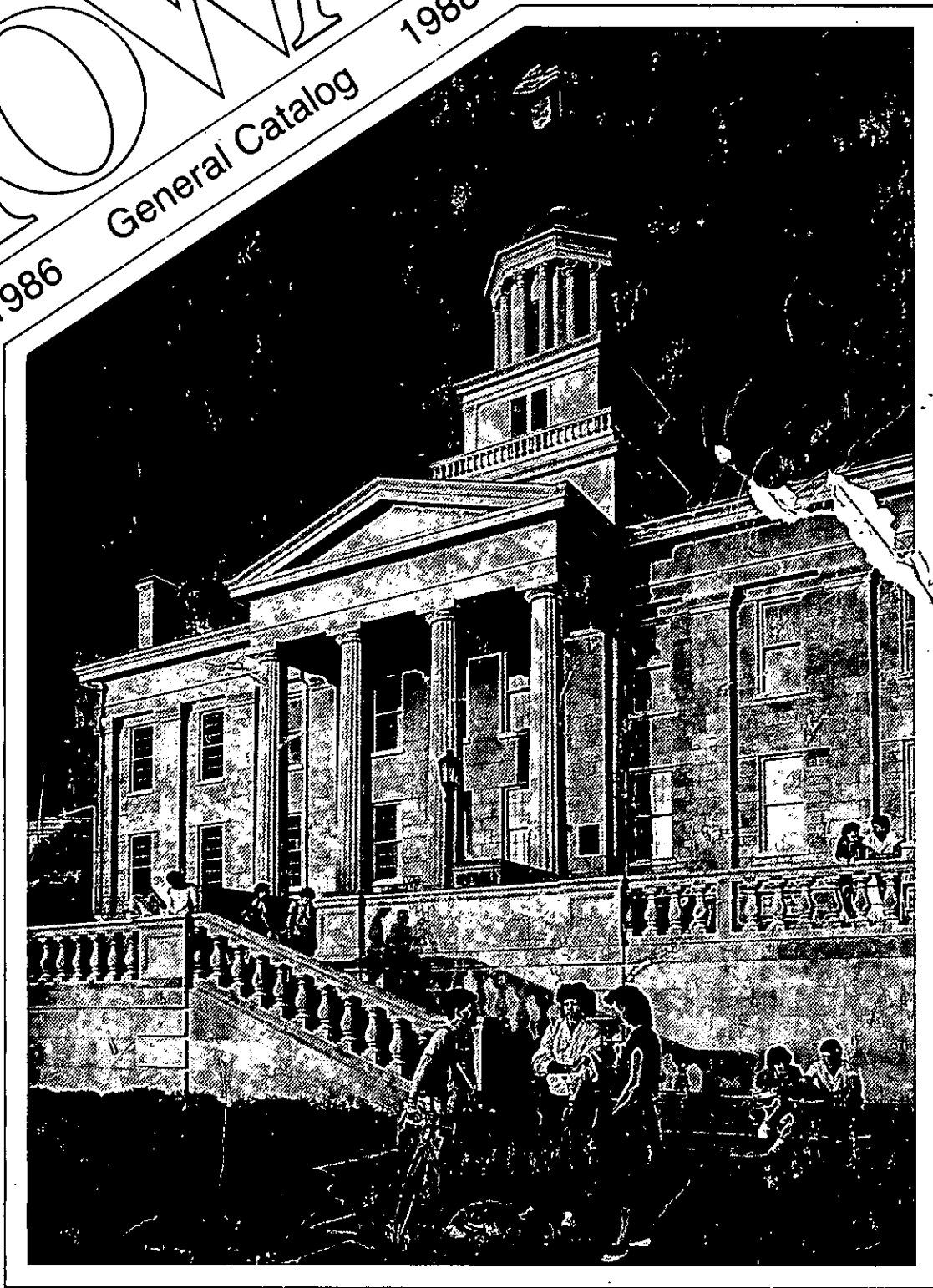


IOWA

1986 General Catalog 1988



The University of Iowa

37:238 Topics in Population Biology and Ecological Genetics	2 s.h.
37:260 Developmental Genetics	2 s.h.
127:301 Graduate Research in Genetics	arr.

