**COLUMBUS STATE UNIVERISTY**
**COLLEGE OF SCIENCE**
**DEPARTMENT OF CHEMISTRY AND GEOLOGY**

# COMPREHENSIVE PROGRAM REVIEW

# BACHELOR OF SCIENCE IN GEOLOGY

**February 7, 2007**
**Revised May 3, 2007**

**EXECUTIVE SUMMARY FOR THE**
**BACHELOR OF SCIENCE IN GEOLOGY**

**Major Findings of the Program's Quality and Productivity**

**PROGRAM QUALITY**
**Strengths**
Teaching
- Faculty in program are highly qualified, have broad backgrounds, and very experienced
- Faculty have active research interests in the region
- Mid to upper level classes are small.
- Student access to faculty for help with course work is excellent
- Student interaction with faculty is high
- Basic equipment is adequate

Curriculum
- Is broad
- Involves students in research projects
- Prepare students for taking the licensing test for geologists
- Addresses regional and state needs

Students
- Are mature
- Are serious about their education
- Are finding employment
- Are doing well in graduate school

**Weaknesses**
- Teaching
    - Faculty are nearly the same age and approaching retirement
    - There are too few faculty to offer as many core classes as we could and still offer upper level courses as often as we would like.
    - Faculty are stretched by administrative duties
    - Replacement of aging tools is needed
    - Additional equipment needed to improve the relevance and delivery of the curriculum
- Curriculum
    - GIS not an official part of the curriculum
- Students
    - Students are not being compared to other BS Geology students in the nation or region.

**PROGRAM PRODUCTIVITY**
**Strengths**
- Lower cost per credit hour than the university as a whole
- Lower cost per credit hour than the department as a whole

**Weaknesses**
- The program could handle more majors
- Students need to pass through the system more quickly
- Diversity of students and graduates could be improved

**List of Recommendations for Improving Program Quality**
- Hire replacements for retiring faculty and support their efforts for recruiting majors
- Hire new faculty as need arises and support their efforts for recruiting majors
- Establish outreach fieldtrips to geologically rich areas, especially in the western United States
- Participate more in Georgia Academy of Sciences and the local Honors Colloquium to highlight student projects

- Purchase Earth drill with field vehicle

**List of recommendations for improving program productivity**

- Establish a more dynamic web page for the Geology program
- Promote student participation in professional meetings and report this participation through media outlets
- Increase recruiting efforts within the University through
    - More aggressive marketing in Physical Geology courses
    - Continued support of outside lectures
    - Self-promoting field trips and other activities in the Saber and on the Departmental web pages
- Increase recruiting efforts outside the University through
    - Encouraging Geology majors to promote the program through their personal MySpace-type pages.
    - Continuing involvement with Science Fair and Science Olympiad
    - Establish an aggressive marketing plan to include students within the College of Science, Junior College graduates, retiring soldiers and soldiers soon to be discharged from the Army

**Conclusions about the program's viability at CSU**

It is our conclusion that the BS in Geology will be viable at Columbus State University. Viability will be assured through maintaining quality and increasing productivity through more aggressive marketing on a broad front. These activities are indicated in the following plan. Geology is a science that will become increasingly important as we increase the strain on our natural resources.

Pr**ogram improvement plan**

The details of this plan will have to be discussed and approved by the Dean of the College of Science and the VPAA. Elements of this plan will include:

- Hire replacement for retiring "hard rock" geologist. This is in progress.
- Support of the "hard rock" geologist in his/her efforts at recruiting. This support should be ongoing but must begin in the fall of 2007. These recruiting efforts will include
    - Developing research projects for students to complete and present at Southeastern Section meetings of the GSA, National meetings of GSA, and meetings of the Alabama and Georgia Academy of Sciences.
    - Travel support for faculty and students to attend these meetings
    - Travel support for field trips organized by the Alabama and Georgia Geological Societies.
    - Equipment to excite students and help them prepare their presentations.
    - Participation in campus activities related to advertising major programs to high school students (visitation days) and University students (Majors Fair in the fall). Develop table presentations for these opportunities.
- Revamping departmental and Geology web pages. Begin this process in the Fall of 2007.
- Support efforts of a similar nature by other faculty.
- Support efforts to form a Geology or Earth Sciences student organization.
- Develop a track in the BS Geology for Environmental Geology as suggested by the outside review team. The review team pointed out that potential majors may not recognize the major in Geology while they might search for and recognize a major in Geology with an environmental track keying on the term "environmental." This should be done in the Fall of 2007 for inclusion in the 2008-2009 Catalog.
- Promote the usefulness of a BS in Geology to core courses (Physical Geology, Historical Geology, and Fossil Record) as well as some of our more advanced courses such as Physical Anthropology, Vertebrate Paleontology and Human Origins. Do this through highlighting careers during class lectures and by inviting guest lecturers from the community who practice geology in the Columbus area.

- Continue support of Science Education through the recently instituted BS in Geology and Secondary Education (Earth Science), as well as continued involvement with Science Fair and Science Olympiad.

**Summary Recommendation and viability at CSU**
Maintain the BS in Geology at is present level. The program's high quality and the promise of increased productivity through aggressive marketing make this a reasonable conclusion. The program is aligned with CSU's mission and goals. The need for geologists will increase in the near future as society deals with diminishing energy resources, increasing demand for energy and raw materials and increased environmental strain.

## I. BRIEF PROGRAM OVERVIEW

The Bachelor of Science in Geology prepares graduates for entry into the practice of professional geology. The program includes the curricular requirements for registration by the Georgia Board of Registration for Professional Geologists. Furthermore, students successfully completing program requirements are prepared for graduate studies in many branches of the geosciences, or for further studies in science education, environmental science, natural resources development, and regional planning. The BS in Geology requires satisfactory completion of courses in mathematics, physics, and chemistry, as well as in geology. These provide a broad foundation in the field and permit flexibility for evolving and changing student interests. A broad range of upper-level elective courses exists to introduce fields within the geological sciences and to help students broaden their college experience.
Graduates with a BS in Geology from CSU will be able to:

- demonstrate a working knowledge of the major areas of geology (mineralogy, petrology, paleontology, stratigraphy, structural geology, environmental geology, and geomorphology)
- communicate geological concepts, data, and interpretations to others
- demonstrate knowledge and apply field observations, traditional techniques, and modern technology to the solution of geologic aspects of problems in regional planning and the environment as well as traditional geologic problems (use appropriate data bases, software, and analytical tools)
- demonstrate ability to assemble diverse geologic data into environmental, economic, and regional geologic interpretations
- perform the tasks requested in entry level geologic employment or graduate school

## II. SUMMARY FINDINGS OF THE PROGRAM'S OVERALL *QUALITY*

The B.S. in Geology provides a high quality program with a relatively small number of faculty. The faculty has broad expertise that they share with students in small classes, active research projects and abundant interactions outside class. Graduates are satisfied with the program and both employers and graduate programs are happy with the abilities of graduates. The program needs to encourage and expand activities that have proved successful in the past. To further increase the quality of the program, it must also find and implement a national assessment tool, institute an exit interview with graduating students to probe for weaknesses in advising or other aspects of the program, continue its cooperation with the Honors Program, continue the Geology of Georgia course for majors and for teachers, develop a field trip course that goes beyond the southeast region, continue to re-evaluate curriculum in light of changing needs of the profession and to take advantage of local opportunities, increase library holdings, add instrumentation and equipment, replace retiring faculty, expand the use of new tools like GIS in its courses, implement the new internship course, and add faculty to address emerging fields in Geology. Recruiting efforts need to be intensified through developing a more interesting and dynamic web portal, more aggressive marketing within the introductory courses, marketing to potential science teachers, additional outreach to middle and high school teachers and students, and enlisting the help of the University's marketing unit.

### II A. The Quality of Teaching Supporting the Program

***State your assessment of the strength of the evidence of program quality on the indicator.*** Above Average

***Explain how good teaching is assessed and rewarded***

At the end of each academic year, each faculty member submits to the department chair a self evaluation of his or her performance; this self-evaluation includes quality of teaching as well as scholarly activities, service to the institution and service to the community. Student evaluations of larger courses are required and are used both in faculty members' self evaluations and in annual performance reviews. Faculty make an effort to converse with our students outside of the classroom. This is a unique benefit of having a relatively small program: our students generally have good relations with our faculty and with our department chair. Their comments on the program and on specific courses are solicited and are used in annual performance reviews.

Teaching is central to the mission of Columbus State University and is given greatest weight in faculty members' annual performance reviews and in determination of annual salary raises. Similarly, quality teaching is a major factor in considerations on awarding both tenure and promotion. Teaching is also recognized at the University level by the annual "Educator of the Year" award, determined by a committee of students. One of our faculty members received this award and another has been a finalist three times.

***Describe opportunities for interaction between faculty and students outside of the classroom***

This is one of our greatest strengths and is specifically the result of the small size of our program. There are a number of ways in which faculty - student interactions are promoted:

Faculty have developed personal relationships with their students. Students commonly visit our offices to discuss courses, student projects, *etc*. but often the conversations are more general. We encourage these interactions.

Geology is a field-based science. We take our students out into the field on trips ranging from several hours to entire days. Once or twice a year, classes are taken on weekend field trips to distant locations with important geological features not found locally. On all of these trips, there are abundant opportunities for faculty - student conversations on all kinds of matters. We all prize these opportunities and encourage them.

Students are encouraged to conduct research projects. These projects involve close interactions between faculty and students, both in the laboratory and in the field.

We strongly recommend that our students attend professional field trips and conventions and present results of their research projects at regional and national meeting. These trips give us further opportunities to help students make professional contacts they will need to secure employment or educational opportunities after graduation.

***Indicate the availability of tutoring***

The Geology program does not have a formal tutoring service. On the other hand, each faculty member maintains liberal office hours and students are encouraged to come by for help. In addition, the program's size facilitates close and friendly relationships among our students and they routinely form study groups and work together on laboratory exercises. Finally, several of our more advanced Geology students work with the University's advisement system and provide guidance to introductory Geology courses.

***Describe opportunities for internships, service-learning, practical, study abroad, and career planning and placement***

Students are encouraged to conduct a senior thesis project. Because of the close faculty - student interactions that develop in the program, there are ample opportunities for students to learn professional techniques and methods that may not be parts of specific courses. Students are encouraged to present their results at profession conventions and their contributions have generated 6 student coauthored, published abstracts in as many years.

Recently, individual students have been employed to conduct research outside of CSU's courses. For example, one student has been contracted by the Army to conduct suspended-sediment sampling of streams on the Fort Benning military reservation.

Career-planning is a fundamental aspect of advising and is considered as important as course planning. Students learn about career opportunities through regular postings on the programs information board, email announcements, and program-wide meetings with representatives from potential employers.

Although we do not have a formal program involving international education, some of our students have taken advantage of such opportunities; for example, one of our students spent the summer in Italy as a student in such a course.

***Describe methods to be pursued for program improvement***
Geology is a constantly and rapidly changing science. In addition, the nature of our students has changed over the years. We plan to accommodate these changes in several ways:

- Add several new faculty members in emerging areas (surface water/low temperature geochemistry) while replacing expertise of retiring faculty (mineralogy, hard rock petrology and structural geology);
- Implement the new Internship course for Geology students.
- Continue to keep our courses current through attending professional meetings, seminars and workshops and by searching for the most current textbooks.

