

# GEOLOGICAL SCIENCES PROGRAM



IN THE

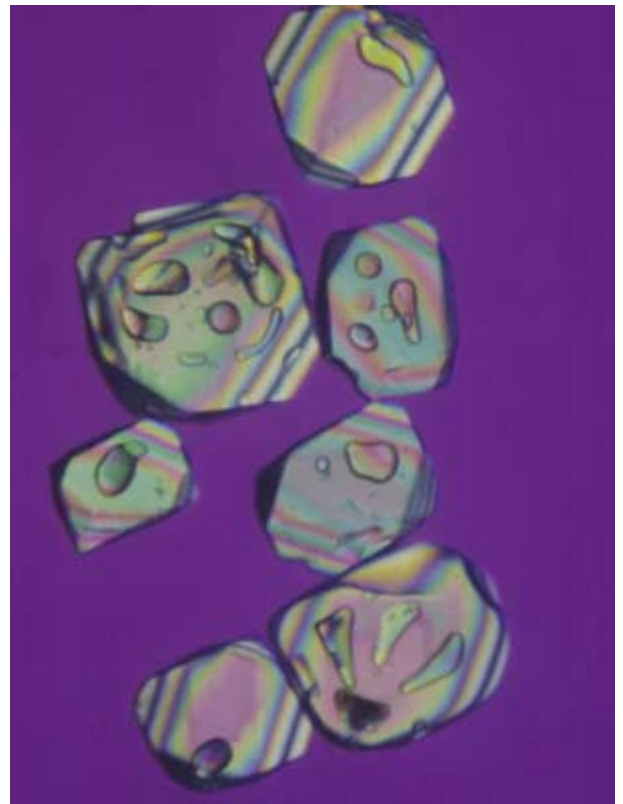
DEPARTMENT

OF

EARTH

AND

ATMOSPHERIC SCIENCES



UNIVERSITY AT ALBANY  
STATE UNIVERSITY OF NEW YORK

**Program in Geological Sciences**

**Department of Earth and Atmospheric Sciences  
University at Albany, State University of New York**

***Introduction***

Geology is the scientific study of the Earth (and Moon) including such diverse subjects as earthquakes, volcanoes, plate tectonics, the formation of mountain ranges, fossils, history of the Earth, determination of ages using radioactive isotopes, past climate changes, Earth resources (ores, petroleum, coal, water), surface and ground water, erosion, and more. People have long been curious about the cause of natural disasters, with interest in geology particularly high after a large deadly earthquake, large volcanic eruption, prediction of imminent climate change, destruction of barrier islands during large hurricanes, or damage and/or death by landslides or tsunamis ("tidal waves"). There is now widespread interest in Earth's history, especially the rise and extinction of dinosaurs, and fossils of early man. The written history of man only covers a very tiny portion of Earth's history: all history of life, climates, and events on Earth before historic times is recorded in rocks and fossils. Geology is still a relatively young science, with the greatest encompassing theory -- the Theory of Plate Tectonics -- only being developed about 30 years ago. Geology has played the central role in understanding the origin and history of the Moon as revealed by the study of samples returned to Earth by the Apollo missions. Geology is also an essential component for understanding and planning rational responses to problems on the Earth, including global climate change, resource recovery and limitations, radioisotope disposal and other environmental hazards involving groundwater pollution. Geology is also a key component in the multidisciplinary effort to determine the origin of life.

The study of geology at a university provides students with a unique and valuable perspective especially with regard to the vast amount of time since the Earth formed, and the evolution of life over much of that interval. The fossil record indicates that human-like species appeared only in the last few million years - a tiny part of the Earth's 4,550,000,000 year history. Huge climate changes have occurred in the last 20,000 years resulting in rapid melting of huge ice sheets and a corresponding 120-meter rise in sea level. From a geological perspective, the enormous man-made changes of the Earth's surface (and atmosphere) in the last few hundred years is geologically instantaneous and represents one of the greatest events in all of our planet's history; such large changes in such a short time may have enormous implications for Earth's climate and the human species. Many people are poorly aware of some significant challenges facing civilization, in particular the projected depletion of petroleum within the next 40 years, and anthropogenically-induced global climate change. A geologic perspective is essential for making informed political choices regarding such problems.

