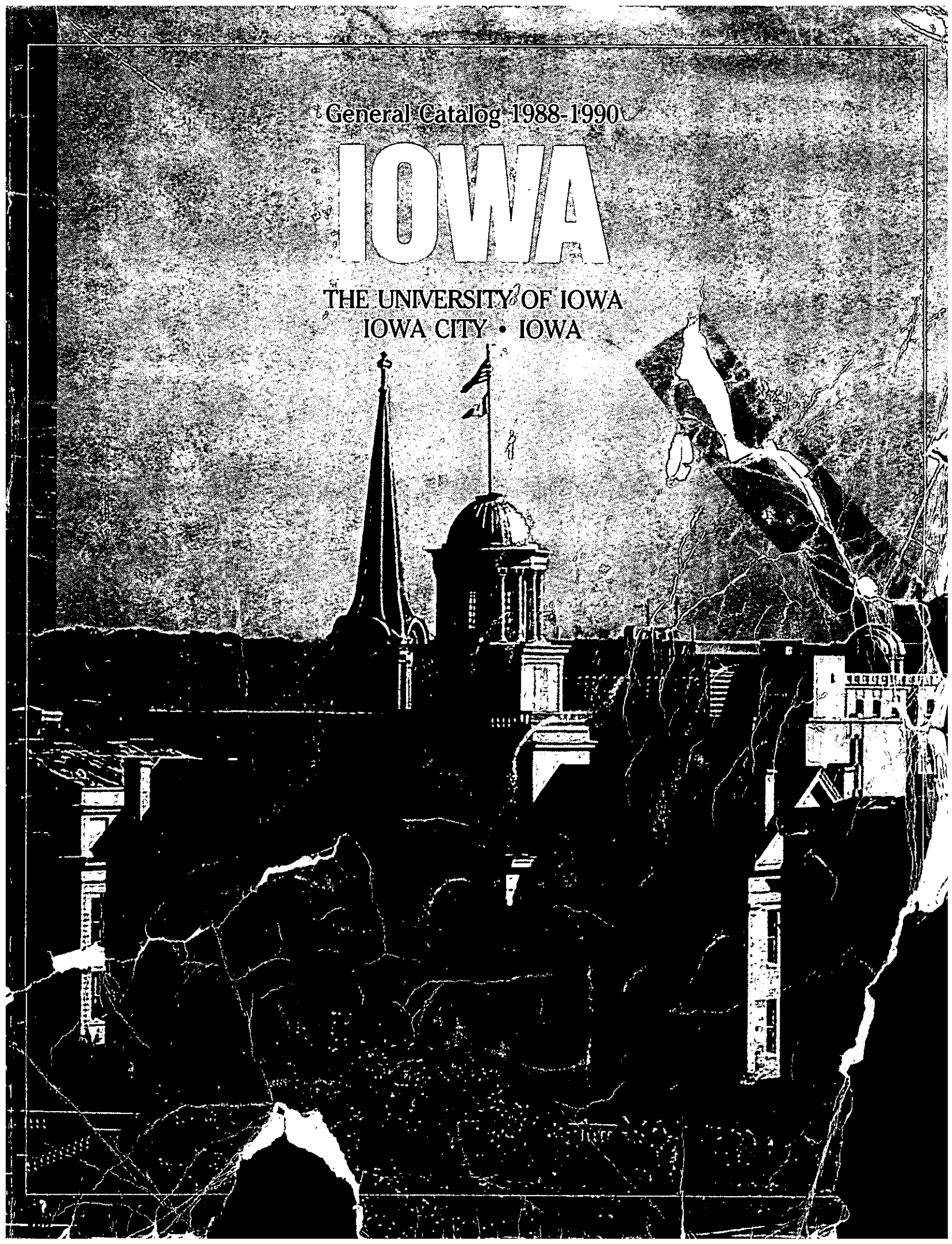General Catalog 1988-1990

# IOWA

## THE UNIVERSITY OF IOWA
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biology, all of which contribute significantly to the overall training program.

In addition to completing research and course work, students also must pass a comprehensive examination, usually within their first two years in the program.

## Admission

Prospective doctoral students in genetics should have a strong undergraduate background in science, including courses in general genetics, organic chemistry, introductory physics, and mathematics, as well as a strong commitment to research and teaching in genetics. Students with deficiencies in a particular area can make them up during the first year of graduate study.

Admission to the program is based on assessment of applicants' undergraduate academic record, performance on the Graduate Record Examination (GRE) Aptitude Test (verbal and quantitative), and letters of recommendation. Admission requirements are not rigid. Almost all students currently working toward the Ph.D. in genetics at The University of Iowa have undergraduate grade-point averages higher than 3.20, and their average GRE Aptitude Test scores (verbal plus quantitative) exceed 1300. Students with lower grade-point averages or GRE scores may be admitted, depending on other indications of academic potential.

