

# GEOLOGICAL SCIENCES PROGRAM



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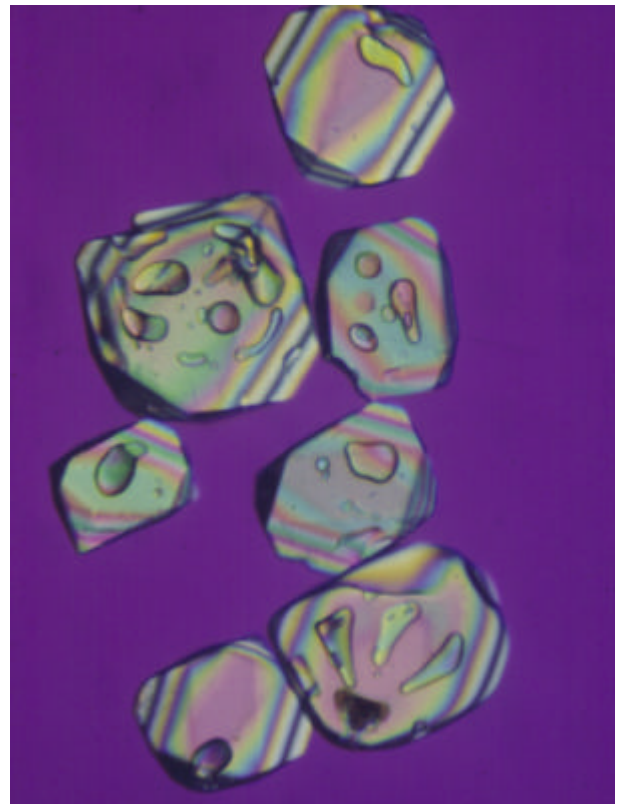
DEPARTMENT

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. The general population is unaware of many of the challenges facing civilization such as a projected depletion of petroleum within the next 40 years and anthropogenically induced global climate change. A geologic perspective is very important for making politically wise 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.

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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. Since the faculty is 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).

### *Available Undergraduate Courses and Awarded Credits*

GEO 100N:	Planet Earth (3)
GEO 100F:	Planet Earth (3) (Writing Intensive version)
GEO 105N:	Environmental Geology (3)
GEO 106:	Physical Geology Laboratory (1)
GEO 190N:	Earth Resources: Problems and Choices (3)
GEO 201 (GOG 201):	Environmental Analysis (3)
GEO 210:	Mineralogy (3)
GEO 211:	Optical Mineralogy Laboratory (1)
GEO 222:	Igneous and Metamorphic Geology (4)
GEO 230:	Stratigraphy (3)
GEO 231:	Field Excursions for Stratigraphy (3)
GEO 231Z:	Field Excursions for Stratigraphy (3) (Writing Intensive version)
GEO 315 (ANT 310):	Human Paleontology (3)
GEO 330:	Structural Geology I (3)
GEO 331:	Field Excursions for Structural Geology I (1)
GEO 332:	Structural Geology Laboratory (1)
GEO 335:	Sedimentary Geology (3)
GEO 336:	Laboratory for Sedimentary Geology (1)
GEO 395Z:	Writing in the Geological Sciences (1)
GEO 400:	Field Mapping (4)
GEO 410:	Geochemical Thermodynamics (3)
GEO 412:	General Geochemistry (3)
GEO 415:	Environmental Geochemistry (3)
GEO 416:	Laboratory for Environmental Chemistry (1)
GEO 435:	Geohydrology (3)
GEO 440Z:	Structural Geology III (3)
GEO 450:	Special Topics (2-3)
GEO 470:	Tectonics (4)
GEO 480:	World Historical Geology (3)
GEO 480Z:	World Historical Geology (3) (Writing Intensive version)
GEO 497:	Independent Study (1-3)
GEO 498:	Undergraduate Honors Research (3)
GEO 499:	Seminar in Geology (1)

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

*B.S., Major in Geology.* A minimum of 66 credits for the combined major and minor, including: GEO 100N or GEO 100F or 105; 106, 190N, 210, 211, 222, 230, 231 (or 231Z), 330, 331, 332, 335, 336, 400, 412 (or 415 and 416), 435, 470; MAT 111 or 112 or 118, 113 or 119;

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PHY 105N, 106, 108, 109; CHM 120N, 121, 122A, 122B. Students are encouraged to take the following additional courses: GEO 315, 428, 480 (or 480Z); PHY 109; MAT 108, 214, 220, 311; CSI 101N or 201N; ATM 100N.

