

PROGRAM IN GEOLOGICAL SCIENCES

Faculty

Distinguished Teaching Professors

John W. Delano, Ph.D.

State University of New York at Stony Brook

Professors

William S. F. Kidd, Ph.D.

Cambridge University

Gregory D. Harper, Ph.D.

University of California, Berkeley

Professor Emeritae/i

Winthrop D. Means, Ph.D.

University of California, Berkeley

Akiho Miyashiro, D.O.C.

Tokyo University

Associate Professors

Andrei Lapen, Ph.D.

State Hydrological Institute, St. Petersburg

(joint appointment in Geography and Planning)

Braddock K. Linsley, Ph.D.

University of New Mexico

Associate Professor Emeritae/i

George W. Putman, Ph.D.

Pennsylvania State University

Visiting Assistant Professors

John G. Arnason, Ph.D.

Stanford University

Adjuncts (estimated): 2

Teaching Assistants (estimated): 8

Careers

Graduates with a B.S. in geology or environmental science have found satisfying employment not only in jobs directly related to these disciplines but also in a wide variety of other activities. Students graduating with a B.S. in geology who pursue advanced degrees in geology, computer science, business administration, or geophysics have a competitive edge in the job market. Professional opportunities in jobs using geological expertise are much wider for graduates with master's degrees, in particular for employment with environmental service/consulting companies, oil and mineral resource companies, and with state or federal agencies having responsibilities involving geological matters (geological surveys, water supply, environmental conservation, transport, etc.). Developing shortages of fossil fuels and raw materials for industry, along with an increasing need for professionals trained to understand complex environmental problems should provide a sustained demand for professional geologists and environmental scientists.

Special Programs or Opportunities

The Geology Program sponsors two weekly seminar series that provide students with a sampling of important topics in current geological research: (1) informal talks given by faculty and graduate students; and (2) formal seminars presented by outside speakers. The Program also sponsors field trips in New York, New England, and the Appalachians.

Degree Requirements for the Major in Geology

General Program B.S.: A minimum of 66 credits for the combined major and minor including: (Required) A Geo 100N or A Geo 100F, 106, 210, 212, 222, 230, 231 (or 231Z), 330, 350, 400, , 470 ; A Mat 111 or 112 or 118, 113 or 119; A Phy 105N, 106, 108N; 109, A Chm 120N, 121, 122A, 122B. Elective Classes (choose at least 9 credits of the following; A Geo 260, 211, 331, 332, 420, 435, 450, 466, 497. Students are encouraged to take the following additional courses: A Geo, 317; A Mat 108, 214, 220, 311; A Csi 101N or 201N; A Atm 100N.

Degree Requirements for the Major in Earth and Atmospheric Sciences

Bachelor of Arts (B.A.): 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 120N; A Geo 100N or 100F, 106, 250 or A Gog 101N; A Atm 100N or 102N, 210 or 210Z, 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 or 304Z, 305, 307 or 307Z, 311, 335, 390, 408B.

The B.A. in Earth and Atmospheric Sciences is offered as an interdisciplinary study of significant breadth spanning two classical disciplines. Students electing this major have the potential to realize new opportunities for personal enrichment and career development. However, those students committed to seeking advanced degrees in geology or atmospheric science should pursue the corresponding B.S. degree instead. All students contemplating any of the curricula described here should thoroughly discuss their options with personnel of the Advisement Services Center (ASC) and a department undergraduate adviser before formal declaration of a specific major.

Departmental Honors Program

Students who have achieved a GPA of 3.5 in the major, and an overall GPA of 3.25, may apply to the Department Chairperson not later than the end of their junior year to enter the Department Honors Program. Interested students should enroll in Geo 499, Seminar in Geology, in the spring semester of their junior year. In order to graduate with Honors, accepted students must take A Geo 498, Independent Honors Research (3 credits), and complete it with a grade of *A* or *A-*, as well as maintaining superior academic performance overall and in the major during their senior year. Proposals for research to be done in A Geo 498 must be approved in writing by the supervising faculty member and the Department Chairperson before the end of the spring semester of the student's junior year. The other three required credits for Departmental Honors will consist of a total of three credits of A Geo 499 Seminar in Geology, one in each of the last three semesters of the degree program.