The program accepts applications for admission at any time, but students generally begin graduate work during the fall semester.

## Financial Aid

All genetics graduate students receive a financial stipend that is in the range of $10,000 plus tuition per year. Nearly all financial aid is committed by April 1 for students entering in the fall.

Financial support comes from a National Institutes of Health predoctoral training grant, 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. Further 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, Biology, Botany, and Microbiology offer degree programs in which students may specialize

in a particular aspect of genetics. See departmental descriptions elsewhere 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.

| | |
|---|---|
| 99:130 Metabolism | 3 s.h. |
| 99:150 Biochemistry of Informational Macromolecules | 3 s.h. |
| 99:223 Gene Expression | 1-2 s.h. |
| 2:104 Cytogenetics | 2 s.h. |
| 2:160 Genetics and Biogenesis of Cell Organelles | arr. |
| 61:170 Microbial Genetics | 3 s.h. |
| 61:175 Microbial Genetics Laboratory | 2 s.h. |
| 61:179 Comparative Microbial Genetics and Physiology | 3 s.h. |
| 61:268 Molecular Biology of Animal Viruses and the Eukaryotic Cell | 3 s.h. |
| 61:270 Topics in Molecular Biology | arr. |
| 37:162 Population Genetics and Molecular Evolution | 3 s.h. |
| 37:170 Eukaryotic Molecular Biology | 2 s.h. |
| 37:171 Molecular Genetics | 4 s.h. |
| 37:172 Topics in Molecular Genetics | 2 s.h. |
| 37:173 Molecular Biology of Phage Lambda | 3 s.h. |
| 37:175 Topics in Evolutionary Genetics | 1-2 s.h. |
| 37:176 Topics in Eukaryotic Molecular Biology | 2 s.h. |
| 37:195 Pattern Formation in Development | 2 s.h. |
| 37:215 Genetics Seminar (same as 2:215, 61:215, 99:215) | 0-2 s.h. |
| 37:260 Developmental Genetics | 2 s.h. |
| 127:301 Graduate Research in Genetics | arr. |
| 63:254 Genetics and Epidemiology | 3 s.h. |
| 70:161 Human Genetics | 2 s.h. |

# GEOGRAPHY

**Chair:** David R. Reynolds
**Professors:** John W. Fuller, Joel L. Horowitz, James B. Lindberg, Michael L. McNulty, R. Rajagopal, David R. Reynolds, Gerard Rushton
**Professor emeritus:** Clyde F. Kohn
**Associate professor:** Rex D. Honey
**Assistant professors:** Marc P. Armstrong, George P. Malanson, Joseph L. Scarpaci, Frank H. Weirich
**Visiting assistant professors:** Rebecca S. Roberts, Abdi Samatar
**Adjunct faculty:** Susan Cowart, Marie P. Klugman, Thomas G. Newton, Carol A. Parsons
**Undergraduate degrees offered:** B.A., B.S. in Geography
**Graduate degrees offered:** 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 explanations of specific research questions from a distinctly geographic perspective.

Students who elect courses in 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 during geographical training.

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 environmental 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 other problems related to the 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 Program

The geography faculty has developed an undergraduate instructional program that provides educational opportunities for a variety of students: for the nonmajor interested in elective courses as they relate to a liberal education; for students interested in electing a cluster of courses in conjunction with another discipline or for the B.G.S. degree; and for students interested in acquiring a major or minor in geography. The department also joins in significant interdepartmental programs involving global, urban, and environmental components.

## Programs for the Undergraduate Major

Students majoring in geography may choose from alternative programs

depending on their interests. The substantive strengths of the department fall into three areas: environmental studies, urban and regional studies, and international development studies. Students may concentrate their studies in one of these areas, or they may develop an individualized program within the curriculum offered by the department.

Students planning advanced training or seeking careers in geography should elect the Bachelor of Science (B.S.) degree. Those who wish to pursue a liberal arts objective are advised to elect the Bachelor of Arts (B.A.) degree.

### Requirements

All geography majors must complete a minimum of 26 semester hours of geography course work, at least 15 of which must be numbered 100 or above. Many students find that they need more than the minimum requirements to master a specific subfield.

All geography majors must complete:

44:110 Spatial Organization
44:150 Undergraduate Seminar for
   Geography Majors

One of the following courses in statistics:

22S:101 Biostatistics
22S:102 Introduction to Statistical Methods
22S:127 Applied Statistical Methods and
   Computations

Bachelor of Science students must fulfill a mathematics requirement of two courses, preferably to the level of calculus. Students should select one course from section A and one course from section B, or two courses from section B.