**II B. The Quality of the Curriculum Supporting the Program**
***State your assessment of the strength of the evidence of the program quality on this indicator*:** Very strong

***Describe the relationship between the program's curriculum and its outcomes***
The general curriculum within the Bachelor of Science degree program includes two basic geology courses, and approximately 12 Sophomore-to-Senior courses. All courses are currently taught by doctoral-level, full-time faculty with over 90 years of cumulative experience. Student's outcomes from the curriculum are best judged by: 1) their professional competence upon graduation, 2) their acceptance in graduate programs, 3) their perceived general satisfaction with the degree they received, and 4) the perception of professional colleagues in other institutions about the quality of the students' preparation when entering graduate programs. Based on available metrics (discussed in other sections), the overall quality of the curriculum is extraordinarily high, especially considering the small number of faculty providing the curriculum. However, these metrics are to somewhat anecdotal and limited by insufficient data.

A significant element of the geology curriculum is the multi-purpose nature of nearly all courses within the degree program. Four basic courses (at Freshman and Sophomore levels) have been integrated into the university core curriculum, while three upper-division courses are integrated into the Environmental Science Masters program, two courses are co-listed with Anthropology, and most upper-division courses also are electives in undergraduate and graduate Science Education programs. Further integration of geology courses into the Biology major would be advantageous to students pursuing environmental and evolutionary biology.

The BS geology program has been oriented toward traditional geological education, offering a broad spectrum of courses in hard-rock (e.g. mineralogy and igneous petrology, geochemistry), soft-rock (e.g. sedimentology and paleontology), geomorphology, mapping, and environmental geological subjects (e.g. environmental geology, hydrology). Emerging research tools such as Geographic Information Systems analysis and remote sensing will be offered to Geology students by new faculty associated with the program.

***Indicate how technological skills are incorporated into the program of study***
Technology incorporated within the geological curriculum may be divided into computer-based, laboratory-based and field-based. Computer-based technology in current use extends beyond typical academic software applications (e.g. word processing, spreadsheets, web browsers, Power Point) to include such applications as ArcView, rock- and fossil-databases, graphing, mapping, and analysis applications. Technology currently in use within the context of laboratory applications includes rock and fossil preparation equipment and a variety of microscopy instruments ranging from petrographic to opaque imaging and photomicrography. Field technology used in general departmental curriculum is limited to traditional field tools including Brunton compass, GPS units, plane table and alidade, soil sampling, coring devices, and pick-and-shovel collection. A Zeiss Total Station is introduced in Field Methods. A basic earth drill and field vehicles have not been funded, despite obvious need and repeated requests.

***Indicate how the program is relevant to student needs***
The Occupational Outlook Handbook, 2006-07 Edition, published by the Bureau of Labor Statistics of the US Department of Labor, points out that employment is expected to grow and that job opportunities are expected to be good in most areas of geoscience. The Handbook states: "Traditional geoscience courses emphasizing classical geological methods and topics (such as mineralogy, petrology, paleontology, stratigraphy and structural geology) are important for all geoscientists." The Handbook also states that

computer skills that include modeling, data analysis and integration, digital mapping, remote sensing, and geographic information systems are essential for prospective geoscientists. The Program includes these essential traditional courses and is actively incorporating various computer skills into it curriculum. The handbook also emphasizes the importance to geologists of strong interpersonal skills, oral and written communication skills, complex analytical thinking and spatial visualization, the ability to develop comprehensive conclusions from sparse data, and the ability to do field work. The main goal of our Geology students is to gain admission to graduate school or find employment directly after graduation. To prepare them, our program provides and is attempting to expand the opportunities mentioned above. As indicated in other parts of this report, our graduates have been very successful in following either of these two paths.

***Describe how students are challenged to think across disciplines***
Though Geology has its own methods and perspectives, it applies the other sciences to problems that are peculiar to Geology. The following table lists some Geology courses and examples of information from other disciplines that the course uses.

| **Geology course** | **Other disciplines utilized** |
|---|---|
| Physical Geology | Chemistry, mathematics |
| Historical Geology | Biology |
| Fossil Record and Invertebrate Paleontology | Biology |
| Mineralogy | Chemistry, mathematics |
| Sedimentary geology | Chemistry, statistics, mathematics, physics |
| Igneous and metamorphic geology | Chemistry, mathematics |
| Structural Geology | Physics, trigonometry |
| Vertebrate Paleontology | Biology |
| Oceanography | Mathematics, chemistry, physics |
| Hydrogeology | Physics, mathematics |
| Geochemistry | Chemistry, mathematics |
| Physical Anthropology | Archeology |
| Environmental Geology | Chemistry, mathematics |

***Explain how diversity, multiculturalism, and international perspectives are included in the program***
Geology is international in the sense that political boundaries have no meaning. From Physical Geology through all the upper level courses, North-, Central- and South-American, European, African and Asian examples of geologic features and phenomena are discussed. Cultural topics are generally not discussed in geology courses; however, the core provides students with opportunities to study issues of diversity, multiculturalism, and develop an international perspective.

***Describe methods to be pursued for program improvement***
Increase use GPS and GIS in Field Methods and other Geology courses.
Continue to increase the use of data analysis software in the Geology courses.
Acquire the following equipment: Basic earth drill and vehicle to transport it.

**II C. Selectivity, Academic Achievement and Satisfaction of Students in the Program**

***State your assessment of the strength of the evidence of the program quality on this indicator*: V**ery Strong

***Describe the characteristics of your students (test scores, overall GPA, retention rates).***
The three-year average for SAT scores for Geology majors from 2003 to 2006 is 529 Verbal and, 494 Math. The three year average undergraduate GPA is 2.87 and the retention rates for the 2003/04 cohort and

the 2004/05 cohort is 100% (from CSU Facts and Figures). Geology is one of the more rigorous programs and attracts motivated students.

***Describe student learning, satisfaction and evidence of success in meeting student needs and learning outcomes as reflected by major field assessment.***
A major field assessment test does not exist for Geology. In lieu of that feedback system, we have interviewed graduate school advisors and employers of our graduates about student preparation for their positions. In addition, we have surveyed our graduates about their view of the preparation they received from us. These efforts are in keeping with our program mission of preparing students for graduate programs in Geology or for work in geology-related fields. Recent graduates have gone to Auburn University for grad school in Geology and have gone to the CSU Masters in Environmental Sciences (MS-ENVS). They have also been recruited to work for Civil and Environmental Engineering and other geotechnical companies. Graduates who have enrolled in the Masters in Geology program at Auburn have done very well academically and they have been judged well prepared for their graduate courses and for their work as graduate assistants. They have also progressed very well on their research projects Two of our recent graduates have progressed so well in their research at Auburn that they have been awarded an NSF grant to continue their research as Doctoral projects. Another recent Geology graduate completed a MS-ENVS at CSU and went on to a job on Fort Benning and is now working in the Columbus City Planning Office. Those who have worked with local companies right after the BS in Geology receive good evaluations by their employers and have advanced in these positions or have gone on to other work in Geology. Some graduates have chosen to teach science, especially Earth Science at local middle schools.

***Describe methods to be used for program improvement.***
We must identify a good national assessment tool for geology graduates. A comment from one of our graduates from our last CPR asked for more field trips and greater exposure to the Geology beyond the classroom. Since then, Dr. Schwimmer and Dr. Frazier have institutionalized their Fall paleontology and sedimentary rock field trip to northwest Georgia. The department has also re-established the Geology of Georgia summer course and has sought and sponsored a series of lectures by distinguished outside lecturers. The most recent surveys of our graduates also called for more field trips. These field trip programs will be enhanced even more. They will soon be joined by an internship course that will introduce students in a structured, academic way to local geology-oriented companies and NGO's. We also hope to continue to benefit from hosting visiting professors as we did in Fall 2002 and Spring 2003. These experts in environmental concerns and management gave our students access to a wider view of geology and human impact than is typically available at our institution.

**II D. The Quality of the Faculty Supporting the Program**

***State your assessment of the strength of the evidence of program quality on this indicator.*** Very Strong

***Describe the adequacy of the faculty and staff to support the program.***
The BS-Geology program during the past 5-year period has been served principally by three full-time, doctoral-level geologists, with over 90 cumulative years of teaching experience. These principal departmental faculty teach introductory and upper-division courses and conduct most laboratory sections. Two additional, doctoral-level faculty with backgrounds in geosciences-related fields have recently been added to the Chemistry & Geology departmental faculty, serving partially in the BS geology program along with their commitment to the MS environmental sciences program.

One Master's-level part-time faculty has been teaching one introductory geology course per semester, and one graduate student in the MS environmental sciences program, with a bachelor's degree in the geology, served during a four-year period as teaching assistant responsible for laboratories in the introductory courses. In addition, one or two senior undergraduate geology majors have been employed each semester to teach some 1000-level laboratory sections under the supervision of faculty.

<u>Full-time program faculty:</u>
**William J. Frazier, Professor**
Ph.D., Geology, University of North Carolina, Chapel Hill (went straight to Ph.D.)
specializations in Sedimentary geology and Coastal Plain geology,

secondary specialization in hydrogeology
Chair of Department of Environmental Sciences, 2005-present

**Thomas B. Hanley, Professor**
M.S., Geology, Indiana University
Ph.D., Geology, Indiana University
specializations in igneous and metamorphic petrology, structural geology
Chair of Department of Chemistry & Geology, 2001-present

**David R. Schwimmer, Professor**
M.A., Geology, State University of New York (SUNY) at Buffalo
Ph.D., Geology, SUNY, Stony Brook, Geology
specializations in invertebrate and vertebrate paleontology,
secondary specialization in environmental geology
Registered Professional Geologist in Georgia (P.G. #594) and Alabama (P.G. #692)

Faculty shared with Environmental Science:

**Roger Brown, Assistant Professor**
M.A., Geography, SUNY, Binghamton
Ph.D., Physical Geography, University of Tennessee, Knoxville
specializations in geomorphology and Quaternary studies
Postdoctoral research, University of Maryland, Center for Environmental Sciences
Appalachian Laboratory, modeling floodplain vegetation response to sedimentation

**Troy A. Keller, Assistant Professor**
M.S., Biology, University of Michigan, Ann Arbor
Ph.D., Biology, University of Michigan, Ann Arbor
Postdoctoral research, Georgia Institute of Technology, Atlanta
Bowling Green State University, Ohio,
specializations in fluvial processes and their ecological consequences

Part-time program faculty:

**Brad Tompa**
M.A., Geology, University of Alabama
Registered Professional Geologist in Georgia (P.G. # 1143), Alabama (P.G. # 431)
and Florida (P.G. # 1769)

***Describe the support provided for faculty development (details in individual vitae, to follow).***
During the five-year period the university has provided substantial funding for academic research and travel to Geology faculty, including travel to national and regional professional conferences, international travel, professional workshops, support for prime research, research supplies, and laboratory equipment. The collective five-year total of faculty development funding received by the three principal geology faculty has been approximately $15,000. In addition, the same three geology faculty received approximately $54,000 in external grants for research.

The collective results of this financial support for department faculty in the five-year period include an academic book, 6 peer-reviewed articles in professional journals, 4 field-trip guidebook chapters, and 29 presentations with published abstracts from national and sectional meetings. They have also served as conveners or chairs of 4 technical symposia at these national and regional scientific meetings, many supported by Faculty Development funds. In addition, departmental faculty contributed 4 articles and technical editing for the on-line *New Georgia Encyclopedia*.

