Geological Sciences Department
2010-11 Academic Program Review

California State Polytechnic University, Pomona

Department Self Study

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with input from
Geological Sciences Department Faculty

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The Geological Sciences Department Program

The Geological Sciences Department is one of six departments in the College of Science. We offer a diverse and modern undergraduate program to produce graduates who understand the science behind active Earth processes and bring quantitative problem-solving skills to the table in an interdisciplinary work environment. The curriculum balances classroom theory, modern technology and laboratory application with field experiences that incorporate industry-standard equipment, and offers opportunities for faculty-mentored research. Our applied approach to learning and career training is directed by faculty who can provide personal guidance specific to each student. Geoscientists of the next decade will confront a rapidly changing world with regional, national, and global issues related to strained water resources, natural hazards mitigation, shortages of mineral and energy resources, and site evaluations of infrastructure or housing projects. Their endeavors must interface with the environmental challenge of maintaining quality of life while managing development in an increasingly populated world. Graduates of the Geology program have broad capabilities and are ready to confront these new challenges as professional geologists or in post-graduate educational settings.

Students entering the Geological Sciences Department are offered a choice between three tracks leading to a Bachelor’s of Science Degree in Geology. Each track presents a comprehensive curriculum in the Geosciences with support courses in mathematical, physical, chemical and biological sciences. Each has a different focus, enabling students to direct their own curriculum towards their main Geoscience interests. The Geology track is strongly field-oriented and offers a hands-on, traditional, program focused on mineral resources and developing excellent field and mapping skills. The Geophysics/Earth Exploration track takes a more global and quantitative approach to the Earth and Planetary Sciences, producing graduates who use modern technology to address another growth area in the Geosciences: natural hazard analysis and mitigation. The Environmental Resources track, through its interdisciplinary coursework, addresses the important contemporary need for geoscientists able to tackle the challenges posed by the world’s demand for mineral, energy and water resources in the context of environmental change.

Our location in a unique geologic and urban environment provides a dramatic natural laboratory in which to teach Geological Science. Frequent occurrence of earthquakes, landslides, storms, floods, wildfires, and human-induced environmental mishaps in the densely populated region surrounding Cal Poly Pomona presents significant challenges that require rapid response and evaluation. All Geological Sciences faculty play an important role in community issues like natural hazards mitigation, site investigation, resource management, and public outreach or education. Most of our graduates are placed locally as scientists in geotechnical firms or as teachers in primary or secondary schools. Hence, the Geological Sciences Department and its programs have great value and relevance to the University and the community.
Mission and Goals
The Geological Sciences Department Strategic Plan, containing detailed outlines of our programmatic Goals, Objectives, Strategies and Success Indicators is posted at: http://geology.csupomona.edu/GeologyStrategicPlanJan2011.pdf

Mission Statement
The Geological Sciences Department aspires to provide the highest quality education in Earth Science and its applications. Through hands-on learning methods, faculty-mentored research, and exposure to current technology, students shall acquire skills applicable to careers in Earth Science and related disciplines. The Department’s programs emphasize understanding of Earth system processes and their interrelationships, thereby providing students a global perspective needed for problem solving, decision making, and leadership roles in a rapidly-changing world confronted with environmental challenges.

Goals
The Geology Department has formulated four Goals designed to address key elements of its mission. Relationships of these goals to the University Goals are shown in the matrix on the next pages:

1. **Knowledge**
   Impart broad knowledge of Earth Science and understanding of processes that drive the dynamic Earth system.

2. **Skills**
   Develop skills applicable to successful careers or further education in Earth Science and supporting disciplines.

3. **Technology**
   Provide hands-on learning experience with current technology used to acquire and analyze scientific data, solve problems, and present results.

4. **Perspective**
   Enhance student awareness of local and global environmental challenges and problems facing Earth inhabitants within the context of geologic history.

Review of Previous Self Study(s)
1999-2000 Academic Program Review
The previous Geological Sciences program self study was conducted in 1999-2000. External reviewers were Dr. George Dunne, Geology Professor at CSU Northridge and Dinah Shumway of Terra Mins, Inc. Findings of the external reviewers were generally positive, noting that the Cal Poly Geology program was on par with comparable programs in the CSU. We were commended for our alumni outreach efforts. Most of the significant reviewer recommendations have been met during the past ten years:

1. A permanent faculty appointment was made for one productive long-term (11 year) full-time lecturer. That recommendation was realized in 2003 with the support of Dean Donald Straney, when a competitive national search was opened for a faculty position in General Geology. The lecturer in question (Dr. Jon Nourse) was appointed
as a tenured Associate Professor. He was subsequently awarded early promotion to full Professor in 2007 and eventually appointed as Department Chair in 2009.

2. The Department has improved its gender balance with respect to faculty and student body. A female Assistant Professor was hired in 2007, and the current Geology major population stands at 38% female.

3. The Geology curriculum has developed a strong emphasis in Geophysics. Our newest faculty member, Dr. Jascha Polet, has designed and implemented 4 new courses in this area. All of these courses have been successfully taught twice, on a two-year cycle.

4. The Department now teaches a GIS applications course, offered ~once every 1 ½ years.

5. We have hired several part-time instructors from local geotechnical industry to alleviate some of the growing service needs for Engineering Geology (a course required for all Civil Engineering majors).

6. The Senior research requirement has been modified to accommodate students who opt not to write a formal written Senior Thesis. (see “curriculum Bottlenecks” in Section 2)

7. An alternative to the 6-week Summer Field Camp bottleneck has been devised and successfully implemented (see Section 2 below)

8. Several important new equipment items have been purchased to bring the Department up to the “digital” age (see “Facilities” description in Section 5)

2005-06 Assessment Plan

During the next 5-year review cycle (2005-06), the Geology Department opted to write an Assessment Plan in lieu of Academic Program Review. External reviewers Stephen Semken of Arizona State University and Joan Fryxell of CSU San Bernardino conducted the site visit. Our Assessment Plan, approved by the Academic Senate in 2008, is posted at http://geology.csupomona.edu/docs/GeologyAssessmentPlan%20(2).pdf

2009-10 Ad Hoc Program Review

During our last budget crisis the Geology Department underwent an ad hoc review as part of the Provost’s evaluation of small programs. We were asked to respond to a variety of numerical indicators compiled by IRAP (Institutional Research & Academic Resources), and write a series of “Qualitative Indicators” to describe other less tangible aspects of the program. These Qualitative Indicators and supporting Appendices are posted under “Strategic Planning” at http://geology.csupomona.edu/academics.htm

The principle outcome of the ad hoc review and associated meetings with Provost DenBoer was a Geology Department proposal to combine its Geology and Integrated Earth Studies degree programs as part of a mechanism to increase efficiency and teach fewer total courses. This merger was accomplished by designing a new Geology degree curriculum with Emphasis Areas in “Geology,” Geophysics / Earth Exploration,” and “Environmental Resources.” The new curriculum was endorsed by the Academic Senate and approved by President Ortiz in spring 2010. Catalog changes have been finalized and the curriculum will be officially implemented in fall of 2011. Details of the new, modernized curriculum are presented in Section 2 below.
Section 2 - The Program Description

Review the Units to Degree

The Geology program requires 180 quarter units for its Geology Bachelor of Science degree. This is standard for the CSU system (equivalent to 120 semester units).

Current Curriculum

Bachelor of Science Degree in Geology

As described in Section 1, the Geology Department redesigned and modernized its curriculum during the 2009-2010 ad hoc program review. Essentially, the two pre-existing Bachelor of Science degree programs (Geology and Integrated Earth Studies) were merged into one Geology degree program with three Emphasis Areas. The Integrated Earth Studies degree has been discontinued in accordance with Cal Poly Pomona protocol. No new applications were accepted to this program during 2010-11, and the few remaining IES majors are either graduating this June or will complete their degrees during the next year or so.