Geography

Chair: David R. Reynolds

Professors: John W. Fuller, James B. Lindberg, Michael L. McNulty, David R. Reynolds, Gerard Rushton

Professors emeriti: Clyde F. Kohn, H.H. McCarty

Associate professors: Rex D. Honey, Joel L. Horowitz, R. Rajagopal, Graham A. Tobin

Assistant professors: Marc P. Armstrong, Joyce Cooper

Visiting assistant professors: George P. Malanson, Abdi Samatar

Adjunct faculty: Susan Cowart, Marie P. Klugman, Jordan Louviere, Thomas G. Newton

Degrees offered: B.A., B.S., M.A., Ph.D.

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 which are 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. There is a demand for 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, of students 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 at the 100 level. 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

and 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 a computer programming course from one of the following:

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

With the consent of the geography faculty, equivalent courses that have 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 both 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.

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.

Courses for the Nonmajor

Students in the College of Liberal Arts or other schools and colleges 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 available for general education credit in social science, and 44:3 Introduction to Physical Geography is available for general education credit in natural science. 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, 44:157 Third World Development Support, 44:165 The Changing 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.

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 the student 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 sub program of the Department of Geography.

Students concentrating in environmental studies should take 44:3 Introduction to Physical Geography and 44:19 Contemporary Environmental Issues at the beginning of their program. Students are advised to select additional geography courses from among the following:

44:1 Introduction to Human Geography
44:30 Introduction to Economic Geography
44:101 Weather and Climate
44:120 Natural Hazards
44:122 Environmental Conservation in the United States
44:123 Geography of Natural Resources
44:125 Environmental Impact Analysis
44:126 Water in the Biosphere
44:128 Drainage Basin: Form and Process
44:129 Water Resources Management
44:175 Locational Conflict
44:180 Field Studies
44:191 Energy in Contemporary Society

Also strongly recommended:

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

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

Physical Systems

12:5 Introduction to Geology
12:108 Introduction to Oceanography
12:110 Introduction to Remote Sensing
12:166 Hydrogeology and Groundwater Quality
12:171 Geomorphology
12:179 Engineering Geology

Environmental Science

11:22 Ecology and Evolution
29:5 Chemistry and Physics of the Environment
4:5 Technology and Society
2:95 Plants and Human Affairs
2:100 Plant Diversity
2:111 Plant Ecology
2:116 Field Ecology
2:119 Plant-Animal Interactions
2:132 Population and Community Ecology
37:133 Topics in Ecology
37:135 Quantitative Field Ecology
37:169 Quantitative Methods in Biology

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 Design and Management of Organizations
102:101 Introduction to Planning and Policy Development
102:104 Introduction to Environmental Planning
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:

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
44:125 Environmental Impact Analysis
44:130 Location of Services
44:131 Medical Geography: Health Services
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 Urban Problems
44:162 Spatial Organization and Political Economy in the Third World
44:163 Geography of the Newly Industrializing Countries
44:166 Contemporary Europe: Interaction and Change
44:167 Patterns of Urbanization and Development in Latin America
44:170 Political Organization of Space
44:175 Locational Conflict

Also strongly recommended:

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

Under the direction of their advisers, students should select courses in related disciplines from the following:

113:119 Urban Anthropology
16A:187 Afro-American History 1914-Present
30:111 Municipal Government and Politics
102:101 Introduction to Planning and Policy Development
102:115 Regional Development Policy and Planning
6E:113 Health Economics
6E:135 Regional and Urban Economics
6E:137 Problems in Urban Economics
6M:134 Marketing Research

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:

- 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
- 44:157 Third World Development Support
- 44:161 African Development
- 44:162 Spatial Organization and Political Economy in the Third World
- 44:163 Geography of the Newly Industrializing Countries
- 44:165 The Changing World
- 44:166 Contemporary Europe: Interaction and Change
- 44:167 Patterns of Urbanization and Development in Latin America
- 44:170 Political Organization of Space
- 44:175 Locational Conflict
- 44:191 Energy in Contemporary Society

Also strongly recommended:

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

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
- 16:122 Modern African History
- 16:196 China: Opium War to Mao

Appropriate foreign language training also might be a 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 at the 100 level. They also must include the following courses:

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

and 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 a B.A. or B.S. 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

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 3.2 in all University work and 3.4 in geography;

- Prepare and successfully defend an honors thesis; the thesis consists of original work under the direction of a faculty member and is assessed by a three-member faculty committee.

The 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.