***Describe how part-time faculty are integrated into the program.***
As discussed in the opening paragraph, a single part-time faculty, Brad Tompa, took part in the introductory geology program, teaching two sections of one course per semester.

***Describe methods to be pursued for program improvement.***
The quality of the BS in Geology curriculum has been high by all available measures (see section II A and II L), especially considering that it has been administered by the small number of geology faculty in the program. Nevertheless, the limited number of students generally enrolled in the BS geology curriculum

and the inevitable attrition of faculty to retirement mandates improvements and innovations. These are planned as follows:

Hiring new geology faculty. This single most important requirement for the program will inherently allow for both continuity and greater breadth. In addition to simply allowing greater flexibility in course offerings, new faculty will amplify the program's strengths, especially by additions in so-called "hard-rock" subjects such as mineralogy, mining and economic geology. Additional faculty expertise in hydrology and low-temperature geochemistry would be very beneficial in continuing the integration of the geology curriculum with the environmental sciences program requirements.

Improving program visibility through a much more interesting and accessible web portal, and hopefully better communications by the university with the regional community. In general, the existence of the geology major at CSU has been nearly invisible in University media and public relations, even where individual faculty accomplishments have been extensively reported.

Encouraging students to consider becoming geology majors by introducing them to the field early in their college experience. Commonly, students express strong interest after taking an introductory course, but are not willing to change majors in their junior or senior years. Implementing this enhancement will require better visibility of the program both on- and off-campus, as discussed above, and may be enhanced by visitations from successful professional graduates of the program to introductory classes.

Increasing program relevance to the region through applied work in important projects. These include very active participation in river-based work, notably the Chattahoochee dam-removal project and its aftermath. Further activity and coordination with CSU's growing archeological work in the region will improve community visibility and continue to attract new students, as initial efforts have indicated.

Enhancing geological equipment. Few funds for capital equipment have been allocated to the Geology program in CSU, and additional cost-effective equipment such as an earth drill and field vehicle have been frequently requested but never supplied. These would be essential to improve the field-oriented aspects of the geology program, especially in hydrology.

**II E. The Quality of Facilities and Equipment Supporting the Program**

***State your assessment of the strength of the evidence of program quality on this indicator.*** Above Average

***Describe the condition and adequacy of available space.***
The condition of the space supporting the program is adequate for the current number of faculty and students. As the student and faculty population of the university continues to increase, so will the number of class sections that must be offered. This does not present a major difficulty for the lecture portion of courses, but it becomes very problematic for laboratory sections. Each laboratory room can seat only 30 students and must be specifically equipped for only a few uses.

***Describe the condition and adequacy of technology labs, equipment, and library resources.***
Technology labs: There is one computer lab in LeNoir Hall that seats approximately 30 students. There is increasing demand for classes that use this lab, and it is becoming difficult to schedule the use of this room since some classes now utilize the lab for every class period. One specific need is the development of computer-equipped laboratories for both introductory and advanced classes. With digital media including maps, aerial photography, satellite imagery increasingly accessible on the internet, the development or expansion of computer-equipped laboratories would facilitate teaching and offer students increasing access to and experience with technology.
Equipment: The department has managed to continue a quality program with a minimum of major capital funds for equipment; most of the existing materials have been obtained through individual grants or supply funding. Both the department and individual faculty have extensive collections of rock, mineral and fossil samples that are stored and utilized in instructional settings. We currently share a van and a pickup with many of the other departments in the College of Science. Both vehicles are dated and in need of

replacement. A newer, reliable van available for field trips would enhance teaching and the ability to take students to regional workshops and meetings.
A table summarizing significant equipment follows:

| | |
|---|---|
| Paleontological Laboratory | Meiji R2 stereo microscope, Bausch and Lomb research stereo microscope, 24 student stereomicroscopes<br>Photographic accessories; stands for display, Airscribe physical preparation devices with air compressors<br>Lane brand paleontological curating cabinets<br>Extensive collection of fossil cast and paleontological specimens for instruction<br>Six major skeletal mounts. |
| Paleoecology Laboratory | Fisher research grade stereomicroscope.<br>Centrifuge, Barnstead Thermolyne muffle furnace, OHaus balance with 0.0001 g precision |
| Rock and Mineral Preparation | Trim saw, thin section saw, large slab saw, metallurgical polisher,<br>gem lab polisher, two Graves lapidary wheels, Graves grinding wheel, vibrating lap, fast faceting machines, rock splitter, and a Braun 'Chipmunk' cycle crusher |
| Sedimentological | Particle analysis sieves including a vibrating shaker.<br>Multipore fine filtering apparatus, drying oven |
| Field Equipment | Five Brunton compasses, Zeiss total station, Plane table and Alidade<br>6 small soil augers, two 3" soil / sediment corers with extensions, a Wildco 2' by 2" lake core sampler hand sampling device, Husquvarna gas rocksaw,<br>hand Jackhammer |
| Additional | Three Vickers binocular polarizing microscopes, Lietz Laborlux II Pol petrographic microscope |

Library Resources: The resources of the library are somewhat limited. The holdings of the library may be adequate in some fields of geology, but in many areas they are inadequate or even non-existent. Of a total of 822 total journal subscriptions the library currently holds, only 8 are Geological or Geology related journals. The library also maintains collections of back issues and microfilm of additional geological-related journals for which subscriptions have been discontinued. The searching capability often only finds resources in very obscure journals that are of little use, while missing relevant resources in well-known journals. Search engines available through the library (ie. JSTOR, etc.) have limited access to journals compared to what is available at UGA. One suggestion is that the Board of Regents improve the availability of online journals system-wide instead of only at the major universities, which would greatly facilitate research and scholarship at all institutions within the system. The list of all Geology and related journals below demonstrates the gaps in present and past journal coverage:

***Geology-related journals with current subscriptions:***

*The American Journal of Science*: 1995-current; 1949-1962 microfiche.
*Geological Society of America Bulletin*: 1974-current; 1950-1973 microfiche.
*Geology*: 1976-current
*Geotimes*: 1975 – current
*The Journal of Geology*: 1975-current; 1950-1974 microfiche.
*AAPG Bulletin*: 1991-2006; 1974-1990 microfiche.
*Journal of Paleontology*: 1975-1977; 1989-2006; 1978-1988 microfilm.
*Journal of Vertebrate Paleontology*: 1985-current.

**Additional archived journals:**

*Earth Science*: 1971-1990.
*Journal of Structural Geology*: 1982-1998; 1979-1081 microfiche.
*Lethaia*. 1985-1989.
*Economic Geology and the Bulletin of the Society of Economic Geologists*: 1987-1991; 1956-1986 microfiche.
*Tectonophysics*: 1985-1989; 1976-1984 microfiche.
*Journal of Geological Education*: 1975-1981.

*Sedimentary Geology*: 1975-1992; 1967-1974.
*American Association of Petroleum Geologists Bulletin* [microform]; 1948-1973).
*Journal of Sedimentary Petrology*: 1975-1991; 1964-1974 microfiche.
*Annual Review of Earth and Planetary Sciences*: 1973-1989.

**Other related journals available through JSTOR (Online coverage ends 4 years prior to the current year)**: *Paleobiology* 1975-2002; *Limnology and Oceanography*: 1956-2002.

The limited resources available have necessitated faculty maintaining individual subscriptions to key journals and frequently providing students with copies of relevant articles and materials to students from their own reprint collections. Through individual subscriptions and donations to and by the department, journal resources available within the department include: *GSA Bulletin, Journal of Sedimentary Petrology, Geology, Geotimes, Bulletin of the American Association of Petroleum Geologists, Palaos, Journal of Paleontology, Journal of Vertebrate Paleontology, Paleobiology, Hydrogeology Journal, Science, Nature.* We recommend that the library be allowed to invest in geology-focused journals instead of encumbering the faculty members with the need to have individual subscriptions.

***Provide other indicators of adequacy of campus infrastructure to support the program.***
The campus infrastructure in general (e.g., the office of alumni affairs, the registrar and financial aid) seems adequate to support the program. Adding additional support staff in the grants office with more extensive experience in science and NSF funding protocols, preview, and the editing of individual grant proposals would enhance the ability of geology and other science faculty to obtain extramural funding. The Computer and Information Networking Services department (CINS) provides support to the department by maintaining and upgrading hardware and software as needed; however, they are somewhat overextended and there is often a wait period for requests. One drawback is that University policy does not allow individuals administrator access on their office computers. Our department has also traditionally had minimal support from advising, university advancement and public relations.

***Describe methods to be pursued for program improvement.***
More money for equipment, newer vehicles and increased library services would greatly improve our program. Relatively minimal capital funding has been historically allocated to the geology program at CSU; increased funding for a field vehicle, an earth drill or coring equipment, would greatly improve the visibility and field component of our program, especially in areas such as hydrology, sedimentology, and paleoecology. Of note is that among levels of satisfaction category responses of recently surveyed CSU geology graduates, facilities was tied for the lowest number of very satisfied responses.

**II F. The Quality of Research and Scholarship Supporting the Program**

*State your assessment of the strength of the evidence of the program quality on this indicator***: Very Strong**

The program's professors, students, and graduates comprise the leading experts on this geologically diverse region of the country. The success of the Department's scholarship is evidenced by 22 published abstracts, 11 scholarly manuscripts, 4 grants, and a sole-authored scholarly book.

The scholarly activities of the Geology program have been recognized broadly with several research articles published in the most respected geological journals including *Geology*, *Journal of Geology*, *Journal of Paleontology*, *Journal of Vertebrate Paleontology*, and *Palaios*. This Department's scholarship is on par with much larger programs and the faculty scholarly productivity provides convincing evidence of the strength and rigor of CSU's Geology program. Faculty research has the greatest benefit to CSU's students, as the faculty incorporate their recent discoveries in lectures and laboratory activities.

***Explain how faculty members involve students in research.***
CSU has an active and faculty-mentored, student research program in Geology. Geology has long recognized the importance of research experience and has developed an elective research course (GEOL 4175). The effectiveness of this research emphasis is evident from the 10 student coauthors on published abstracts--5 of these abstracts have students as primary authors (see Appendix).

***Describe how faculty research relates to the program's mission.***
Successful research is an integral element of the Geology program's mission to produce graduates with the knowledge and experience to serve as professional geologists or to continue their training in geology-related disciplines. To achieve these worthwhile goals faculty use their technical expertise as scientific investigators to mentor students in research in the classroom, the laboratory, and the field. By maintaining an active research program the faculty members keep abreast of the newest scientific advancements and use this knowledge to enhance the quality of education for students.

***Describe mentoring and professional development opportunities for faculty.***
Faculty have actively engaged in faculty development activities. Since 2000 they have attended 5 field trip training exercises and 3 special faculty development workshops.