Only in the science of geology do students get to experience a combination of a distinctively observational/historical approach with exact analytical/experimental techniques using highly sophisticated computational and analytical devices. Because geology is largely based on field observations, the study of geology at the University at Albany includes several field courses and field trips. The Albany area is particularly well-suited for such field work as the local geology is unusually varied. Since laboratory analyses are another key component of geology, the Department has three modern geochemical laboratories.

## Undergraduate Degree Programs in the Geological Sciences

---

The program in Geological Sciences within the Department of Earth and Atmospheric Sciences offers two undergraduate (B.S.) degrees and a new B.A. degree in Earth and Atmospheric Sciences. The geology faculty at the University at Albany teach a wide variety of courses in geology in order to provide a broad education in the geological sciences. They are also actively involved in ongoing internationally recognized research, and have a well known graduate program leading to the M.S. and Ph.D. degrees. Because the faculty are strongly committed to undergraduate teaching, all geology courses are taught by the faculty, including freshman-level courses. Sophomore through senior level courses are small (10-20 students), resulting in individual attention by faculty and teaching assistants (graduate students). Dr. Delano has been the recipient of both the Presidential Award for Excellence in Teaching (University at Albany Campus) and the Chancellor's Award for Excellence in Teaching.

### *Available Undergraduate Courses and Awarded Credits*

|                    |                                                                   |
|--------------------|-------------------------------------------------------------------|
| GEO 100N:          | Planet Earth (3)                                                  |
| GEO 100F:          | Planet Earth (3) (Writing Intensive version)                      |
| GEO 106:           | Physical Geology Laboratory (1)                                   |
| GEO 201 (GOG 201): | Environmental Analysis (3)                                        |
| GEO 210:           | Earth Materials (3)                                               |
| GEO 211:           | Optical Mineralogy Laboratory (1)                                 |
| GEO 212:           | Earth Materials Laboratory (1)                                    |
| GEO 222:           | Igneous and Metamorphic Geology (4)                               |
| GEO 230:           | Stratigraphy, Sedimentology, and the Fossil Record (3)            |
| GEO 231:           | Field Excursions for Stratigraphy (2)                             |
| GEO 231Z:          | Field Excursions for Stratigraphy (2) (Writing Intensive version) |
| GEO 250:           | Energy and Resources (3)                                          |
| GEO 260:           | Earth Surface Processes and Hazards (3)                           |
| GEO 330:           | Structural Geology I (3)                                          |
| GEO 331:           | Field Excursions for Structural Geology I (1)                     |
| GEO 332:           | Structural Geology Laboratory (1)                                 |
| GEO 350:           | Environmental Geochemistry (4)                                    |
| GEO 395Z:          | Writing in the Geological Sciences (1)                            |
| GEO 400:           | Field Mapping (4)                                                 |
| GEO 420:           | Instrumental Analysis in Environmental Science (3)                |
| GEO 435:           | Geohydrology (3)                                                  |
| GEO 450:           | Climate Change(4)                                                 |
| GEO 455:           | Special Topics (2-3)                                              |
| GEO 466:           | Marine/Estuary Systems                                            |
| GEO 470:           | Tectonics (4)                                                     |
| GEO 480:           | World Historical Geology (3)                                      |
| GEO 497:           | Independent Study (1-3)                                           |
| GEO 498:           | Undergraduate Honors Research (3)                                 |
| GEO 499:           | Seminar in Geology (1)                                            |

### *Requirements for the B.S. Degree*

*B.S., Major in Geology.* A minimum of 66 credits for the combined major and minor, including: GEO 100N or GEO 100F, 106, 210, 212, 222, 230, 231 (or 231Z), 330, 350, 400, 470; MAT 111 or 112 or 118, 113 or 119; PHY 105N, 106, 108, 109; CHM 120N, 121, 122A, 122B. Elective Classes: choose at least 9 credits of the following: GEO 260, 211, 331, 332, 420, 435,

## Undergraduate Degree Programs in the Geological Sciences

---

450, 455, 466, 480, 497; Students are encouraged to take the following additional courses: MAT 108, 214, 220, 311; CSI 101N or 201N; ATM 100N.