The new Geology degree curriculum was endorsed by the Academic Senate and approved by President Ortiz in spring 2010. Catalog changes have been finalized and the curriculum will be officially implemented in fall of 2011. Expanded course outlines for all courses have been updated and are available in electronic format. Learning outcomes for each course are posted on line under “Assessment” at http://geology.csupomona.edu/academics.htm

The table below compares the previous Geology and Integrated Earth Studies degree requirements (Columns 1 and 2) with the approved course listings for the new 3-track Geology degree curriculum (Column 3). This table is also posted at http://geology.csupomona.edu/curriculum/CurriculumRevision2010.pdf

## Geology Degree Curriculum Revision—Fall 2010 Final:

<table>
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<th>Integrated Earth Studies (15)</th>
<th>Geology-HES Combined Major (Approved for Implementation Fall 2011)</th>
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</table>

**Required Core Courses for Major**: 80 Units

**Integrated Earth Studies**: 15 Units

**Geology-HES Combined Major**: Approved for Implementation Fall 2011

### Track 1: Geology

- **Units**: 4
- **Geologic Mapping (GSC 201)**
- **Physical Geology Lab (GSC 201L)**
- **Geologic Mapping (GSC 201)**
- **General Chemistry I (CHE 111A)**
- **Calculus I (MAT 181)**
- **Total Units**: 12

**Restricted Electives**: 12 to 14

### Track 2: Geophysics / Earth Exploration

- **Units**: 4
- **Geologic Mapping (GSC 201)**
- **Physical Geology Lab (GSC 201L)**
- **Geologic Mapping (GSC 201)**
- **General Chemistry I (CHE 111A)**
- **Calculus I (MAT 181)**
- **Total Units**: 12

**Restricted Electives**: 12 to 14

### Track 3: Environmental Resources

- **Units**: 4
- **Geologic Mapping (GSC 201)**
- **Physical Geology Lab (GSC 201L)**
- **Geologic Mapping (GSC 201)**
- **General Chemistry I (CHE 111A)**
- **Calculus I (MAT 181)**
- **Total Units**: 12

**Restricted Electives**: 12 to 14

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**Total Units**: 180
**Minor in Geology**

The Geology Minor has been offered for more than 25 years. Currently about 8 students are enrolled from disciplines such as Civil Engineering, Agriculture, Landscape Architecture, Regenerative Studies and Biology. The curriculum requires 14 units of lower division plus 16 units of upper division GSC courses. Twenty of these 30 required units are elective courses. Details are posted at: [http://geology.csupomona.edu/geolomin.htm](http://geology.csupomona.edu/geolomin.htm)

During 2009-10 the Geology Department created three suggested course pathways for the Geology Minor to guide students who wish to focus their curriculum in specific areas where faculty expertise has been developed in recent years. Details of these three emphasis areas in the Geology Minor, “Earth and Planetary Science,” “Engineering Geology,” or “Water and Hydrology,” are posted at:
- [http://geology.csupomona.edu/GeologyMinorWaterW11.pdf](http://geology.csupomona.edu/GeologyMinorWaterW11.pdf)

**Master’s Degree in Geology**

Our proposal for a new Master of Science degree program in Geology, written and spearheaded by Dr. David Jessey in 2008, was endorsed by the Academic Senate in and President Ortiz in 2009 and approved by the Chancellor’s Office in Spring of 2010. The text of the original graduate proposal, containing a list of course descriptions, is posted at: [http://geology.csupomona.edu/MastersProposal.pdf](http://geology.csupomona.edu/MastersProposal.pdf)

Geology Department faculty members are currently working on the many details necessary to initiate the Master’s program. An implementation date of Fall 2012 has tentatively been approved by Provost DenBoer. We submitted updated expanded course outlines for the new graduate courses to the College Curriculum Committee in March 2011. Pending approval of the University Curriculum Committee, the graduate curriculum will be printed in the 2012 University Catalog. Meanwhile, we developed a teaching plan for the first three years of the program, and are designing a recruitment plan for Summer 2011 to attract high-quality students applicants. Applications for Fall 2012 are due November 30, 2011.

**Service Learning and Honors Courses**

The Geology Department regularly teaches one Service Learning course for the College of Science. Earth Science (SCI 212/L) is a required course for pre-service teachers of the Liberal Studies Department. The Service Learning component involves hands-on activities in which students develop teaching modules for sixth-grade and implement them at local elementary schools. Two sections of 30-40 students are offered each year. Dr. Jeff Marshall is the primary instructor; and recently (Winter 2011), we have found an effective adjunct instructor with experience in Science Education who is working out well. This course is especially effective because of personal connections developed between the instructors and several local elementary school teachers. See also [http://www.csupomona.edu/~marshall/sci.ed.htm](http://www.csupomona.edu/~marshall/sci.ed.htm)

The Geology Department does not teach any Honors courses.
GE and Service Courses

General Education Courses

Category B-1 Physical Science
GSC 111 Principles of Geology (4 units)
GSC 112 Earth, Time, and Life (3 units)
GSC 116 Introduction to Astronomy (4 units)
GSC 120 Introduction to Oceanography (4 units)
GSC 141L Principles of Geology Laboratory (1 unit)
GSC 151L Earth, Time, and Life Laboratory (1 unit)

Category B-5 Science Synthesis
GSC 304 Meteorology (4)
GSC 320 Studies of a Blue Planet (4)
GSC 321/321L Engineering Geology I/Laboratory (4)
GSC 335 Exploring the Oceans: Oceanography (4)
GSC 350 Natural Disasters (4)

GSC 111, 112, 141L, 151L and 350 are required core courses for the Geology major. GSC 116, 120, 304, 320 and 321/L are restricted electives for the Geophysics/Earth Exploration Emphasis Area. GSC 304, 320 and 335 are restricted electives for the Environmental Resources Emphasis Area.

Service Courses
GSC 321/321L Engineering Geology I/Laboratory (4)
SCI 212/212L Earth Science/Earth Science Laboratory (4)
GSC 415/415L Engineering Geology II/Laboratory (4)
RS 414/L Current Applications in Regenerative Studies (4)

GSC 321/L and GSC 415/L are important service courses for the Department of Civil Engineering. The first of these courses is required for every CE undergraduate major. The Geology Department teaches about 6 sections of GSC 321 (48 students/lecture) and 12 sections of GSC 321L (24 students/lab section) each year. GSC 415/L is a required course for graduate students enrolled in the Civil Engineering Geotechnical Engineering Master’s program. It is also a restricted elective for the Geophysics/Earth Exploration Emphasis Area in the Geology degree program. GSC 415/L is taught once every two years, but may be run more frequently in the future as demand for the CE Master’s program grows.

SCI 212/L is a Service Learning course (described above) and is required for all Liberal Studies majors. The class also draws a few students from other programs who are interested in teacher education or science education.

Geology faculty members Marshall and Nourse team taught a new course “Watershed Restoration” for the Regenerative Studies Center during spring 2010. This course is part of an interdisciplinary series (RS 414/L--Current Applications in Regenerative Studies) that draws students from Environmental Design, Civil and Mechanical Engineering, Geology, Agriculture and Regenerative Studies. The course was so popular (24 enrolled) that it is being offered again this Spring (2011).
Curriculum Comparison to Other CSU and non-CSU institutions

The current Geological Sciences Department curriculum is comparable to that of other Geology Departments, both in the CSU and nationwide, in that a similar suite of traditional core courses are required for the BS degree in Geology. Direct comparison with most programs is difficult because Cal Poly Pomona operates on a quarter system—most universities use semesters. However, a broad inspection of posted Geology undergraduate curricula indicates that the common bases are covered at Cal Poly Pomona.

One of the more unique aspects of our curriculum is the breadth of courses in Geophysics, Engineering Geology and Economic Geology that reflects the special expertise of three Geology faculty members. Another unusual characteristic is the service we provide to the Department of Civil Engineering. Every undergraduate CE major is required to take Engineering Geology I (GSC 321/L) and each graduate student in the CE Geotechnical Engineering MS program must take Engineering Geology II (GSC 415/L). Recently, Civil Engineering has added several Geophysics courses to their curriculum as technical electives: (Shallow Subsurface Geophysics–GSC 434/L, Intro to Seismology-GSC 450/L and Geophysical Field Module-GSC 491L).

