth History & Cultural Context		*Aspects integrated into 205*
322	Structural Geology (L)	322	Structural Geology (L)
404/504	Geodynamics & Tectonic Geomorph.	404/504	Geodynamics & Tectonic Geomorph.
405/505	Systematic Paleontology (L)		*Aspects integrated into 205*
408/508	Introduction to Hydrogeology (L)	408/508	Introduction to Hydrogeology (L)
420/520	Sedimentology & Stratigraphy (L)		*Modified and split into 301 & 450/550*
422	Petrography (L)		*Modified and changed to 357*
428/528	Groundwater Flow Modeling (L)	428/528	Groundwater Flow Modeling (L)
454/554	Geomorphology (L)	**454/554**	**Geomorphology (L)**
482/582	Contaminant Hydrogeology (L)	482/582	Contaminant Hydrogeology (L)
484/584	X-ray Diffractometry (L)	484/584	X-ray Diffractometry (L)
491/591	Geochemistry of Natural Waters	491/591	Geochemistry of Natural Waters
492/592	Advanced Structural Geology (L)	492/592	Global Tectonics (L)(name/content change)
643	Advanced Min/Pet/Geochem (L)	643	Advanced Min/Pet/Geochem (L)
644	Geochronology		*Aspects integrated into 427/527*
646	Igneous Petrology	646	Igneous Petrology
671	Intro. to Geology for Teachers I (L)	671	Intro. to Geology for Teachers I (L)
710	Geology Seminar	710	Geology Seminar
720	Advanced Mineralogy	720	Advanced Mineralogy
730	Advanced Igneous Petrology	730	Advanced Igneous Petrology
750	Advanced Crust/Mantle Development	750	Advanced Crust/Mantle Development
760	Advanced Carbonate Sedimentology	760	Advanced Carbonate Sedimentology
		131	Geology & Gemstones
		175	**Environmental Science Seminar**
		205	Evolution and Earth Systems
		217	Planetary Geology
		275	**Principles of Environmental Science**
		301	Sedimentology & Stratigraphy (L)
		357	Igneous & Metamorphic Petrology (L)
		401/501	Global Climate Change
		402/502	**Geomicrobiology**
		411/511	Field Geology
		417/517	Chemistry of Earth's Interior
		427/527	Isotope Geochemistry
		430/530	Mineral Surface Geochemistry
		432/532	Clays & Clay Mineralogy
		444/544	Oceanography for Teachers
		450/550	Sedimentary Basin Analysis
		496/596	Isotopes in Environmental Processes
		633	Extensional Tectonics
		723	Advanced Sedimentology
		770	Advanced Isotope Geochemistry

Note [1]: Exclusive of Honors, independent study, thesis/dissertation, and AY and summer workshop courses (except capstone, Field Geology); some upper-level courses offered only when demand exists. (L) following a course indicates formal laboratory component.

Note [2]: New and substantially modified courses at end of listing

Note [3]: Bolded courses are cross-listed;
175 with 7 departments
275 with 7 departments
402/502 with Microbiology
454/554 with Geography

Table A5.2: Course Distribution by Semeseter

		AY96/97			AY97/98			AY98/99			AY99/00			AY00-01			AY01-02			AY02/03		
		F	Sp	Su	F	Sp	Su	F	Sp	Su	F	Sp	Su	F	Sp	Su	F	Sp	Su	F	Sp	Su
111	Dynamic Earth	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
115L	Understanding the Earth	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
115H	Honors Laboratory																	X			X	
121	Environmental Geology	X	X	X	X	X		X	X	X	X	X		X	X		X	X	X	X	X	
131	Geology & Gemstones																				X	
141	Geology of US Natlional Parks	X	X		X	X		X	X		X	X		X	X		X	X		X	X	X
171	Earthquakes and Volc. (one-time only)		X																			
175	Environmental Science Seminar																X	X		X		
177	Independent Study			X						X					X							
180	Various Honors courses	X				X												X			X	
201	Mineralogy	X			X			X			X			X			X			X		
205	Evolution and Earth Systems							X			X			X						X		
207	Water & Society	X				X			X			X			X			X			X	
211	Chemistry of Earth Systems		X			X			X			X					X			X		
244	Oceanography		X	X		X	X	X		X	X			X		X	X			X		
275	Principles of Environmental Science																	X			X	
277	Independent Study					X			X			X	X				X				X	
301	Sedimentology & Stratigraphy							X			X				X			X			X	
322	Structural Geology		X			X			X			X		X			X			X		
340	Summer Scholars Program			X			X			X						X			X			
357	Igneous & Metamorphic Petrology														X			X			X	
377	Independent Study			X	X	X	X		X	X	X	X	X	X	X		X	X		X	X	
401/501	Global Climate Change											X						X			X	
402/502	Geomicrobiology														X			X				
405/505	Systematic Paleontology	X			X																	
408/508	Introduction to Hydrogeology		X			X			X			X			X			X			X	
411/511	Field Geology			X			X			X			X			X			X			X
412/512	Tropical Ecosystems of Costa Rica			X			X			X			X			X			X			X
413/513	Tropical Marine Ecology			X			X			X			X			X			X			X
414/514	Coastal Ecology of Bahamas			X			X			X			X			X			X			X
415/515	Coral Reef Ecology																					X
417/517	Chemistry of Earth's Interior										X											
420/520	Sedimentology & Stratigraphy		X			X																
422	Petrography	X			X			X			X											
427/527	Isotope Geochemistry				X				X					X			X			X		
428/528	Groundwater Flow Modeling	X												X								
430/530	Mineral Surface Geochemistry								X			X									X	
432/532	Clays & Clay Mineralogy														X							
440/540	Remote Sensing (one-time only)		X																			
444/544	Oceanography for Teachers														X							
450/550	Sedimentary Basin Analysis													X			X					
454/554	Geomorphology	X			X			X			X										X	
461/561	Carbonate Lagoons (one-time only)								X													
477	Independent Study	X	X		X	X		X	X		X	X	X	X	X	X	X	X		X	X	
482/582	Contaminant Hydrogeology				X						X						X					
484/584	X-ray Diffractometry		X						X													
491/591	Geochemistry of Natural Waters	X			X			X			X						X			X		
492/592	Global Tectonics														X			X			X	
496/596	Isotopes in Environmental Processes																				X	
498	Senior Thesis	X			X												X	X		X	X	
499/599	Various workshops	X		X		X			X	X					X			X			X	
633	Extensional Tectonics																			X		
643	Advanced Min/Pet/Geochem	X			X			X														
646	Igneous Petrology											X										
671	Intro to Geology for Teachers I	X				X											X					
671L	Intro to Geology Lab for Teachers I	X															X					
699	Various workshops			X			X			X			X		X	X	X	X	X	X	X	X
700	Research for M.S.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
710	Geology Seminar	X	X			X	X	X		X			X				X	X				
720	Advanced Mineralogy	X			X													X				
730	Advanced Igneous Petrology	X																		X		
750	Advanced Crust/Mantle Development		X			X			X					X				X		X		
760	Advanced Carbonate Sedimentology	X			X	X		X												X	X	
770	Advanced Isotope Geochemistry																			X		
790	Research in Geology	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X		X	X	X
850	Research for Ph.D.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Appendix 6: Course Data - Fall 1996 through Spring 2003

