



THE UNIVERSITY
OF IOWA

GENERAL CATALOG

1992-1994



Financial support comes from research assistantships, teaching assistantships, scholarships, individual research grants, or other departmental or college funds. All students are encouraged to do some teaching as part of their development as scientists and teachers.

Medical Scientist Training Program

Students may combine study toward an M.D. and a Ph.D. in genetics. Information about this program is available from the director of the Medical Scientist Training Program in the College of Medicine.

Departmental Ph.D. Programs

The Departments of Biochemistry, Biological Sciences, Physiology and Biophysics, and Microbiology offer degree programs in which students may specialize in a particular aspect of genetics. See the appropriate departmental sections in the *Catalog* for information about these programs.

Courses

The following genetics courses are open to graduate students. Not all courses are offered every year.

2:125 Cytogenetics	2 s.h.
2:131 Evolution	4 s.h.
2:160 Genetics and Biogenesis of Cell Organelles	3 s.h.
2:161 Plant Molecular Biology	3 s.h.
2:162 Population Genetics and Molecular Evolution	3 s.h.
2:164 Seminar in Plant Molecular Biology	2 s.h.
2:171 Molecular Genetics	4 s.h.
2:172 Topics in Molecular Genetics	2 s.h.
2:176 Topics in Eukaryotic Molecular Biology	2 s.h.
2:195 Pattern Formation in Development	2 s.h.
2:215 Genetics Seminar (same as 61:215, 99:215)	0-2 s.h.
2:260 Developmental Genetics	2 s.h.
61:179 Bacterial Diversity	4 s.h.
61:268 Molecular Biology of Animal Viruses and the Eukaryotic Cell	3 s.h.
61:270 Topics in Molecular Biology	arr.
70:161 Human Genetics	2 s.h.
99:130 Biochemistry and Molecular Biology II	4 s.h.
99:223 Gene Expression	1-2 s.h.
127:216 Ethics in Science	1 s.h.
127:301 Graduate Research in Genetics	arr.
142:215 Molecular Biology II	3 s.h.

GEOGRAPHY

Chair: Michael L. McNulty
Professors: John W. Fuller, Joel L. Horowitz, James B. Lindberg, Michael L. McNulty, R. Rajagopal, David R. Reynolds, Gerard Rushton
Associate professors: Marc P. Armstrong, Rex D. Honey, George P. Mairanson, Frank H. Weirich, Rebecca S. Roberts, Abdi Samatar

Assistant professor: Claire Pavlik
Adjunct faculty: David E. Osterberg
Undergraduate degrees: B.A., B.S. in Geography; minor in Geography
Graduate degrees: M.A., Ph.D. in Geography

Geography seeks to explain spatial organization and areal differentiation through detailed studies of significant patterns and processes. The discipline is concerned with "place" or "environment" and ongoing forces that promote change within and between human and physical systems. Geography is a composite science, requiring a broad base of knowledge from many related disciplines. It also is an analytical science that seeks answers to specific research questions from a distinctly geographic perspective.

Students of geography find that they develop insights and methods of inquiry that are particularly applicable to understanding many of the complex problems confronting societies. For instance, the distribution and consumption of natural resources, air and water pollution, the growth and development of urban areas, increasing populations, transportation problems, spatial inequalities, location of services, and conflicts between nations are some of the issues dealt with by geographers.

Studies in geography also provide students with concepts and methods for organizing such spatial units as urban areas, marketing regions, school districts, health service areas, drainage basins, and other areas of concern. Thus, geographers can make substantial contributions toward understanding the behavior of individuals and of societies and their relations with the environment.

Career opportunities for majors in geography exist in many branches of government and in business. In demand are persons capable of dealing with resource management, regional development, market area analysis, and problems in distribution and spatial interaction of physical, economic, social, and political phenomena.

Courses in geography are commonly required of students preparing to teach at the elementary and secondary school levels, those who want to work in urban and regional planning, and as a background for many related professions, including law, health care, environmental or transportation engineering, and business administration.

Undergraduate Programs

The geography faculty has developed an undergraduate instructional program that serves students majoring or minoring in geography, as well as those concentrating in other disciplines who are interested in elective geography courses as part of a liberal education. The department also participates in interdepartmental programs with global, urban, and environmental components.

Bachelor's Degrees

Each student majoring in geography selects one of the following three concentration areas: urban and regional studies, international development studies, or environmental studies.

Majors may work toward either a Bachelor of Science or a Bachelor of Arts. Students who plan advanced training or careers in geography should elect the B.S. Those with a liberal arts objective may elect either the B.A. or B.S.

General Requirements

All geography majors must complete one of the following computer programming courses.

22C:7 Introduction to Computing with FORTRAN	3 s.h.
22C:16 Introduction to Programming with Pascal	4 s.h.

Bachelor of Science students must satisfy a mathematics requirement consisting of one of the following pairs of courses.

22M:15 Mathematics for the Biological Sciences	4 s.h.
and	
22M:16 Calculus for the Biological Sciences	3 s.h.

or

22M:25 Calculus I	4 s.h.
and	
22M:26 Calculus II	4 s.h.

or

22M:35 Engineering Calculus I and	4 s.h.
22M:36 Engineering Calculus II	4 s.h.

With the consent of the geography faculty, students may fulfill the computer programming and mathematics requirements by taking equivalent courses with objectives similar to these.

In addition, all geography majors must complete one of the three course sequences described below. Students are advised to pay close attention to the prerequisites of the intermediate and advanced courses in each sequence and to develop programs of study that ensure timely satisfaction of the prerequisites of required courses.

Urban and Regional Studies

The undergraduate program in urban and regional studies is designed for students who are preparing for positions in government and private business, graduate programs in geography, or professional programs such as urban and regional planning, business administration, applied policy analysis, or regional science.

Courses cover location theories and their application to applied problems, such as assessing sites for development potential, finding the best locations for public and private facilities, developing plans for regions and communities, evaluating improved transport services in a city or region, and forecasting the populations of small areas.

Methods for solving these applied problems are based on a thorough understanding of the processes of urban and regional development, the roles of individuals and institutions in effecting change, and the processes through which policy decisions are reached. Requisite skills are developed in quantitative analysis, development and management of geographical information systems, and computer methods.

Opportunities for experience in working with real problems are included.

Students concentrating on urban and regional studies are required to complete the following sequence of courses.

INTRODUCTORY COURSES

- 44:1 Introduction to Human Geography 4 s.h.
- 44:3 Introduction to Physical Geography 4 s.h.