Major Curricular Changes Made in the Past Five Years

A major reorganization of the Geology undergraduate curriculum was completed during 2009-10. The changes contained in the new 3-track Bachelor of Science curriculum (see http://geology.csupomona.edu/curriculum/CurriculumRevision2010.pdf) had been under discussion for the previous 3 years, and predated the ad hoc program review of 2009-10. Motivation to modify the curriculum stemmed from:

1) Discussions with alumni and industry stakeholders who hire the majority of our graduates. The Department was urged to teach more quantitative courses in geophysical, geotechnical and hydrogeologic disciplines to meet employment demand in these areas,
2) Need to accommodate 4 new geophysics and geomath courses designed by our most recent (2007) addition to the Geology Department faculty, and
3) Recognition that the Integrated Earth Studies degree program was under-enrolled and might fit better as an Option or Emphasis Area.

Another major curricular change stemming from CSU Master Plan approval in 2010 is currently underway. Our new Master of Science in Geology degree program is slated for implementation Fall 2012. As described above, Geology Department faculty members are diligently working on the many details necessary to initiate the Master’s program.

Anticipated Evolution of the Curriculum

During the next 5 years we expect the undergraduate curriculum to evolve in response to a new faculty hire in Hydrogeology and the replacement of three FERP faculty. Our current search for an Assistant Professor in Hydrogeology is nearly complete; five finalists have interviewed on campus and an offer will be made in mid April, 2011. This new person will teach existing water-related courses in the new 3-track BS curriculum, and is expected to
develop several courses for the graduate curriculum. Specific emphases may include water resources exploration and management or environmental challenges of preserving clean groundwater supplies and cleaning up contaminated groundwater sites.

Three future replacement hires will be requested to maintain existing strengths in the undergraduate curriculum and contribute to three additional strategic growth areas identified in the Geological Sciences Department Strategic Plan:
1. Natural hazard analysis and mitigation; e.g., earthquakes, landslides and floods,
2. Exploration / development of metals, industrial minerals and energy resources, and
3. Environmental quality and global climate change

Another important area of curriculum evolution is the Geology Master of Science degree program, slated for implementation in Fall 2012. We are currently developing this curriculum with input from alumni and industry stakeholders to incorporate new ideas, directions, and technical advances.

**Curricular Bottlenecks and Alleviation Efforts**

The Geology Department has recognized a couple of bottlenecks that appear to have impeded student progress to degree. The Field Camp problem discussed below was addressed about 8 years ago and has been resolved. The Senior Thesis bottleneck is addressed by the new curriculum. Also discussed below is our recent effort to share courses with CSULA Geology Department.

**Summer Field Camp—GSC 490**

The main issue here was the 6-week (8 unit) summer field camp requirement intended to teach students a broad spectrum of geological mapping skills. Traditionally Geology majors enrolled in an acceptable course taught by another institution. This created a financial burden in that the students were required to pay a $2000 to $3500 tuition/lodging fee in addition to forfeiting rent or living expenses during their six week absence from home. Hence, some Geology majors postponed completion of this course indefinitely.

Our solution, which seems to work quite well, was to teach a series of 2 unit “Field Mapping Modules” in house. After experimenting for a couple of years with a “Special Studies” course, in 2006 we instituted a new course (GSC 491L—Field Mapping Module), taught by a different Geology faculty member each quarter. Each mapping module requires students to participate in two weekend trips (2-3 days each) to conduct geologic or geophysical field investigations. A written report is also required. Four Field Modules (8 units), taken after the Geological Field Methods course (2 units), is now an acceptable equivalent to the Field Camp requirement. Most Geology students opt for this alternative, although we still strongly encourage our majors to attend an external field camp if they can afford the time and expense.

With the new 3-Track Geology curriculum in place, field camp will not be an issue for Geology majors enrolled in the Geophysics / Earth Exploration and Environmental Resources
Emphasis Areas. These two tracks require Geological Field Methods—GSC 255L plus one Field Module—GSC 491L. The Department views the required 4 units field work to be acceptable for Geology majors enrolled in these focus areas that are inherently less field-oriented. Additional field experiences are built into laboratory components of several of the required GSC courses.

**Senior Thesis—GSC 463**

Another long-recognized bottleneck has been the inability of many Geology majors to complete the written portion of the Senior thesis requirement. Students seemed to have no problem acquiring field or laboratory data and presenting results in poster or Powerpoint format. However, the process of writing a formal thesis document with appropriate background descriptions and discussion of data and interpretations, supported by scientific citations has added much time (sometimes years) to the degree completion. After much discussion, Geology faculty modified the three-course Senior Thesis series to allow students the option of taking a 4-unit technical writing course instead of writing up their thesis. The 2011 catalog spells out the Senior Thesis series as follows:

- **GSC 461 Senior Project (2) FWSp**
  Independent research study into a geologic problem of scientific merit following standard scientific methodology. Topic selection, research techniques, and data acquisition are conducted under close guidance and supervision of a GSC faculty research advisor. 2 units.

- **GSC 462 Senior Presentation (2) FWSp**
  Analysis and interpretation of data acquired in GSC 461. Formal presentation of results via a poster or an oral presentation to peers and faculty. Carried out under supervision of a GSC faculty research advisor. 2 units.

- **GSC 463 Senior Thesis (2) FWSp**
  Completion of a formal written thesis document, formatted to GSC Department specifications with appropriate scientific citation style. The thesis will be evaluated for clarity, organization, and scientific merit. Carried out under supervision of a GSC faculty research advisor. 2 units.

The new (2011) curriculum allows Geology majors to substitute ENG 301—Writing for the Professions (4 units) or COM 216—Report Writing (4 units) or CE 362/A—Technical Communication/Documentation (3 units) for GSC 463. Should these technical writing courses not be taught at Cal Poly during a particular quarter, students may petition a similar course from another institution. The Geology Department plans to assess the impacts of this new plan during our next 5-year review.

**Course Sharing Initiative with CSULA**

During the budget crunch of 2009-10, Dr. Nourse met with Dr. Kim Bishop, Chair of the CSULA Geology Department to explore possibility of sharing Geology core courses between campuses. The idea was to reduce tenured/tenure track instructor costs by teaching certain classes less often by offering them at only one of the universities. At the same time, total enrollments could be boosted with consequent increase in student/faculty ratio. Another
potential benefit was an opportunity for students to take certain required core courses at an adjacent university which might not be offered.

The first meeting took place in November of 2009. At first, it appeared that our respective course offerings were quite out of sync; however, with some creative adjustments to the schedule, we were able to share several courses beginning Spring 2010. The table below shows the results of this program to date:

### Cal Poly Pomona-CSULA Geology Course Sharing Initiative

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<th>CPP Course Number</th>
<th>Course Name</th>
<th>CSULA Course Number</th>
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<td>Earth, Time and Life</td>
<td>1</td>
<td>6</td>
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<td>Winter 2011</td>
<td>GSC 151L</td>
<td>Earth Time and Life Lab</td>
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### Table of Required and Elective GSC Courses

(Numbers represent average number of sections offered per quarter during the past four years):

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<th>Course #</th>
<th>Course Name</th>
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<td>Principles of Geology</td>
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<td>GSC 255L</td>
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<td>GSC 360/L</td>
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<tr>
<td>GSC 423/L</td>
<td>Sedimentary Geology</td>
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<td>GSC 425L</td>
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<td>GSC 433/L</td>
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<td>GSC 444/L</td>
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<td>GSC 434/L</td>
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<td>GSC 440/L</td>
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<td>Taught for the first time in 20 years Winter ’11</td>
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<td>GSC 491L</td>
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<td>RS 414/L</td>
<td>Watershed Restoration</td>
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<td>Interdisciplinary course taught for Regenerative Studies Dept Spring ’11 and Spring ’11</td>
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</table>
Section 3 – Program Assessment

Accreditation Status or Other External Assessment of the Program
There is no official accreditation agency for Geological Sciences programs. The last external review was conducted in May 2006 by Professors Stephen Semken of Arizona State University and Joan Fryxell of CSU San Bernardino. The purpose of their site visit was to evaluate the Geological Sciences Department 5-year Assessment Plan. Reviewer comments were generally positive other than suggesting that the Department needed resources dedicated to an Assessment Coordinator. Following endorsement by Dean Straney and minor modifications suggested by Academic Programs, our Assessment Plan was approved by the Academic Senate in 2008. The plan is posted at http://geology.csupomona.edu/docs/GeologyAssessmentPlan%20(2).pdf

Student Learning Outcomes of the Geological Sciences Department
The Department formulated seven programmatic Learning Outcomes during the process of designing our Assessment Plan in 2006. At that time they were called “Learning Objectives.” We believe these Learning Outcomes continue to be relevant and current. They stem from the Department Goals stated above in Section 1, and are arranged in a hierarchy that relates to different stages of the scientific method:

Learning Outcomes Graduates from the Geology degree program should be able to:

(General Science)
A. Understand and implement various facets of the scientific method.
B. Effectively communicate results of scientific investigations in written and oral format.