Exclusive of Summer, Honors, Independent Study, and 7xx, 8xx Courses

Table A6.1: Foundation Courses - All Campuses

Course	Sections	Enroll	OIR [1]	GPA	Avg. Enroll	Avg. Enroll/AY	Avg. Sect./AY
GLG 111 ALL [2]	**97**	**7,745**		**2.7**	**80**	**1,106**	**13.9**
Oxford Campus	67	6,591	2.9	2.8	98	942	9.6
Hamilton Campus (MUH)	19	887	NA	2.1	47	127	2.7
Middletown Campus (MUM)	11	267	NA	2.7	24	38	1.6
GLG 121 ALL	**55**	**3,611**		**2.6**	**66**	**516**	**7.9**
Oxford Campus	27	2,629	3.0	2.7	97	376	3.9
Hamilton Campus (MUH)	17	722	NA	2.4	42	103	2.4
Middletown Campus (MUM)	11	260	NA	2.7	24	37	1.6
GLG 141 ALL	**49**	**3,857**		**2.7**	**79**	**551**	**7.0**
Oxford Campus	32	3,268	2.9	2.7	102	467	4.6
Hamilton Campus (MUH)	6	331	NA	2.5	55	47	0.9
Middletown Campus (MUM)	11	258	NA	2.9	23	37	1.6
GLG 115.L	**241**	**4,462**		**3.4**	**19**	**637**	**34.4**
Oxford Campus	218	4,006	3.1	3.4	18	572	31.1
Hamilton Campus (MUH)	13	272	NA	3.3	21	39	1.9
Middletown Campus (MUM)	10	184	NA	2.9	18	26	1.4
GLG 111,121,141 ALL	**201**	**15,213**		**2.6**	**76**	**2,173**	**28.7**
Oxford Campus	126	12,488	2.9	2.7	99	1,784	18.0
Hamilton Campus (MUH)	42	1,940	NA	2.3	46	277	6.0
Middletown Campus (MUM)	33	785	NA	2.8	24	112	4.7

Note [1] : Not available (NA); too few returns on file for MUH and MUM to be meaningful.

Note [2] : GLG 111 data include one section GLG 131, first offered Spring 2003

Table A6.2: Upper-level Courses - Oxford Campus

Course(s)	Sections	Enroll	OIR	4xx GPA	5/6xx GPA	Avg. Enroll	Avg. Sect./AY
Elective & Thematic Sequence Courses (GLG 205, 207, 244)	20	1,356	3.0	2.7		68	2.9
Core Curriculum Courses (GLG 201,211,301 322,357)	32	588	3.3	2.7		18	4.6
Emphasis & Elective Courses (GLG 4xx/5xx)	51	600	3.4	3.0	3.5	12	7.3
Capstone Course, Field Geology (GLG 411/511); only MU students listed (* = 1999-2003 only)	7	178 (103 MU)	3.4 *	3.4 *	3.7 *	25	1.0
Geology **600-level** Courses	8	52	3.8		3.6	7	1.1

Appendix 7: Workshop Courses and Enrollments

Table A7.1 : Workshop Courses Offered	No. of Offerings	Total Students UG	Total Students G	MU Students UG	MU Students G
Active Geomorphic Processes in Baja, California	1	5	5	5	5
Active Tectonics & Geomorph. of Eastern California	3	13	7	12	7
Carbonate Depositional Systems ***(CDS)***	7	9	85	0	25
Coastal Ecology of the Bahamas ***(CEB)***	7	91	25	78	1
Coral Reef Ecology ***(CRE)***	3	11	16	8	7
Environment and Culture in Haiti	2	2	12	2	12
Env. Science for Elementary Teachers ***(ESET)***	7	0	563	**(OH teachers)**	
Field Geology (Geology Capstone Course) ***(FG)***	7	161	16	88	15
Field Geology of National Parks	1	9	5	9	5
Field Methods in Economic Geology	1	2	1	2	1
Field Methods in Hydrogeology	2	1	18	1	18
Field Methods of Carbonate Aquifers ***(FMCA)***	6	0	33	0	19
Field Research in Geology	3	5	15	5	14
Geology & Tectonics of the Rio Grande Rift	1	8	7	8	7
Geology of Big Bend National Park, Texas	1	5	8	5	8
Geology of North Central Kentucky	1	0	9	0	9
Paleoclimates of the Atacama Desert - Chile	1	2	2	2	2
Scanning Probe Microscopy	3	0	27	0	27
Structure and Tectonics of SE Arizona	1	1	3	1	3
Teaching Field Geology	3	1	6	1	6
Tect. Geomorph. of the Dead Sea Fault & W. Turkey	2	0	6	0	6
Tect. & Geomorph. of an Active Collision Zone, Turkey	1	5	1	5	1
The Rhine River Basin	1	5	9	5	9
Triassic Environmentals of NW Argentina	1	1	1	1	1
Tropical Ecosystems of Costa Rica	3	17	20	15	20
Tropical Marine Ecology ***(TME)***	7	69	108	63	103
Volcanology of the Western Snake River Plain Region	2	0	4	0	4
Total Workshops AY 96/97 to AY 02-03	**78**	**423**	**1012**	**316**	**335**
		1435		**651 (45%)**	
Total Income Generated (excluding *ESET* [1])		**$1,421,931**			

Table A7.2 : Enrollment from Other Institutions [2]	Total	UG	G
Ohio School Systems ***(ESET)***	563	0	563
Wright State Univ. ***(CDS,CEB,FMCA,CRE)***	69	6	63
Univ. of Cincinnati ***(CDS,CEB,CRE,FG)***	61	22	39
SMU & Univ. Wisc.-Milwaukee ***(FG)*** (7 each)	14	14	0
Ohio Univ. ***(FG,TME)*** & Denison Univ. ***(FG)*** (5 each)	10	10	0

Note [1] : Supported through award from State, thus included with extramural funding.