### Section A

22M:5 Trigonometry
22M:10 Finite Mathematics
22M:15 Mathematics for the Biological
   Sciences

### Section B

22M:16 Calculus for the Biological Sciences
22M:19 Elementary Functions
22M:25 Calculus I
22M:26 Calculus II
22M:35 Engineering Calculus I
22M:36 Engineering Calculus II

Bachelor of Science students also must take one of the following computer programming courses:

22C:7 Introduction to Computing with
   FORTRAN
22C:16 Introduction to Programming with
   Pascal

With the consent of the geography faculty, equivalent courses with objectives similar to these may be accepted in fulfillment of the statistical, mathematical, and computer science requirements.

### Recommendations

Students majoring in geography are advised to:

Take the introductory-level courses 44:1 Introduction to Human Geography and 44:3 Introduction to Physical Geography during their freshman or sophomore years;

Take 44:110 Spatial Organization followed by 44:150 Undergraduate Seminar for Geography Majors during their senior year;

Take the statistical, mathematical, and computer programming requirements as early as possible, because many advanced-level geography courses assume prior knowledge of these subjects; and

Take the 44:107, 44:109, 44:113 sequence of courses beginning in the fall semester of their junior year.

It is strongly recommended that students take 22M:25 Calculus I or its equivalent in fulfillment of the mathematics requirement. Students equipped with these skills will have greater flexibility in further geographic studies and career opportunities.

## Environmental Studies

The undergraduate program in environmental studies is designed for students who have career expectations or personal interest in resource management or environmental protection, or who are interested in physical geography per se.  ·  The program provides a knowledge of physical 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 should be 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 water resources subprogram of the Department of Geography.

Students concentrating on environmental studies must take:

44:3 Introduction to Physical Geography
44:19 Contemporary Environmental Issues
29:5 Chemistry and Physics of the
   Environment (or a more advanced course
   in chemistry or physics)

At least two of the following:
44:107 Maps and Mapping
44:109 Computer Methods in Geographical
   Analysis
44:113 Geographic Information Systems

Fifteen hours from:
44:101 Climatology
44:102 Earth Surface Processes
44:103 Biogeography
44:121 Natural Resources Policy
44:122 Environmental Conservation in the
   United States

44:125 Environmental Impact Analysis
44:126 Water in the Biosphere
44:128 Drainage Basin: Form and Process
44:129 Water Resources Management
44:180 Field Studies

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
2:111 Plant Ecology
2:116 Field Ecology
2:119 Plant-Animal Interactions
2:132 Population and Community Ecology
37:133 Topics in Ecology
12:108 Introduction to Oceanography
12:110 Introduction to Remote Sensing
12:127 Paleobotany
12:128 Quaternary Palynology
12:166 Hydrogeology and Groundwater
   Quality
12:171 Geomorphology
12:172 Glacial and Pleistocene Geology
12:173 Quaternary Environments
12:179 Engineering Geology

### Environmental Engineering

53:71 Principles of Hydraulics
53:78 Principles of Hydrology
53:152 Environmental Chemistry
53:153 Environmental Chemistry Laboratory
53:154 Environmental Microbiology
53:155 Limnology
53:178 Hydrometeorology

### Environmental Management

6E:1 Principles of Microeconomics
6E:2 Principles of Macroeconomics
6E:103 Microeconomics
6E:105 Macroeconomics
6E:119 Economics of the Government
   Sector
6E:127 Natural Resources in the World
   Economy: Control and Conflict
6E:133 Environmental Economics
6L:100 Administrative Management
6K:161 Individual Behavior in Organizations
6K:163 Organizational Design and
   Operations
102:101 Introduction to Planning and Policy
   Development
53:204 Theories of Environmental Policy
   and Assessment

## 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. Courses in this area also are designed to provide a suitable background for graduate programs in geography or professional programs such as urban and regional planning, business administration, applied policy analysis, or regional science.

The 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 regional and community

development, evaluating alternate plans for improving transport services in a 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, cartography, 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 advised to select at least 21 semester hours of courses from the following.