***List faculty publications, papers given (2000-Present)*:**
**Books**
Schwimmer, D. R. 2002. *King of the Crocodylians: The Paleobiology of Deinosuchus.* Indiana University Press, 221 pp.
**Manuscripts (papers, scholarly letters, book reviews)**
Schwimmer, D.R. and W.M. MONTANTE, (in press) 2007. Exceptional Fossil Preservation in the Conasauga Formation, Middle Cambrian, Northwestern Georgia. **Palaios**, 21(3):
Frazier, W. J. 2006 Geologic Regions of Georgia: Overview. http://www.georgiaencyclopedia.org/nge/Article.jsp?id=h-1159&hl=y **New Georgia Encyclopedia**
Schwimmer, D. R. 2006. Paleontology of the Coastal Plain. Province. http://www.georgiaencyclopedia.org/nge/Article.jsp?path=/ScienceMedicine/EarthSciences/Paleontology&id=h-3166. **New Georgia Encyclopedia**
Schwimmer, D. R., 2006. Review of Scott, E.C. 2004. Evolution vs. Creationism: An Introduction. **American Paleontologist**,14: 18-19 (book review)
Schwimmer, D. R., 2005. Letter on dinosaur geography. **Natural History Magazine**, invited response to article by Norell and Xu, July/August issue: p. 10-11.
Carr, T. D., T. E. Williamson, and D. R. Schwimmer. 2005. A new genus and species of tyrannosauroid from the Late Cretaceous (middle Campanian) Demopolis Formation of Alabama. **Journal of Vertebrate Paleontology**, 25(1):116-140
Kiernan, C. R. and D. R. Schwimmer. 2004. A velociraptorine tooth from Alabama and its paleogeographic implications**.** **The Mosasaur**, 7: 89-93
Schwimmer, D. R., G. E. Hooks, and B. Johnson. 2002. Revision of taxonomy, age, and geographic range of the large lamnid *Cretodus semiplicatus*. **Journal of Vertebrate Paleontology**, 22(3): 704-707
Schwimmer, D. R. 2002. Giant fossil coelacanths from the Late Cretaceous of the eastern USA**.** **Fernbank Magazine,** 22(2): 24-30
Case, G. R., D. R. Schwimmer, and P. D., Borodin and J. J. Leggett. 2001. A new selachian fauna from the Eutaw Formation (Upper Cretaceous/early to middle Santonian) of Chattahoochee County, Georgia. **Paleontographica**, Part A, 261: 83-102
Schwimmer, D. R. 2001. Review of: Eldredge, N., 2001, The Triumph of Evolution and the Failure of Creationism. **American Paleontologist**, February, 2001: 14-16

**Papers presented**
Faculty have combined to publish 32 abstracts for meetings attended since 2000 (see Appendix for complete list)

**List of Public lectures presented**
Schwimmer D.R. 2005. Southeastern dinosaurs Geology Department, Emory University, on. Atlanta, GA
Schwimmer D.R. 2005. Southeastern dinosaurs. Georgia Science Teachers Association, Annual Meeting, Columbus, GA
Schwimmer D.R. 2004. Cretaceous fossils from Georgia. Macon Museum of Arts and Sciences, Macon, GA
Schwimmer D.R. 2003. Lecture on Cambrian soft-tissue fossils, Geology Department, Auburn University, AL

Schwimmer D.R. 2002. Georgia dinosaurs at Georgia Southern Museum and Cambrian soft-tissue fossils at Geology Department, Georgia State University, Statesboro, GA

Schwimmer D.R. 2000. Cambrian soft-bodied fauna. Geology Department, Georgia State University, Atlanta, GA

***Describe methods to be pursued for program improvement.***
Continue to encourage the high quality of scholastic achievements of Geology faculty and students. Increase dramatically the level of exposure to the University community and to the community at large the high level of this outstanding scholarship. The faculty need additional support from CSU to maintain and enhance their scholarly activities especially in conjunction with students.

**II G. Quality of Service Supporting the Program**
***State your assessment of the strength of the evidence of program quality on this indicator.*** Above Average.

***Describe projects completed and outcomes which contribute to the program, department, college, institution, community and/or region .***
Geology students and faculty help run the Science Olympiad and Muscogee County Science Fair. Faculty have run field trips, given keynote speeches and advised the Georgia Science Teachers' Association. Faculty have advised the Weinmann Mineral Museum, Fernbank and the State Capital Museum, served on the Chamber of Commerce Environmental Committee, and Trees Columbus and have advised Rivers 2000 on the location of paleontological resources. Faculty have also worked at locating environmentally sensitive sites on Fort Benning, reviewed the environmental plan for Fort Benning, reviewed articles for publication, written book and article reviews for journals and reviewed grant applications for NSF and the Petroleum Research Fund. The Geology program has organized visitation by distinguished lecturers to CSU for talks that are both specific to geological topics and appropriate to broad audiences. These have served the Honors program as well as programs in a number of other disciplines. A number of Geology students assist in Physical, Historical and Fossil Record laboratories and help in the CSU writing lab.

***Describe methods to be pursued for program improvement.***
Encourage faculty and students to continue support of activities mentioned above and encourage students to increase participation in Geology, Environmental or Education related civic NGO's, especially through the newly introduced Internship course. Continue to organize outside lectures that serve the needs of both the Geology program and the ENVS and the Honors programs.

**II H. Program Honors and Awards**

***State your assessment of the strength of the evidence of program quality on this indicator.*** Satisfactory.

The program *per se* has not received awards, whereas individual faculty and students have received many citations and awards as documented in section II I. There are no "Best Practices" or analogous citations in Geology, to our knowledge.

***If program accreditation is available but has not been attained at CSU, explain why.***
Program accreditation is not available in Geology. However, the BS- Geology degree at CSU is accepted as credentials for students wishing to take the ASBOG (Associated Board of Geologists) Geologist-in-training exam for Georgia and other states' certification.

**II I. Exceptional Achievements & Honors of the Program's Students, Graduates & Faculty**

***State your assessment of the strength of the evidence of program quality on this indicator.*** Above Average.

***Student Achievements and Awards*:**
Published abstracts of professional meeting presentations with student authors (in bold):

**Taylor, J., Woodall, B., Hok**, **T**., Babulski, D., Hanley, T. B, 2006, Calc-silicate pods in North Columbus Metamorphic Complex and in Junction City mylonitic gneiss of west-central Georgia: diopside+garnet metamorphism followed by zeolite crystallization: ***Abstracts With Programs, Southeastern Meeting Geological Society of America****, v*, 38(2), p. 34.

Hanley, T., **DeBice, P. and Ljubojevic, D**., 2005, Stop 19, Kendall Creek stream traverse. Phenix City gneiss, Uchee terrane, in Steltenpohl, M., ed., Southernmost Appalachian Terranes, Alabama and Georgia: ***Fieldtrip Guidebook for the Geological Society of America Southeastern Section 2005 meeting***, p. 154-155.

**Knight, T,** and Schwimmer, D. R. 2005. Anatomy of the skull and braincase of a new *Deinosuchus rugosus* specimen from the Blufftown Formation, Russell County, Alabama**. *Abstracts With Programs, Southeastern Meeting Geological Society of America*,** *v*ol. 37 (2) p. 12.

**Bingham, S.** and Frazier, W.J. 2004. Paleogeographic reconstruction of Upper Cretaceous southwest Georgia and eastcentral Alabama using GIS method (DIGGH) to analyze the disconformity separating Tuscaloosa sediments from the Eutaw Formation. ***Abstracts With Programs, Southeastern/Northeastern Meeting Geological Society of America,*** 36(2), p. 137.

**Knight, T. K. , Bingham**, P. S. and Schwimmer, D.R., 2004. The Ingersoll Shale, an Upper Cretaceous Konservat-Lagerstätte in the Eutaw Formation of eastcentral Alabama. ***Abstracts With Programs, Southeastern/Northeastern Meeting Geological Society of America,*** 36(2), p. 109.

**Clepper, M. L.** and Frazier, William J., 2000, Heavy mineral provenances of the Upper Cretaceous Eutaw Formation of western Georgia and eastern and central Alabama. ***Abstracts With Programs, Southeastern Meeting Geological Society of America****,* 32 (2), p. A12.

***Student Awards and Grants***

2006: Jessica L. Taylor, Federal "Smart Grant" and CSU Tower Scholarship
2005: Jessica L. Taylor, Sears Scholarship
Brian Woodall, American Institute of Professional Geologists (AIPG) Student Membership Award
2004: Shawn Lovelace, AIPG Student Membership Award
2003: Sean Bingham, AIPG Student Membership Award
2001: Tracy L. Hall, Columbus Water Works Environmental Science Scholarship and Hughston Sports Medicine Education Foundation Scholarship

***Graduates' Honors***

2006: Terry Knight and Sean Bingham, NSF Grant for Research
2005: Sean Bingham: Auburn University "Geology Graduate Student of the Year "
Tracy L. Hall, CSU Alumni Scholarship
2003: Tracy L. Hall, CSU Alumni Scholarship and Regents' Opportunity Scholarship

***Faculty Honors***

2005: William J. Frazier, finalist, Faculty Service Award,
David R. Schwimmer, finalist, Educator of the Year
William J. Frazier, American Meteorological Society grant
2003: David R. Schwimmer, Faculty Research and Scholarship Award
2002: Thomas B. Hanley National Science Foundation Research Experience for Undergraduate Education (REU) grant for three years
2001: David R, Schwimmer, finalist, Educator of the Year
David R. Schwimmer, National Geographic Society Grant for Research
1999: Thomas B. Hanley, National Science Foundation Research Experience for Undergraduates grant for three years.

**II. J. General Success of the Program's Graduates**

***State your assessment of the strength of the evidence of the program quality on this indicator*:** Very Strong

Geology graduates have performed remarkably well after graduating from Columbus State University. Of the 12 graduates since 2000/2001, one has earned a Ph.D., two earned a MS in Geology, and one, a MS in Environmental Sciences. At least eleven of the twelve are woring in either geology or science education. We have not heard form one but the last we heard, she was applying for a position in Indiana. This statistic is remarkable and indicates the quality of the education received by graduates of the Geology Program. Thus the quality of the graduates is unparalleled and well document by their achievements after graduation.

**II. K. Stakeholder Satisfaction with the Program**

***State your assessment of the strength of the evidence of the program quality on this indicator*:** Very Strong

***Report the results of surveys of students, alumni, employers, community partners, concerning their satisfaction with the quality of the program and its learning experience.***
More than 100% of students who graduated in the last five years and received the survey responded with comments. Responses are summarized in the table below. Respondents showed overwhelming satisfaction with the program --more than 90% of all responses were marked as satisfactory. Furthermore more than 72% of responses indicated that graduates were very satisfied and no responses checked very dissatisfied with their experience in the program. Results suggest that opportunities to interact with geologists outside of CSU could enhance student satisfaction. All respondents were very satisfied by the geology faculty accessibility. This reason was often cited in the comments as the reason they benefited from the program and why they were glad they majored in Geology. There was near universal agreement among respondents that field outings and other out of class opportunities should be enhanced.

The following table shows the percentage of surveyed respondents indicating their level of satisfaction with 6 elements of the Geology undergraduate experience at CSU.

| Category | very satisfied | satisfied | neutral | dissatisfied | very dissatisfied |
|---|---|---|---|---|---|
| Advising | 87.5 | 0.0 | 0.0 | 12.5 | 0.0 |
| Geology courses | 75.0 | 25.0 | 0.0 | 0.0 | 0.0 |
| Non-geology courses | 62.5 | 37.5 | 0.0 | 0.0 | 0.0 |
| Facilities | 62.5 | 25.0 | 12.5 | 0.0 | 0.0 |
| Faculty accessibility | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Interactions outside of CSU | 50.0 | 25.0 | 12.5 | 12.5 | 0.0 |
| Average | 72.9 | 18.8 | 4.2 | 4.2 | 0 |

***Effectiveness of the program's use of community advisory board.***
The program does not have a community advisory board.