Combined B.S./M.S. Program

The combined B.S./M.S. program in geology provides an opportunity for students of recognized academic ability and educational maturity to fulfill integrated requirements of undergraduate and master's degree programs from the beginning of the junior year. A carefully designed program can permit a student to earn the B.S. and M.S. degrees within ten semesters.

The combined program requires a minimum of 138 credits, of which at least 30 must be graduate credits. In qualifying for the B.S., students must meet all University and college requirements, including the requirements of the undergraduate major described previously, the minimum 60-credit liberal arts and sciences requirement, general educational requirements, and residency requirements. In qualifying for the M.S., students must meet all University and college requirements as outlined in the Graduate Bulletin, including completion of a minimum of 30 graduate credits and any other conditions such as a research seminar, thesis, comprehensive examination, professional experience, and residency requirements. Up to 12 graduate credits may be applied simultaneously to both the B.S. and M.S. programs.

The following graduate courses may be substituted for required undergraduate courses: A Geo 517 for A Geo 470, A Geo 535 for A Geo 435, A Geo 550 for A Geo 450, A Geo 566 for A Geo 466. A reading knowledge of a foreign language useful in the study of geology (French, German, Russian, Spanish, Portuguese, Chinese) must be demonstrated before completion of the program, or satisfactory proficiency in a research skill such as computer programming may be substituted for the language requirement at the discretion of the department.

Students are considered as undergraduates until completion of 120 graduation credits and satisfactory completion of all B.S. requirements. Upon meeting B.S. requirements, students accepted into the combined B.S./M.S. program are automatically considered as graduate students.

Students may apply for admission to the combined degree program in geology at the beginning of their junior year or after the successful completion of 56 credits, but no later than the accumulation of 100 credits. A cumulative grade point average of 3.20 or higher and three supportive letters of recommendation from faculty are required for consideration.

Courses

A Geo 100N Planet Earth (3)

Introduction to the Geological Sciences, including evidence for the major processes and significant events in the origin, history and present condition of the solid Earth. Major topics include geological time, earthquakes, volcanism, plate tectonics and the origin and movement of continents and oceans, mountain building, evidence for past climate change, including glaciation, formation of the earth-moon system, earth resources and geological constraints and consequences of energy use. Emphasis is placed on understanding why we think we know things about the Earth, to enable the student to understand common features of rocks and minerals and the larger-scale solid Earth, and to provide a lifetime background for making informed judgments on increasing number of public issues requiring geological knowledge. Fall and spring semesters. [NS]

A Geo 100F Planet Earth (3)

A Geo 100F is the writing intensive version of A Geo 100N; only one may be taken for credit. Fall semester only. [NS]

W|A Geo 102N Planet Earth and Physical Geology Laboratory (4)

Introduction to the Geological Sciences, including geological time, earthquakes, volcanism, plate tectonics evidence for climate change in the past, glaciation, earth resources, and origin of the Earth-Moon system. The laboratory section introduces geological

maps, identification of rock and mineral specimens, and making of geological cross-sections.

A Geo 106 Physical Geology Laboratory (1)

Elementary classification of minerals and rocks, and their identification in hand specimen. Introduction to geological maps and sections, both as sources of geological information and as aids in the solution of practical problems. Guided and self-guided field trips to building stones of downtown Albany. This course is required for majors in Geology and Earth Science. One lab each week. Corequisite(s): A Geo 100N or 100F. Fall and spring semesters.

A Geo 201 (= A Gog 201) Environmental Analysis (3)

Uses laboratory work and local field excursions to give students “hands-on” experience in physical geography and environmental sciences. Focuses on human impacts on the environment and on problems of environmental contamination. Prerequisite or corequisite: A Gog 101N. [NS]

A Geo 210 Earth Materials (3)

Crystal structures and crystal chemistry, with emphasis on the major rock- and soil-forming mineral groups. Selected minerals of commercial importance. Examples of mineral-forming processes, and use of mineral properties as indicators of geological conditions. Three lectures each week. Prerequisite(s): A Geo 100N or 100F, 106; or permission of instructor. Fall semester only.

A Geo 211 Optical Mineralogy Laboratory (1)

Introduction to the petrographic microscope. Optical properties of minerals and their use for mineral identification. One lab each week. Corequisite(s): A Geo 210 or permission of instructor.