(Observation/Inquiry)
C. Recognize common Earth materials, structures, and landforms, describe their properties, and determine their age relationships.
D. Acquire geologic data in the laboratory or field using standard observational procedures and scientific equipment.
E. Describe the interrelated processes operating in Earth’s lithosphere, hydrosphere, atmosphere, and biosphere over different geologic time scales.

(Analysis/Interpretation)
F. Use maps, cross sections, and other imagery to analyze and interpret spatial and temporal relationships displayed by Earth features or geologic data sets.
G. Utilize quantitative reasoning, experiential judgment, and computer technology to assess data, draw conclusions, and solve problems.
The matrix below allows one to view the interconnections between our Department Goals and Department Learning Outcomes. Most objectives address more than one goal.

<table>
<thead>
<tr>
<th>Outcome A</th>
<th>Goal 1</th>
<th>Goal 2</th>
<th>Goal 3</th>
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<td>Outcome G</td>
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A matrix that relates Geology Department to specific University Goals is posted at [http://geology.csupomona.edu/academics.htm](http://geology.csupomona.edu/academics.htm)

**Matrix Relating Specific GSC Courses to Student Learning Outcomes**

*I= Introduced, D= Developed or Practiced, M= Mastered*

<table>
<thead>
<tr>
<th>GSC Core Course or Restricted Elective:</th>
<th>Outcome A</th>
<th>Outcome B</th>
<th>Outcome C</th>
<th>Outcome D</th>
<th>Outcome E</th>
<th>Outcome F</th>
<th>Outcome G</th>
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<td>*GSC 111-141L</td>
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</table>

* Denotes General Education Course **Denotes Service Course
Process for Assessing the Learning Objectives, Courses and Curricular Structures
(See annual Assessment Reports for 2007-2010, contained in the Appendix and posted under “Assessment” at http://geology.csupomona.edu/academics.htm)

Procedures for Collecting and Analyzing Evidence
(See annual Assessment Reports for 2007-2010, contained in the Appendix and posted under “Assessment” at http://geology.csupomona.edu/academics.htm)

Summary of Assessment Performed in the Last Five Years
Following the approval of our Department Assessment Plan, we produced three Assessment Reports describing assessment activities and the analysis of related evidence. A summary for 2007-08 is reproduced below; complete reports for 2007-07, 2008-09 and 2009-10 are contained in the Appendix.

2007-08 Assessment Summary

Geological Sciences Department Assessment Progress
(for College of Science Tipping Point report)
Compiled by: Dr. Jonathan Nourse, Department Assessment Coordinator
Date: July 29, 2008

A. Assessment Program Description
--The Geological Sciences Department Mission, Goals, and Learning Objectives are posted on line at http://geology.csupomona.edu/academics.htm
--The Geological Sciences Department 2006-2010 Assessment Plan is posted on line at http://geology.csupomona.edu/academics.htm
The intent of the assessment activities listed in the Assessment Plan is to evaluate three fundamental questions:
1. Does the current course curriculum address the Learning Objectives and Goals of the Department in sufficient breadth and depth?
2. How effectively do the Department courses accomplish the Learning Objectives?
3. Do the Department’s Goals and Learning Objectives address the current needs, trends, and opportunities in the Geoscience profession?
All Geological Sciences faculty have been involved in these activities since the Assessment Plan was drafted in 2006. The quantitative and qualitative feedback yielded shall be incorporated into the next 5-Year Program Review of Geological Sciences Department during 2011-2012.

B. Learning Outcomes Addressed by Each Course
--Learning outcomes are written and compiled for most GSC courses.
--A matrix linking Department Learning Objectives to their degree of coverage in specific GSC courses is compiled.
Both documents are available from the GSC Department Assessment Coordinator.

C. Assessment Results—several examples follow:
1. Surveys of alumni and prospective employers are complete. These surveys and ongoing informal discussions with alumni provide valuable and constructive feedback on the relative strengths of our instructional curriculum and which skills or sub-disciplines the Department should emphasize to capitalize on future growth areas. Findings have resulted in new initiatives described in Part D below.
2. GSC faculty continue to monitor student learning in their courses, and make adjustments accordingly. Some examples are described in Part D below.
3. A senior thesis rubric is used to evaluate each student thesis presentation with respect to organization, data, articulation of results, quality of illustrations, etc. Faculty advisors and students learn much from this process, and student audiences gain insight into the trials and tribulations of completing a significant research project. Completed rubric forms are given to the thesis advisor and student presenter and are retained by the department Assessment Coordinator. Strengths and weak areas of presentations are more clearly understood. This process is resulting in better presented defenses.
4. Instructors in Natural Disasters (GSC 350), Optical Mineralogy (GSC 325) and Engineering Geology I (GSC 321) commonly use pretest-posttest analysis to monitor student progress related to learning outcomes of the course. Statistical compilations of this data reveal significant gains in student learning in several areas.
5. More than half of the graduating class of 2008 is attending graduate school, indicating that the GSC program prepares its students well and is achieving national academic standards.

D. Changes Made—several examples follow:
GSC faculty meet regularly to discuss feedback from various assessment indicators. Tangible outcomes of these discussions include:
1. Design of a graduate proposal, now pending before Academic Senate
2. Design of two new courses in Geophysics, and new courses in Advanced Engineering Geology and Mathematic Applications for Earth Scientists
3. Development of a plan for a three-option curriculum in the Geology major
4. Revision of exit interview for graduating majors.
5. Development of new strategies to make the senior thesis process more efficient
6. Changes made to specific courses:

GSC 120; Introductory Oceanography-- Understanding fundamental concepts of plate tectonics is an important learning outcome of. Student responses on examinations and quizzes have indicated a problem with student understanding of "ancillary" features called hot spots. As a result of studying student responses to queries regarding plate tectonics and specifically the way hot spots are discussed has been changed. A powerpoint presentation is now used to more fully cover hot spots. The presentation displays the geographic distribution of hot spots and superimposes the major plate boundaries. Thus, it visually shows the lack of a plate boundary / hot spot connection. It also verbally points out that these features are not related to plate boundaries.
Preliminary results have been positive and indicate a more sound understanding of these concepts.

GSC 320 and GSC 304; Studies of a Blue Planet and Meteorology--Oral presentations are an important aspect of these upper division courses. Assessment of student views regarding oral presentations resulted in modification of point values assigned to talks. Students are "spotted" five points for presenting a talk in lieu of completing a written assignment. For example, each student speaker is given 5 additional points for presenting a report worth 40 points. Thus, oral reports are rewarded. This change has resulted in increased interest in talks and increased number of presentations.