At least one of these:

- 44:11 Introduction to Social Geography 3 s.h.
- 44:15 Introduction to Political Geography 3 s.h.
- 44:30 Introduction to Economic Geography 3 s.h.

INTERMEDIATE COURSES

At least two of these:

- 44:130 Location Strategy of Firms 3 s.h.
- 44:132 Industrial Location 3 s.h.
- 44:133 Introduction to Economics of Transportation 3 s.h.
- 44:135 Urban Geography 3 s.h.

METHODS COURSES

All of these:

- 44:108 Statistical Methods of Geographical Analysis 3 s.h.
- 44:109 Computer Methods in Geographical Analysis 3 s.h.
- 44:150 Undergraduate Seminar for Geography Majors 3 s.h.

ADVANCED COURSES

Students are required to take at least one course each from group A and B.

Group A

- 44:134 Methods of Transportation Analysis 3 s.h.
- 44:137 Economic Theory of Location 3 s.h.
- 44:139 Economic Analysis of Urban Spatial Structure 3 s.h.

Group B

- 44:166 Contemporary Europe: Interaction and Change 3 s.h.
- 44:171 Geography of the U.S. and Canada 3 s.h.
- 44:175 Locational Conflict 3 s.h.

International Development Studies

The undergraduate program in international development studies is designed for students interested in the processes of economic, social, and political development, particularly as they affect Third World countries. This concentration gives students a better understanding of regional and national development in international and cross-cultural perspective. Students who are interested in the problems of developing countries and who wish to examine competing theories of development intended to explain international and regional inequalities will find this concentration helpful.

Students concentrating on international development studies are required to complete the following sequence of courses.

INTRODUCTORY COURSES

- 44:1 Introduction to Human Geography 4 s.h.
- 44:3 Introduction to Physical Geography 4 s.h.

INTERMEDIATE COURSE

- 44:94 International Development 3 s.h.

METHODS COURSES

- 44:108 Statistical Methods of Geographical Analysis 3 s.h.
- 44:109 Computer Methods in Geographical Analysis 3 s.h.
- 44:150 Undergraduate Seminar for Geography Majors 3 s.h.

ADVANCED COURSES

- 44:194 Geographic Perspectives on Development 3 s.h.

At least two of these:

- 44:162 Planning and Geography of Underdevelopment 3 s.h.
- 44:163 Geography of the Newly Industrializing Countries 3 s.h.
- 44:172 Development Planning and Policy 3 s.h.

One of these:

- 44:161 African Development 3 s.h.
- 44:164 Geography of the Middle East 3 s.h.

Environmental Studies

The undergraduate program in environmental studies is designed for students who have career expectations or personal interests in resource management or environmental protection, or who are interested in physical geography. The program provides a knowledge of physical, chemical, and biological processes in landform development, atmospheric conditions, hydrology, soil development, and biotic communities. It stresses the interrelationships among those processes and helps students acquire knowledge necessary to assess the impact of human activities on physical systems.

Training in field observation, quantitative analysis, computer methods, and cartographic representation are included in this concentration. The program also provides a sound foundation for graduate- or professional-level studies. This undergraduate program has been designed as an introduction to the graduate-level physical geography and water resources subprograms of the Department of Geography.

Students concentrating in environmental studies must complete the following sequence of courses. Students are required to take 15 semester hours of intermediate and advanced courses.

INTRODUCTORY COURSES

- 44:1 Introduction to Human Geography 4 s.h.
- 44:3 Introduction to Physical Geography 4 s.h.

- 44:19 Contemporary Environmental Issues 3 s.h.
- 29:5 Chemistry and Physics of the Environment (or a more advanced course in chemistry or physics) 3 s.h.

INTERMEDIATE COURSES

- 44:101 Climatology 3 s.h.
- 44:102 Earth Surface Processes 3 s.h.
- 44:103 Biogeography 3 s.h.
- 44:121 Natural Resources Policy 3 s.h.
- 44:122 Environmental Conservation in the United States 3 s.h.

METHODS COURSES

- 44:108 Statistical Methods of Geographical Analysis 3 s.h.
- 44:109 Computer Methods in Geographical Analysis 3 s.h.
- 44:150 Undergraduate Seminar for Geography Majors 3 s.h.

At least one of these:

- 44:107 Maps and Mapping 2 s.h.
- 44:113 Geographic Information Systems 3 s.h.

ADVANCED COURSES

- 44:123 Landscape Ecology 3 s.h.
- 44:125 Environmental Impact Analysis 4 s.h.
- 44:126 Water in the Biosphere 3 s.h.
- 44:127 Water Quality: Science, Technology, and Policy 3 s.h.
- 44:128 Drainage Basin: Form and Process 3 s.h.
- 44:129 Water Resources Management 3 s.h.
- 44:180 Field Studies arr.

RELATED COURSE WORK

Under the direction of an adviser, students should select at least 12 semester hours of courses from one of the following clusters.

Biophysical Systems

- 2:100 Land Plants: An Evolutionary Survey 4 s.h.
- 2:111 Plant Ecology 4 s.h.
- 2:116 Field Ecology 4 s.h.
- 2:119 Plant-Animal Interactions 3-4 s.h.
- 12:108 Introduction to Oceanography 2 s.h.
- 12:110 Introduction to Remote Sensing 3 s.h.
- 12:128 Quaternary Palynology and Paleobotany 4 s.h.
- 12:166 Hydrogeology and Groundwater Quality 3 s.h.
- 12:172 Glacial and Pleistocene Geology 3 s.h.
- 12:173 Quaternary Environments 3 s.h.
- 12:179 Engineering Geology 3 s.h.

Environmental Engineering

- 53:71 Principles of Hydraulics 2 s.h.
- 53:78 Principles of Hydrology 2 s.h.
- 53:150 Principles of Environmental Engineering 3 s.h.
- 53:152 Environmental Chemistry 3 s.h.
- 53:153 Environmental Chemistry Laboratory 3 s.h.
- 53:154 Environmental Microbiology 3 s.h.
- 53:155 Limnology 3 s.h.
- 53:178 Hydrometeorology 3 s.h.

Environmental Management

6E:103 Microeconomics	3 s.h.
6E:105 Macroeconomics	3 s.h.
6E:119 Economics of the Government Sector	3 s.h.
6E:133 Environmental and National Resource Economics	3 s.h.
6J:100 Administrative Management	3 s.h.
6J:161 Individual Behavior in Organizations	3 s.h.
6J:163 Organizational Design and Operations	3 s.h.
102:101 Introduction to Planning and Policy Development	3 s.h.
102:123 Introduction to Environmental Policy and Planning	3 s.h.
53:204 Theories of Environmental Policy and Assessment	3 s.h.