A Geo 212 Earth Materials Laboratory (1)

An introduction to the study of minerals. Major topics include the formation, physical properties, structure, symmetry, and classification of minerals with emphasis on rock-forming minerals. In laboratory, students will gain hands-on experience with mineral identification of hand samples and mineral properties. The course also introduces more advanced topics in mineral transformations, crystal chemistry, and crystallography.

A Geo 222 Igneous and Metamorphic Geology (4)

Description, classification, and occurrence of igneous and metamorphic rocks. Introduction to phase diagrams, metamorphic facies, and petrogenetic grids. Laboratory section will involve practical identification of mineralogy and textures in hand specimens and thin sections. Three lectures and one lab per week. Prerequisite(s): A Geo 100N or 100F, 106, 210, 211; or permission of instructor. Spring semester only.

A Geo 230 Stratigraphy, Sedimentology, and the Fossil Record (3)

Stratigraphic principles and correlation, identification and classification of sedimentary rocks, introduction to paleontology and historical geology. Three lectures and one lab each week. Geology BS and Earth Science BS majors must also register concurrently for either A Geo 231 or A Geo 231Z, Field Excursions in Stratigraphy. Prerequisite(s): A Geo 100N or 100F, 106; or permission of instructor. Fall semester only.

A Geo 231 Field Excursions for Stratigraphy (2)

One lab per week and five full-day weekend field trips to be taken by Geology BS and Earth Science BS majors concurrently with A Geo 230 Stratigraphy. Corequisite(s): A Geo 230 or permission of instructor. Offered fall semester only.

A Geo 231Z Field Excursions for Stratigraphy (2)

One lab per week and five full-day weekend field trips to be taken by Geology and Earth Science BS majors concurrently with A Geo 230 Stratigraphy. Extended written and illustrated reports must be submitted based on the observations made on each trip. A Geo 231Z is the writing intensive version of A Geo 231; only one may be taken for credit. Corequisite(s): A Geo 230 or permission of instructor. [WI]. Offered fall semester only.

A Geo 250 Energy and Resources (3)

Examination of energy production using non-renewable (coal, oil, natural gas, uranium) versus renewable resources (hydroelectric, solar, wind, geothermal) relative to present and future environmental and societal impacts. Fields trips to energy producing facilities (e.g., Blenheim-Gilboa Pumped Storage Power Plant). Prerequisites: A Geo 100 or Atm 100; Chm 120N or Phy 105N; Mat 111.

A Geo 260 Earth Surface Processes and Hazards (3)

An aspect of environmental science that includes natural geologic processes potentially harmful to people and human modifications of natural systems that can make them harmful. Includes rivers and flooding, groundwater, severe storms, landslides, soil erosion, acid rain, greenhouse effect, pollution and waste disposal, coastal problems, estuarine and wetland problems, and hazards associated with volcanoes and earthquakes. Prerequisites: A Geo 100N.

A Geo 317 (= A Gog 317) Geomorphology (3)

A systematic introduction to the study of landforms and the processes that shape them. Laboratory work and field trips are part of the course. Prerequisite(s): A Gog 101N; A Geo 100N or 100F; or permission of instructor. Fall semester only. May not be offered in 2003-2004.

A Geo 330 Structural Geology I (3)

Descriptive structural geology, with emphasis on features seen at outcrop and map scales. Selected examples of rock microstructures and their interpretation. Three lectures each week. Prerequisite(s): A Geo 100N or 100F, 106. Spring semester only.

A Geo 331 Field Excursions for Structural Geology I (1)

Five full-day weekend field trips to be taken by Geology and Earth Science BS majors concurrently with Structural Geology I. Several written and illustrated reports must be submitted based on the observations made. Prerequisite(s): permission of instructor; corequisite: A Geo 330. Offered spring semester only.

A Geo 332 Structural Geology Laboratory (1)

Structures on maps, on images, and in rock specimens; computer-based presentation of data. One lab each week. Corequisite(s): A Geo 330. Spring semester only.