**II L. Program's Responsiveness to Change & Improvement**

***State your assessment of the strength of the evidence of program quality on this indicator***. Above Average.

***Cite the most significant examples of improvements made in the program over the last seven years in response to changing conditions, new external requirements, and/or departmental assessment initiatives.***
Notable program improvements include the following :

- Many courses in the BS-Geology major have been reformatted and in some cases co-listed to serve multiple academic programs, in recognition that larger enrollments will serve a wider range of students and programs. Specifically, GEOL 3245 (Invertebrate paleontology) was revised as a more general course, GEOL 2225 (The Fossil Record), now an Area D core science course; GEOL 5165 (Hydrology), GEOL 5255 (Environmental Geology), are all requirements for the Environmental Science MS degree, and GEOL 5115 (Geochemistry) and GEOL 5275 (Vertebrate Paleontology) are Environmental Science MS electives; GEOL 5175 (Physical Anthropology and Archeology) is integrated into the Anthropology program as ANTH 5175, and this course plus GEOL 5135 are frequently taken as upper-level science electives by education majors.

- Hydrology was added as a requirement of the geology major, in recognition that water resources and groundwater remediation are essential components of modern geotechnology.
- Greater emphasis has been placed on student-driven research projects, with 14 student research sections of GEOL 4175 (Undergraduate Research) completed during the seven-year period. Some of these undergraduate projects have led to Master's thesis research by our graduates, and two former undergraduates are considering PhD dissertations based on undergraduate research begun at CSU.
- Several students have taken advantage of the graduate course in GIS through the special topics course

***Comment on how frequently the program's faculty is engaged in program assessment activities, comprehensive program evaluations, and fine tuning of the program and its requirements.***
Geology faculty meet annually to discuss the status of the program, the needs of current students, textbook changes, curriculum suggestions, equipment details, and other program needs. In addition, the department did a Comprehensive Program Review in 2001-2002. The program has tried several assessment methods for graduating seniors, including an attempt to administer the ASBOG exam. However, we were unable to administer the exam at CSU and there are no general GRE-type tests of achievement in geology presently offered. We have kept contact with many recent graduates to track their post-graduation success and acceptance in graduate programs and professional positions. Our general observations have confirmed that our graduates do remarkably well and have been well-prepared for careers in geology.

## III. SUMMARY OF THE PROGRAM'S OVERALL PRODUCTIVITY

Though the BS in Geology addresses the academic and employment needs of students and the need for geological expertise in the region, and supports the Mission Statement of CSU, the number of graduates is low compared the other programs at CSU and BS in Geology programs at other USG institutions. Additional faculty will allow the program to offer additional sections of core geology which in turn will expose more students to the Geology major. The increase in faculty will be offset by the credit hours generated in additional sections. The program will work with CSU's recruiting office to reach out to soldiers nearing discharge or retirement, junior college graduates and students interested in science education. Local and state administrators need to be educated about the contribution geological studies make to regional development and environmental protection. Tracks should be established within the degree to inform students about the application of geology to a wide set of employment options, namely traditional, geotech/environmental and education. The program will continue to arrange for outside lecturers to come to CSU to both inform student and faculty about emerging ideas in Geology as well as to provides events that help spread the news about Geology. To facilitate communication among undergraduates, email lists should be updated regularly and used to advertise talks, job and research opportunites, class schedules and other departmental news. Projected class schedules should be posted in the department office. Students should be encouraged to take the new Internship course to both serve the community, gain experience in the science, and generate news stories to advertise the existence of the BS in Geology. To further advertise the program, flyers and display panels should be constructed for display at places such as CCSSC, OxBow and Roosevelt State Park and the Little White House, as well as at majors fairs at CSU and local schools. We should find scholarship money to support students who are near graduation but have to support families. Increase funding to replace old equipment and to purchase and update software used in classes.

### III A. Enrollment of students in the program.

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Below Average

***Analyze and interpret the number of majors enrolled in the program and the enrollment trends of these majors for the past five years.***
The following table (Report from ISIS) shows the number of declared Geology majors registered for courses in each Fall semester since 2000.

| | Fall, 2000 | Fall, 2001 | Fall, 2002 | Fall, 2003 | Fall, 2004 | Fall, 2005 | Fall, 2006 |
|---|---|---|---|---|---|---|---|
| # majors | 9 | 13 | 14 | 12 | 16 | 7 | 17 |

The number of enrolled majors has fluctuated since Fall, 2000, but is higher now than it has been in the last seven years.

***For undergraduate programs, compare strength of the numbers of the upper division majors and enrollment trends for Geology with the enrollments and trends of upper division declared majors in other undergraduate programs at CSU.***

"Upper division majors" (Facts and Figures) describes the number of Junior and Senior Geology majors and shows a decrease in enrollment from 2003/2004 to 2005/06. The current enrollment should increase the number of upper level students in a few years. In the College of Science the Computer Science program has seen a decrease in the same period of time.

***Methods to be pursued for program improvement.***

The number of majors in Geology must continue to increase. Students listed as majors must be identified early on through the department office and their advisors and encouraged to continue into mid and upper level courses. Communication with majors via email has recently been established and must be continued to encourage greater involvement with the program. Careers in Geology, both the practical and the romantic, must be specifically promoted within the curriculum of the introductory courses.

**III B. Annual Degree Productivity**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Below Average

***Analyze and interpret the number of degrees granted annually (fiscal year) by Geology and the trends of Geology's productivity over the past five years.***

The following table shows the numbers of Geology degrees conferred for the past five years.

| | 2000/01 | 2001/02 | 2002/03 | 2003/04 | 2004/05 | 2005/06 |
|---|---|---|---|---|---|---|
| Degrees conf. | 0 | 1 | 0 | 4 | 2 | 2 |

***Compare the strength of the degree productivity of the Geology program with the productivity of other programs at CSU.***

The BS in Geology graduates relatively few majors compared to other programs at CSU.

## *Methods to be pursued for program improvement.*

Intensify recruiting efforts. Use the CSU recruiting office to target junior college graduates and recently discharged soldiers as well as recent high school graduates.

**III C. Completion efficiency and graduation rate of Geology**

***State your assessment of the strength of the evidence of program productivity on this indicator.***
Satisfactory

***Analyze and interpret the program's graduation rate.***

Graduation rate for this portion of the report is defined by the CSU Facts and Figures tables as the percent of either the 1999 and 2000 cohorts (that is, students who entered the Geology program in summer or fall of either year) who graduated within six years. Because we have no students who fall into either cohort, we are not listed as having a graduation rate. However, we had two students graduate in 2004/05 and two in 2005/06.

***Compare the Geology program's graduation rate with those of other programs at CSU and offer possible explanations for this program's unusually high or low graduation rate if applicable.***

The four students who graduated in 2004 through 2006 were all non-traditional students who entered the program after 2000. Of the students who graduated in the past five years, most were non-traditional in that

they were supporting families in some cases after a being in the military. In some cases, students have changed their majors in favor of Geology, thus losing credits

***Describe methods for program improvement.***

- Encourage students to graduate as soon as they can. Success at encouraging students to major in Geology will smooth out irregularities in numbers of graduates.
- Promote the internship course as a way to provide financial support as well as a way to gain experience in the field.
- Establish a special scholarship program for non-traditional students who are trying to finish the BS in Geology.

**III D. Efficiency and Clarity of the Program's Course Requirements**

***State your assessment of the strength of the evidence of program quality on this indicator.*** Above Average

***Analyze the published course requirements for program completion in terms of the simplicity and efficiency of the program's curricular design and the degree to which program requirements are communicated clearly and effectively.***

The published course requirements, as stated in the CSU college catalog, are straightforward, denoting all the classes required within each of the academic areas. Although there are prerequisites for a number of the classes, they are all clearly stated.

***Comment on the ease with which majors understand and successfully navigate through the required curriculum for program completion.***

Geology majors generally determine which classes they need and to plan out their degree with a fair amount of accuracy. Their efforts are further guided by close involvement with faculty which allows potential conflicts with scheduling and availability of classes to be resolved.

***Describe methods to be pursued for program improvement.***

Having additional faculty will expedite being able to offer courses on a regular schedule. Improving the cross-listing of applicable courses and more coordination with biology and other majors to minimize potential scheduling conflicts would also be beneficial. Dr. Brown is currently involved with the Math and Science Secondary Teachers Preparation Council (recruitment of math and science education majors) and also in meetings regarding Harris County's interest in developing a Math and Science Partnership program. Both of these efforts are facilitating the linkage of courses and content to Georgia GPS standards ($6^{th}$ grade Earth and Space Science) and creating stronger links to the BS in Geology and secondary education programs. As part of our effort to generate broader visibility for the program, we are also intending to include links on our web site to courses offered, expanded course descriptions with learning outcomes and goals, sample syllabi, and prerequisites.

**III E. Frequency and sequencing of course offerings required for program completion**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Above Average

***Analyze and interpret the scheduling and enrollment history of courses required for program completion with particular focus on regularity, frequency, and sequencing of course offerings required for degree completion.***

The table in Appendix B lists courses and frequency of offering since 2000/01. 2006/07 has been included to project enrollments into the future based on early registration. Required courses are indicated by an asterick; courses without an asterick are program electives. Numbers in GEOL 1121 and 1122 indicate the numbers of students in individual sections in the Fall (F) and Spring (Sp). Most courses are offered once per year.

Fossil Record, Mineralogy, Geochemistry, and Environmental Geology have been offered every fall semester. Igneous and Metamorphic Geology, Introduction to Hydrology, Physical Anthropology and

Archeology, and Introduction to Oceanography have been offered every spring. Structural Geology has been offered every other year.

Mapping and Field Geology, and Geomorphology have not been taught every other year as intended. Mapping and Geomorphology will be taught this coming spring. During the years when Geomorphology was not taught, special topics courses in Fluvial Geomorphology and Fluvial Processes were taught by a visiting professor and a newly hired Physical Geographer, respectively, and substituted for Geomorphology.

Vertebrate Paleontology is been offered in alternate years or more frequently in response to student interest. This course is in the process of being reworked to highlight the paleontology of dinosaurs.

Senior Seminar is listed as a required course, but has not been taught in the last five years. Instead, students have substituted Special Topics and Undergraduate Research or one of the other program electives.

***Describe methods for program improvement.***
Continue to emphasize the recommended sequence of courses through advising. Post a two year projection of course offerings on the Department web page ad in the Departmental office. Teach a section of Historical Geology in the Spring semester.

**III F. Enrollment in Geology's required courses**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Above Average

***Analyze and interpret the strength of the enrollment in the courses required for program completion.***
The table in Appendix B shows the enrollment in courses taught in Geology and their enrollments since 2000/01; required courses are indicated by an asterick. Two charts in Appendix C summarize total enrollments for core Geology courses (Physical, Historical and Fossil Record) and upper level Geology courses.

***Comment on the differences between core and elective course enrollments as well as differences among courses required for optional tracks or concentrations. Identify any required courses that are dropped from the schedule of classes frequently due to low enrollment and which majors must complete through approved substitutions.***
Our core courses have maximum enrollments and a number of our upper level courses have good enrollments.

