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## EARTH SCIENCES

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### FACULTY

**Chairperson:** Professor Jacek Sulanowski

#### **Graduate Program**

**Coordinator:** Associate Professor Peter Saccocia

**Professor:** Richard Enright

#### **Associate**

**Professor:** Michael Krol

#### **Assistant**

**Professor:** Robert Cicerone

**Department Telephone Number: 508.531.1390**

**Location: Conant Science Building, Room 308A**

**Web site: [www.bridgew.edu/EarthSciences/](http://www.bridgew.edu/EarthSciences/)**

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### DEGREE PROGRAMS

- BA in Earth Sciences
- BS in Earth Sciences  
Concentrations: Environmental Geosciences, Geology
- BS in Chemistry/Geology (offered jointly with the Department of Chemical Sciences)
- MAT General Science
- MAT - Physical Sciences

### UNDERGRADUATE MINORS

- Earth Sciences
- Geophysics\*

\*Interdisciplinary Minor

The Department of Earth Sciences offers several undergraduate programs in the earth and environmental sciences. Majors in the BS earth sciences program may elect a concentration in environmental geosciences or geology. The BA or BS earth science programs may also be taken as a double major with education. In addition, a program in chemistry-geology, and a preprofessional program in oceanography are available.

The Earth Sciences faculty have a wide range of expertise within the geosciences and are actively engaged in research. The department includes faculty with extensive background and experience in the realm of field work, laboratory investigations, and theoretical work, including computer modeling. This diversity supports a modern

curriculum and provides numerous opportunities for students to extend their education beyond the confines of the traditional classroom.

Departmental faculty collaborate with scientists from other academic institutions to increase the number and variety of research opportunities for students. One member of the faculty is a Guest Investigator at the Woods Hole Oceanographic Institution. This appointment generates research opportunities for students in marine geochemistry, geology, and oceanography and includes sea-going expeditions. Another faculty member collaborates with the Earth Resources Laboratory in the Department of Earth, Atmospheric and Planetary Sciences at the Massachusetts Institute of Technology. The latter collaboration creates student research opportunities in geophysics, which includes projects focused on earthquake generation. The research program of a third faculty member enables additional undergraduate research opportunities in the fields of petrology and tectonics with a focus on the geology of both the Appalachian and Rocky Mountains. The department also supports research within the realm of sedimentology and paleontology. This includes course-based research projects involving both field investigations and laboratory analysis of sediment transport and deposition, particularly within the coastal environment.

The department has a long history of active engagement within the cutting-edge field of remote sensing and supports these activities with both traditional courses and numerous applied research opportunities. In this regard, the department has been selected as the only one in the state college system in Massachusetts to participate in the National Aeronautics and Space Administration (NASA) sponsored Joint Venture (JOVE) program. This distinction led to collaborations with the Jet Propulsion Laboratory on remote sensing projects in Mexico, Alabama, and Southeastern Massachusetts and the Goddard Space Flight Center on bolide impacts. Similar research projects, performed by both faculty and undergraduate students, are on-going today.

The department is committed to providing undergraduate students the opportunity to perform research with a faculty mentor. Each year, earth science students are involved in research and present their work at professional conferences organized by both regional and national geologic organizations. These opportunities help to propel our students into rewarding careers and excellent graduate programs.

Modern equipment supports the department's curriculum, including laboratory courses and undergraduate research projects. This equipment includes: (1) an X-ray

Diffractometer with powder cameras, (2) thin sectioning equipment; (3) new polarizing and stereoscopic microscopes; (4) a research grade Olympus polarizing microscope complete with a digital camera and image analysis software; (5) a proton precession magnetometer; (6) a seismic refraction unit; (7) an AS-I earthquake seismometer; (8) a Frantz Isodynamic Separator; (9) a 14-foot coastal research vessel; (10) a portable gamma-ray spectrometer; (11) a portable visible-near infrared spectroradiometer (12) a Sunsparc 20 UNIX work station; (13) a SunBlade 150 UNIX workstation; (14) GPS surveying equipment and (15) groundwater and stream water sampling/monitoring equipment.

Finally, our close relations with the Department of Chemical Sciences have facilitated access to more specialized instrumentation used to investigate geochemical problems. This includes an atomic absorption spectrometer, an ultraviolet-visible spectrophotometer and a gas chromatograph/mass spectrometer.

In addition to course related laboratory spaces, the department has several smaller specialized laboratories to support research activities. These include a well-equipped remote sensing laboratory, a geochemistry and petrology laboratory, a fine particle sedimentology laboratory, and extensive facilities for the preparation of rock samples for numerous analyses.