### *Requirements for the B.A. Degree in Earth and Atmospheric Sciences*

*B.A., Major in Earth and Atmospheric Sciences.* A minimum of 56-60 credits for the combined major and minor including: A Phy 105, 106, 108, 109; A Mat 101, 108, 111; A Chm 12Nn: A Geo 100N, 106, 250 or A Gog 101N; A Atm 100N or 102, 210, 211; two courses from A Gog 304, 385, 431, 496; a total of at least 12 credits from the following, including at least one course from each discipline: A Geo 330, 350, 435, and A Atm 304, 305, 307, 311, 408.

### *Proposed requirements for the B.S. degree in Earth Science*

*B.S., Major in Earth Science (for prospective Earth Science Teachers).* (Proposed revision) A minimum of 66 credits for the combined major and minor, including (required) GEO 100N or 100F, 106, 210, 212, 230, 231, 330, 331, 332, 350 or 435, 380, 470, 494; ATM 107N, 210, 211, 304 or 305 (or GEO 450), 408B; PHY 100N, 105N, 108N; CHM 120N, 121N, 122A, 122B; MAT 112. Students are strongly encouraged to take the following additional courses: \*BIO 110N, 111N (or at least 102N and another BIO course); MAT 113, GEO 250, 260, and two additional credits of GEO 494 starting in the sophomore year. Students are additionally encouraged to take the following other courses: ATM 100N, 101N, 307, 311; BIO 316, 319Z, 320; PHY 106, 109.

New York State Earth Science teacher certification now requires 2 semesters of study of language(s) other than English (or satisfactory performance on CLPE in Spanish, French, or German).

\*Students intending to qualify for Middle-level General Science teaching certification should take at least two Biology courses.

Geology majors must complete two courses each of introductory chemistry, physics, and calculus. Earth Science majors (under the proposed revision) must complete five courses in Atmospheric Science, two courses in astronomy, and in physics, and in chemistry, and one in calculus. Most students complete their degrees in four years, even if they do not start the major until the sophomore year. Earth Science majors should consult the list of requirements of the Department of Educational Theory and Practice for details of the required 42 credits of graduate (MS) coursework in that field, including student teaching, needed before provisional certification.

### *A Typical B.S. Program in Geology* (Required courses shown in **bold**)

| <i>Semester 1</i>                      |          | <i>Semester 2</i>                          |          |
|----------------------------------------|----------|--------------------------------------------|----------|
| <b>GEO 100N/F or 105N Planet Earth</b> | <b>3</b> | <b>GEO 250 Earth Resources</b>             | <b>3</b> |
| <b>GEO 106 Physical Geology Lab</b>    | <b>1</b> | <b>CHM 121N, 122B Chemistry II/Lab</b>     | <b>4</b> |
| <b>CHM 120N/122A Chemistry I/Lab</b>   | <b>4</b> | 2 electives/Gen. Ed.                       | -        |
| 2 electives/Gen. Ed.                   | -        |                                            |          |
| <i>Semester 3</i>                      |          | <i>Semester 4</i>                          |          |
| <b>GEO 210 Earth Materials</b>         | <b>3</b> | <b>GEO 222 Igneous/Metamorphic Geology</b> | <b>4</b> |
| <b>GEO 212 Earth Materials Lab</b>     | <b>1</b> |                                            |          |