Enrollment in core courses increased dramatically starting in 2003/04. Starting in 2003 to the present, faculty increased the number of sections of core by adding Fossil Record to the core and by teaching additional sections of Physical Geology. Additionally, a part time instructor, Mr. Brad Tompa, taught sections of GEOL 1121 in the fall of 2003, 2004 and 2005. The enrollments have dropped in 2005/06 because as the Head of the Environmental Sciences program, Dr. Frazier has had a reduced load. Also, Mr. Tompa is no longer available.

Enrollment in upper level Geology and related courses since Fall 2000 are summarized in a chart in Appendix D. Enrollments have increased since Fall 2000. The large enrollments in upper level courses in 2002/03 reflect larger than normal enrollments in Sedimentary Geology, Oceanography, Environmental Geology, Physical Anthropology and Archeology and several courses related to the ENVS. These enrollments were due to education and environmental sciences students. These enrollments will increase with an increase as education students take courses to enhance their content backgrounds and as the ENVS program increases.

The program has not dropped courses because of low enrollment.

***Describe methods to be employed for program improvement.***
Establish tracks in the Geology curriculum that would emphasize the employment opportunities in Geology. These tracks would be traditional, environmental/geotechnical and education. These tracks would utilize courses that are already available in the curriculum.

**III G. Diversity of program's majors and graduates**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Above Average

***Analyze and interpret the gender, ethnicity, nationality and age of the majors and graduates in the program.***
Diversity of students in the Geology program is summarized in Appendix D. Students listed as Geology majors since 2003 are mixed by gender, race, and age. Many geology programs across the nation have about the same number of women as men. CSU's Geology program is trending towards that distribution. Black students have been represented intermittently in the Geology program for a number of years, though in the years noted in the table, their numbers have decreased for the last few years. Our majors tend to be older than the "traditional" student.

***Comment on the program's success and distinctiveness in enrolling and graduating a diverse mix of students.***
We interpret the ethnic and age diversity of students in the Geology program to complex circumstances involving exposure to geology as a career at some time after their graduation from high school. Students exposed to Geology in eighth grade often enjoy the science but do not recognize it as a base for a career. Exposure in High School is mainly to academically challenged students, not to those who might be considering a career in science and who might graduate with the background needed to succeed in science. Our older students are those who have come back to school after working or being in the military and who have developed career interests not known to them when they graduated from high school. Two of our recent non-traditional graduates are typical examples of students who chose Geology based on life experiences outside the classroom. One, an international student from South Africa, learned about Geology as a career because mining is important in South Africa and his father is in the mining industry. He is now working for a company prospecting for diamonds in South Africa. A second, one of our black graduates, immigrated to the US from Guyana. He was aware of mining and of the relation between geology and the environment from his youth, and is now working on environmental and construction projects for a local Geotechnical company. Some of our female students have come to geology after working in other fields.

***Methods for program improvement.***
Produce a more imaginative flyer and a display panel for use at various University events and other opportunities for outreach. These opportunities include the majors fair held in the Fall, display at the Coca-Cola Space Science Center and OxBow Meadows. Flyers should be distributed to high school guidance councilors. Increase efforts to inform CSU students of careers in geology. Introduce them to careers through invited lectures by local practitioners in Physical Geology classes. Market careers in Geology to soldiers on active duty in preparation for their eventual discharge in the Columbus area. Market the program to junior college graduates. Expand the outside speakers program. As an institution that has a large community of potential students represented at a very low level in the Geology community, CSU is in a good position to increase that representation.

**III H. Cost-effectiveness of instructional delivery in Geology's home department.**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Above Average

***Contrast the instructional cost-effectiveness of this program's home Department with others at CSU.***
The Cost per Credit Hour (CpCH) of the Department of Chemistry and Geology in fiscal 2006 was $187. This was determined by multiplying the credit hours for each course by the course enrollment and dividing that number into the fiscal 2006 budget. The CPCH for the Institution is $170 and CpCH for the Geology program is $159. Even though the Department of Chemistry and Geology is less cost effective than the institution as a whole, the Geology program is more cost effective than the institution and the department as a whole. The Geology program increases the cost effectiveness of the department.

***List the principal factors that cause this program's home department to appear to be unusually cost-effective or to be unusually expensive.***

The Department has a fairly high CpCH for several reasons. Very few courses are taught by part time faculty. A number of courses (Engineering, Chemistry and Geology) have low enrollments. Some equipment and software that are essential to the department are bought through the operating supplies and expenses budget. Most programs/departments do not have such expensive needs. On the other hand, many of the courses that are taught through the department serve the core and have high enrollments. These high enrollment courses reduce the CpCH and increase the cost effectiveness of the department. These courses include the Chemistry, Geology, Physics and Astronomy sequences with their labs. A few contribute to the core in other programs (Sociology through Anthroplogy courses, and Environmental Sciences). This is due to the large number of students we teach in our core courses: GEOL 1121, 1122 (and Lab) and GEOL 2225. Education undergraduates and grad students also take our mid and upper level courses further increasing our cost effectiveness.

***Comment of the degree to which this program (Geology) contributes to or detracts from the cost effectiveness of the Department.***

Enrollment in the Core courses (Physical and Historical Geology, Fossil Record, and Introduction to Environmental Sciences) and enrollment in Environmental Sciences graduate courses taught by Geology faculty reduce the CpCH and increase our cost-effectiveness.

***Describe methods for program improvement.***

Promote Historical Geology as a second core science course to be taken during the regular part of the academic year. Hire part time or full time faculty whose main job would be to teach the core geology courses. Recruit more education majors to take the mid to upper level Geology courses as the to build their backgrounds to teach in the Middle and Elementary schools.

**III I. Program's Responsiveness to State Needs and Employer Demand for Program Graduates**

***State your assessment of the strength of the evidence of program quality on the indicator****:* Above Average

***Comment on the demand for graduates of this program, followed by an assessment of the program's success in responding productively to such need and demand:***

The profession of Geology is not a large one but the nature of employment and societal needs change constantly. Currently, the major area of employment is in general geological and environmental consulting. Most of our recent graduates have been hired by engineering consulting companies and municipal agencies. In most cases, their jobs entail working on environmental impact studies, evaluating geological hazards, and planning clean-up activities following toxic-material spillages or leakages. Also, with the intensification of energy shortages and activities to locate increasingly more remote and hard-to-access hydrocarbon resources, energy companies are now hiring more geologists. Finally, the need for public educators well-trained in geological sciences grows yearly.

In order to keep up with these changing needs, our faculty members maintain close relations with local and regional employers, both private and public, and adjust our advisement accordingly. We also adjust our courses to match perceived needs. For example, our Geochemistry course was originally focused on the chemistry and thermodynamics of both surface and subsurface processes. Interest in and need for students trained in high-temperature, high-pressure geochemistry (for example, in igneous and metamorphic systems) had waned over the years; for this reason, the course has been changed to focus principally on surface processes and environmental problems. Similarly, our Environmental Geology has changed its focus to keep up with ever-new environmental concerns. In addition, new courses have been developed to enhance our students' marketability. These courses include: landfills and land use geology; groundwater hydrology; stream-system geomorphology; and training in Global Information Systems.

A major change in the profession of Geology is the increasing importance of computer systems and cyber-resources. Virtually all aspects of Geology are now addressed by new software packages. We have tried to keep up with these major trends and have had some successes. Several years ago, we purchased *Visual MODFLOW for Windows*, one of the industry-standard software packages for description and evaluation of groundwater systems. But all of our courses now have aspects of computer analysis. For example, courses in Sedimentary Geology, Geochemistry, Hydrology, Igneous and Metamorphic Geology, and others now feature *Excel*-based lab and homework exercises. Internet resources are now emphasized in all of our courses and are integral in some. For example, Internet videos and animations of sedimentary processes such as sediment-gravity flows, turbidity currents, tectonic-plate motions and interactions, magma-chamber dynamics, and trends in organic evolution are all now in use.

***List the factors that limit the program's ability to be more productive and responsive to these needs and demands:***
To be as responsive to current and future trends in Geology as well as to employment demands, we need young faculty trained in these new developments. For example, the current demand for geologists trained in the synergistics of surface-system interactions of geology, biology, chemistry, meteorology, and physics mandate the hiring of recent Ph.D.'s trained in Earth-System science. In addition, as current faculty members retire, new ones must be added as replacements.

A constant need is for increased funding. No doubt, all programs at all institutions expressed the same concern. But in our case, the need is even greater. We have requested for years funds for new equipment, course-related software, and repair or replacement of essential equipment. These requests have commonly been denied. For example, our large slab-saw, a requirement for processing rocks for analysis, has needed a new motor, new bearings, and a new drive system for a number of years. It still does. Our cut-off saw also is in constant need of repair. Money has not been forthcoming for these and others repairs. As mentioned earlier in this report, field trips are fundamental in Geology education. On a yearly basis, our travel budgets have been inadequate and faculty members routinely pay for their own and student travel out of their own pockets.

***Describe methods to be pursued for program improvement:***

- Increase funding to replace old equipment, add new equipment and purchase and maintain software related to the needs of a changing curriculum;
- Add new faculty members.
- Particularly, we need a renewed and enhanced commitment on the part of the University's administration to recognize the importance of Geology to the region and the opportunities afforded our citizens by a BS in Geology.

**III J. Position of Geology's Annual Degree production among comparable USG programs.**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Below Average

***Identify the ranking of our Geology program relative to comparable programs in the USG (or beyond) in terms of the number of degrees granted annually.***
The following table shows the three year averages for 2002 through 2005 for the five University System of Georgia (USG) State Universities with geology programs. All institutions show fluctuating yearly rates. Our graduation rate for 2005/2006 is shown for comparison. Numbers in parentheses indicate the number of geology faculty in each program. CSU, Georgia Southern and Georgia Southwestern produce about one graduate per faculty member per year while West Georgia produces one graduate per two faculty members per year. Savannah State produces approximately 2 graduates per faculty member in a program that is not focused on Geology.

| Institution (# Geology faculty) | 3-year average 2002-through 2005 | 2005/06 |
|---|---|---|
| CSU (2.5) | 2 | 2 |
| Georgia Southern (8) | 7 | |
| Georgia SW (3) | 2 | |
| Savannah State (3 marine science/oceanography) | 7 | |
| West Georgia (10) | 5 | |

***Describe methods for program improvement.***
The Geology program will recruit more aggressively to increase the numbers of Geology majors and rate of graduation.

**III K. Geology's contributions to achieving CSU's mission.**

***State your assessment of the strength of the evidence of program productivity on this indicator.*** Very Strong

**List the substantive contributions this program makes to the achievement of CSU's published statement of institutional mission.**
Columbus State University's mission is to promote educational, economic, social and cultural growth in Georgia and beyond. Our program provides the opportunity for local people to participate in various industries that are based on the earth sciences. Most recent graduates have gone to work for companies that protect, monitor, or remediate water supplies or other aspects of the environment. They have taken advantage of opportunities in the Columbus area and have also developed careers across the country.

*The University is dedicated to excellence in teaching in a student-centered environment, research and creative activities, service to the region and the state, and community engagement through university-community partnerships.* The faculty encourage student research projects that are based in local geology. These creative activities expand the understanding of local geology and place graduates in a position to help guide regional development.

***Describe methods to be pursued for program improvement.***
Promote the internship program with local companies and NGO's.