Earth sciences faculty are using Bridgewater State College's sophisticated computer facilities for classroom instruction, including demonstrating and displaying web-based and self-authored material and models. In a growing number of courses, students may submit assignments online, and in some courses, a majority of class time is spent in "virtual classrooms." To learn more, visit the department Web site at [www.bridgew.edu/depts/EarthSciences/](http://www.bridgew.edu/depts/EarthSciences/).

The department boasts an active Earth Sciences and Geography Club that sponsors both local (Museum of Comparative Zoology at Harvard University), regional (New Hampshire's White Mountains), national (Hawaii), and international (Canada, Iceland, Mexico) field trips. Students may also qualify for Sigma Gamma Epsilon, the national earth science honor society.

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## UNDERGRADUATE PROGRAMS

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### EARTH SCIENCES MAJOR

The major in Earth Sciences is a solid broad-based program that provides the student with an understanding and appreciation of the physical aspects of the earth and earth processes. Career opportunities for graduates exist in federal, state and local government service, industry, and environmental studies both with regulatory agencies and consulting firms. Teaching in the elementary, middle and secondary schools is another option. Many of our earth science majors have been awarded full fellowships at leading graduate schools. In addition, the faculty have an extensive program of undergraduate research, and many students have presented the results of their undergradu-

ate research at various national meetings. Some of this research has been funded, and students are encouraged to contact the faculty if interested. Internships are also available for those students desiring to prepare themselves for employment upon graduation. Interested students are encouraged to contact the earth science/geology faculty – Drs. Cicerone, Enright, Krol, Saccocia and Sulanowski for more information about earth science/geology programs.

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### EARTH SCIENCES MAJOR – BACHELOR OF ARTS

EASC 100 Physical Geology  
EASC 101 Historical Geology  
EASC 210 Oceanography  
EASC 215 Solar System Astronomy  
EASC 280 Vertebrate Paleontology  
EASC 300 Excursions in Geology  
EASC 400 Earth Systems Science I  
EASC 410 Earth Systems Science II  
GEOG 221 Meteorology

#### Earth Science Elective Requirement:

One earth science elective course at the 200, 300, or 400 level

#### Cognate requirements:

MATH 100 Precalculus Mathematics (or equivalent passing score on the mathematics placement test)  
CHEM 102 Chemistry in Everyday Life  
or  
CHEM 131 Survey of Chemistry I  
Any one biology or physics course

Not more than one grade of "D" in the major, taught in the department, shall be accepted to fulfill the requirements for this program.

### Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the "Undergraduate Academic Programs" section of this catalog. For additional graduation requirements, see the "Undergraduate Academic Policies" section of this catalog.

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### EARTH SCIENCES MAJOR – BACHELOR OF SCIENCE

#### Earth science core courses required:

EASC 100 Physical Geology  
EASC 101 Historical Geology

EASC 210 Oceanography  
 EASC 215 Solar System Astronomy  
 EASC 240 Hydrology  
 EASC 280 Vertebrate Paleontology  
 EASC 284 Geomorphology  
 EASC 300 Excursions in Geology  
 EASC 400 Earth Systems Science I  
 EASC 410 Earth Systems Science II  
 GEOG 221 Meteorology

**Additional earth science course required:**

One earth science elective course at the 200, 300, or 400 level.

**Cognate requirements:**

CHEM 141-142 Chemical Principles I and II  
 PHYS 181-182 Elements of Physics I and II  
 or  
 PHYS 243-244 General Physics I and II  
 MATH 141-142 Elements of Calculus I and II  
 or  
 MATH 151-152 Calculus I and II

Not more than one grade of “D” for a course in the major, taught in the department, shall be accepted to fulfill the requirements for this program.

**Core Curriculum Requirements**

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

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**ENVIRONMENTAL GEOSCIENCES CONCENTRATION**

This concentration is designed to provide students with a fundamental understanding of earth processes as well as the specific tools which they will employ as environmental geoscience professionals. Career opportunities for graduates exist in federal, state and local government service, industry and environmental studies both with regulatory agencies and consulting firms. The selection of appropriate elective courses within the major as well as in the cognate disciplines of biology and chemistry will prepare the student for environmental work related to the detection and monitoring of pollutants as well as for remediation of affected areas.

EASC 100 Physical Geology  
 EASC 101 Historical Geology  
 EASC 240 Hydrology  
 EASC 283 Structural Geology  
 EASC 284 Geomorphology

EASC 372 Mineralogy  
 EASC 476 Sedimentology and Stratigraphy  
 EASC 496 Seminar in Geology

Plus a minimum of four other earth science courses selected with the **written concurrence of the adviser**. Other courses may be added or approved as substitutes **with approval of the adviser**.