*B.S., Major in Earth Science, Teacher Education Program.* A minimum of 64 credits for the combined major and minor, including GEO 100N or 100F or 105N, 106, 210, 230, 231 (or 231Z), 330, 331, 332; ATM 210 (or 210Z), 211; MAT 111 or 112 or 118 and 113 or 119; PHY 105N, 106, 108N, 109; CHM 120N, 121N, 122A, 122B; BIO 110F/N and 111N; and three courses from the following: GEO 222, 315, 335 and 336, 400, 412 (or 415 and 416), 428, 435, 440Z, 470; ATM 300Z, 305, 307. GEO 190N is strongly recommended.

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

*B.A., Major in Earth and Atmospheric Sciences.* A broad perspective in the earth and atmospheric sciences is achieved in this combined major/minor with courses including GEO 100N or GEO 105N, GEO 106, GEO 190N, ATM 100N or ATM 102, ATM 210, ATM 211; eighteen (18) credits selected from GEO 230, GEO 330, GEO 335, GEO 415, ATM 305, ATM 307, ATM 311, ATM 408, ATM 414; and twenty-seven (27) credits in PHY 105, PHY 106, PHY 108, PHY 109, MAT 101, MAT 108, MAT 111, BIO 102N, CHM 120N, and either PHY 202 or BIO 230N.

### *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 or Environmental Geology</b>	<b>3</b>	<b>GEO 190N 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>	3 electives/Gen. Ed.	-
2 electives/Gen. Ed.	-		
<i>Semester 3</i>		<i>Semester 4</i>	
<b>GEO 210 Mineralogy</b>	<b>3</b>	<b>GEO 222 Igneous/Metamorphic Geology</b>	<b>4</b>
<b>GEO 211 Optical Mineralogy Lab</b>	<b>1</b>	<b>MAT 113 or 119 Calculus II</b>	<b>4</b>
<b>GEO 230 Stratigraphy</b>	<b>3</b>	2 electives/Gen. Ed.	-
<b>GEO 231/Z Field Excursions for Stratigraphy</b>	<b>2</b>		
<b>MAT 111 or 112 or 118 Calculus I</b>	<b>4</b>		
1 elective/Gen. Ed.	-		
<i>Semester 5</i>		<i>Semester 6</i>	
<b>GEO 335 Sedimentary Geology</b>	<b>3</b>	<b>GEO 330 Structural Geology I</b>	<b>3</b>
<b>GEO 336 Laboratory for Sedimentary Geology</b>	<b>1</b>	<b>GEO 331 Field Excursions for Structural Geology I</b>	<b>1</b>
<b>PHY 105N, 106 Physics I/Lab</b>	<b>4</b>	<b>GEO 332 Structural Geology Lab</b>	<b>1</b>
2 electives	-	<b>PHY 108, 109 Physics II/Lab</b>	<b>4</b>
		2 electives	-

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<i>Semester 7</i>		<i>Semester 8</i>	
<b>GEO 400 Field Mapping</b>	<b>4</b>	<b>GEO 435 Geohydrology</b>	<b>3</b>
<b>GEO 412 or 415 General Geochemistry or Environmental Geochemistry</b>	<b>4</b>	4 electives	-
<b>GEO 470 Tectonics</b>	<b>4</b>		
Elective	-		

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.** 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.

Students are encouraged to take the following additional courses: GEO 315, 428, 480 (or 480Z); PHY 109; MAT 108, 214, 220, 311; CSI 101N or 201N; ATM 100N.

### *A Typical B.S. Program in Earth Science (Teacher Education Program)* (Required courses shown in **bold**)

<i>Semester 1</i>		<i>Semester 2</i>	
<b>GEO 100N/F or 105N Planet Earth or Environmental Geology</b>	<b>3</b>	<b>CHM 121N, 122B Chemistry II/Lab</b>	<b>4</b>
<b>GEO 106 Physical Geology Lab</b>	<b>1</b>	<b>MAT 113 or 119 Calculus II or Honors Calculus</b>	<b>4</b>
<b>CHM 120N/122A Chemistry I/Lab</b>	<b>4</b>	2 electives/Gen. Ed.	-
<b>MAT 111 or 112 or 118 Calculus I or Honors Calculus I</b>	<b>4</b>		
1 elective/Gen. Ed.	-		
<i>Semester 3</i>		<i>Semester 4</i>	
<b>GEO 210 Mineralogy</b>	<b>3</b>	<b>GEO elective*</b>	<b>3</b>
<b>GEO 230 Stratigraphy</b>	<b>3</b>	<b>PHY 108N/109 Physics II Lab</b>	<b>4</b>
<b>GEO 231/Z Field Excursions for Stratigraphy</b>	<b>2</b>	1 elective/Gen. Ed.	-
<b>PHY 105N/106 Physics I Lab</b>	<b>4</b>	ATM 100N strongly recommended	
1 elective/Gen. Ed.	-	Two electives/Gen. Ed.	-
<i>Semester 5</i>		<i>Semester 6</i>	
<b>ATM 210/Z Atmospheric Structure</b>	<b>3</b>	<b>GEO 330 Structural Geology I</b>	<b>3</b>
<b>BIO 110F/N General Biology I Ed. Foundations course</b>	<b>4</b>	<b>GEO 331 Field Excursions for Structural Geology I</b>	<b>1</b>
2 electives/Gen. Ed.	-	<b>GEO 332 Structural Geology Lab</b>	<b>1</b>
		<b>ATM 211 Weather Analysis and Forecasting</b>	<b>4</b>
		<b>BIO 111N General Biology II Ed. Foundations Course</b>	<b>4</b>
			<b>3</b>
<i>Semester 7</i>		<i>Semester 8</i>	
<b>GEO elective(s)*</b>	<b>3-6</b>	<b>GEO elective*</b>	<b>3</b>
<b>E TAP 414</b>	<b>3</b>	<b>E TAP 402 (course requirement under revision)</b>	<b>3</b>
<b>E TAP 464</b>	<b>3</b>	<b>E TAP 474 (note: 9 credit course)</b>	<b>9</b>
1 to 2 electives/Gen. Ed.	-		