## IV. Conclusion about the Program's Viability at CSU

It is our conclusion that the BS in Geology will be viable at Columbus State University. Viability will be assured through maintaining quality and increasing productivity through more aggressive marketing on a broad front. These activities are indicated in the following plan. Geology is a science that will become increasingly important as we increase the strain on our natural resources.

## V. Program Improvement Plan

Actions to improve the enrollment and graduation rates in the BS in Geology will include:

- Hire replacement for retiring "hard rock" geologist. This is in progress.
- Support of the "hard rock" geologist in his/her efforts at recruiting. This support should be ongoing but must begin in the fall of 2007. These recruiting efforts will include
    - developing research projects for students to complete and present at Southeastern Section meetings of the GSA, National meetings of GSA, and meetings of the Alabama and Georgia Academy of Sciences.
    - Travel support for faculty and students to attend these meetings
    - Travel support for field trips organized by the Alabama and Georgia Geological Societies.
    - Equipment to excite students and help them prepare their presentations.
    - Participation in campus activities related to advertising major programs to high school students (visitation days) and University students (Majors Fair in the fall). Develop table presentations for these opportunities.
- Revamping departmental and Geology web pages. Begin this process in the Fall of 2007.
- Support efforts of a similar nature by other faculty.
- Support efforts to form a Geology or Earth Sciences student organization.
- Develop a track in the BS Geology for Environmental Geology as suggested by the outside review team. The review team pointed out that potential majors may not recognize the major in Geology while they might search for and recognize a major in Geology with an environmental track keying on the term "environmental." This should be done in the Fall of 2007 for inclusion in the 2008-2009 Catalog.
- Promote the usefulness of a BS in Geology to core courses (Physical Geology, Historical Geology, and Fossil Record) as well as some of our more advanced courses such as Physical Anthropology,

Vertebrate Paleontology and Human Origins. Do this through highlighting careers during class lectures and by inviting guest lecturers from the community who practice geology in the Columbus area.

- Continue support of Science Education through the recently instituted BS in Geology and Secondary Education (Earth Science), as well as continued involvement with Science Fair and Science Olympiad.

## VI. Summary Recommendation

Maintain the BS in Geology at is present level. The program's high quality and the promise of increased productivity through aggressive marketing make this a reasonable conclusion. The program is aligned with CSU's mission and goals. The need for geologists will increase in the near future as society deals with diminishing energy resources, increasing demand for energy and raw materials and increased environmental strain. The program is the sole source for local geological expertise. Increasing faculty and space will be required as the numbers of students and graduates increase in the years ahead. Through these actions, the program will become a greater asset to students, the University, the community and the state.

# APPENDIX A

## *Published abstracts*


Schwimmer, D. R., 2007. Dinosaur feathers, fish fingers, and luck of the mammals in evolution pedagogy. Abstracts With Programs, **Southeastern Meeting Geological Society of America,** vol. 39 (2)

Schwimmer, D. R., 2006. *Megalocoelacanthus dobiei*: morphological, range, and ecological descriptions of the youngest fossil coelacanth. **Journal of Vertebrate Paleontology**, vol. 26(Supplement to 3): 122A

Taylor, J., Woodall, B., Hok, T., Babulski, D., Hanley, T. B, 2006, Calc-silicate pods in North Columbus Metamorphic Complex and in Junction City mylonitic gneiss of west-central Georgia: diopside+garnet metamorphism followed by zeolite crystallization: Abstracts with Programs, Southeastern Meeting **Geological Society of America,** 38(2), p. 34

Hanley, T., DeBice, P. and Ljubojevic, D., 2005, Stop 19, Kendall Creek stream traverse. Phenix City gneiss, Uchee terrane, in Steltenpohl, M., ed., Southernmost Appalachian Terranes, Alabama and Georgia: Fieldtrip Guidebook for the Southeastern Meeting **Geological Society of America**, p. 154-155

Knight, T, and Schwimmer, D. R. 2005. Anatomy of the skull and braincase of a new Deinosuchus rugosus specimen from the Blufftown Formation, Russell County, Alabama. Abstracts With Programs, Southeastern Meeting **Geological Society of America**,. 37 (2) p. 12

Montante, W. and Schwimmer, D. R. 2005. Brachiopods of the Conasauga Formation, Middle Cambrian of Northwestern Georgia, Southeastern Meeting **Geological Society of America,** vol. 37 (2) p. 12

Schwimmer, D. R. 2005. Exceptional Preservation in nonexceptional conditions: Conasauga Formation, Middle Cambrian, western Georgia. Abstracts With Programs, Southeastern Meeting **Geological Society of America,** vol. 37 (2): 3

Schwimmer, D. R., Bingham, P. S. and Knight, T. 2005. An Upper Cretaceous (Santonian) nonmarine deposit in eastern USA—with fossil feathers. **Journal of Vertebrate Paleontology**, 25 (Supplement to 3): 112A

Bingham, S. and Frazier, W.J. 2004. Paleogeographic reconstruction of Upper Cretaceous southwest Georgia and eastcentral Alabama using GIS method (DIGGH) to analyze the disconformity separating Tuscaloosa sediments from the Eutaw Formation. Abstracts With Programs, Southeastern/Northeastern Meeting **Geological Society of America**, 36(2): p. 137

Hanley, Thomas, Kar, Aditya, Neurath, Robert, Tourscher, Sara, Hansel, Krisha, La Tour, T.E., Burnley, P.C., Malchow, R., 2004, Cerro Azul Plutonic Complex: Cretaceous island arc rocks exposed in Rio Mamoni Valley, eastern Panama. Abstracts with Programs **Geological Society of America**, 36(2): p. 71

Hobbs, Benjamin, Cabiles, Liana, Beville, Susan, Kar, Aditya, Burnley, Pamela, and Hanley, Thomas, 2004. Constraints on the p-t path for uplift of the uchee belt based on microthermometry of fluid inclusions in metamorphic rock. Abstracts with Programs **Geological Society of America**, 36(5): p. 79

Knight, T. K. , Bingham, P. S. and Schwimmer, D.R., 2004. The Ingersoll Shale, an Upper Cretaceous Konservat-Lagerstätte in the Eutaw Formation of eastcentral Alabama. Abstracts With Programs, Southeastern/Northeastern Meeting **Geological Society of America**, 36(2): 109

Scanlan, M., James, Russell, Bratton, Gregory, Kar, A., Hanley, T., Burnley, P., Malchow, R., and LaTour, T., 2004; Geochemical and Petrographic Comparison of Amphibolite and Associated Gneiss from the Phenix City Gneiss in the Uchee Belt of Western Georgia. Abstracts with Programs **Geological Society of America**, 36(5), p. 79

Schwimmer, D. R. 2004. Late Cretaceous dinosaurs of the eastern Gulf Coast, and their relationships with Atlantic Coast taxa. Abstracts With Programs, Southeastern/Northeastern Meeting **Geological Society of America**, 36(2): 117

Hanley, T.B., Wright, A.O., Wilson, C.G., Kar, A., Steltenpohl, M.G., La Tour, T.E., Ghazi, M., and Burnley, P.C., 2003, The significance of the extension of the Motts Gneiss from eastern Alabama into the Uchee Belt of western Georgia. Abstracts with Programs **Geological Society of America** 35(1): p. 9

Leigh, Alanda, Neurath, Robert, Moore, James, Sample, Michael, Hanley, T.B., Kar, A., La Tour, T.E., Burnley, P.C., and Malchow, R. 2003, Comparative geochemistry and petrographic analysis of lineated

gneiss and meta-aplites from Uchee Belt, Georgia. Abstracts with Programs **Geological Society of America,** 35(6): p. 328

Schwimmer, D. R. 2003. New fossil of the largest known coelacanth, from the Late Cretaceous of Southeastern USA. **Journal of Vertebrate Paleontology**, 23 (Supplement to 3): 95A

Schwimmer, D. R. 2002. Late Cretaceous dinosaurs of eastern North America—how and when did they cross the Western Interior Seaway? Abstracts With Programs, Southeastern/South-Central Meeting of **Geological Society of America**, 35(1): 17

Schwimmer, D. R. and Montante, W. W. 2002. Exceptional fossil preservation in the Conasauga Formation, Middle Cambrian of western Georgia. Abstracts With Programs, **Geological Society of America** 34(6): 81.

Hanley, Thomas and Hansel, Krisha, 2001, Chemical Study of rocks from the Mamoni River valley of Eastern Panama: Fourth Annual Conference on the Americas, March 30-31, Armstrong Atlantic University, Savannah, Georgia

Hansel, Krisha, Hanley, Thomas B., Commander, Cason, Kar, Aditya, La Tour, Timothy E., Burnley, Pamela C., 2001, Petrographic and geochemical study of rocks from eastern Panama: an Atlanta Consortium of research in Earth Sciences (ACRES) progress report: Abstracts with Programs **Geological Society of America** 33(2): p. A-69

Schwimmer, D. R. 2001. Eastern Late Cretaceous theropods in North America and the crossing of the Interior Seaway. **Journal of Vertebrate Paleontology**, 21 (Supplement to 3): 99A.

Shopa, Amanda, Hansel, Krisha, Kobor, Jeremy, Davison, Jeff, Hanley, Tom, Kar, Aditya, La Tour, Timothy E., Burnley, Pamela, 2001, Geochemical, petrological and field study of Motts gneiss and other lineated gneisses in the Uchee belt of western Georgia and eastern Alabama. Abstracts with Programs **Geological Society of America** 33(2): p. A-68

Wagner, John R., Anderson, James R., Arthur, Jonathon, Astwood, Philip M., Brown, Charles Q., Clark, G. Michael, Huebner, Nancy, Russell, Gail, Gibson, Michael, Gore, Pamela, Hanley, Thomas, Mills, Hugh H. 2001, SE Maps: a hands-on integrated curriculum package introducing remote sensing technology to the secondary school classroom: Abstracts with Programs **Geological Society of America** 33(2): p. A-13

Clepper, M. L. and Frazier, William J., 2000, Heavy mineral provenances of the Upper Cretaceous Eutaw Formation of western Georgia and eastern and central Alabama. Abstracts With Programs, Southeastern Meeting **Geological Society of America**, 32 (2), p. A12

Hanley, Tom, Stracher, Glenn B., Wampler, J.M., 2000, Allaghanian K-Ar ages from texturally distinctive biotite-rich lithologies in the central Uchee belt of western Georgia: Abstracts with Programs **Geological Society of America** 32(2): p. A-23

Hansel, Krisha, Kobor, Jeremy, Shopa, Amanda, Davison, Jeff, Hanley, Tom, Kar, Aditya, La Tour, Timothy E., Burnley, Pamela, 2000, Geological and geochemical study of gneisses, amphibolites, and additional rocks in the Uchee belt of western Georgia and eastern Alabama: an Atlanta Consortium of Research in the Earth Sciences (ACRES) Progress Report. Abstracts with Programs **Geological Society of America** 32(7): p. A-272

Huebner, Nancy, Hanley, Thomas, Gore, Pamela, Wagner, John R., 2000, SE Maps in Georgia: strategies and currently developed geologic sites in Coastal Georgia, the Atlanta Metropolitan area and Pine Mountain. Abstracts with Programs **Geological Society of America** 32(7): p. A-348

Kopera, Joe, Nicholas, Brian, Todd, Dave, Davison, Jeff, Hanley, Tom, Kar, Aditya, and La Tour, Timothy E., 2000, Geochemistry of gneisses and amphibolites in the Uchee belt of western Georgia and eastern Alabama: an ACRES progress report. Abstracts with Programs **Geological Society of America** 32(2): p. A-31

Schwimmer, D. R. 2000. Where are the large, Late Cretaceous sharks on the Atlantic Coastal Plain of the USA? **Journal of Vertebrate Paleontology**, 20(3):68A.