Minimum cognate requirements include:  
 MATH 141-142 Elements of Calculus I-II  
 or  
 MATH 151-152 Calculus I-II  
 CHEM 131-132 Survey of Chemistry I-II  
 or  
 CHEM 141-142 Chemical Principles I-II  
 PHYS 181-182 Elements of Physics I-II  
 or  
 PHYS 243-244 General Physics I-II  
 or

Two approved biology courses  
 Students are also encouraged to take the following courses:

BIOL 117 The Biological Environment  
 BIOL 225 Ecology  
 BIOL 240 Plant Morphology  
 BIOL 327 Wetlands Biology  
 CHEM 343-344 Organic Chemistry I-II  
 ENGL 201 Technical Writing I

**Core Curriculum Requirements**

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the “Undergraduate Academic Programs” section of this catalog. For additional graduation requirements, see the “Undergraduate Academic Policies” section of this catalog.

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**GEOLOGY CONCENTRATION**

The most comprehensive of all of the earth science programs within the Commonwealth, this concentration provides students with an understanding of the physical and chemical aspects of the earth and its internal as well as surface processes. Career opportunities for graduates exist in federal, state and local government service, industry and environmental studies both with regulatory agencies and consulting firms. With the selection of appropriate electives, students will be prepared for government service, for environmental work related to the detection and monitoring of pollutants as well as for remediation of affected areas, and for careers in such fields as environmental geology, mining or petroleum geology and hydrology. This concentration gives students a solid background in geology and the cognate

sciences required to successfully pursue graduate work at leading universities.

EASC 100 Physical Geology  
EASC 101 Historical Geology  
EASC 283 Structural Geology  
EASC 284 Geomorphology  
EASC 372 Mineralogy  
EASC 463 Petrology  
EASC 475 Paleontology  
EASC 496 Seminar in Geology

Four additional earth science courses **selected with the adviser's approval**

Plus:

MATH 151-152 Calculus I-II

or

MATH 141-142 Elements of Calculus I-II

CHEM 141-142 Chemical Principles I-II

or

CHEM 131-132 Survey of Chemistry I-II

Physics or Biology:

PHYS 243-244 General Physics I-II

or

PHYS 181-182 Elements of Physics I-II

or

Two semesters of biology courses **selected with the adviser's approval**

Not more than one "D" for a semester course in the major, taught in the department, shall be accepted to fulfill the requirements for this program.

### Core Curriculum Requirements

A minimum of 120 earned hours is required for graduation. These earned hours include Core Curriculum Requirements as specified in the "Undergraduate Academic Programs" section of this catalog. For additional graduation requirements, see the "Undergraduate Academic Policies" section of this catalog.

### CHEMISTRY-GEOLOGY MAJOR

A major in chemistry-geology is offered jointly with the Department of Chemical Sciences. See the catalog section "Interdisciplinary and Preprofessional Programs" for details.

### EARTH SCIENCES MINOR

EASC 100 Physical Geology  
EASC 101 Historical Geology

Four additional earth sciences courses (**departmental approval required**)

*School of Arts and Sciences*

### GEOPHYSICS MINOR

A minor in geophysics is jointly offered with the Department of Physics. For further information, contact the department chairpersons.

### MINOR IN SECONDARY EDUCATION (HIGH SCHOOL, MIDDLE SCHOOL OR PREK-12 SPECIALIST)

Students may minor in secondary education (high school, middle school or PreK-12 specialist). Successful completion of this minor will lead to Massachusetts Initial Teacher Licensure. Please refer to the "Department of Secondary Education and Professional Programs" for specific teacher licensure and program requirements.

### DOUBLE MAJOR WITH ELEMENTARY EDUCATION, EARLY CHILDHOOD EDUCATION OR SPECIAL EDUCATION

Students may choose a double major in earth sciences and elementary education, early childhood education or special education for licensure purposes. Please contact the Department of Earth Sciences and the appropriate education department for further information.

## GRADUATE PROGRAMS

*Graduate Program Coordinator: Dr. Peter Saccoccia*

### MASTER OF ARTS IN TEACHING EARTH SCIENCES

This program is inactive.

### GENERAL SCIENCE

For current information concerning this program, consult the "Physics" section of this catalog.

### PHYSICAL SCIENCE

The MAT in Physical Science degree was developed for high school and middle school subject area teachers who have an initial license in chemistry, earth science or physics and are seeking a professional license in the Commonwealth of Massachusetts. This MAT program is defined to meet the "appropriate master's degree" requirement, which is part of the criteria for professional stage licensure, as set forth in the most recent Massachusetts Department of Education licensure regulations.

Students should consult the "School of Graduate Studies" section of this catalog for information regarding program policy and procedures.

For current information concerning program requirements, consult the "Physics" section of this catalog.