2008-09 Assessment Report
(Please see Appendix; this is a large document. The report may also be viewed at http://geology.csupomona.edu/GSCProgramAssessmentActivities2008-09.pdf)

2009-10 Assessment Report for WASC with Comments from Cal Poly Pomona Assessment Committee
(Please see Appendix; reviewer comments are in blue text. The report may also be viewed at http://geology.csupomona.edu/Geology2010AssessmentReportforWASC.pdf)

Section 4 - Program Quality

Section 4.1 Faculty

Quality of Teaching
Instructional Assessment
As one measure of Teaching quality, all permanent and part-time faculty conduct course evaluations for each class taught each quarter. This has been Geology Department policy for decades. Each instructor administers the assessment during the last week of class, using a standardized Instructional Assessment form. These forms are scored and tabulated centrally by I & IT. Instructors view the results early during the subsequent quarter. Below is a sample Instructional Assessment Form containing questions that were updated and revised in 2008 by consensus of permanent geology faculty members. Questions 2-8 relate to attributes of the instructor and/or course. Question 1 is an experiment that we devised to assess student perceptions of how well they think they have performed in class. For this question, we thought it would be interesting to compare student responses to the actual grade awarded:
What letter grade do you expect to receive in the course? A=1, B=2, C=3, D=4, F=5

Was the sequence of course content presented in a logical progression? 1=logical, 5=random

How well does the instructor explain the course material and related assignments?

How well does the instructor respond to questions?

How well did the overall course components (lectures, assignments, readings, etc.) Prepare you for exams?

What is your overall opinion of the teaching effectiveness of the instructor?

How well did the course advance your knowledge of the subject area?

Based upon your overall perception of the course experience how highly would you recommend this instructor/course to others? 1=very high, 5=not at all

ATTENTION STUDENTS PLEASE READ BELOW BEFORE PROCEEDING!

INSTRUCTIONS AND PROCEDURES—DO NOT EVALUATE THIS SECTION!

In no manner should you identify yourself on this form.

You must use a number two (2) pencil, just like a scantron sheet.

Place no written comments on this form— the university no longer accepts these and the comments will be erased. (Instructors do not see these comments).

Should you wish to write constructive comments about the course or instructor those should be submitted on a SEPARATE sheet of paper and submitted separately to the Chair of the Geological Sciences Department. All written comments must have the instructor name, course, and must be signed by yourself.

The instructor should not be present when the evaluation is conducted.

A student or other suitable administrator should conduct the evaluation.

The designated evaluation administrator is responsible for the collection and return of the evaluations to the Geological Sciences Dept. 8-242 (M-F 8-4pm, if no one is in the office please slide under door if possible).
**Evaluation of Geology Department Instructional Assessment Results**

The chart below shows discipline averages of student responses to the eight instructional assessment questions over a 2-year period. The averages encompass all GSC core, elective, GE and service courses. For questions 2-8, a response of 1 represents “very good” while a response of 5 is “very poor.” The mean of student responses to these questions falls between 1.4 and 2.2 for all quarters for which data tables were readily available. These results suggest that Geology faculty members (permanent and part-time combined) are collectively viewed by students as “Good” to “Very Good” teachers.

Responses to question 1 are interesting. Discipline averages cluster tightly between 1.7 and 2.0, indicating that students collectively consider their course performance to be approximately at the B+ level. This expectation is probably somewhat inflated as the mean grades awarded in GSC courses (although not calculated) are probably closer to B- or C+. Nevertheless, these responses suggest that students are generally confident in their abilities at the end of each quarter.

![Instructional Assessment Responses: Geology Discipline Averages 2009-2011](image)

**Special Mention**

A couple of noteworthy items here:
1. Dr. Nourse received the College of Science Distinguished Teacher award in 2004.
2. Perhaps a reflection of excellent teaching in the Geological Sciences Department, Lauren Carey, a double major in Geology and Integrated Earth Studies, received the College of Science Julien McVie award at the 2009 commencement ceremony. Lauren was “valedictorian,” earning the top GPA in the College of Science.
Research and Scholarly Activity

Annual Reports produced by the Department Chair show that Geological Science Department Faculty members are very much engaged in research and scholarly activity. Reports from 2007-08, 2008-09 and 2009-10 are contained in the Appendices and posted at http://geology.csupomona.edu/academics.htm

Geology faculty are nationally and internationally renowned for their research endeavors:

- Dr. Polet is an expert on characterizing source parameters for large global earthquakes. She is consulted regularly by the USGS National Earthquake Information Center to assist in the determination of rapid magnitudes for large global earthquakes, such as the recent Tohoku earthquake in Japan. Polet was recently asked to serve on a review panel for the southern California section of the National Earthquake Hazard Reduction Program.
- Dr. Marshall is internationally known for his research on earthquake and volcanic hazards of Costa Rica. He serves on the national Council of Undergraduate Research. Marshall is also Cal Poly Pomona’s Coordinator of Undergraduate Research.
- Dr. Nourse is an expert on earthquake faults, geology and hydrology of the San Gabriel Mountains. He is also consulted for mineral exploration endeavors in Sonora, Mexico.
- Dr. Jessey is well-known for his studies on mineral deposits and volcanic rocks of the Mojave Desert.
- 5 out of 6 GSC faculty are regularly invited to speak at national and international conferences, also at local universities and professional organizations.
- 4 out of 6 GSC faculty regularly lead field trips for professional associations and the general public.

Below is a synopsis of Faculty Professional Activity since 2007:

- 20 peer-reviewed journal articles and field trip guides
- 29 student-coauthored publications or conference presentations
- 43 abstracts or posters presented at national or international conferences
- 15 senior theses completed under faculty supervision
- 32 invited speaking engagements or science/community outreach events
- 20 grant proposals submitted (10 of them funded, and 2 recommended for funding).

Typical Annual Workload (not including summer)

<table>
<thead>
<tr>
<th>Faculty member</th>
<th>Teaching WTU</th>
<th>Assigned WTU for Research</th>
<th>Assigned WTU for Service</th>
<th>Administrative WTU</th>
<th>Total WTU</th>
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</thead>
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<tr>
<td>Jonathan Nourse</td>
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<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Jeffrey Marshall</td>
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<tr>
<td>David Berry</td>
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<td>36</td>
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<tr>
<td>Jascha Polet</td>
<td>24</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>36</td>
</tr>
</tbody>
</table>
Faculty Participation in the Department, University, Profession and Community

Service activities of Geological Science Department Faculty are described in the Annual Reports cited above. Most faculty members are active with Department, College and/or University committees. Dr. Marshall has played an important role as University Coordinator of UR Bronco, the University undergraduate research initiative during the past four years; see http://www.csupomona.edu/~urbronco/. Drs. Nourse, Marshall and Polet regularly serve as peer reviewers for journals and scientific proposal and as session chairs at professional conferences. Dr. Marshall serves on the national advisory board for REU (Research Experiences for Undergraduates) and as an officer in SACNAS (Society for Advancement of Chicano and Native American Students). Dr. Polet collaborates with staff at the National Earthquake Information Center (NEIC) of the US Geological Survey to maintain a system to determine fully automatic Centroid Moment Tensors near real-time for large global earthquakes. These CMT's provide a reliable and fast magnitude estimate, in addition to information on the type of faulting responsible for global event. She also served as an ADVANCE associate on a 5 year NSF grant to create a university-wide system of recruitment, retention and development that increases the number of women faculty in STEM disciplines.

Department Involvement in Civic Engagement and Other Community Outreach

The numerous invited speaking engagements and field trips listed in Geology Department Annual Reports provide a good measure of our level of civic engagement and community outreach. Geology majors have also been asked to speak to local community organizations. For example, Logan Wicks and Andrew Kieta presented results of their San Gabriel Mountains senior thesis projects to the Angeles Forest Outdoor Association in Glendora in June 2010.

Another important outreach activity is the annual “Great California Shakeout” event, which promotes awareness of earthquake hazards to the Cal Poly Pomona campus and local community. Several Geology Department faculty members have given mini-lectures and assisted the Geology Club with an information booth during the Shakeout event.