### Introductory Courses

44:1 Introduction to Human Geography
44:3 Introduction to Physical Geography
44:11 Introduction to Social Geography
44:15 Introduction to Political Geography
44:30 Introduction to Economic Geography
44:35 World Cities

### Urban/Economic Geography

44:130 Location Strategy of Firms
44:132 Industrial Location
44:133 Introduction to Transportation
44:134 Methods of Transportation Analysis
44:135 Urban Geography
44:137 Economic Theory of Location
44:139 Economic Analysis of Urban Spatial Structure

### Regional Perspectives

44:131 Medical Geography: Health Services
44:162 Geography of Underdevelopment
44:163 Geography of the Newly Industrializing Countries
44:165 Geography of the Modern World
44:166 Contemporary Europe: Interaction and Change
44:167 Patterns of Urbanization and Development in Latin America

### Political Geography

44:170 Political Organization of Space
44:175 Locational Conflict

### Geographical Methods

44:107 Maps and Mapping
44:109 Computer Methods in Geographical Analysis
44:113 Geographic Information Systems
44:125 Environmental Impact Analysis

## International Development Studies

The concentration in international development studies is designed for students interested in the processes of economic, social, and political development, particularly as they affect the countries of the Third World. 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 nations 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 should select at least 21 semester hours of courses from the following.

### Introductory Courses

44:1 Introduction to Human Geography
44:3 Introduction to Physical Geography
44:11 Introduction to Social Geography
44:15 Introduction to Political Geography
44:30 Introduction to Economic Geography
44:35 World Cities

### Intermediate Courses

44:109 Computer Methods in Geographical Analysis
44:131 Medical Geography: Health Services
44:157 Third World Development Support
44:161 African Development
44:165 Geography of the Modern World
44:166 Contemporary Europe: Interaction and Change
44:167 Patterns of Urbanization and Development in Latin America

### Advanced Courses

44:137 Economic Theory of Location
44:162 Geography of Underdevelopment
44:163 Geography of the Newly Industrializing Countries
44:170 Political Organization of Space
44:173 Social Theory and Space
44:175 Locational Conflict
44:194 Geographic Perspectives on Development

Under the direction of an adviser, students should select courses in related disciplines from the following:

30:60 Introduction to World Politics
30:127 Policy Problems in Industrial Societies
30:150 The Political Economy of the Third World
30:160 International Politics
30:166 Politics of War and Peace
6E:123 Political Economy of the Military-Industrial Complex
6E:129 Economic Development of Underdeveloped Areas
16:111 Colonial Latin America
16:112 Introduction to Modern Latin America
16:121 History of Colonial Africa
16:122 Modern African History
16:137 Topics in History of Public Health
16:194 Imperialism and Modern India
16:196 Modern China: 1800 to Present
16:198 Modern Japan

Appropriate foreign language training also might be part of the student's degree program.

The department cooperates in the interdisciplinary Global Studies Program.

## Individual Programs

Students with more general interests who wish to pursue a Bachelor of Arts degree

may design their own individual programs of instruction with the help of their advisers. Such programs must include 26 semester hours of geography, at least 15 of which must be numbered 100 or above. They also must include the following courses:

44:110 Spatial Organization
44:150 Undergraduate Seminar for Geography Majors

One of the following statistics courses:

22S:127 Applied Statistical Methods and Computations
22S:101 Biostatistics
22S:102 Introduction to Statistical Methods

## Minor

A minor in geography is an option available to all students pursuing B.A. or B.S. degrees in the College of Liberal Arts. To minor in geography, students must complete a minimum of 15 semester hours in geography, 12 of which must be taken at The University of Iowa in 100-level courses. Minors should declare one of the department's three areas of concentration—environmental studies, urban and regional studies, and international development studies—and, in consultation with their geography minor adviser, should select courses from those listed in that area (see above).

## Honors Program

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 the College of Liberal Arts Honors Program as well as 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.

There are two options. Students may complete the thesis through a year-long tutorial in 44:198 Honors Tutorial and 44:199 Honors Thesis OR they may pursue the thesis while enrolled in the senior courses 44:110 Spatial Organization and 44:150 Senior Seminar, but with the direction of a particular faculty member.

The department offers honors discussion/lab sections in its introductory courses (44:1 and 44:3), arranges for honors students to attend meetings of the national association, encourages competition for scholarships, and provides ready access to participation in faculty research.

## 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 program 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, 44:165 Geography of the Modern World, and 44:191 Energy in Contemporary Society.

Students in related disciplines may take groups of courses leading to a minor in geography. Bachelor of General Studies students also may take a group of geography courses as part of their degree. The geography courses listed below, under the different programs for the major in geography, will serve as a guide to course selection. Additional information about a minor in geography is available in the department office.

## Graduate Programs

The goals of the department's graduate programs are to prepare students to carry on creative and productive research in selected areas of geography involving the use and further elaboration of theory, and to prepare students for positions in research, teaching, or some 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 department offers five M.A. subprograms: locational analysis, 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 breakdowns of the discipline 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 water resources subprogram builds on a strong foundation in physical geography and environmental science.