Environment and Development

44:94 International Development	3 s.h.
44:157 Third World Development Support	3 s.h.
44:161 African Development	3 s.h.
44:162 Planning and Geography of Underdevelopment	3 s.h.
44:163 Geography of the Newly Industrializing Countries	3 s.h.
44:172 Development Planning and Policy	3 s.h.
44:194 Geographic Perspectives on Development	3 s.h.
30:150 The Political Economy of the Third World	3 s.h.
113:138 Economic and Political Development: Women's Roles	3 s.h.
113:143 Environment and Culture	3 s.h.
113:151 Sociology of the Third World	3 s.h.
113:156 Women's Roles in Cross-Cultural Perspective	3 s.h.

Honors

The honors major is for students of superior ability who want to pursue studies beyond the typical undergraduate level. To graduate with honors in geography, a student must be admitted to both the University Honors Program and the honors program in geography by the first semester of the senior year, and must:

maintain a grade-point average of 3.20 in all University work and a 3.40 in geography; and

prepare and successfully defend an honors thesis.

The thesis consists of original research under the direction of a faculty member and is assessed by a three-member faculty committee.

Students complete the thesis through a year-long tutorial in 44:198 Honors Tutorial and 44:199 Honors Thesis. The senior course 44:150 Undergraduate Seminar for Geography Majors may be substituted for 44:199 Honors Thesis, provided the student continues work on the thesis under the direction of a faculty member.

Minor

To minor in geography, a student must complete at least 15 semester hours in geography courses with a minimum grade-point average of 2.00. Twelve of the 15 must be

taken at The University of Iowa in 100-level courses. Minors are encouraged to select one of the department's three areas of concentration—urban and regional studies, international development studies, or environmental studies—and to take courses from those listed in that concentration. Minors who wish further assistance in selecting courses may contact the department secretary to request assignment of a minor adviser.

Cooperative Education Program

The Department of Geography is a participant in the University's Cooperative Education Program, which provides opportunities for both undergraduate and graduate students to secure cooperative training assignments related to their academic programs.

Courses for the Nonmajor

Students in the College of Liberal Arts as well as other areas of the University may find geography courses meaningful to their own programs of study. The beginning-level courses 44:1 Introduction to Human Geography, 44:11 Introduction to Social Geography, 44:19 Contemporary Environmental Issues, and 44:30 Introduction to Economic Geography are approved for the General Education Requirement in social sciences; 44:157 Third World Development Support is approved for the General Education Requirement in foreign civilization and culture; 44:161 African Development is approved for the General Education Requirements in social sciences and foreign civilization and culture; and 44:3 Introduction to Physical Geography is approved for the General Education Requirement in natural sciences. These courses serve as part of a liberal education.

Other courses also may be attractive as individual electives. These include 44:15 Introduction to Political Geography, 44:35 World Cities, 44:126 Water in the Biosphere, 44:128 Drainage Basin: Form and Process, and 44:133 Introduction to Economics of Transportation.

Graduate Programs

The department's graduate programs prepare students to carry on creative and productive research in selected areas of geography involving the use and further elaboration of theory. They also prepare students for positions in research, teaching, or an area of applied geography. Success in achieving these goals has been demonstrated by the strong demand for University of Iowa graduates to fill positions on college and university faculties, in private research organizations, and in business and government.

The department offers specialized instruction in the teaching of geography at the college level for those pursuing academic careers. Opportunities are provided for all graduate students to gain practical teaching experience through service as departmental teaching assistants or graduate instructors.

Master of Arts

The B.A. or B.S. degree in geography is not a prerequisite for entry into the program, but students are expected to have an undergraduate background relevant to pursuing graduate work. A strong analytical background in any of the social or environmental sciences and an interest in exploring the regional and spatial perspectives characterizing modern geography are more important than the particular disciplinary orientation of the student's baccalaureate degree. Depending on the strength and suitability of their prior training, however, students may be required to take courses that are prerequisites for courses in their elected subprograms. Credit received for such courses cannot be applied toward the 30 semester hours required for the M.A.

Each of the M.A. subprograms is designed to be completed in four semesters. This means that the student typically will accumulate 40 to 48 semester hours of graduate credit in completing the M.A. Students are advised to use these additional hours to elect graduate courses in other subprograms in geography and/or in other University departments and programs, thereby tailoring their programs of study to their individual interests.

The department offers six M.A. subprograms: locational analysis, physical geography, political geography, regional development, transportation systems analysis, and water resources. These specialties are designed for students seeking positions in community planning, health planning, development planning in the Third World, water resources management, and transportation, as well as for those who intend to pursue the Ph.D.

Each subprogram cuts across some of the more traditional fields of geography and builds on the research specialties of the faculty. For example, topics of interest in urban geography are included in three subprograms—locational analysis, political geography, and regional development—while the traditional concerns of economic geography are included in locational analysis and regional development. The more quantitative perspectives of regional science are included in locational analysis and transportation systems analysis. The subprogram in physical geography emphasizes interacting processes and integrates field studies with computer modeling. The water resources subprogram builds on foundations in environmental science and political economy.

Although M.A. students pursue a program of study within one of the subprograms, they also must gain a basic proficiency in another. The M.A. emphasizes the acquisition of analytical skills and their application in research. Courses that provide necessary training in oral and written communication, computer programming and graphics, statistics, mathematics, and research methods are integral to the M.A. program. Students in the transportation subprogram may take additional electives that enable them to receive a transportation certificate in addition to their M.A.

General Requirements

The M.A. requires a minimum of 30 semester hours of graduate work, of which 15 semester

hours must be in courses numbered 200 or above. In addition to fulfilling the course requirements in one of the department's six subprograms, students must:

complete at least one course not in their own subprogram from the following introductory graduate courses: 44:121, 44:123, 44:125, 44:126, 44:128, 44:129, 44:134, 44:137, 44:175, 44:194, or 44:210;

enroll in the department's general colloquium series (44:350 Research Seminar: Staff) during each semester in residence;

satisfy the department's B.S. requirements or their equivalents in mathematics, statistics, and computer programming; and

complete, with a grade of B or better, at least one 3-semester-hour quantitative methods course from a list of courses approved by the faculty.

The M.A. may be earned with or without thesis, except in the physical geography and water resources subprograms, which require a thesis. A maximum of 6 semester hours of credit may be earned for thesis work.

Students who elect the M.A. without thesis must pass a written examination and, in most subprograms, an oral examination. For students electing the M.A. with thesis, the written examination can be waived and the thesis defense serves as the oral M.A. examination.