All permanent Geology faculty members are listed as scientific experts in their respective fields on the Cal Poly web site “Experts Online”: http://experts.csupomona.edu/default.asp. This site draws several queries from the public each year. For example, Dr. Nourse was contacted by the Los Angeles Times and San Gabriel Valley Tribune to comment about the landslide that closed the I-10-57 Freeway connector during winter 2010. He also provided
related drawings and photographs to the Poly Post that were published in this campus newspaper. Dr. Polet is frequently asked to comment on earthquake events or related seismic hazards and has an active informational Twitter account (@CPPGeophysics), with over 400 followers. Drs. Marshal, Nourse and Polet were interviewed by the Poly Post in association with an article on the San Jose fault.

**Department Service Functions for Other Programs**

The Geology Department provides an important service to the Departments of Civil Engineering, Liberal Studies and Regenerative Studies in terms of the service courses described in Section 2. The Department also teaches a very significant General Education component. Six of our courses are designated as GE Category B-1 (Physical Science), five are classified as GE Science Synthesis (Category B-5). During a typical year, the Department teaches approximately 36-40 total sections of GE courses to satisfy campus demand. Enrollments in these courses range from 25 to 60 students.

**Section 4.2 Student Success**

**Departmental Advisement Program**

For the past 15 years the Geology Department has required its majors to meet quarterly with a faculty advisor to discuss academic progress and determine which courses to enroll in during the next quarter. This advisement system has proved effective in keeping Geology majors on track for graduation, identifying “at risk” students. One recent addition to the advisement system is a spreadsheet (updated quarterly) that contains easily accessible grades for each Geology major. The spreadsheet is organized sequentially by course number such faculty advisors may pull up the list and get an immediate snapshot of how the student is progressing through the curriculum. This system is much more efficient than using BroncoDirect.

All freshman or transfer students who declare the Geology major meet with the Department Chair for New Student Orientation. In addition to designing a curriculum plan and registering for courses, the students are given a tour of Department facilities. In the case of existing Cal Poly Pomona students who change major to Geology, the Department Chair and available faculty provide a tour and formal advice.

**Assessment of Learning Environment**

The student learning environment is assessed regularly by individual faculty members as part of their Learning Outcomes assessment. Another important aspect of the learning environment is informal faculty-student interaction. This can happen one-on-one during faculty office visits or collectively during group events such as Geology Club meetings. The Department also holds regular gatherings to keep Geology majors informed and motivated. For example, an annual meeting for students during the second week of fall quarter to provide curriculum updates and encouragement. Also during fall quarter we hold an information seminar for students interested in applying for graduate school. Each Spring
quarter we host our annual Alumni Reunion and invite senior-level Geology majors. At this event we award five major scholarships and various other minor prizes to deserving students (see Section 5).

**First Year Experience Program**

Incoming freshmen are encouraged to enroll in the College of Science Freshman Experience course series, SCI 101/A and SCI 102/A. Transfer students and students who changed majors are encouraged to take the Science Success Series, SCI 110/A and SCI 111/A. However, because none of these courses focus directly on the Geology major, the majority of our students choose other courses such as Psychology or Personal Health to satisfy the 4 unit requirement for GE Category E (Lifelong Understanding and Self-Development).

**Student Commitment, Motivation and Satisfaction**

Geological Sciences Department faculty are very proud of the Geology majors and their general commitment to success in the program. We hold an annual meeting for students during the second week of fall quarter, to provide curriculum updates and encouragement. Also during fall quarter we hold an information seminar for students interested in applying for graduate school. Each Spring quarter we host our annual Alumni Reunion and invite senior-level Geology majors. At this event we award five major scholarships and various other minor prizes to deserving students (see Section 5).

The Geology Club is an active organization on campus, holding regular mineral sales to raise funds for various outings and field trips. Geology Club also provides logistical assistance during the annual California Shakeout and Alumni Reunion events.

Geology majors are an important feature of our annual alumni newsletter, “The Mylonite.” This publication, distributed to alumni, friends, and students, describes important student accomplishments and scholarship awards from the previous year. An archive of the last 6 years of this newsletter may be viewed at: [http://geology.csupomona.edu/newslet.htm](http://geology.csupomona.edu/newslet.htm)

Through these directed interactions with our student body, Geology majors stay informed and motivated. Overall student satisfaction with the program remains high, particularly with the promotion of student successes with internships and employment (see also “Co-Curricular Learning Experiences” below).

**Co-curricular Learning Experiences**

Our students benefit from national and global engagement driven by faculty research and teaching collaborations with scientists, agencies and companies from other states and countries:

- Observatorio Volcanológico y Sismológico de Costa Rica (OVSICORI-UNA), Universidad Nacional, Heredia, Costa Rica
Noteworthy student endeavors during the past couple years include:

- Two students were employed with an IP-Resistivity survey on a mining prospect in central Alaska for two months during summer 2010. An additional student will return summer 2011, expanding our pipeline with SJ Geophysics, Ltd.
- Dr. Marshal has recently taken several groups of students to Costa Rica to assist with his NSF-funded research on the active convergent margin.
- Dr. Nourse employed two students during 2010-11 on a USGS-funded project to study the active frontal fault system in the east-central San Gabriel Mountains.
- Geology major Amber Butcher received a prestigious SETI Institute Internship and was featured in a recent PolyTrends magazine: [http://www.csupomona.edu/~advancement/publications/polytrends_winterspring11.pdf](http://www.csupomona.edu/~advancement/publications/polytrends_winterspring11.pdf)
- Geology major Hannah Potter was accepted into the SURGE summer research program at Stanford and completed a Southern California Earthquake Center Internship.
- Integrated Earth Studies major Liliana Nunez received a multi-year research fellowship as a RISE Intensive Undergraduate Student: [http://www.csupomona.edu/~rise/scholars.shtml](http://www.csupomona.edu/~rise/scholars.shtml)
- Most recently, 7 Geology undergraduates are scheduled to present their research at the 2011 GSA meeting in Logan, Utah.

Most of these students present results of their endeavors at professional conferences and Department thesis seminars. The Department Chair commonly asks them to give informal summaries at other Department gatherings such as Geology Club meetings and general information seminars. Such student presentations can be very inspirational to other Geology majors.

**Placement of Graduates and Related Data**

The Geology Department maintains a data base to track its alumni after graduation. Summarized below are statistics compiled during November of 2009. An exceptional record
of career placement is well-documented (also see table in the Appendix and web posting under “Strategic Planning” at http://geology.csupomona.edu/academics.htm). The majority of alumni hold life-long careers in geology-related fields:

- 87% of 62 Geology majors tracked from the 1976 to 2003 graduation years were placed in Earth science-related fields and have remained in similar industries:
  - 37% work in geotechnical industry
  - 26% work in hydrogeology industry
  - 13% work in mineral resource or petroleum industry
  - 11% work in environmental remediation industry
  - 11% work as Earth science educators
  - 2% work in paleontology

- ~25% of the 1976 to 2003 graduates have earned California certification as Professional Geologist, Professional Engineer or Professional Hydrogeologist

- 88% of Geology majors graduating between 2004 and 2009 were placed in Earth science-related fields as follows:
  - 42% went on to graduate school
  - 28% work in geotechnical industry
  - 10% work in hydrogeology industry
  - 10% work in mineral resource or petroleum industry
  - 5% work in environmental remediation industry
  - 5% work as Earth science educators

- 93% of IES majors graduating between 2004 and 2009 were placed in Earth science-related fields as follows:
  - 31% went on to graduate school
  - 23% work in geotechnical industry
  - 15% work in hydrogeology industry
  - 15% work in environmental remediation industry
  - 15% work as Earth science educators

- Geology graduates are known in local industry to be field-savvy and well-trained with practical skill sets. Many such individuals hold prominent positions in companies.

- Active alumni/employer/faculty network successfully places students into geoscience industries or prestigious graduate schools.

- 10 students served as interns at local companies or agencies during 2008-11.