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 methodology therefore are integral to the M.A. program. Students in the transportation subprogram may take an additional elective course that enables them to receive a transportation certificate in addition to their M.S. degree.

### General Requirements

The M.A. degree 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 five subprograms (see below), students must:

Complete at least one course in another subprogram from the following introductory graduate courses: 44:125, 44:126, 44:134, 44:137, 44:175, or 44:194;

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

Satisfy the department's B.S. degree 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. degree can be earned with or without 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
44:137 Economic Theory of Location

6E:190 Consumer and Firm Behavior
or
6E:202 Price Theory
or
6E:203 Microeconomics I

44:237 Urban Economics and Urban Spatial Structure
44:285 Methods of Regional Analysis: Regional Science
44:293 Advanced Location Theory
44:330 Research Seminar: Location Theory

### Political Geography

44:173 Social Theory and Space
44:175 Locational Conflict

6E:190 Consumer and Firm Behavior
or
6E:202 Price Theory

44:210 Philosophy and Epistemology in Geography
44:262 Political Economy of Regional Development
44:270 Jurisdictional Organization/Public Service Provision
44:315 Research Seminar: Political Geography

### Regional Development

44:194 Geographic Perspectives on Development
44:210 Philosophy of Epistemology in Geography
44:262 Political Economy of Regional Development
44:263 Industrial Location and Regional Development in Latin America
44:264 Agrarian Change and Rural Development in the Third World
44:394 Research Seminar: Regional Development

### Transportation Systems Analysis

*22S:120 Probability and Statistics
*6E:184 Introduction to Econometrics

6E:190 Consumer and Firm Behavior
or
6E:202 Price Theory
or
6E:203 Microeconomics I

44:134 Methods of Transportation Analysis

44:236 Travel Demand Modeling
102:260 Transportation Policy and Planning
102:261 Problems in Transportation and
    Land Use
53:262 Urban Transportation Planning

*Course satisfies the M.A. and Ph.D.
quantitative methods requirements.

### Water Resources

44:121 Natural Resources Policy
44:125 Environmental Impact Analysis
44:126 Water in the Biosphere
44:128 Drainage Basin: Form and Process
44:329 Research Seminar: Water Resources

Three of the following:

44:225 Water Resources Systems Analysis
44:226 Fluvial Systems in Landscape
    Ecology
44:227 Water Quality Control Systems
44:229 Water Resources Management
*44:450 Thesis

*M.A. Thesis is required of all students in
this subprogram.

Students are expected to have an
undergraduate background relevant to
pursuing graduate work in one of the
department's subprograms. The B.A. or B.S.
degree in geography is not a prerequisite
for entry into the program. 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 is 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.

## 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, and water resources
management.

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. degree 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 must
then complete and defend the dissertation.

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

## Admission

In addition to the general rules and
regulations set forth in the *Manual of Rules
and Regulations of the Graduate College*,
the department considers the applicant's
undergraduate grade-point average,
especially of his or her junior and senior
years; scores on the Graduate Record
Examination (GRE) Aptitude 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 Aptitude 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 laboratory for computer cartography and spatial analysis equipped with IBM PCs, Graf-Bar and Graf-Pen digitizers, an HP 7475 6-pen plotter, and two remote printers. The PCs and other terminals in the department are linked to the University's SYTEK broadband communication network, which provides high-speed access to graphics, data management, and analysis software on University IBM, PRIME, and VAX computer systems. Analytical capabilities in the computer cartography laboratory are expected to be enhanced by the acquisition of ERDAS microcomputer-based software for image processing and geographic information handling, and simulation software for drainage basin processes. Students also have access to a University computing cluster that contains IBM PCs, terminals, several printers, and a plotter. It is located on the same floor as the departmental 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 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

Most courses open to undergraduate students may be taken in any order or simultaneously, except those in the environmental track. All courses numbered below 100 are open to freshmen; 44:1, 44:11, 44:19, 44:30, and 44:161 satisfy the General Education Requirement in social sciences; 44:3 satisfies the General Education Requirement in natural sciences; and 44:157 and 44:161 satisfy the General Education Requirement in foreign civilization and culture.

## 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.

**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.

**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 and social services; diffusion of ideas and traits over space.

**44:15 Introduction to Political Geography**        **3 s.h.**
Geographic principles applied to political and economic problems at international, national, and 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, and cultural resources; air pollution; water pollution; energy and environment; alternative approaches to the resolution of environmental problems; real world case studies.