Note [2] : An additional 67 students (68% ***FG***) from 57 institutions (65% ***FG***) enrolled in the above italicized workshop courses. Noteworthy among these institutions are Boston U., Binghamton, Delaware, Franklin & Marshall, Harvard, Middlebury, Oberlin, Maryland, North Carolina, Rochester, Southern California, U.S. Air Force Academy, and Virginia Tech.

Appendix 8: Student Scholarship AY 96-97 - AY 02-03

Table A8.1: Student-Derived Funding

Number of different students receiving awards indicated in parentheses

	Extramural [1]	MU Sources [2]	Total
Ph.D. (9)			
Awards	27	7	34
Amount	$31,500	$5,700	$37,200
M.S. (15)			
Awards	25	2	27
Amount	$34,466	$3,000	$37,466
A.B. / B.S. (19)			
Awards	3	23	26
Amount	$5,820	$43,185	$49,005
Total (43)			
Awards	55	32	**87**
Amount	$71,786	$51,885	**$123,671**

Note [1] : Sources include Geological Society of America, Sigma Xi, White Mountain Research Center, American Association of Petroleum Geologists, Clay Minerals Society, Society of Economic Geologists, American Federation of Mineral Societies, Society for Luminescence Microscopy and Spectroscopy, Mineralogical Society of America, Geochemical Society, and Council for Undergraduate Research.

Note [2] : Sources include Undergraduate Summer Scholars Program, Dean's Scholar (CAS) Program, Undergraduate Research Program, Graduate School, Office for the Advancement of Research and Scholarship, College of Arts and Science, Graduate Student Enrichment Fund, and Graduate Student Association (excludes support from Department of Geology).

Table A8.2: Student Publications (author/coauthor)

Number of different students indicated in parentheses

	Refereed Papers	Published Abstracts	Other Publications	Total
Ph.D. (15)	21	60	1	82
M.S. (35)	4	56	3	63
A.B. / B.S. (47)	5	50	1	56
Total (97)	30	166	5	**201**

Appendix 9: Student Initial Career Paths and Appointments

AY 1996/97 through 2002/03 students

Table A9.1: Career Sector by Degree Program

Career Sector	A.B./B.S.		M.A./M.S.		Ph.D.	
Post-doctoral research appointment					2	33%
University faculty appointment					1	17%
Grad. school; Geology or Earth Sci. Education	28	42%	5	19%		
Medical or Law school, other Graduate School	7	10%				
Environmental / Geotechnical (private)	10	15%	5	19%	1	17%
Environmental / Geotechnical (fed/state)	5	7%	4	15%	1	17%
Petroleum industry	3	4%	3	12%		
Research / Technical support	4	6%	3	12%		
IT professional			2	8%	1	17%
Primary or secondary education	3	4%	2	8%		
Outdoor earth science education	2	3%	2	8%		
Major League Baseball	1	1%				
U.S. Military	1	1%				
Employed - Other	3	4%				
Total known	**67**	**64%**	**26**	**90%**	**6**	**100%**
Total graduates	**104**		**29**		**6**	

Table A9.2: Graduate & Professional Schools Attended

California Institute of Technology (1)
Cleveland State University (1)
Duke University (2)
Kent State University (1)
Lousiana State University (1)
Miami University (11)
Michigan State University (1)
Northern Arizona University (1)
Notre Dame University (1)
Ohio State University (5)
Oregon State University (1)
Pennsylvania State University (1)
Purdue University (1)
SUNY - Stony Brook (1)
University of California at Davis (1)
University of Cincinnati (1)
University of Hawaii (1)
University of Michigan (1)
University of Montana (1)
University of Rhode Island (1)
University of Vermont (1)
University of Washington (1)
University of Wyoming (2)
Western Michigan University (1)

Table A9.3: Internship & Visiting Research Appointments

Undergraduate Students (21)

AMOCO Production Company (8)
Carnegie Institution of Washington (1)
Gryphon Exploration Company (2)
Lunar & Planetary Institute (1)
National Park Service (2)
Savannah River Technical Center (1)
State of Maine Parks & Recreation (1)
University of Vermont (1)
UNOCAL (1)
U.S. Geological Survey (3)

Graduate Students (11)

Carnegie Institution of Washington (3)
Los Alamos National Laboratory (1)
Savannah River Technical Center (3)
Southwest Florida Water Management District (1)
U.S. Geological Survey (3)

Appendix 10: Faculty Extramural Funding 9/1/96 - 9/1/03

Source and Category	Awards	Amount and Percent		
Faculty Extramural Grant Source				
National Science Foundation	20	$	1,688,095	81.9%
U.S. Department of Energy	6	$	84,040	4.1%
U.S. Department of the Interior	3	$	180,125	8.7%
U.S. Geological Survey	2	$	108,793	5.3%
Total Federal	*31*	*$*	*2,061,053*	*52.3%*
Ohio Board of Regents	14	$	1,030,330	91.9%
Ohio State University Research Foundation	1	$	43,954	3.9%
Ohio Water Development Authority	1	$	46,900	4.2%
Total State	*16*	*$*	*1,121,184*	*28.4%*
American Chemical Society	1	$	60,000	7.9%
Council for International Exchange of Scholars	1	$	20,350	2.7%
Geological Society of America	2	$	15,150	2.0%
Joint Oceanographic Institutions	1	$	10,000	1.3%
Landmark Graphics Corporation	1	$	544,570	71.7%
National Geographic Society	1	$	8,179	1.1%
North Atlantic Treaty Organization	3	$	35,270	4.6%
Save Our Local Environment, Inc.	1	$	5,000	0.7%
Sci. & Eng. Research Council of Turkey	2	$	7,097	0.9%
Seismic Micro-Technology, Inc.	1	$	54,120	7.1%
Total Private/International	*14*	*$*	*759,736*	*19.3%*
Faculty Extramural Grant Category				
Research	36	$	1,445,280	36.7%
Undergraduate Research	3	$	19,175	0.5%
Equipment/Facilities	8	$	1,509,851	38.3%
Primary/Secondary Education	9	$	827,860	21.0%
Other	5	$	139,807	3.5%
Total Extramural Grants	**61**	**$**	**3,941,973**	