Subprogram Requirements

LOCATIONAL ANALYSIS

- 44:134 Methods of Transportation Analysis 3 s.h.
- 44:137 Economic Theory of Location 3 s.h.
- 6E:203 Microeconomics I 3 s.h.

Three of these:

- 44:216 Behavioral Analysis in Geography 3 s.h.
- 44:236 Travel Demand Modeling 3 s.h.
- 44:237 Urban Economics and Urban Spatial Structure 2 s.h.
- 44:285 Methods of Regional Analysis: Regional Science 3 s.h.
- 44:293 Advanced Location Theory 3 s.h.
- 44:330 Research Seminar: Location Theory arr.

PHYSICAL GEOGRAPHY

An M.A. thesis is required of all students in this subprogram.

- 44:113 Geographic Information Systems 3 s.h.
- 44:123 Landscape Ecology 3 s.h.
- 44:128 Drainage Basin: Form and Process 3 s.h.
- 44:328 Research Seminar: Physical Geography arr.
- 44:450 Thesis arr.

Two of these:

- 44:225 Water Resources Systems Analysis 3 s.h.
- 44:226 Advanced Biogeography/Landscape Ecology 3 s.h.
- 44:228 Advanced Earth Surface Processes 3 s.h.

Two from one of the following groups:

- 12:128 Quaternary Palynology and Paleobotany 4 s.h.
- 12:173 Quaternary Environments 3 s.h.
- 2:119 Plant-Animal Interactions 3-4 s.h.

or

- 12:132 Sedimentology 3 s.h.
- 12:172 Glacial and Pleistocene Geology 3 s.h.
- 53:170 Flow in Open Channels 3 s.h.
- 53:173 Mechanics of Sediment Transport 3 s.h.

or

- 53:152 Environmental Chemistry 3 s.h.
- 53:154 Environmental Microbiology 3 s.h.
- 53:155 Limnology 3 s.h.
- 53:251 Environmental Systems Modeling 3 s.h.

or

Equivalent group of courses

POLITICAL GEOGRAPHY

- 44:210 Philosophy and Epistemology in Geography 3 s.h.
- 44:273 Social Theory and Human Geography 3 s.h.
- 44:315 Research Seminar: Political Geography 3 s.h.

Three of these:

- 44:175 Locational Conflict 3 s.h.
- 44:221 Nature-Society Theory 3 s.h.
- 44:232 Advanced Industrial Geography 3 s.h.
- 44:262 Political Economy of Regional Development 3 s.h.
- 44:270 Jurisdictional Organization/Public Service Provision 3 s.h.

REGIONAL DEVELOPMENT

- 44:194 Geographic Perspectives on Development 3 s.h.
- 44:210 Philosophy and Epistemology in Geography 3 s.h.
- 44:262 Political Economy of Regional Development 3 s.h.
- 44:264 Agrarian Change and Rural Development in the Third World 3 s.h.
- 44:394 Research Seminar: Regional Development 3 s.h.

TRANSPORTATION SYSTEMS ANALYSIS

- *22S:120 Probability and Statistics 4 s.h.
- *6E:184 Introduction to Econometrics 3 s.h.
- 6E:203 Microeconomics I 3 s.h.
- 44:134 Methods of Transportation Analysis 3 s.h.
- 44:236 Travel Demand Modeling 3 s.h.
- 44:265 Transportation Regulation and Finance 3 s.h.
- 102:260 Transportation Policy and Planning 3 s.h.
- 102:261 Problems in Transportation and Land Use 3 s.h.
- 53:262 Urban Transportation Planning 3 s.h.

*Satisfies the M.A. and Ph.D. quantitative methods requirements.

WATER RESOURCES

- 44:329 Research Seminar: Water Resources arr.
- 44:450 Thesis (required of all students in the subprogram) arr.

The following courses, with at least 9 semester hours earned at the 200-level:

One of these:

- 44:126 Water in the Biosphere 3 s.h.
- 44:128 Drainage Basin: Form and Process 3 s.h.

Three of these:

- 44:121 Natural Resources Policy 3 s.h.
- 44:125 Environmental Impact Analysis 4 s.h.
- 44:127 or 44:227 Water Quality: Science, Technology, and Policy 3 s.h.
- 44:129 Water Resources Management 3 s.h.
- or
- 44:225 Water Resources Systems Analysis 3 s.h.
- 44:221 Nature Society Theory 3 s.h.

An additional sequence of three courses in social theory and regional development, systems analysis, or biophysical processes, chosen under the direction of a faculty adviser is required. This may include courses in other departments and may fill the out-of-subprogram requirement.

Doctor of Philosophy

The Doctor of Philosophy program is designed to prepare students for positions in college and university teaching and in advanced research. It provides programs of study leading to broad knowledge of a field of geography and its literature and special expertise in a specific subfield. The former usually represents the general area in which the Ph.D. holder seeks employment, whereas the latter represents his or her area of most active research involvement.

The Ph.D. is fundamentally a research degree and as such is constrained by the expertise of the faculty. At the Ph.D. level, the department is best known for its rigorous analytical orientation, particularly in the areas of locational analysis, spatial behavior, transportation, Third World regional development, urban political geography, physical geography, and water resources management and policy.

The Ph.D. is a four- to five-year, postbaccalaureate program, the first two years of which are identical to the department's M.A. program. Students can enter the program with advanced standing corresponding to their previous graduate training equivalent to that in the department's M.A. program. Students entering the program directly from the B.S. or B.A. must fulfill all departmental requirements for the M.A. except for the M.A. examination. In addition, students whose ultimate objective is the Ph.D. are required to:

complete at least 3 additional semester hours in graduate-level geography courses from those required or recommended for one of the department's subprograms that is not the student's general area of interest;

complete at least one additional quantitative methods course (3 semester hours) that is at a level above that required for the B.S. and is

chosen from a list of courses approved by the faculty (students in the Ph.D. program are advised to fulfill both the M.A. and Ph.D. quantitative methods requirements—a total of 6 semester hours—during their first year in residence);

complete one additional research seminar under the direction of a faculty member who is not directing the research seminar satisfying the student's M.A. requirement; and

register for the department's colloquium series, 44:350 Research Seminar: Staff, each semester that the student is in residence.

Before students can be admitted formally to candidacy for the Ph.D., they must submit an original research paper to the faculty for its approval. Students completing the M.A. with thesis can submit the M.A. thesis to fulfill this requirement. Students entering the program with an M.A. from another institution can submit theses or research papers completed elsewhere to fulfill the requirement. Students who initially enter the M.A. program with a terminal M.A. as their degree objective and who complete that program can enter the Ph.D. program by fulfilling the research paper requirement.