**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.

**44:35 World Cities**        **3 s.h.**
Introductory course on urban geography examining urbanization as a process through lectures, films, readings, and discussions; specific concepts and theories of urbanization through global patterns, regional urban systems, and individual metropolitan areas. Offered spring semesters.

**44:100 Readings for Undergraduates**        **arr.**
Supervised readings in geography. Prerequisite: consent of instructor.

## 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. Prerequiste: 44:3 or consent of instructor.

**44:102 Earth Surface Processes**        **3 s.h.**
Processes that shape the surface of the earth. Emphasis on processes of weathering; mass movement such as creep, land slides, and earth flow; erosion, transport, and deposition by fluid agents such as wind, water, and ice; related geomorphic processes; methods used to study these processes. Prerequisite: 44:3 or 12:3 or 12:5 or consent of instructor.

**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 or diagram; types of maps or diagrams for particular uses; major types of cartographic presentations; available tools for constructing maps and diagrams; procedures for the compilation of maps and diagrams; laboratory experiences in compiling maps and diagrams.

**44:109 Computer Methods in Geographical Analysis**        **3 s.h.**
Use of computer mapping as a tool in geographic analysis; various mapping programs including SYMAP, CALFORM, and others. Prerequisite: 22C:7 or 22C:16 or consent of instructor.

**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.**
Survey of 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.**
Geographical, cultural, political, economic, and ethical dimensions of natural resources policy; substantive and theoretical insights from the natural sciences, social sciences, and 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. Prerequisite: 44:19 or consent of instructor.

**44:122 Environmental Conservation in the United States**        **3 s.h.**
Varied natural environments of the United States and problems arising from conflicting land uses; consideration of public land use policy, environmental impacts of different land uses, and problems of habitat preservation and endangered species. Prerequisite: 44:3 or 44:19 or consent of instructor.

**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, and system simulation; field trips to local environmental control facilities. Prerequisite: senior standing or consent of instructor.

**44:126 Water in the Biosphere**        **3 s.h.**
Biotic aspects of water resources production and the geographical basis of physical processes in drainage basins; spatial aspects of lotic dynamics and regional characterization of wetland structure and process. Prerequisite: 44:101 or 44:102 or 44:103 or 2:111.

**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. Prerequisite: 44:3 or consent of instructor.

**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, and droughts. Prerequisite: 44:128 or consent of instructor.

**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; districting and dispatching models; route-distance functions; multi-attribute preference elicitation and spatial competition. Prerequisite: 44:30 or 6E:1 or consent of instructor.

**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, and cultural accessibility to health services; other topics include disease ecology, prospective payment systems, privatization, and 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 Transportation**        **3 s.h.**
Overview of transportation markets — intercity, rural, and urban — and transportation modes — railroads, highways, air carriage, and waterways; discussion of regulation, finance, and 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, and equilibration. Same as 102:134.

**44:135 Urban Geography    3 s.h.**
Models of urban growth and urban forms; spatial patterns of selected activities; processes that generate these patterns; current problems.

**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; the relationship between location-allocation models and competitive location theory.

**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, and rents within cities; empirical tests of the models; applications of the theory to practice policy issues such as urban sprawl, racial segregation, transportation planning. Prerequisite: 6E:1.

**44:150 Undergraduate Seminar for
     Geography Majors    3 s.h.**
Participation in a term project and preparation of a documented report. Offered spring semesters. Prerequisites: 44:110 and completion of departmental statistics requirement, or consent of instructor.

**44:157 Third World Development Support    3 s.h.**
Critical analysis of theories, policies, programs, and practices of Third World development; nature of the social scientific support needed to understand and to accelerate the process; analysis of historical trends in the administration of organized development aid since its inception in 1945. Same as 19:157.

**44:160 The World of Wines    2 s.h.**
Production, distribution, and consumption of wines throughout the world, with emphasis on quality related to landforms, soils, weather conditions; viticultural practices in the different grape-growing areas.

**44:161 African Development    3 s.h.**
Problems of economic, political, and spatial integration in Africa; patterns and processes of economic development and nation building. Same as 30:146.

**44:162 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.

**44:163 Geography of the Newly
     Industrializing Countries    3 s.h.**
The newly industrializing countries (NICs) in geographic and historical perspectives; U.S. manufacturing base as a backdrop in the NICs' industrialization; topics include off-shore industrial production, women in development, import-substitution industrialization (ISI), export-led industrialization, theories of industrial location, high-technology industries, and the international division of labor; regional profiles taken from the Pacific Rim, Chile, Brazil, and the northern Mexican maquila industry.

**44:165 Geography of the Modern World    3 s.h.**
Conceptualization of the world as an increasingly interconnected system; similarities and differences in the ways diverse regions participate in the changing world.