## Undergraduate Degree Programs in the Geological Sciences

---

|                                                        |          |                                   |          |
|--------------------------------------------------------|----------|-----------------------------------|----------|
| <b>GEO 230 Stratigraphy</b>                            | <b>3</b> | <b>MAT 113 or 119 Calculus II</b> | <b>4</b> |
| <b>GEO 231/Z Field Excursions<br/>for Stratigraphy</b> | <b>2</b> | 1 or 2 electives/Gen. Ed.         | -        |
| <b>MAT 111 or 112 or 118 Calculus I<br/>Gen. Ed.</b>   | <b>4</b> | <b>GEO ELECTIVE</b>               | <b>3</b> |

### *Semester 5*

|                                    |          |
|------------------------------------|----------|
| <b>GEO ELECTIVES</b>               |          |
| <b>PHY 105N, 106 Physics I/Lab</b> | <b>4</b> |
| 2 to 4 electives/Gen. Ed.          |          |

### *Semester 6*

|                                               |          |
|-----------------------------------------------|----------|
| <b>GEO 330 Structural Geology I</b>           | <b>3</b> |
| <b>GEO 350 Environmental<br/>Geochemistry</b> | <b>4</b> |
| <b>PHY 108, 109 Physics II/Lab</b>            | <b>4</b> |
| 1 or 2 electives/Gen. Ed.                     |          |

### *Semester 7*

|                                           |          |
|-------------------------------------------|----------|
| <b>GEO 400 (See below*) Field Mapping</b> | <b>4</b> |
| <b>GEO 470 Tectonics</b>                  | <b>4</b> |
| <b>GEO ELECTIVE</b>                       | <b>3</b> |
| 1 or 2 electives                          |          |

### *Semester 8*

|                      |  |
|----------------------|--|
| <b>GEO ELECTIVES</b> |  |
| 3 or 4 electives     |  |

**GEO 395Z – Writing in the Geological Sciences, 1 credit (may be taken with any GEO course at the 300 or 400 level to fulfill a writing intensive version of that course)**

**\*NOTE: GEO 400, Field Mapping.** GEO 400, Field Mapping. Three weeks of field work followed by independent study and laboratory sessions for preparation of report (in Albany). Starts in early August; laboratory sessions will be once a week in first quarter of fall session.

### ***Geology Minor***

A separate minor in Geology is available to students in majors other than Geology or Earth Science. This minor requires a minimum of 20 graduation credits in courses in Geological Sciences. Required courses include: GEO 100N or 100F, 106, 230, 250 and 9 credits at-or-above the 300 level in Geology courses.

### ***Special Programs and Opportunities***

The Geological Sciences Program sponsors two weekly seminar series that provide students with a sampling of important topics in current geological research: (1) formal seminars presented by outside speakers from research universities such as MIT, Columbia, Penn State, and Cornell; (2) seminars presented by graduate students on their research. Both of these are open to interested undergraduates.

Albany is located within the most varied geologic setting of any of the SUNY University centers, making it superior for field-based education, which has always been a particular strength of our program. The Geological Sciences Program has three courses that involve extensive field work (Stratigraphy in the fall semester, Structural Geology in the spring semester, and a three-week senior-level Field Mapping course in Maine during August).

Undergraduates may do an internship in Albany at the State Geological Survey, NY State Department of Environmental Conservation (DEC), Dept. of Transportation (DOT), U.S. Geological Survey (water resources), or with private companies. Interested undergraduates may also assist in the research program of a faculty member.

## **Undergraduate Degree Programs in the Geological Sciences**

---

### ***Graduate School Opportunities***

Qualified undergraduates may enroll for a combined B.S./M.S. program (5 years), which generally saves approximately one year toward the completion of the M.S. The graduate program involves courses and research, including a thesis (M.S.) or dissertation (Ph.D.), the contents of which are commonly published in peer-reviewed scientific journals. The faculty do field research work in NY State, Tibet, Oregon, Italy, and on islands in the equatorial Pacific. Even research on Moon rocks is conducted here!