Alumni Opinions Regarding the Program and its Quality

During the 2009-10 ad hoc Academic Program Review the Geology Department solicited letters from alumni and industry stakeholders. Over a one month period in beginning mid December, 2009 we received 23 letters of support of various individuals. These letters, reproduced in the Appendix, universally speak to the high quality of the Geological Sciences Department program and its ability to consistently produce productive Earth scientists.
Section 5 - Resources

Enrollment

The following charts and graphs illuminate significant gains in enrollment and teaching efficiency made by the Geological Sciences Department in recent years:
Geological Sciences Department Historical FTE
(Includes Summer Term)

Geology Average Class Enrollment By Quarter:
2007-2010
(WTU-weighted average)
Student Outreach and Recruitment.

The Geology Department has made significant gains in outreach and recruitment during the past 3 years. Probably not coincidentally, we have seen a doubling of Geology majors during that same time period. Several recruitment mechanisms we have recently developed are described below:

1. Modernization of the Department web site under the design of Dr. David Jessey: see http://geology.csupomona.edu/default.htm. The main page includes a new logo (photograph of the San Gabriel Mountains by Dr. Jessey), a revolving series of Flash photos depicting interesting geologic sites and current Department news items. Also shown are a series of testimonials describing current students and recent alumni.

2. Redesign of the Geology Department brochure by Dr. Jon Nourse in 2008 and updated by Dr. Jascha Polet in 2011. This brochure outlines our new Geology Degree program and contains numerous colorful photographs of students “learning by doing” in laboratory and field settings. The brochure is mailed to all applicants and distributed to students at community college recruitment fairs or generally interested students who drop by the office.

3. Several display cases outside the Geology Department office have been revitalized. The case directly across from the office door describes current job opportunities, alumni testimonials, and details of the new Geology curriculum. Many photographs of students in action are included, and two monitors display the movie “Why Earth Science” from the American Geological Institute and a looped Powerpoint slide show with 500 images of geologic interest. Our display cases capture the interest of many students (predominantly engineers) waiting outside a large Physics classroom.

4. The Department Chair works closely with Admissions and carefully monitors the pool of freshman and transfer applicants throughout the year. Letters are sent to all applicants inviting them to visit campus for a tour of Department facilities.

5. The Department Chair maintains and periodically updates spreadsheet of potential new majors.

6. Community college and high school outreach: The Department Chair maintains and periodically updates spreadsheet of Earth Science instructors at local schools. Geology faculty periodically present recruiting slide shows or recruitment booths at these schools; e.g., Mt. San Antonio College and Crafton Hills College. Several faculty members and the Geology Club have participated in a USGS-sponsored recruitment event at Pasadena City College for two years running: 2009 and 2010.

7. On-campus recruiting events: Each year, Department faculty members participate in several campus events designed to promote awareness of different majors and academic programs at Cal Poly Pomona; e.g., Bronco Fusion during Fall Conference, Showcase of Excellence in January, Transfer Day in March, Majors Expo in April.
Faculty
Description of Current Faculty
The Geological Sciences Department currently utilizes 6.5 full-time equivalent faculty (FTEF), including 4.5 FTEF tenured/tenure-track and 2.0 FTEF lecturers. The Department Chair receives 0.5 re-assigned time. In reserve is one tenure-track faculty position not utilized due to two half-time FERP faculty (Drs. Klasik and Jessey). Another full-time faculty member (Dr. Berry) has declared his intention to FERP beginning fall 2011. Three full-time retirements are anticipated during the next 3 to 5 years.

Geology faculty are nationally and internationally renowned for their research endeavors:

• Dr. Polet is an expert on characterizing source parameters for large global earthquakes. Consulted regularly by the USGS National Earthquake Information Center, she determined official magnitude of the Sept. 29, 2009 Samoa earthquake. Polet was recently asked to serve on a review panel for the southern California section of the National Earthquake Hazard Reduction Program.
• Dr. Marshall is internationally known for his research on earthquake and volcanic hazards of Costa Rica. He serves on the national Council of Undergraduate Research. Marshall is also Cal Poly Pomona’s Coordinator of Undergraduate Research.
• Dr. Nourse is an expert on earthquake faults, geology and hydrology of the San Gabriel Mountains. He is also consulted for mineral exploration endeavors in Sonora, Mexico.
• Dr. Jessey is well-known for his studies on mineral deposits and volcanic rocks of the Mojave Desert
• 5 out of 6 GSC faculty are regularly invited to speak at national and international conferences, also at local universities and professional organizations.
• 4 out of 6 GSC faculty regularly lead field trips for professional associations and the general public.

Plan for Future Faculty Hires
The Department has nearly concluded its search for a new Assistant Professor with a specialty in Hydrogeology. Five finalists recently interviewed on campus and an offer is forthcoming. Thus we expect to welcome a new faculty member in September 2011.

As shown in the charts below, student / faculty ratio (SFR) recorded by the Geological Sciences Department exceeds that of all other departments in the College of Science except Mathematics. Compared to all Geology Departments in the CSU system, the Cal Poly Geology Department SFR currently ranks second out of 20, and has exceeded the CSU system average since 2004. Undergraduate enrollments are increasing as along with faculty efficiency as measured by FTES/WTU ratio. Core course enrollments have grown substantially since 2004, while the number of full time faculty positions has declined from 6.5 to 4.5. Part-time instructors have accommodated the higher demand for GSC courses, while the ratio of FTES to WTU has increased from 1.60 to 2.01. Meanwhile, tenure stream faculty have devoted a greater proportion of their work efforts to non-teaching activities in response to growing expectations for grant success, faculty-directed student research, and committee service.
(Data on Both Charts Above From Chancellor’s Office)
It is crucial that we replace the three FERP faculty in a timely fashion as retirements occur. Tenure-track hires are needed to reduce dependency on part-time instructors, especially in core areas of the curriculum for which qualified instructors are difficult to find. Also we will soon initiate our graduate program which requires special expertise. Two retirements have been informally announced at the end of Spring 2011, leaving two vacant faculty positions. Presuming that our current search for an Assistant Professor in Hydrogeology is successful, the Geology Department Strategic Plan outlines the next steps in our hiring plan as follows:

“Maintain faculty expertise as requirements occur and seek new hires in strategic areas”:
a) Maintain existing faculty expertise in Ocean and Atmospheric Science, Geochemistry, Economic Geology, Petroleum Geology and Earth History as retirements occur
b) Request new faculty searches in areas of Earth Surface Processes, Global Climate Change, Engineering Geology and/or Energy/Mineral Resources
c) Attract faculty with language capabilities and research interests that promote international collaboration

Library Resources

The Cal Poly Pomona library has been recently renovated. A limited number of the important geosciences journals are physically shelved there, but these date back only a couple decades. Additional journals may be accessed on microfilm. This is a resource topic that has been flagged in recent academic program reviews, with little improvement.
However several faculty members regularly utilize interlibrary loan, and find the service to be very responsive and efficient in locating obscure journal articles.

To augment the Cal Poly Pomona library resources we maintain our own library in the part-time faculty office area (Room 8-243). A wide variety of classic Geosciences textbooks are housed there, in addition to journal collections of Geology, Geological Society of America Bulletin, American Association of Petroleum Geologists, etc., dating back to the 1950’s. The optical mineralogy laboratory (Room 8-239) also houses a large collection of textbooks and reference materials related to mineralogy, petrology and geochemistry.

**Staff**

The Department Chair and Geology faculty members are supported by a full-time Administrative Support Coordinator (Monica Baez) and a half-time technician (Mike McAtee). The coordinator’s position description was expanded during summer 2009 such that she now maintains and updates a variety of data bases that are important to the Department; e.g., budget pages, foundation accounts, alumni information, prospective employers, student grades, etc. She also assists faculty in the conversion of 35 mm slides to digital format. Other duties include formatting of the annual alumni newsletter and organization of the alumni reunion.

The department technician is responsible for maintaining various Department laboratory and field equipment and organizing/ upgrading the rock and minerals teaching collection. He is skilled with carpentry and metal working and provides badly needed support to College of Science faculty in designing and building various custom projects that require the machine/wood shop.