**44:166 Contemporary Europe: Interaction
     and Change    3 s.h.**
Examination of 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.

**44:167 Patterns of Urbanization and
     Development in Latin America    3 s.h.**
Change in Latin America examined through the processes of urbanization; perspectives from modernization and human ecological, dependency, and neo-Marxist theories of development; topical aspects include informal economies, women in development, housing, residential segregation, squatter settlements, and urban-ecological views of the Latin American city.

**44:168 Icelandic Studies    2 s.h.**
Same as 12:188.

**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, and public policy.

**44:173 Social Theory and Space    3 s.h.**
The assumption that space is a socially produced and reproduced commodity that gains value as it enters the production process; how space enters production vis-a-vis forces that circumscribe larger societal relationships; production and reproduction of social space in a capitalist economy.

**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. Prerequisite: 44:15 or graduate student status or consent of instructor.

**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.

**44:191 Energy in Contemporary Society    3 s.h.**
Technical, legal, economic, and behavioral issues in energy production, delivery, and use; emphasis on cross-disciplinary implications of energy systems. Prerequisite: junior, senior, professional, or graduate status.

**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.

**44:198 Honors Tutorial    arr.**
Individual study for honors majors. May be repeated.

**44:199 Honors Thesis    arr.**
Supervised original research project leading to written thesis and oral defense. Open only to honors students.

# For Graduates

**44:200 Readings    arr.**
Supervised readings by graduate students in topics of their choice. Prerequisite: consent of instructor.

**44:208 Quantitative Analysis I    3 s.h.**
Problems of drawing inferences from data in studies using simple measures; research design; commonly used measures of statistical and spatial association; logic of statistical inference and hypothesis testing; simple correlation and regression analysis; introduction to computer modeling. Prerequisite: introductory statistics or consent of instructor.

**44:209 Quantitative Analysis II    3 s.h.**
Statistical mathematical analysis in current geographical research, with emphasis on problem formulation and research design; multiple correlation and regression; analysis of variance; testing causal models; selected topics in multivariate analysis, scaling, and network analysis. Continuation of 44:208. Prerequisite: 44:208 or consent of instructor.

**44:210 Philosophy and Epistemology in
     Geography    2 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.

**44:211 Advanced Quantitative Methods    3 s.h.**
Nonregression statistical methods used in current geographical research: discriminant analysis, factor analysis, multivariate hypothesis testing, models with simultaneous equations; assumes knowledge of ordinary regression techniques. Prerequisite: 22S:157 or 22S:152 or 6E:184 or 44:209.

**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, and spatial choice models; preference structures, utility theory, and decision making by individuals or groups in relation to the geographical organization of activities.

**44:221 Natural Resources Policy    3 s.h.**

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

**44:226 Fluvial Systems in Landscape Ecology    3 s.h.**
Interaction of hydrological processes and dynamics of spatial heterogeneity at the landscape level; effects on biotic and abiotic processes, the transfer of material and energy to and from adjacent ecosystems by fluvial processes, the interactions of agro-forest, wetland, riparian, and stream and lake ecosystems.

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

**44:228 Drainage Basin: Form and Process    3 s.h.**
Theoretical concepts and empirical studies of hydrological principles, stream channel processes, and fluvial geomorphology in the drainage basin; spatial and temporal variations in stream discharge, analyses of hydrological data flow mechanisms, sediment transport, hydrograph construction, and flow modeling. Prerequisite: strong background in physical geography or consent of instructor.

**44:229 Water Resources Management    2-3 s.h.**
Theoretical concepts and empirical studies of water management problems; application of hydrological data to water problems, including water quantity and water quality issues, groundwater availability, water treatment development policies, political and administrative considerations, and drainage basin management programs. Prerequisite: 44:228 or consent of instructor.

**44:236 Travel Demand Modeling    3 s.h.**
Mathematical and statistical background for travel demand modeling; choice theories; random utility models; econometric methods for the multinomial logit and related models; applications of random utility models to travel demand forecasting; demand/performance equilibration. Prerequisite: 6E:184 or 6E:221. 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, and contemporary development problems of Third World societies; form and function of the Third World-industrial world relationship, in both external and internal dimensions. Prerequisite: consent of instructor.

**44:263 Industrial Location and Regional
     Development in Latin America    3 s.h.**
Conceptual approaches drawn from structuralist, dependency, neo-Marxist, and neoclassical perspectives on regional development; case strategies; topics include methods of industrial location, female labor force participation, the automotive industry, spatial perspectives on industrialization, informal economies, research and development, import substitution, and foreign debt.