By the end of the M.A. portion of the program (typically the fourth semester for the student entering the program directly from the B.S. or B.A.), the student should submit a written report that includes an assessment of progress to date, an outline of the area of geography in which he or she intends to specialize, and a proposed plan of study for the remainder of his or her Ph.D. program. This report is prepared in consultation with the student's Ph.D. adviser and other members of the faculty in the student's general area. The plan of study is amended, as necessary, throughout the remainder of the student's program.

The remainder of the Ph.D. program includes the completion of the student's individual program of study designed to prepare him or her for a research career in a specific area of concentration. It consists of appropriate graduate courses, seminars, readings, and independent research in geography; courses in related disciplines; and courses that satisfy the tool requirements of the student's program of study.

Prior to taking the comprehensive examination, consisting of both written and oral components, the student must submit an "area review paper" to his or her Ph.D. committee. This paper, which must be approved by the student's Ph.D. adviser, consists of a critical review of research in the student's area of concentration. As such, it is a culminating step in a student's program of study as well as a statement of future research directions. The comprehensive examination covers both the student's area of concentration and his or her more general field in the discipline. After obtaining the approval of a dissertation supervisor, the student must submit a dissertation proposal to his or her dissertation committee for its critical comments and approval. The student then must complete and defend the dissertation.

Before receiving the Ph.D., students are expected to serve as both classroom instructors (or teaching assistants) and research assistants.

Admission

The department adheres to the general rules and regulations set forth in the *Manual of Rules and Regulations of the Graduate College*, and evaluates the applicant's undergraduate grade-point average, especially of his or her junior and senior years; scores on the Graduate Record Examination (GRE) General Test; three letters of recommendation; and an essay in which the applicant sets forth the reasons for wanting to study geography at The University of Iowa.

Ordinarily, applicants must have earned an undergraduate grade-point average of 3.00 or better to be admitted to either the M.A. or Ph.D. program in geography. Students from foreign countries or from undergraduate institutions that evaluate students on a basis other than grade-point average will be considered according to academic standing in their respective institutions.

Financial Aid

A number of graduate appointments as teaching or research assistants are available. Awards are based on merit. Students usually must have a combined score of 1100 on the GRE General Test verbal and quantitative sections and a 3.00 undergraduate or graduate grade-point average to be appointed to an assistantship. Applications for graduate appointments should be received by February 15.

Facilities

The department houses a geographic information systems and spatial analysis laboratory equipped with a variety of workstations, digitizers, and plotters. These UNIX, DOS, and Macintosh workstations support a variety of GIS software packages, including ARC/INFO, ERDAS, IDRISI, MAP, MAPINFO, Transcad, and GIS Plus. The department also participates in an advanced GIS facility in the Center for Global and Regional Environmental Research. Departmental computers are linked to the University's SYTEK broadband communication network, which provides access to graphics, data management, and analysis software on University IBM, PRIME, and VAX computer systems. Selected departmental systems have Ethernet Connections to facilitate data transfer.

Students also have access to a University computing cluster that contains IBM PCs, Macintosh computers, terminals, several printers, and a plotter. It is located on the same floor as the department offices.

For studies in water resources and physical geography, the department has laboratories for analysis of vegetation, sediment, soil, and water quality; a field station in California; and a variety of field equipment ranging from electronic data loggers to boats.

The map collection in the University's Main Library contains more than 115,500 maps, a total of 3,600 atlases and reference works, and about 100,000 aerial photographs, primarily of Iowa. The library is a depository for maps of the U.S. Army Topographic Command (formerly the Army Map Service).

The Geology Library contains approximately 70,000 maps, including both geologic maps and U.S. Geological Survey topographic maps. The Department of Geography has its own collection of topographic maps, maps of large urban centers, and aerial photographs for use by students in laboratory exercises.

Courses

Primarily for Undergraduates

- 44:000 Cooperative Education Training Assignment** 0 s.h.
- 44:1 Introduction to Human Geography** 4 s.h.
Application of geographic principles to contemporary social, economic, and political problems; urban growth; problems of the ghetto; diffusion of innovations; territoriality and perception. GER: social sciences.
- 44:3 Introduction to Physical Geography** 4 s.h.
Elementary principles of physical geography: physics of weather and climate, hydrological systems, geomorphological and geological forces, pedological processes and spatial factors in vegetation distribution; geographic explanation of physical environment, with principles applied to the human use system; environmental pollution and natural hazards. GER: natural sciences.
- 44:11 Introduction to Social Geography** 3 s.h.
Spatial considerations of population growth and distribution; minorities within a population; poverty; housing; social organization and disorganization; social systems including education, religion, recreation, medical, social services; diffusion of ideas and traits over space. GER: social sciences.
- 44:15 Introduction to Political Geography** 3 s.h.
Geographic principles applied to political and economic problems at international, national, local levels; topics include regional disparities in social well-being, service outputs of governments, political dimensions of environmental quality, spatial organization of political systems.
- 44:19 Contemporary Environmental Issues** 3 s.h.
Problems associated with population growth, technology, and resource consumption; protection of natural, historic, cultural resources; air pollution; water pollution; energy and environment; alternative approaches to the resolution of environmental problems; real-world case studies. GER: social sciences.
- 44:30 Introduction to Economic Geography** 3 s.h.
Location and spatial organization of the world's major types of economies; agriculture, energy and minerals, manufacturing, transportation; trade and service centers. GER: social sciences.
- 44:35 World Cities** 3 s.h.
Urbanization as a process; specific concepts and theories of urbanization through global patterns, regional urban systems, individual metropolitan areas. Offered spring semesters.
- 44:94 International Development** 3 s.h.
Theories of international development, political economy, development policy and planning; empirical analysis of conditions, policies, experiences of selected Third World countries. Prerequisite: 44:1.
- 44:100 Readings for Undergraduates** arr.
Supervised readings in geography. Consent of instructor required.

For Undergraduates and Graduates

- 44:101 Climatology** 3 s.h.
Boundary layer processes that drive atmospheric dynamics; exchanges of energy and water at simple and complex surfaces; global climate change records, theories, models; impacts of climate on society. Prerequisite: 44:3 or consent of instructor.
- 44:102 Earth Surface Processes** 3 s.h.
Basic geomorphic and environmental processes that shape the surface of the earth; emphasis on processes of weathering: mass movement such as creep, landslides, earth flow; erosion, transport, deposition by fluid agents such as wind, water, ice; methods used to study these physical processes. Prerequisite: 44:3 or a course in geology. Same as 12:102.