Schwimmer, D. R. 2000. A new Middle Cambrian lagerstätten in the Conasauga Formation of northwestern Georgia. Abstracts With Programs, **Geological Society of America** 32(3): A72

Stracher, Glenn B., Hanley, Thomas B., and Fleisher, Christopher J., 2000, Hydrogarnet mineral recalculation program and ternary classification diagram exemplified by Uchee belt coronites in western Georgia, U.S.A. Abstracts with Programs **Geological Society of America** 32(7): p. A-15

# APPENDIX B

**Enrollment in Geology courses Fall 2000 through Fall 2006.**

Courses required for the major have an asterisk. The core courses, Physical, Historical (including the lab course) and Fossil Record, are required for the major. Bold numbers in Physical Geology indicate total enrollment for the year; in upper level courses, the number in parentheses indicates the graduate student contribution to the total enrollments.

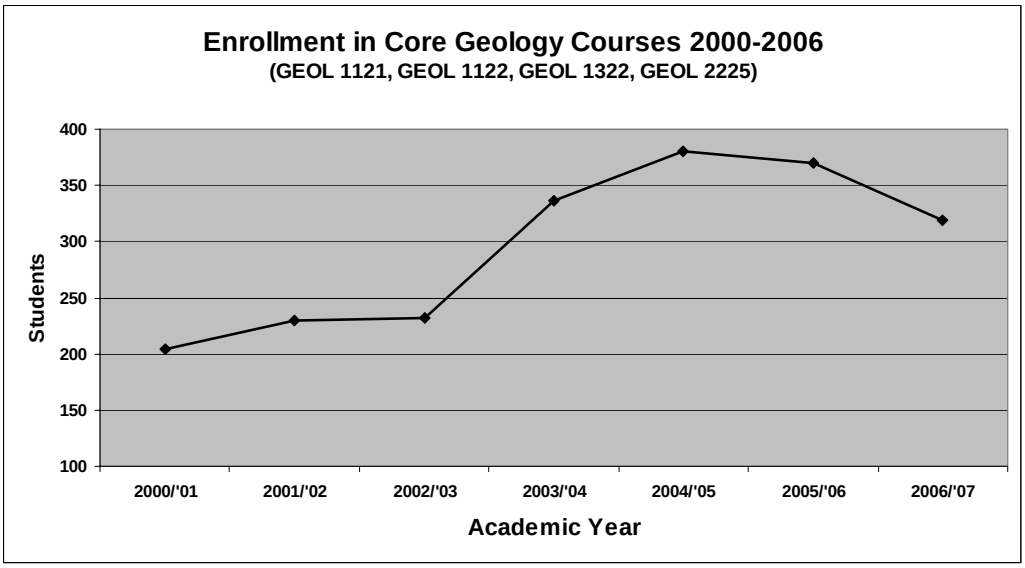
| **Course** | **Course name** | **2000/01** | **2001/02** | **2002/03** | **2003/04** | **2004/05** | **2005/06** | **F2006/07** |
|---|---|---|---|---|---|---|---|---|
| GEOL 1121* **Core** | Physical Geology | **179** | **194** | **203** | **303** | **336** | **329** | **282** |
| GEOL 1122* **core** | Historical Geology lecture | Sp 25 | Sp 17 | Sp 10 | Su'03 lect 5 | Su '04: 15 | Su '05: 14 | Su '06: 11 |
| GEOL 1322* **core** | Historical Geology lab required of majors. | | | | Su '03: 4 | Su '04: 10 | Su '05: 8 | Su '06: 5 |
| GEOL 2225* **core** | Fossil Record | | 19 *course added this year to serve the CORE. Also required for major.* | 19 | 24 | F: 19 (incl. 1 honors section) | F: 19 | 21 |
| GEOL 3215* | IgMet Geol | 2 | 4 | 5 | 5 | 3 | 3 | |
| GEOL 3235* | Sed Geol | 5 | 6 | 16 | 11 | 10 | 4 | 5 |
| GEOL 3245 | Invert Paleo | 2 | *Course eliminated .* | *Content shifted to Fossil Record* | | | | |
| GEOL 3265 | Strat and Basin | | | 5 | 9 | 5 | | |
| GEOL 3266* | Mineralogy | 2 | 4 | 5 | 2 | 4 | 3 | 1 |
| GEOL 3275 | Mapping & Field | | 1 | | 7 | | | |
| GEOL 4175 | Undergrad Res | 1 | 2 | 2 | 5 | 2 | | 1 |
| GEOL 4275 | Structural | | 2 | | 7 | | 2 | 2 |
| GEOL 4795* | Sr. Geol Seminar | | | | | | | |
| GEOL 5115 | Geochem | | (6gr) | 5 (1gr) | 7 (3gr) | 3 (1 gr) | 3 (1 gr) | 4 (2 gr) |
| GEOL 5135 | Intro Ocean | 12 (1gr) | 15 (1gr) | 22 (3gr) | 17 (6 gr) | 14 | 12 (1 gr) | |
| GEOL 5165* | Intro Hydro | 7 (6gr) | 2 (9gr) | 12 (7 gr) | 9 (6 gr) | 4 (2 gr) | 5 (3 gr) | |
| GEOL 5175 | Phys Anth Arch | 12 (7 gr) | 16 (9gr) | 15 (7gr) | 16 (9 gr) | 15 (3 gr) | 11 (6 gr) | 15 (4 gr) |
| GEOL 5215 | Geomorph | | | | | 7 (1 gr) | | |
| GEOL | Environ | 9 (8 gr) | 6 (5 gr) | 19 (12gr) | 12 (6gr) | 7 (5 gr) | F 95: 8 (4 | F; 7 (4 gr) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5255* | Geol | | | | | | gr) | |
| GEOL 5275 | Vertebrate Paleo | | 2 | | 3 | 8 | | |
| GEOL 5555 | Selected Topics | | 4 | F: 4 *(Monteza, Panama Canal cross-listed across several departments)* Sp: 9 (1gr) *(Wilcox, Fluvial Geomorphology)* Latin American and European scholars, respectively | | 2, 1 Su '04: 3 | Su '05: Geol of GA, 8 (6 gr). Sp '06: Fluvial proc, 4 (4 gr) | Su '06: Geol of GA, 5 (4 gr). F '06: Sp '07: Meteor. 2; GIS 1 |
| **Course** | **Course name** | **2000/01** | **2001/02** | **2002/03** | **2003/04** | **2004/05** | **2005/06** | **2006/07 (projected)** |

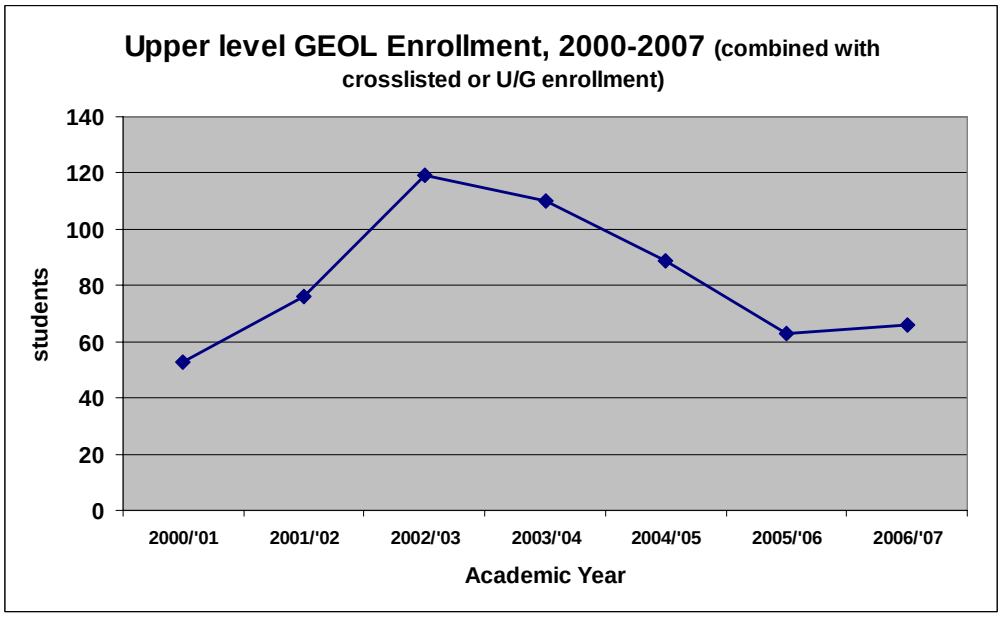
## APPENDIX C

Charts summarizing Fall and Spring enrollments in Geology and related courses Fall 2000 through Spring 2007 (projected)

The following chart, based on Appendix B, summarizes enrollment in core courses since fall, 2000.




The following chart based on Appendix B summarizes enrollment in upper level Geology and related courses since Fall 2000.



## APPENDIX D

## Diversity table

Groups not contributing to the major in these years are left out of the table

| **Enrollment by Gender** | **2003/04** | **2004/05** | **2005/06** | **3-Yr Avg** |
|---|---|---|---|---|
| Female | 4 | 4 | 4 | 4 |
| Male | 11 | 11 | 6 | 9 |
| *Total* | 15 | 15 | 10 | 13 |
| **Enrollment by Ethnic Origin** | | | | |
| International Students | 1 | 2 | 0 | 1 |
| Asian | 0 | 0 | 0 | 0 |
| Black | 4 | 3 | 1 | 3 |
| Hispanic | 0 | 0 | 0 | 0 |
| American Indian | 0 | 0 | 0 | 0 |
| Multi-Racial | 1 | 0 | 0 | 0 |
| White | 9 | 10 | 9 | 9 |
| *Total* | 15 | 15 | 10 | 13 |
| **Number of Graduates by Ethnic Origin** | | | | |
| International Students | 0 | 1 | 0 | 0 |
| Asian | 0 | 0 | 0 | 0 |
| Black | 0 | 0 | 2 | 1 |
| Hispanic | 0 | 0 | 0 | 0 |
| American Indian | 1 | 0 | 0 | 0 |
| Multi-Racial | 0 | 0 | 0 | 0 |
| White | 3 | 1 | 0 | 1 |
| *Total* | 4 | 2 | 2 | 3 |
| **Enrollment by Age** | **2003/04** | **2004/05** | **2005/06** | **3-Yr Avg** |
| Under 21 | 2 | 5 | 3 | 3 |
| 21 - 25 | 6 | 5 | 3 | 5 |
| 26 - 30 | 3 | 2 | 1 | 2 |
| 31 - 40 | 3 | 2 | 2 | 2 |
| 41 - 50 | 1 | 1 | 1 | 1 |
| 51 - 60 | 0 | 0 | 0 | 0 |
| Over 60 | 0 | 0 | 0 | 0 |
| *Total* | *15* | *15* | *10* | *13* |
| *Average* | 26.6 | 25.2 | 26.2 | 26.0 |