A Geo 350 Environmental Geochemistry (4)

Contemporary topics are used to develop concepts of geochemical processes operating in Earth’s environmental system. These topics (a) PCBs in the Upper Hudson River, (b) biogeochemical cycles in the global climate system, and (c) geochemical constraints on long-term disposal of high-level, nuclear wastes. 3 hours per week in classroom setting + 2 hours per week of oral presentations by

students. [OD]

A Geo 395Z Writing in the Geological Sciences (1)

May be taken with any Geo course at the 300 or 400 level to fulfill a writing intensive version of that course. Students will have an opportunity for assistance during writing and revision of written material with the help of editorial assignments from the instructor. Corequisite(s): any A Geo 300 or 400 level course. Fall and spring semesters. [WI]

A Geo 400 Field Mapping (4)

Supervised geological mapping. Three weeks of field work (off campus) followed by independent study and laboratory sessions for preparation of report (in Albany). Field work starts in early August; laboratory sessions once a week in first quarter of fall semester. Prerequisite(s): A Geo 230, 330; or permission of instructor.

A Geo 420 Instrumental Analysis in Environmental Science (3)

A hands-on introduction to instrumental analysis in earth science. Lecture topics include basic principles of spectroscopy, chromatography, mass spectrometry, sampling methods, and error estimation with specific applications to environmental science and geology. In laboratory, students will gain hands-on experience with ion chromatography, atomic absorption spectrometry, carbon analysis, and other methods. Provides a foundation for research projects in the senior year. Two hours lecture/2 hours laboratory each week. Prerequisite(s): A Mat 108 and A Geo 350 or permission of the instructor. S/U graded

A Geo 435 Geohydrology (3)

Introduction to surface water hydrology and ground water hydrogeology. Topics to be covered include, stream hydrograph analysis, flood plain determination, drainage basin analysis, aquifer characterization, pump test analysis, groundwater chemistry and tracers, contaminant hydrogeology, regulatory policy, and introduction to groundwater modeling. Prerequisite(s): A Mat 112, A Chm 120N or permission of instructor. Spring semester only.

A Geo 450 Climate Change (4)

Introduction to the field of Paleoclimatology. Focus will be on the use of sediments and other biological and geological archives to reconstruct environmental, climatic, and oceanographic change over a range of time scales. Lecture will also provide an introduction to the fields of climatology, age dating techniques, climatic/ environmental proxies (tracers), micro-paleontology, and time-series analysis. In addition to lectures, the class will involve review of current scientific studies, class presentations by each student, and a review paper on a relevant topic of choice. 3 lectures each week and 2 hours each week of oral presentations by students; Prerequisites: A Chm 120N, A Mat 108, or permission of the instructor. This course satisfies the General Education requirement in Oral Discourse. Fall semester only.

A Geo 455 Special Topics (2-3)

A structured program of reading and seminars leading to an in-depth understanding of a chosen topic in geology. Prerequisite(s) A Geo 210, 230, or 230Z; and permission of instructor. Students may repeat course once for an additional two or three credits. Fall or Spring semester.

A Geo 466 Marine/Estuary Systems (3)

Interdisciplinary study of marine and estuary systems with a focus on marine/estuary sedimentology and biogeochemistry. Additional study of lacustrine systems will be integrated into the class. In addition to lectures, the class will involve review of current scientific studies, a class presentation by each student, and a review paper on a relevant topic of choice. 3 lectures each week. Prerequisites: A Geo 100N, A Chm 120N, A Geo210, or permission of the instructor

A Geo 470 Tectonics (4)

Seismologic basis for plate tectonics, kinematics of plate motions, paleomagnetism. Study of modern mid-ocean ridges, magmatic arcs, transforms, and collisional belts. Three lectures and one lab per week. Prerequisite(s): A Geo 230, 330; or permission of instructor. Fall semester only.

A Geo 497 Independent Study (1-3)

Field or laboratory investigation of a chosen geologic problem, including the writing of a research report to be undertaken during the senior year. Prerequisite(s): permission of instructor. Students may repeat this course once for additional credits. Fall or spring semesters.

A Geo 498 Undergraduate Honors

Research (3)

Supervised research for undergraduates admitted to the Department Honors Program. To be taken summer and/or fall semester at beginning of senior year. Written proposal for research must be approved no later than end of spring semester of junior year. Prerequisite(s): Permission of instructor and chair. Fall and spring semesters.

A Geo 499 Seminar in Geology (1)

Oral presentation by students of a research topic: attendance at weekly seminar given by other students in this course, and A Geo 500, and regular attendance at geological science seminars given by outside speakers [approximately once weekly in semester]. Students admitted to the Departmental Honors Program must take this course in the last three semesters of their degree program. Fall and spring semesters.