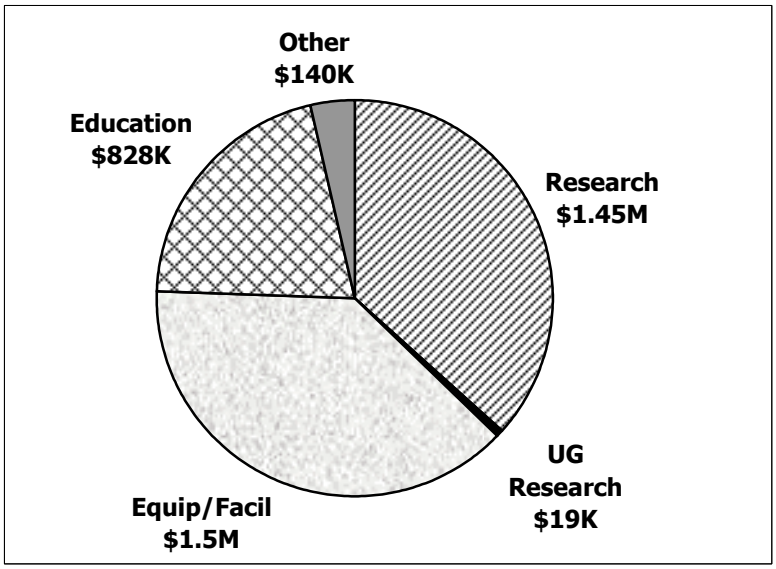


Figure A10.1 : Distribution of faculty extramural funding based on the primary award purpose ("Grant Category")

Appendix 11: Geology Student Credit Hour Data (unweighted)

Table A11.1: Total Credit Hours (SCH) by Campus

	AY 96/97	AY 97/98	AY 98/99	AY 99/00	AY 00/01	AY 01/02	AY 02/03
Oxford Campus	8,270	8,422	8,884	8,995	8,633	9,431	11,559
Hamilton Campus	705	825	996	958	1,010	1,047	1,158
Middletown Campus	336	393	381	556	474	609	845

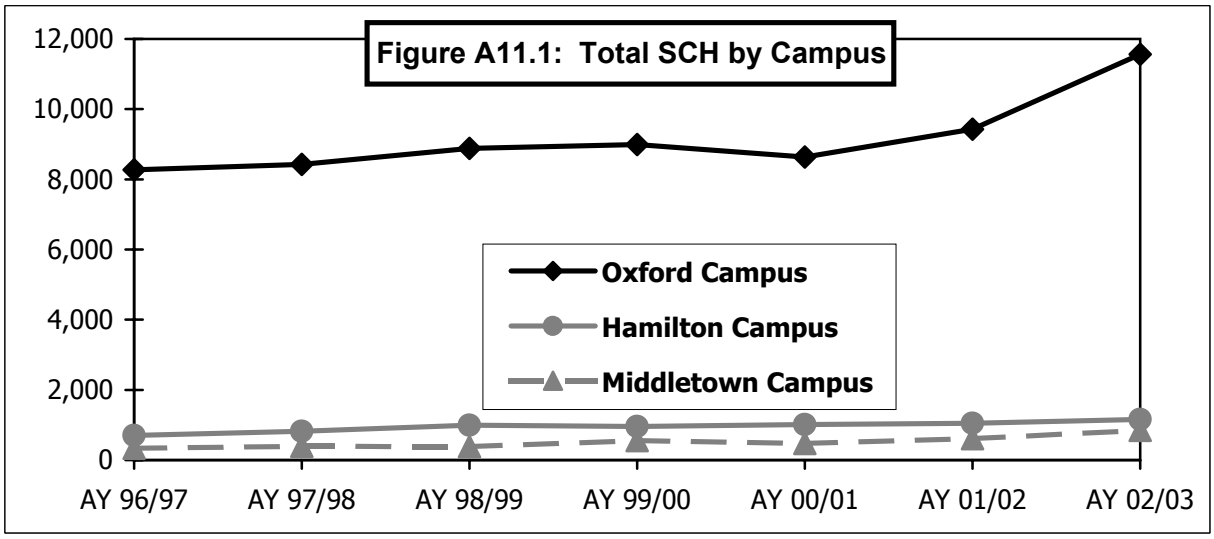


Table A11.2: Credit Hours by Term - Oxford Campus

Academic Year	Fall	Spring	Summer	Total
AY 1996/97	3,710	3,753	807	8,270
AY 1997/98	3,578	3,981	863	8,422
AY 1998/99	3,912	4,109	863	8,884
AY 1999/00	3,314	4,418	1,263	8,995
AY 2000/01	3,440	3,712	1,481	8,633
AY 2001/02	4,174	4,108	1,149	9,431
AY 2002/03	5,558	4,807	1,194	11,559
Total Now [1]	27,686	28,888	7,620	64,194
Total Then [2]	20,486	21,249	5,082	46,817
Avg. Now [1]	3,955	4,127	1,089	9,171
Avg. Then [2]	3,414	3,542	847	7,803

Note [1] : "Now" is current review period; AY96/97 through AY02/03.

Note [2] : "Then" is previous review period; AY90/91 through AY95/96.