**Operating Budget**

The Geology Department state-side operating budget has generally increased during the past few years with the exception of 2008-09 and 2009-10 when two back-to-back budget crises forced us to tap our Foundation accounts to survive. Our operating budget covers instructional materials, copying charges, office supplies, field vehicle expenses, equipment, repairs, software, and sometimes travel. Also included in this budget are maintenance contracts for the X-ray fluorescence spectrometer and the X-ray diffractometer. Full coverage for these instruments (two service visits per year plus parts) is about $28,000. We have had to cut corners in this area during recent years.
A very important hidden component of our operating budget is revenue generated by faculty enterprise. Several grant-active faculty have produced significant indirect cost recovery and salary savings that have been redirected to the Geology Department. These revenue sources, along with successful funding of several proposals are the primary reasons we have been able to make significant equipment purchases and laboratory upgrades during the past five years. The chart below shows value added to the Department budget over the past 5 years:

**Space and Facilities**

**Office and Laboratory Space**

The Geology Department occupies space on the 2nd floor of Building 8 and most of the ground floor of Building 4. Three faculty offices are located adjacent to the Department office in Building 8; the remaining 3 are in building 4. Five faculty members have research space in Building 4: Dr. Marshall’s Geomorphology lab is in room 4-A-656, Dr. Berry’s Paleontology lab is in room 4-A-419 and Dr. Polet’s Seismology/Geophysics research space is in 4-A-629A. Drs. Klasik and Jessey share the X-ray analytical laboratory in room 4-A 639. Dr. Nourse’s research space is the field, usually the San Gabriel Mountains or Mexico.

Due to large enrollments in the Winter 2011 Optical Mineralogy, the Optical laboratory has been moved from room 8-237 to 8-239. Room 8-237 has been designated as the new hydrogeology lab and will be utilized by the new faculty hire.
Equipment

In addition to a standard spectrum of specimen preparation and geological mapping equipment, the Department possesses three digital velocity flow probes and one portable multi-parameter water quality meter manufactured by Global Water Instrumentation, Inc., sixteen Garmin GPS receivers, two Nikon total stations for precise surveying, a Seistronix 24-channel seismic refraction instrument with 3-dimensional mapping software, GSSI ground-penetrating radar with two antennas capable of imaging to depths of 10 meters, La Coste-Romberg gravity meter, magnetometer, digital seismometer, separate Philips X-ray diffraction and X-ray fluorescence instrumentation, a 14-station student computer lab with large format printer, Trimble Pro XRS GPS, Nikon petrographic microscopes, fluid inclusion heating/freezing stage, atomic absorption spectrophotometer, and a 6-passenger F-250 Ford 4-wheel drive pickup with camper shell. Additional information is available at http://geology.csupomona.edu/facilities.htm

New equipment acquisitions during 2010-11 include:
1) A 12-passenger Ford E350 van
2) Three field-deployable seismometers with software
3) Three Nikon petrographic microscopes
4) One portable multi-parameter water quality meter
5) A major audio-visual upgrade for the heavily utilized lower division Geology teaching laboratory in room 4-A-634

Due to severe budget constraints during recent years we have been able to acquire much of our more modern equipment through faculty grant-writing initiatives and creative course scheduling / budgeting that directs salary savings toward improvements in our infrastructure. All faculty members and students are reaping significant benefits of this new equipment.

Computing Resources

An important improvement during the past 5 years has been complete upgrade of the Geology student computer lab in room 4-A-626. This lab now contains 14 modern stations (13 PCs and one Macintosh with flat panel monitors, with the latest graphics and GIS software installed. Through several grant acquisitions, Dr. Polet has installed a variety seismic 3-D imaging software on several of these stations. Geology majors utilize this room heavily to complete homework assignments and socialize.

Each full-time faculty member is provided a laptop by Cal Poly Pomona, complete with standard Office software and other programs for which the Department has licenses. All faculty members (and students) are connected to the “Win” network domain, which provides regular backup of files. This arrangement allows efficient classroom instruction in that faculty
members can plug in their laptops and immediately access personal documents created just minutes earlier.

**Scholarships, brochures, websites, other efforts to support recruitment and retention**

The Geology Department awards 5 major scholarships each spring at its annual Alumni Reunion. The first four are paid out of Foundation endowments created from generous donors, the fifth is covered by the Department discretionary account:

1. Margaret VanBuskirk Memorial scholarship ($750)
2. Henderson-Valles scholarship ($750)
3. Ernest Prete, Jr. scholarship ($1000)
5. Brunton compass award for excellence in geological field mapping (~ $300)

The Department brochure and web site were recently updated—please refer to “Student Outreach and Recruitment” above; also see [http://geology.csupomona.edu/](http://geology.csupomona.edu/)

**External funding – contracts, grants, gifts, etc.**

Four Geology faculty members succeeded in obtaining competitive grant funding from national and international sources during the past 5 years:

- Recent awards from National Science Foundation, Southern California Earthquake Center, United States Geological Survey, Jet Propulsion Laboratory, Colibri Resource Corporation and Department of Education
- Active grant awards ($405,258 over six the last years) average ~10% of the total GSC Department state-side budget (salaries plus operating expenses)
- Drs. Nourse, Marshall and Polet have long-standing collaborations with scientists in Mexico, Costa Rica, Japan, Chile, Italy and Brazil that have resulted in significant support for travel and logistics to these international venues.

The charts below summarize Geology Department grant activity over the past 6 years:
Strong alumni support and Indirect Cost Recovery income from grants create a discretionary fund to supplement the Department operating budget:

- During the past several years, budget rescissions were offset by external support from the discretionary account
- Additional alumni contributions ($16,397) have spawned Lane Student Support Fund and Field Experiences Fund to support field work and student research/travel.
- Four endowed scholarship funds total $61,585 and provide direct support to deserving students

Section 6 - Suggestions for Action

Numerous action items are described in the Geological Sciences Department Strategic plan, posted at http://geology.csupomona.edu/GeologyStrategicPlanJan2011.pdf and contained in the Appendix. Listed below are some of our highest priority objectives with related strategies:

1. Expand curriculum and faculty expertise in the discipline of Hydrogeology / Water Resources
   a) Hire new faculty member in area of Hydrogeology (ongoing April, 2011)
   b) Develop new courses in water-related subjects
   c) Promote interdisciplinary connections with other on-campus water-related programs
   d) Build a Hydrogeology Laboratory “wet lab” to provide students with hands-on experience in water-soil-rock interactions and flooding processes

2. Develop newly-approved Master’s degree program
   a) Finalize graduate curriculum
   b) Survey stakeholders Re: optimal class schedule / time modules
   c) Advertise program
   d) Recruit students for admission
   e) Implement program

3. Maintain faculty expertise as requirements occur and seek new hires in strategic areas
   a) Maintain existing faculty expertise in Ocean and Atmospheric Science, Geochemistry, Economic Geology, Petroleum Geology and Earth History as retirements occur
   b) Request new faculty searches in areas of Earth Surface Processes, Global Climate Change, Engineering Geology and/or Energy/Mineral Resources
   c) Attract faculty with language capabilities and research interests that promote international collaboration

4. Enhance research and analytical capabilities with modern laboratory / field equipment
   a) Acquire and utilize new teaching and research equipment
   b) Upgrade laboratory /field equipment and computer technology to industry standards
5. **Enhance grant success**
   a) Write and submit grant proposals
   b) Provide incentives for grant writing
   c) Seek out new sources of funding

6. **Maintain and expand interdisciplinary relationships with other colleges and departments on campus**
   a) Enhance service component to other disciplines
   b) Develop research and teaching collaborations with faculty from other disciplines
   c) Promote guest lectures utilizing faculty between disciplines
   d) Encourage collaborative thesis projects and field trips involving students and faculty from other disciplines

7. **Interact with Geology alumni and industry stakeholders**
   a) Maintain alumni database and communicate regularly with alumni
   b) Invite alumni and industry representatives to Geology Department events
   c) Organize Advisory Board of alumni and industry stakeholders
   d) Pursue fundraising opportunities where appropriate