- 44:103 Biogeography** 3 s.h.
Distribution and abundance of plants and animals, spatial patterns and processes, and temporal dynamics of succession, response to climate change, and evolution; methods applied to the study of vegetation and plant community patterns. Prerequisite: 44:3 or 2:1 or consent of instructor. Same as 2:103.
- 44:107 Maps and Mapping** 2 s.h.
Qualities of a good map; types of maps for particular uses; major types of cartographic presentations; available tools for constructing maps; procedures for the compilation of maps and diagrams; laboratory experiences in compiling maps.
- 44:108 Statistical Methods of Geographical Analysis** 3 s.h.
Geographical data sources, data collection, spatial sampling, survey methods, descriptive spatial statistics, probability, inference, contingency analysis, variance analysis, linear regression, residual mapping, polynomial trend surface analysis, graphing, presentation.
- 44:109 Computer Methods in Geographical Analysis** 3 s.h.
Use of computers as a tool in geographical analysis; spatial data collection and analysis, mapping programs, and simulation models.
- 44:110 Spatial Organization** 3 s.h.
Approaches to spatial analysis of human activities and natural processes. Offered fall semesters.
- 44:113 Geographic Information Systems** 3 s.h.
Issues important to the establishment of geographic information systems: spatial data encoding, raster-vector options, spatial and attribute resolution, cartographic data models, linkages to spatial analysis procedures, display techniques for decision support, institutional setting. Prerequisite: 44:109.
- 44:121. Natural Resources Policy** 3 s.h.
Geographic, cultural, political, economic, ethical dimensions of natural resources policy; substantive and theoretical insights from the natural sciences, social sciences, humanities in building a conceptual framework for the analysis of current resource problems from a geographic perspective; U.S. natural resource problems and policy questions.
- 44:122 Environmental Conservation in the United States** 3 s.h.
Varied natural environments of the United States; problems arising from conflicting land uses; consideration of public land use policy, environmental impacts of different land uses, problems of habitat preservation and endangered species. Prerequisite: 44:3 or 44:19 or consent of instructor.
- 44:123 Landscape Ecology** 3 s.h.
Effects of spatial pattern on spatial processes in ecology; characteristics of matrix, patch, corridor; fragmentation, deforestation, habitat loss; spatial flows of energy, matter, genetic information; relationship to human impact, global climate change. Prerequisites: 44:103 or a 100-level course in ecology, and 44:108.
- 44:125 Environmental Impact Analysis** 4 s.h.
Environmental impact assessment methodologies; emphasis on cost-benefit-risk analysis, overlay and graphic techniques, optimal resource use, system simulation; field trips to local environmental control facilities. Prerequisites: 44:19, and 29:5 or equivalent.
- 44:126 Water in the Biosphere** 3 s.h.
Biotic aspects of water resources production; geographical basis of physical processes in drainage basins; spatial aspects of lotic dynamics; regional characterization of wetland structure and process. Prerequisite: 44:101 or 44:102 or 44:103 or 2:111.
- 44:127 Water Quality: Science, Technology, and Policy** 3 s.h.
Geographical perspectives in the study and interpretation of chemicals in water; primary and secondary drinking water standards; local, regional, national, international case studies in drinking water and health; socioeconomic and institutional considerations in designing water quality protection strategies. Prerequisites: 44:108 and senior standing, or consent of instructor.
- 44:128 Drainage Basin: Form and Process** 3 s.h.
Hydrological principles, stream channel processes, and fluvial geomorphology within the drainage basin system: spatial and temporal variations in water distribution, analyses of hydrological data, flow mechanisms, sediment transport, forecasting procedures, hydrograph construction and modeling. Prerequisites: 44:108, and 44:102 or a 100-level geology or hydraulics course.
- 44:129 Water Resources Management** 3 s.h.
Application of hydrological information in water resources management; aspects of water quantity and quality, groundwater availability, water use and treatment, resource development, political and administrative issues, and basin management problems—forestry, agriculture, urbanization, floods, droughts. Prerequisite: 44:121 or a 100-level political economy course.
- 44:130 Location Strategy of Firms** 3 s.h.
Theory and methods used by public- and private-sector firms to geographically organize their activities; market selection, site analysis, small-area demand forecasting and sales forecasting, network development, delivery of urban and rural services; use of geographical models of spatial interaction and spatial choice; spatial allocation; location-allocation models; districting and dispatching models; route-distance functions; multi-attribute preference elicitation and spatial competition. Prerequisite: 44:108 or 6K:70.
- 44:131 Medical Geography: Health Services** 1-3 s.h.
Provision of health care in selected countries, with particular reference to the Third World; focus on problems of geographical, economic, cultural accessibility to health services; disease ecology, prospective payment systems, privatization, medical pluralism; includes regional case study.
- 44:132 Industrial Location** 3 s.h.
Theory and practice of manufacturing location and its application to different industries and types of economy; investigations of selected case studies.
- 44:133 Introduction to Economics of Transportation** 3 s.h.
Overview of transportation markets—intercity, rural, urban—and transportation modes—railroads, highways, air carriage, waterways; discussion of regulation, finance, physical distribution issues. Same as 102:133, 6E:145.
- 44:134 Methods of Transportation Analysis** 3 s.h.
Conceptual basis for predicting effects of transportation policy measures on traffic flows and system performance; transportation measurements; introduction to travel demand modeling; introduction to system performance modeling, network analysis, equilibration. Prerequisites: graduate standing, or 44:108 and a previous transportation course. Same as 102:134.
- 44:135 Urban Geography** 3 s.h.
Central ideas of modern urban geography, their links to social theory; focus on interrelation between social change, urban environment; evolution of urban systems, emergence of the capitalist city, urban social and residential differentiation, local politics of uneven development. Prerequisite: 44:1 or 44:15.
- 44:137 Economic Theory of Location** 3 s.h.
Behaviorally based location theories for social and economic activities traced from their classical origins to the contemporary literature where both descriptive (e.g., central place theory) and prescriptive (e.g., location-allocation) models of multiple location decisions exist; relationship between location-allocation models and competitive location theory. Prerequisites: 6E:1 or graduate standing, and 44:30 or 44:132; or consent of instructor.
- 44:138 Health and Development** 3 s.h.
Intricate relationship between health status, health services, and socioeconomic development in the Third World; health implications of socioeconomic policies and planning analyzed through economic and health development theories. Open only to seniors and graduate students.
- 44:139 Economic Analysis of Urban Spatial Structure** 3 s.h.
Use of the methods of economics to understand urban spatial structure; central place theory, why cities exist and trade with one another; theoretical models to explain spatial patterns of population, land use, rents within cities; empirical tests of models; applications of theory to practice policy issues such as urban sprawl, racial segregation, transportation planning. Prerequisites: 44:108 and 44:135.
- 44:150 Undergraduate Seminar for Geography Majors** 3 s.h.
Participation in a term project and preparation of a documented report. Offered spring semesters. Open only to seniors. Prerequisites: 44:108, 44:109, and satisfaction of computer programming requirement.
- 44:157 Third World Development Studies** 3 s.h.
Critical analysis of theories, policies, programs, practices of Third World development; nature of the social scientific support needed to understand and accelerate the process; analysis of historical trends in the administration of organized development aid since its inception in 1945. GER: foreign civilization and culture. Same as 19:157.
- 44:161 African Development** 3 s.h.
Problems of economic, political, spatial integration in Africa; patterns and processes of economic development and nation building. GER: foreign civilization and culture, social sciences. Prerequisite: 44:94. Same as 30:146, 141:146.
- 44:162 Planning and Geography of Underdevelopment** 3 s.h.
Spatial implications of the economic, social, and political institutions affecting contemporary Third World countries; political economy of development and underdevelopment studied through reading major theoretical works and analyzing case studies. Prerequisite: 44:94 or graduate standing. Same as 102:162.
- 44:163 Geography of the Newly Industrializing Countries** 3 s.h.
Newly industrializing countries (NICs) in geographic and historical perspectives; U.S. manufacturing base as a backdrop in the NICs' industrialization; off-shore industrial production, women in development, import-substitution industrialization (ISI), export-led industrialization, theories of industrial location, high-technology industries, the international division of labor; regional profiles taken from the Pacific Rim, Chile, Brazil, and the northern Mexican maquila industry. Prerequisites: 44:94 and 44:108.
- 44:164 Geography of the Middle East** 3 s.h.
Social, political, and economic geography of the Middle East within countries, among countries of the region, and between the region and the rest of the world. GER: foreign civilization and culture. Prerequisite: 44:94.
- 44:166 Contemporary Europe: Interaction and Change** 3 s.h.
Contemporary Europe, stressing societies' problems and attempts to resolve them; interactions within and among European countries, and between Europe and the rest of the world. Prerequisites: 44:15 or 44:30, and 44:135.
- 44:169 Latin American Studies Seminar** 3 s.h.
Redemocratization in the Southern Cone (Brazil, Uruguay, Argentina, Chile); effects of authoritarianism on society and state.
- 44:170 Political Organization of Space** 3 s.h.
Geographical aspects of jurisdictional organization, provision of public services, location of public facilities, geography of elections, public policy.
- 44:171 Geography of the U.S. and Canada** 3 s.h.
Historical, contemporary perspectives on the economic, social, political, physical environments of the United States and Canada and their principal regions. Prerequisites: 44:15 or 44:30, and 44:135, or 44:132.
- 44:172 Development Planning and Policy** 3 s.h.
Explicit and implicit strategies for economic and social development: origins, goals, formulation, execution, results; policy analysis methods. Prerequisites: 44:94 and 44:108.
- 44:175 Locational Conflict** 3 s.h.
Behavioral and institutional bases of locational conflict, with emphasis on public choice, social justice, and radical perspectives; politicizing processes; strategies of resolution in selected contexts—environmental management, urban infrastructure, public education, service provision. Prerequisites: 44:15 and 44:135.
- 44:180 Field Studies** arr.
Problem definition and research design in a field setting; sampling procedures, collection of primary data, data analyses and interpretation; topics encompass the spectrum of geographic discipline. Prerequisite: 12 semester hours of courses in geography or consent of instructor.
- 44:194 Geographic Perspectives on Development** 3 s.h.
Theoretical and empirical studies of the regional development process, with special emphasis on developing countries; alternative regional development theories and changes in development theories as evidenced in the literature of geography and related disciplines. Prerequisite: prior or concurrent satisfaction of all other international development track requirements.
- 44:195 Latin American Economic Development** 3 s.h.
Structural conditions of post-World War II regional development in Latin America; import-substitution industrialization strategies, regional integration schemes, debt repayment; part of Summer Social Science Program in Chile.
- 44:196 State and Society in the Southern Cone** 3 s.h.
Rise of authoritarianism and the transition to democracy in the region, particularly in Chile; relationship between regimes and elements of civil society, such as political parties, the church, and the labor movement, in understanding the Southern Cone; part of Summer Social Science Program in Chile.