Table A11.3: Credit Hours and FTE - Oxford Campus

	AY 96/97	AY 97/98	AY 98/99	AY 99/00	AY 00/01	AY 01/02	AY 02/03
Faculty FTE	18.75	21.50	18.50	19.00	18.20	18.20	18.20
AY SCH / Faculty FTE	441	392	480	473	474	518	635
AY Student FTE / Fac. FTE	28	25	31	29	29	32	40

Figure A11.2: AY Student FTE / Fac. FTE - Oxford

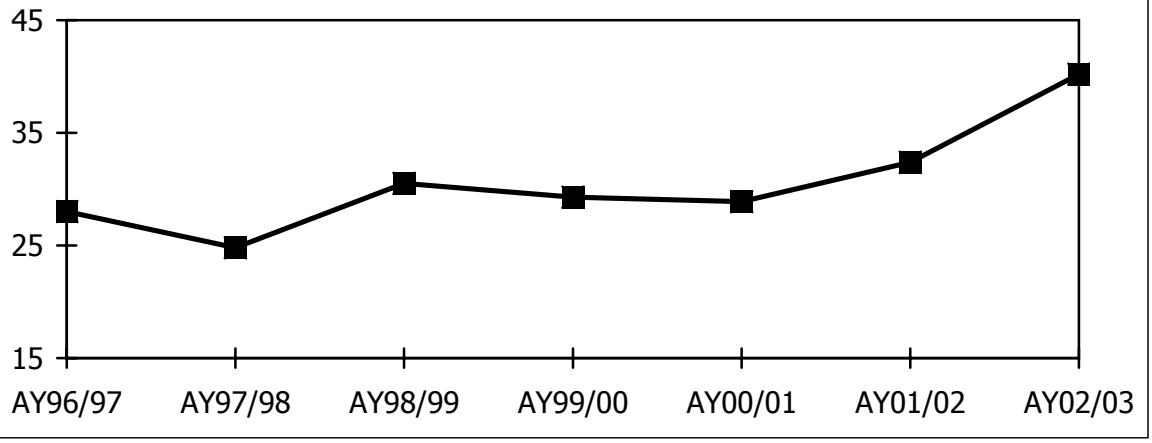


Figure A11.3: Credit Hours by Semester - Oxford

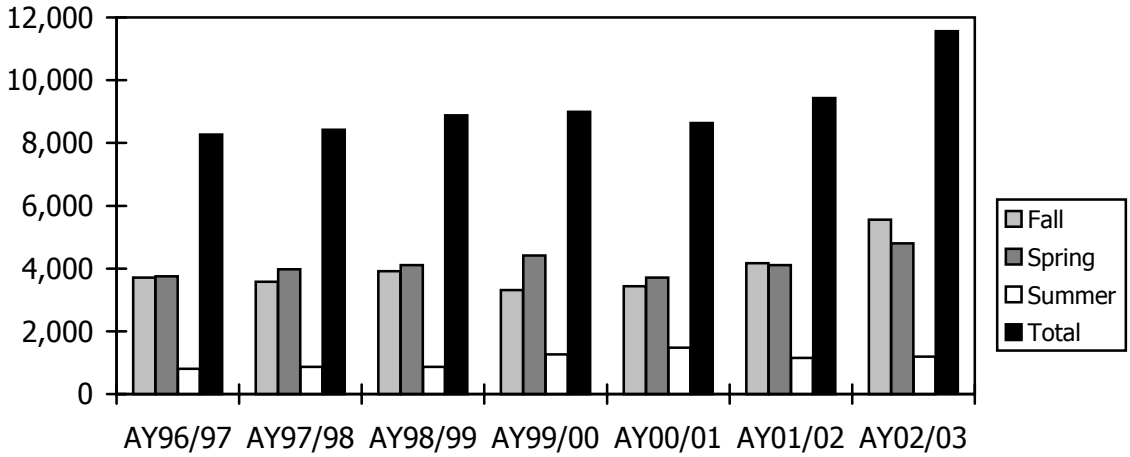
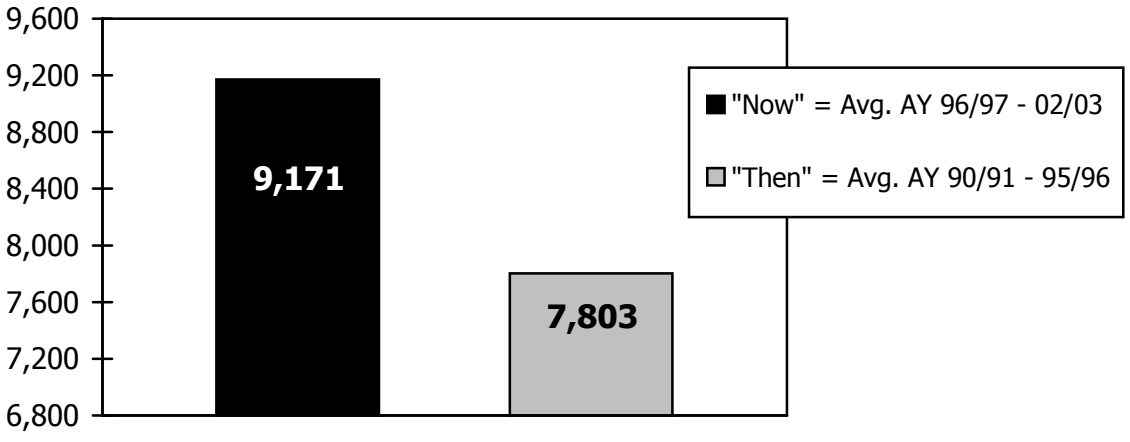


Figure A11.4 : Average Credit Hour Comparison - Oxford



Appendix 12 : Undergraduate Enrollment and Degree Trends

Table A12.1 & Figure A12.1: Miami University Geology Data

Academic Year	Avg./AY	Totals	96/97	97/98	98/99	99/00	00/01	01/02	02/03
Majors in program	51	356	59	69	51	43	46	43	45
AB/BS Degrees	15	105	23	13	21	17	10	7	14
Minors in program	29	203	36	33	33	29	31	25	16
Minor Degrees	12	81	13	10	17	13	14	7	7