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\*Three courses to be used to meet major elective credits must be selected from the following list: GEO 222, 315, 335 and 336, 400, 412 (or 415 and 416), 428, 435, 440Z, 470; ATM 300Z, 305, 307. GEO 190N is strongly recommended. For cross-listed "GEO" courses, you should register for the "GEO" section of the course.

### ***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 or 105N, 106, 190N, 230, and 9 credits in Geology courses at-or-above the 300 level or in Geology courses requiring at least one prerequisite course.

Geology and Earth Science majors must undertake a combined major and minor in Geology or Earth Science, although they may also choose to declare a specific minor in another field. Double majors in geology-math, geology-physics, geology-chemistry, or geology-atmospheric science are encouraged for interested and qualified students.

### ***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.

The Geological Sciences Program has three courses that involve extensive field work (one in the fall semester, one in the spring semester, and a four-week senior-level field course in Vermont). 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.

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.

### ***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, Italy, and on islands in the equatorial Pacific. Even research on Moon rocks is conducted here! Graduate students participate in much of this field research.

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

All faculty presently have research projects funded by the National Science Foundation or NASA, evidence that the faculty are at the cutting edge of their fields. 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 (Ocean Drilling Project) and ancient oceanic crust now exposed on land in Italy and Oregon (Dr. G.

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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); and deformation of crystalline materials (Dr. W. Means). 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. All faculty publish articles regularly in leading scientific journals and are well-known internationally in the geosciences.

Two of the faculty in the Geology program have recently been honored with prestigious awards. 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. Dr. Means received the Career Contribution Award of the Geological Society of America for "achievements that have led to major advances in the fields of structural geology and tectonics." Dr. Means has also received the President's Award for Excellence in Research.

### ***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).

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). Most of our Ph.D graduates are employed in academic positions at universities in the U.S. and abroad.

### ***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: [geology@cnsunix.albany.edu](mailto:geology@cnsunix.albany.edu)

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

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

#### **University at Albany Undergraduate Admissions Office: 1-800-293-7869**

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>

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### ***Faculty: 1999-2000***

John W. Delano, Professor (Ph.D., SUNY at Stony Brook)  
(518) 442-4479; e-mail: [jdelano@atmos.albany.edu](mailto:jdelano@atmos.albany.edu)

Gregory D. Harper, Assoc. Professor, (Ph.D., Univ. of California, Berkeley)  
(518) 442-4476; e-mail: [gdh@csc.albany.edu](mailto:gdh@csc.albany.edu)

William S. F. Kidd, Professor (Ph.D., Univ. of Cambridge)  
(518) 442-4477; e-mail: [wkidd@atmos.albany.edu](mailto:wkidd@atmos.albany.edu)

Andrei Lapenis, Assist. Professor (Ph.D., State Hydrological Inst., St. Petersburg, Russia)  
(518) 442-4191; e-mail: [alapenis@cnsvox.albany.edu](mailto:alapenis@cnsvox.albany.edu)  
(holds a joint appointment in the Department of Geography and Planning)

Braddock K. Linsley, Assist. Professor (Ph.D., Univ. of New Mexico, Albuquerque)  
(518) 442-4478; e-mail: [blinsley@cnsunix.albany.edu](mailto:blinsley@cnsunix.albany.edu)

### ***Temporary Faculty***

John G. Arnason, Visiting Assist. Professor (Ph.D., Stanford University)  
(518) 442-4474; e-mail: [arnason@cnsunix.albany.edu](mailto:arnason@cnsunix.albany.edu)

### ***Emeritus Faculty***

Winthrop D. Means, Professor Emeritus (Ph.D., Univ. of California, Berkeley)  
(518) 442-4472; e-mail: [wdm@cnsvox.albany.edu](mailto:wdm@cnsvox.albany.edu)