44:197 Summer Social Science Program in Chile—Independent Study 3 s.h.
Health care financing, residential segregation, public policy analysis, and other topics of faculty expertise; research paper based on archival or field investigation in Santiago.

44:198 Honors Tutorial arr.
Individual study. May be repeated.

44:199 Honors Thesis arr.
Original research. Open only to honors students.

For Graduates

44:200 Readings arr.
Supervised readings by graduate students in topics of their choice. Consent of instructor required.

44:210 Philosophy and Epistemology in Geography 3 s.h.
Analysis of philosophies and methodologies of modern geography, with emphasis on epistemological and ontological issues; discussion of positivism (empiricism), its variants, and alternatives, in light of past and current research.

44:216 Behavioral Analysis in Geography 3 s.h.
Relationship between human behavior and the social and physical environment; environmental perception, mental maps, spatial cognition, spatial choice models; preference structures, utility theory, decision making by individuals or groups in relation to the geographical organization of activities.

44:221 Nature-Society Theory 3 s.h.
Theoretical bases for understanding the relationship between human society and natural environment. Prerequisite: 44:121 or consent of instructor

44:225 Water Resources Systems Analysis 2-3 s.h.
Linear optimization and related models; recent applications in water resources management, pollution control, economics, public policy; potential future applications in designing water quality monitoring networks. Consent of instructor required.

44:226 Advanced Biogeography/Landscape Ecology 3 s.h.
Current questions on spatial distribution of organisms and effect of spatial structure on ecological processes over landscape.

44:227 Water Quality: Science, Technology, and Policy 3 s.h.
Geographical perspectives in the study and interpretation of chemicals in water; primary and secondary drinking water standards; local, regional, national, international case studies in drinking water and health; socioeconomic and institutional considerations in designing water quality protection strategies.