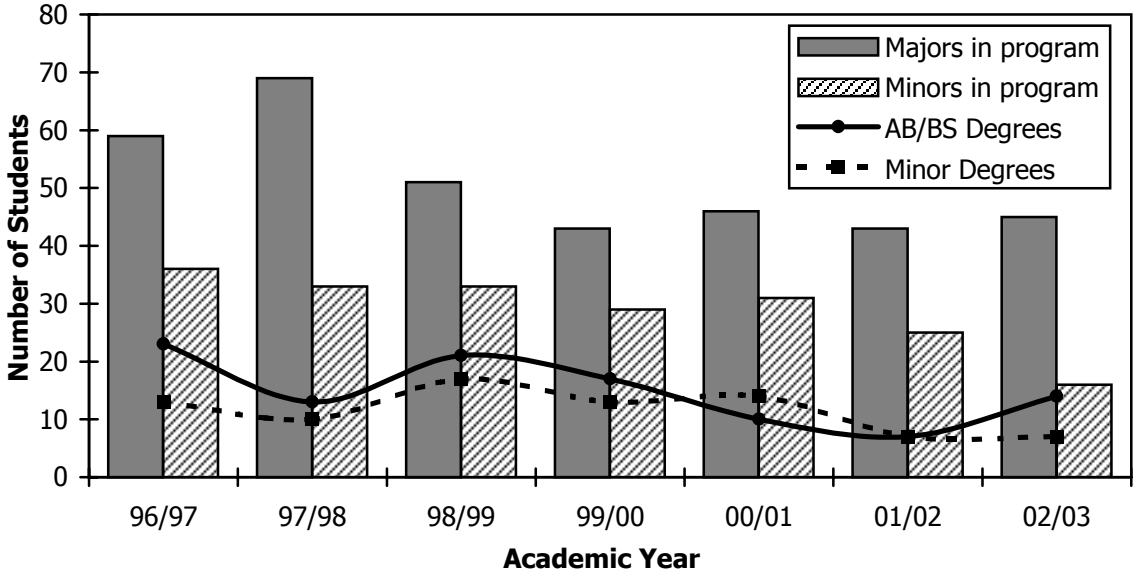
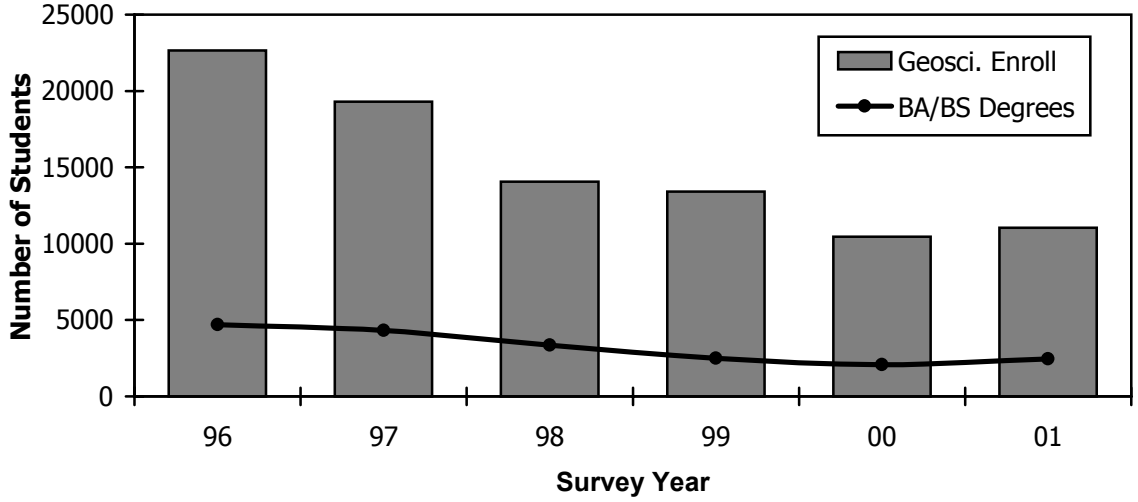


Figure A12.2: National Geoscience Data - includes specific degree programs in marine, atmospheric, and environmental science, physical geography, and others. National data from the American Geological Institute (AGI). [http://www.earthscienceworld.org/careers/stats]



Appendix 13: The Graduate Programs AY 96-97 to Present

Table A13.1: Student Distribution and Status [1]

	Num. of Students	% [2]	Avg. Yrs in Pgm
Enter Ph.D. program	**18**	**24.3%**	
Switch from M.S.	2		
Graduate with Ph.D.	6	30.0%	5.3
Active Ph.D. [3]	10	50.0%	2.4
Switch to M.A.	1	5.0%	
Leave grad program	3	15.0%	
Enter M.S. program	**52**	**70.3%**	
Switch from M.A.	1		
Graduate with M.S.	22	41.5%	2.7
Active M.S. [3]	17	32.1%	1.4
Switch to Ph.D.	2	3.8%	
Switch to M.A.	5	9.4%	
Leave grad program	7	13.2%	
Enter M.A. program	**4**	**5.4%**	
Switch from Ph.D.	1		
Switch from M.S.	5		
Switch to M.S.	1	10.0%	
Graduate with M.A.	7	70.0%	1.2
Active M.A.	2	20.0%	0
Leave grad program	0	0.0%	
Total GLG Students	**74**		
Total GLG Graduates	35	47.3%	
Total Currently Active	29	39.2%	
Total Leave Grad Program	10	13.5%	

Note [1] : Includes all students active in the M.A., M.S., and Ph.D. programs during this time period.

Note [2] : Bolded percentages are with respect to "Total GLG Students", others are with respect to number of students within a given category (Ph.D., M.S., M.A.).

Note [3] : Includes active Ph.D. (1) and M.S. (4) students that currently are not in residence.

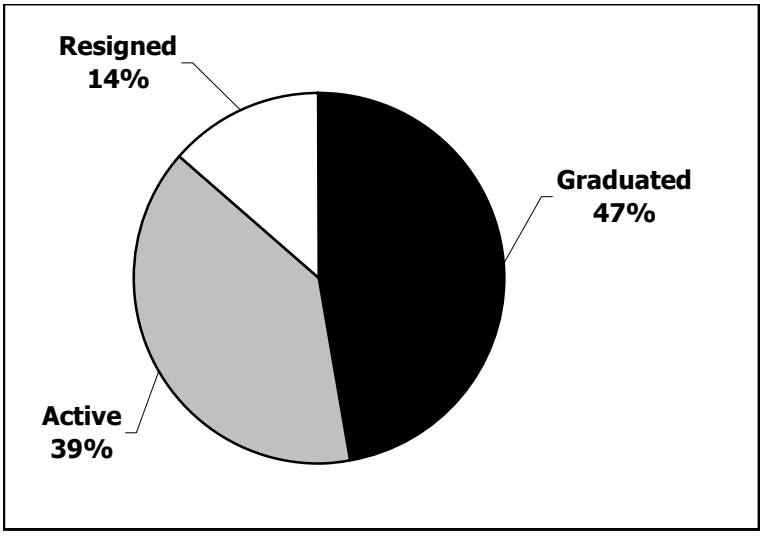


Figure A13.1: Current status of all graduate students enrolled in the M.A., M.S., and Ph.D. programs from AY 96-97 to the present.