### ***Faculty Research Interests***

All faculty presently have research projects funded by the National Science Foundation, NASA, or EPA, publish regularly in leading scientific journals, and are well known internationally in the geosciences; a significant demonstration of the high quality of the faculty. Current topics include: Geochemical investigations of Moon rocks, terrestrial sedimentary rocks, and the origin of life (Dr. J. Delano); tectonic and geochemical processes in the formation of oceanic crust, especially ancient oceanic crust now exposed on land in Oregon and Italy (Dr. G. Harper); processes creating the mountains formed during continental collisions in the Himalayas/Tibet, and the Appalachians (Dr. W. Kidd); climate change inferred from the use of isotopes in deep-sea sediments and living corals (Dr. B. Linsley); the fate and transport of mercury and other heavy metals in the surface environment (Dr. J. Arnason); and global climate evolution of the Earth (Dr. Andrei Lapenis). Dr. Delano is Associate Director of the New York Center for Studies on the Origins of Life. This Center is one of only two such centers in the United States funded by NASA to study the origin of life and is a collaborative effort with Rensselaer Polytechnic Institute.

### ***Careers***

Graduates with a B.S. in geology typically find employment not only in positions directly related to geology (e.g., oil exploration, mineral exploration, groundwater testing, consulting geologist, laboratory research assistant, secondary school teaching [Earth Science/teacher education major]), but also in positions such as computer systems analyst, journalist (science or other fields), technical sales, librarian, politician (e.g., Bruce Babbitt), and many others. Geology is an excellent B.S. to obtain before entering law school (e.g., environmental law, mining law, or water law). Students are advised that environmental consulting businesses (groundwater, pollution remediation, etc) mostly hire graduates with a Geology BS or MS degree; students with Environmental Science BS degrees have not generally been preferred in this field.

Geologists who obtain an M.S. degree have a much wider range of professional opportunities in fields using geologic expertise, including oil, mining, and environmental engineering, as well as potential employment in federal and state agencies (geologic surveys, water supply, environmental conservation, and others). Many of our Ph.D graduates are employed in academic positions at universities in the U.S. and abroad.

## Undergraduate Degree Programs in the Geological Sciences

---

### *For more information contact:*

#### **Department of Earth and Atmospheric Sciences (DEAS)**

University at Albany, ES 351

State University of New York, Albany, NY 12222

Phone: (518) 442-4466 or 4556; Fax: (518) 442-5825

E-mail: find at <http://www.albany.edu/geosciences>

Geology Program Website: <http://www.albany.edu/geosciences>

DEAS Web Site: <http://www.deas.albany.edu>

**University at Albany Undergraduate Admissions Office: 1-800-293-7869 (1-800-293-SUNY)**

### *Other information sources on careers in Geological Sciences*

American Geologic Institute: <http://www.agiweb.org>

4220 King Street, Alexandria, VA 22302-1507

(703) 379-2480

American Geophysical Union: <http://www.agu.org/>

Geological Society of America: <http://www.geosociety.org/index.html>

American Association of Petroleum Geologists: <http://www.aapg.org>

### *Faculty: 2004-2005*

John W. Delano, Distinguished Teaching Professor (Ph.D., SUNY at Stony Brook)

(518) 442-4479; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>

Gregory D. Harper, Professor, (Ph.D., Univ. of California, Berkeley)

(518) 442-4476; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>

William S. F. Kidd, Professor (Ph.D., Univ. of Cambridge)

(518) 442-4477; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>

Andrei Lapenis, Assoc. Professor (Ph.D., State Hydrological Inst., St. Petersburg, Russia)

(518) 442-4191; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>

(holds a joint appointment in the Department of Geography and Planning)

Braddock K. Linsley, Assoc. Professor (Ph.D., Univ. of New Mexico, Albuquerque)

(518) 442-4478; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>

John G. Arnason, Assist. Professor (Ph.D., Stanford University)

(518) 442-4474; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>

### *Emeritus Faculty*

Winthrop D. Means, Professor Emeritus (Ph.D., Univ. of California, Berkeley)

(518) 442-4472; e-mail: find at <http://www.albany.edu/geosciences/geodirec.html>