**44:264 Agrarian Change and Rural
     Development in the Third World    3 s.h.**
Introduction to 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, and land-based transportation modes. Same as 6E:278, 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, and public policy.

**44:272 Social Theory: Social Movement and the Local State    3 s.h.**
Literatures on social theory, territoriality, and relations between national states and their subnational divisions; Marxist and non-Marxist social theories; alternative conceptualizations of territoriality; examination of the jurisdictional organization of space in both Western and non-Western contexts.

**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, 6E:234, 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, and interpretation; may encompass the spectrum of geography; can be tailored to individual requirements. Prerequisite: 44:208 or 44:209 or consent of instructor.

**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, and econometric models; migration and multiregional demographic models; spatial interaction modeling; interregional economic-demographic models; emphasis on theoretical foundations and applications to forecasting and impact analysis. Same as 6E:290, 102:290.

**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. Prerequisites: 6E:202 or 6E:203, and consent of instructor. Same as 6E:293.

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

**44:315 Research Seminar: Political 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.

**44:336 Research Seminar: Urban Travel Behavior    arr.**

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

**44:350 Research Seminar: Staff    arr.**

**44:380 Field Seminar    arr.**

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

**44:406 Research: The Teaching of Geography    arr.**

**44:440 Research: Environmental Systems Analysis    arr.**

**44:441 Research: Locational Analysis    arr.**

**44:442 Research: Models of Spatial Behavior    arr.**

**44:450 Thesis    arr.**

# GEOLOGY

**Chair:** Holmes A. Semken
**Professors:** Richard G. Baker, Robert S. Carmichael, Lon D. Drake, Brian F. Glenister, Philip H. Heckel, Richard A. Hoppin, Gilbert Klapper, George R. McCormick, Holmes A. Semken, Keene Swett, Sherwood D. Tuttle
**Professor emeritus:** William M. Furnish
**Associate professors:** Robert L. Brenner, C. Thomas Foster, Jr.
**Assistant professors:** Ann B. Foster, Mark K. Reagan
**Adjunct professors:** G. Brian Bailey, George Hallberg, Donald Koch
**Adjunct assistant professors:** R. Sanders Rhodes II, Brian Witzke
**Research associate:** Julie Golden
**Undergraduate degrees offered:** B.A., B.S. in Geology
**Graduate degrees offered:** 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 man is changing the earth for future generations. The Department of Geology has the customary subfields—mineralogy, petrology, stratigraphy, structural geology, paleontology, sedimentology, economic geology, geomorphology, glacial geology, environmental geology—as well as applied geophysics, geochemistry, paleobiology, and remote sensing.

Career opportunities are available to professional geologists in industry (especially related to the search for petroleum and minerals), teaching, 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 in exploration geology and geophysics. 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.

The program puts greater stress on the basic aspects of geology than on the engineering or agricultural phases of the

discipline. The department specializes in relating scientific thought to the study of the earth. Its resources include a major paleontology facility (invertebrate, vertebrate, palynology), a terminal link to the Weeg Computing Center, the Geological Survey Bureau (located in the same building as the department), and research equipment for fields such as mineralogy, petrology (igneous, sedimentary, and economic), remote sensing, and exploration geophysics.

Geology majors receive at least an academic year's work in allied scientific areas—physics, chemistry, biology, and mathematics—in addition to a course in each major area of geology.

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

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, energy in contemporary society, remote sensing, geomorphology, and oceanography.

## Undergraduate Programs

Students majoring in geology must meet the general requirements of the College of Liberal Arts. It is recommended that they satisfy the language requirement with French, German, or Russian, and the social science requirement with approved courses in economics, geography, and/or anthropology.

### Bachelor of Science

The Bachelor of Science professional program in geology is designed primarily as preparation for graduate study and for employment in industry. Required courses in this program:

| | |
|---|---|
| *12:5 Introduction to Geology | 4 s.h. |
| 12:6 Evolution of the Earth | 4 s.h. |
| 12:41 Mineralogy | 4 s.h. |
| 12:52 Elementary Petrology | 4 s.h. |
| 12:92 Structural Geology | 5 s.h. |
| 12:93 Geologic Field Methods | 2 s.h. |
| 12:113 Summer Field Course | 6 s.h. |
| 12:121 Principles of Paleontology | 3 s.h. |
| At least two elective geology courses | 6 s.h. |
| Total | At least 38 s.h. |

*The student may substitute 12:23 Earth History and Resources for 12:5 Introduction to Geology, but 12:5 is preferred.

The geology major requires at least 10 semester hours of college mathematics, including 22M:26 Calculus II or 22M:36 Engineering Calculus II. Computer science or statistics courses may be counted toward the 10-semester-hour requirement.