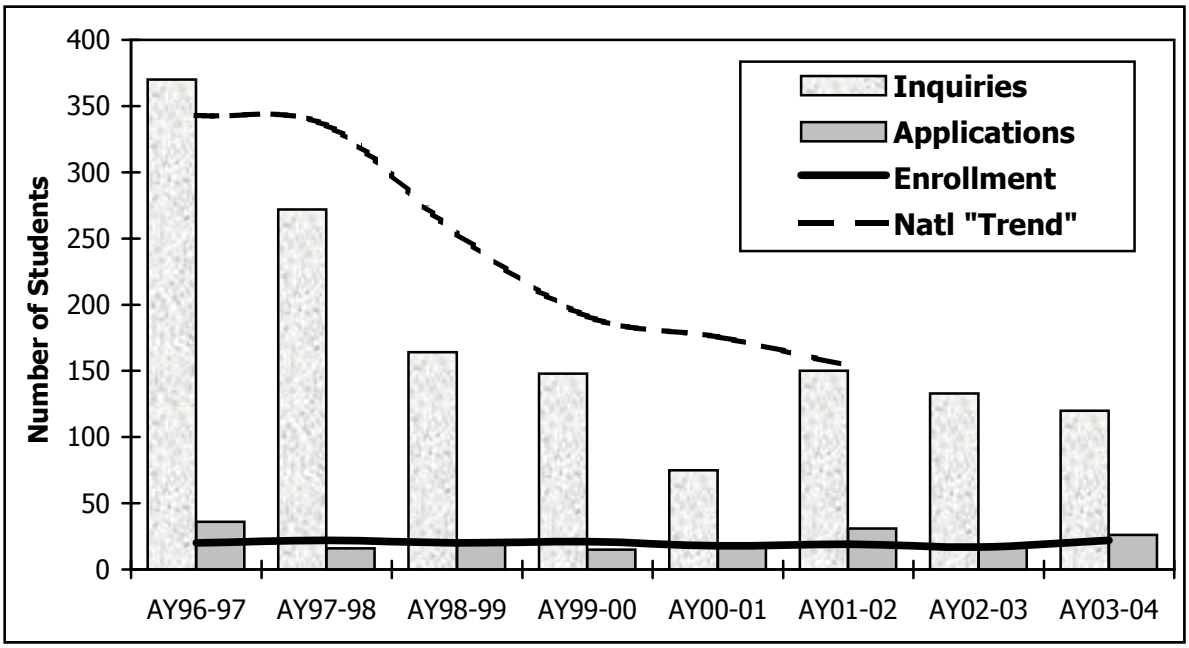


Figure A13.2: Miami University Department of Geology inquiry, application, and enrollment trends compared to the national trend for graduate enrollment in the Geosciences. National data from American Geological Institute [http://www.earthscienceworld.org/careers/stats/2001summary.html]; annual numbers from National Data divided by 30 for scaling purposes.

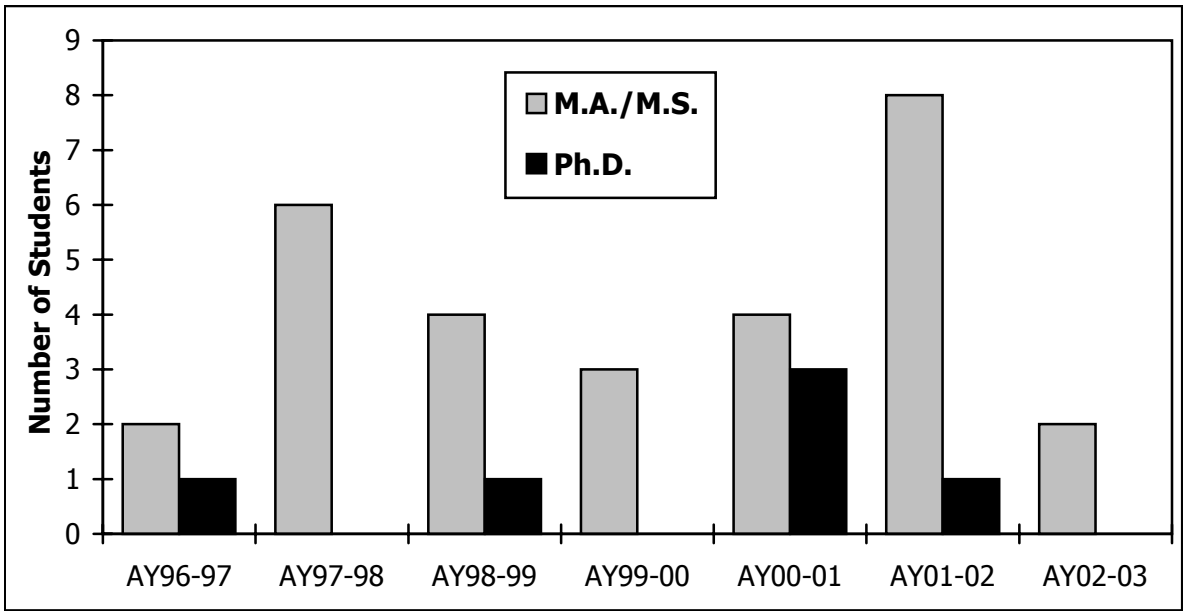


Figure A13.3: Academic year (including summer) distribution of graduate degrees conferred by the Miami University Department of Geology.