44:228 Advanced Earth Surface Processes 3 s.h.
Theoretical concepts and empirical studies of hydrologic, climatic, geomorphic processes as related to the earth's surface: measurement, analysis, modeling; drainage basin analysis and modeling; responses to climatic and environmental change. Prerequisite: strong background in physical geography or consent of instructor. Same as 12:228.

44:229 Water Resources Management 2-3 s.h.

44:232 Advanced Industrial Geography 3 s.h.
The new industrial geography, economic growth processes, industrial organization, theory of the firm; current research.

44:236 Travel Demand Modeling 3 s.h.
Same as 6E:226.

44:237 Urban Economics and Urban Spatial Structure 2 s.h.
Economic models of urban land use and rents, racial segregation in housing; measuring the benefits of pollution control, crime control, and public school quality, choice of residential location, decline and revitalization of city centers.

44:262 Political Economy of Regional Development 3 s.h.
The "unequal" relationship between Third World countries and the industrial world; contemporary development problems of Third World societies; form and function of the Third World-industrial world relationship, in both external and internal dimensions. Consent of instructor required.

44:264 Agrarian Change and Rural Development in the Third World 3 s.h.
Classical and contemporary theories that inform rural development projects and programs; historical roots of contemporary rural development thinking; in-depth research paper on the nature of rural development in a Third World nation.

44:265 Transportation Regulation and Finance 3 s.h.
Public policy options for improving passenger and commodity movements within and between cities, as these policies relate to air, water, land-based transportation modes. Same as 102:265.

44:270 Jurisdictional Organization/Public Service Provision 3 s.h.
In-depth examination of literatures dealing with geographical aspects of jurisdictional organization, provision of public services, location of public facilities, geography of elections, public policy.

44:273 Social Theory and Human Geography 3 s.h.
Assumption that space is a socially produced and reproduced commodity that gains value as it enters the production process; how space enters production vis-à-vis forces that circumscribe larger societal relationships; production and reproduction of social space in a capitalist economy.

44:275 Development Policy and Planning in the Third World 3 s.h.
Interdisciplinary seminar; focus on comparing development policies and planning in Third World countries; important development problems and alternative perspectives on problems and proposed solutions. Same as 113:275, 42:275, 34:275, 102:275, 7F:275.

44:280 Advanced Field Studies arr.
Problem definition and research design in a field setting at the graduate level; sampling procedures, collection of primary data, data analyses, interpretation; may encompass the spectrum of geography; can be tailored to individual requirements. Consent of instructor required.

44:285 Methods of Regional Analysis: Regional Science 3 s.h.
Methods of regional science, including input-output, interregional input-output, econometric and regional economic growth models; emphasis on theoretical foundations and applications to forecasting and policy impact analysis.

44:286 Methods of Regional Analysis: Population Geography/Demography 3 s.h.
Methods of population geography and demography, including migration and multiregional demographic models; models of population growth and spatial interaction; interregional economic-demographic models; emphasis on theoretical foundations and applications to forecasting.

44:290 Regional Development: Theory and Policy 3 s.h.
Methods of regional science, including input, output, econometric models; migration and multiregional demographic models; spatial interaction modeling; interregional economic-demographic models; emphasis on theoretical foundations, applications to forecasting and impact analysis.

44:293 Advanced Location Theory 3 s.h.
Economics of location; location of the firm; transportation cost and location; location-allocation models; spatial price theory. Consent of instructor required. Prerequisite: 6E:203.

44:308 Research Seminar: Quantitative Methods, Computer Methods, and Modeling 2-3 s.h.

44:315 Research Seminar: Political Geography arr.

44:328 Research Seminar: Physical Geography arr.

44:329 Research Seminar: Water Resources arr.

44:330 Research Seminar: Location Theory arr.
Critique of the contemporary location theory literature; discussion of solutions to the problems identified. Prerequisite: 44:137.

44:337 Seminar: Urbanization arr.
Problems and consequences of urbanization processes: political, economic, social study of metropolitan areas. May be repeated. Same as 34:279, 7D:301, 30:324.

44:350 Research Seminar: Staff arr.

44:394 Research Seminar: Regional Development 3 s.h.

44:440 Research: Environmental Systems Analysis arr.

44:441 Research: Locational Analysis arr.

44:450 Thesis arr.

GEOLOGY

Chair: Richard G. Baker

Professors: Richard G. Baker, Robert S. Carmichael, Lon D. Drake, Brian F. Glenister, Philip H. Heckel, Gilbert Klapper, George R. McCormick, Holmes A. Semken, Keene Swett

Professors emeriti: William M. Furnish, Richard A. Hoppin, Sherwood D. Tuttle

Adjunct professors: G. Brian Bailey, George R. Hallberg, Donald L. Koch

Associate professors: Robert L. Brenner, Ann F. Budd, C. Thomas Foster, Jr.

Assistant professors: James E. Faulds, Luis A. Gonzalez, Mark K. Reagan

Adjunct assistant professors: Gregory A. Ludvigson, R. Sanders Rhodes II, Brian J. Witzke

Research associate: Julie Golden

Undergraduate degrees: B.A., B.S. in Geology; minor in Geology

Graduate degrees: M.S., Ph.D. in Geology

Geology is the basic study and practical application of scientific disciplines related to understanding the earth. Geological concerns include the earth's origin, its present appearance and character internally and at the surface, its alteration with time, location of economic and energy resources, and how mankind is changing the earth for future generations. The Department of Geology has several subfields—mineralogy, petrology, stratigraphy, structural geology, paleontology, sedimentology, economic geology, geomorphology, glacial geology, environmental geology—as well as applied geophysics, geochemistry, paleobiology, engineering geology, and remote sensing.

Career opportunities are available to professional geologists in industry (especially related to environmental concerns), education, urban planning, state and federal geological surveys, and government resource and research organizations. The master's degree is regarded by most hiring agencies as the working degree in geology. However, an undergraduate degree is fully satisfactory in certain teaching, federal, and industrial situations.

Many of The University of Iowa's geology graduates find employment with the petroleum industry, environmental corporations, government, and education. Others continue in graduate school or take jobs with government or conservation agencies. Some intend to enter law, business, or other fields such as urban planning, environmental studies, engineering, archaeology, science education, or oceanography as advanced areas. Geology is suited to all of these.

Each year more than 700 students enroll in 12:23 Earth History and Resources and 12:24 Introduction to Environmental Geology, laboratory-lecture courses designed to fulfill the College of Liberal Arts General Education Requirement in natural sciences.

For nonmajors, the department offers a lecture sequence featuring a general survey of geology and several advanced courses with few prerequisites—paleontology, geology of Iowa, remote sensing, geomorphology, and oceanography.