Appendix 14 : FTE, Budget, Income, and Expenditure Summary - Oxford Campus

	Average	FY 02/03	FY 01/02	FY 00/01	FY 99/00	FY 98/99	FY 97/98	FY 96/97
Full-time FTE (FT FTE)	9.9	9.2	9.2	9.2	10.0	10.0	12.0	9.75
Grad FTE	9.0	9.0	9.0	9.0	9.0	8.5	9.5	9.0
Budgeted FTE	18.9	18.2	18.2	18.2	19.0	18.5	21.5	18.75
Budget Allocations								
OE - Chair Travel	$ 543	$ 550	$ 550	$ 550	$ 550	$ 550	$ 550	$ 500
OE - Supplies	$ 25,738	$ 26,283	$ 26,283	$ 26,820	$ 26,101	$ 25,716	$ 24,967	$ 23,997
OE - Services	$ 25,738	$ 26,283	$ 26,283	$ 26,819	$ 26,102	$ 25,716	$ 24,967	$ 23,997
OE - Telephone	$ 5,702	$ 6,312	$ 6,312	$ 6,441	$ 6,269	$ 6,176	$ 6,055	$ 2,346
OE - Student Wages	$ 1,952	$ 2,060	$ 2,060	$ 2,103	$ 2,046	$ 2,016	$ 1,976	$ 1,406
OE - Work Study Wages	$ 2,495	$ 2,613	$ 2,613	$ 2,667	$ 2,595	$ 2,557	$ 2,507	$ 1,911
Graduate Enrichment	$ 2,021	$ 2,423	$ 2,423	$ 2,423	$ 1,700	$ 1,756	$ 1,730	$ 1,690
University Guest	$ 223	$ 236	$ 236	$ 241	$ 235	$ 230	$ 205	$ 180
Department Lecture	$ 1,338	$ 1,403	$ 1,403	$ 1,432	$ 1,377	$ 1,350	$ 1,250	$ 1,150
Additional - Supplies		$ 811						
Additional - Grad. Enrich.							$ 1,000	
Additional - Networking								$ 1,824
Total Arts & Science	$ 66,269	$ 68,974	$ 68,163	$ 69,496	$ 66,975	$ 66,067	$ 65,207	$ 59,001
Salaries	$ 930,609	$ 967,994	$ 985,181	$ 979,842	$ 944,887	$ 919,821	$ 899,784	$ 816,756
Staff Benefits	$ 212,502	$ 244,791	$ 219,721	$ 224,230	$ 211,960	$ 205,587	$ 197,589	$ 183,638
Fees Waived	$ 150,504	$ 204,492	$ 184,414	$ 155,700	$ 142,020	$ 125,630	$ 132,810	$ 108,460
Support Costs	$ 7,426	$ 7,578	$ 7,578	$ 7,733	$ 7,526	$ 7,378	$ 7,198	$ 6,988
Total Central Admin.	$ 1,301,041	$ 1,424,855	$ 1,396,894	$ 1,367,505	$ 1,306,393	$ 1,258,416	$ 1,237,381	$ 1,115,842
Total Allocations	$ 1,367,310	$ 1,493,829	$ 1,465,057	$ 1,437,001	$ 1,373,368	$ 1,324,483	$ 1,302,588	$ 1,174,843
Institutional Research Data								
Total Income (Subsidy+Fees)	$ 5,343,617	$ 7,854,000	$ 6,410,600	$ 5,474,700	$ 4,320,900	$ 4,228,700	$ 3,772,800	
I & DR Expenditures	$ 1,626,383	$ 1,845,100	$ 1,754,000	$ 1,540,400	$ 1,608,300	$ 1,513,700	$ 1,496,800	**Data not provided**
Income/Expenditure Ratio	3.29	4.26	3.65	3.55	2.69	2.79	2.52	
Cost per Student FTE	$ 2,803	$ 2,520	$ 2,970	$ 2,930	$ 2,890	$ 2,690	$ 2,820	

Appendix 15: Geology Department Undergraduate Alumni Survey – Fall 2002

2002 Survey: N = 114 (591 sent; 19% return)
Comparisons with 1995 Survey (N=164) shown where same questions asked

5 = agree strongly, 4 = agree somewhat, 3 = neutral
2 = disagree somewhat, 1 = disagree strongly

2002	1995	
4.2	4.0	A background in geology is important in my present occupation.
4.2	4.0	My Miami geology education did a good job of preparing me for my present occupation.
4.5	4.1	My Miami geology education did a good job of preparing me for graduate study.
3.7	3.0	There is a demand for graduates with the type of geology education Miami provides.
4.6	4.4	The overall quality of teaching in the geology department is high.
4.6	4.6	Overall, the professional quality of the geology faculty is high.
4.4		The geology faculty provide an appropriate level of individualized instruction to students.
4.5	4.3	The geology faculty show concern for the students as individuals.
3.9	3.8	Advising of students by geology faculty is carefully done and helpful.
4.5	4.3	The environment in Miami's geology department is stimulating and conducive to learning.
4.3		The presence of graduate students in the department enhanced my learning experience.
4.3		Departmental laboratory and computing facilities were important to my education.
4.5		Formal, course-based laboratory experiences were important to my education.
4.8		Formal, course-based field experiences were important to my education.
4.4		Participation in faculty-directed, independent study/research was important to my education and professional development.
4.4		Summer and/or academic year workshop courses were important to my education.
4.1		International workshops and/or field experiences were important to my education and professional development.
4.4	4.3	Interdisciplinary courses linking geology to other areas (e.g., chemistry, physics, mathematics) have proved valuable.
4.7	4.0	Field camp was important to my education and professional development.

We share the following unsolicited comment received from a recent A.B. graduate.

"For me, the Geology experience at Miami has been a positive one. I am very much appreciative of the knowledge and skills that I have developed through the department. I hope that as a teacher of geology and earth science, that I too can provide this kind of experience for my students."

Appendix 16: Geology Department Graduate Alumni Survey – Fall 2002

2002 Survey: N = 103 (230 sent; 45% return)
Comparisons with 1996 Survey (N=73) shown where same questions asked

5 = agree strongly, 4 = agree somewhat, 3 = neutral
2 = disagree somewhat, 1 = disagree strongly

2002	1996	
4.5	4.4	My graduate degree in geology is important in my present occupation.
4.4	4.2	My Miami graduate education did a good job of preparing me for my present occupation.
4.5		Overall, I was very satisfied with my individual student-advisor interactions.
4.4		The overall quality of research in the geology department is high.
4.5	4.5	The overall quality of teaching in the geology department is high.
4.6	4.5	Overall, the professional quality of the geology faculty is high.
4.7	4.5	The geology faculty show concern for the students as individuals.
4.6	4.6	The environment in Miami's geology department is stimulating and conducive to learning.
4.4		The environment in Miami's geology department is stimulating and conducive to research.
4.3		Departmental laboratory facilities were important to my graduate education.
3.8		Departmental computing facilities were important to my graduate education.
4.5		Summer and/or academic year workshop courses were important to my graduate education.
4.6		International workshops and/or field experiences were important to my graduate education and professional development.
4.2	4.3	Interdisciplinary courses linking geology to other areas have proved valuable.
4.7	4.6	Overall, I rate my graduate education as highly satisfactory.

ADDENDUM
1996 PRT REPORTS

Internal Team Report

External team Report