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 must also 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 200-level courses 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 44:294;

- 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;

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 selecting 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:203 Microeconomics I
or
- 6E:205 Microeconomics II
- 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

- 44:175 Locational Conflict
- 6E:203 Microeconomics I
- 44:210 Philosophy and Epistemology in Geography
- 44:270 Jurisdictional Organization/Public Service Provision
- 102:204 Collective Decision Making
- 102:272 Social Theory, Social Movements, and Public Policy
- 44:315 Research Seminar: Political Geography

Regional Development

- 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
- 44:294 Geographic Perspectives on Development
- 44:394 Research Seminar: Regional Development

Highly recommended courses:

- 44:285 Methods of Regional Analysis: Regional Science
- 44:290 Regional Development Theory and Methods
- 30:350 Political Economy and Public Policy in Developing Countries

Transportation Systems Analysis

- *6E:183 Statistical Methods in Econometrics
- *6E:184 Methods of Quantitative Economics
- 6E:203 Microeconomics I
or
- 6E:205 Microeconomics II

- 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
or
- 53:262 Urban Transportation Planning
*Course satisfies the M.A. and Ph.D. quantitative methods requirements.

Water Resources

- 44:128 Drainage Basin: Form and Process
 - 44:126 Water in the Biosphere
 - 44:125 Environmental Impact Analysis
- Three of the following:
- 44:220 Flood Studies: Hydrology and Management
 - 44:225 Water Resources Systems Analysis
 - 44:226 Fluvial Systems in Landscape Ecology
 - 44:227 Water Quality Control Systems
 - 44:229 Water Resources Management and
 - 44:329 Research Seminar: Water Resources

Students are expected to have an undergraduate background relevant to pursuing graduate work in one of the department's subprograms. A B.A. or B.S. 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 40-48 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, post baccalaureate 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 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;

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

Before students can formally be admitted 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 will cover 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.

An applicant with an undergraduate grade-point average between 2.3 and 2.75 will be admitted only for the M.A. degree and must achieve a grade-point average of 2.75 or better on the first 12 semester hours of graduate work as approved by the department.

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 3.0 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. Students also have access to a University computing cluster that contains IBM PCs, terminals, several printers, and a plotter and is located on the same floor as the departmental offices. Other facilities in the department include a darkroom and a soils laboratory.

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. All courses below the 100 level are open to freshmen; 44:1, 44:11, 44:19, and 44:30 satisfy the General Education Requirement in social sciences; and 44:3 satisfies the General Education Requirement in natural science.

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 Weather and Climate 3 s.h.
Spatial distribution of weather elements and analyses of atmospheric processes: wind circulation, air mass movement, storm activity, and global climatic conditions; application of principles to urban and forest climates, weather modification, and climatic change. Prerequisite: 44:3 or consent of instructor.

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.

44:120 Natural Hazards 3 s.h.
Human-physical environment interrelationships under extreme geophysical conditions; causes, characteristics, and consequences of natural hazards such as earthquakes, tornadoes, hurricanes, floods, and droughts; human adjustments to these events. Prerequisite: 44:3 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. Prerequisites: 44:3 or 44:19 or consent of instructor.

44:123 Geography of Natural Resources 3 s.h.
Nature and patterns of global differences in the natural resource base for agriculture and industry; environmental problems arising from resource development.

44:124 Introduction to Global Environment 3 s.h.
Survey of the major global ecosystems; the physical and biological processes that create these ecosystems and problems resulting from the impact of human activities on them. Prerequisite: 44:3 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.
The soil and plant components of the hydrological cycle; importance of water in biomes and bioclimates, water movement in soils and plants, plant response to water-related stress, the nature of drought, and perception of and response to drought.

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, basin management problems: forestry, agriculture, urbanization, floods, and droughts. Prerequisite: 44:128 or consent of instructor.

44:130 Location of Services 3 s.h.
Problems in the effective spatial organization of public and private facilities; central place theory; modeling spatial choices between service sites; spatial outcomes of alternative behavioral strategies for reorganizing service systems; location-allocation algorithms and their use in planning and evaluating the spatial delivery of social and economic services.

44:131 Medical Geography: Health Services 1-3 s.h.
Geographical distribution of health resources and services; defining health shortage areas; location decision making by providers of health services, optimal location of health services.

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 (for example, central place theory) and prescriptive (for example, location-allocation) models of multiple location decisions exist; the relationship between location-allocation models and competitive location theory.

44:139 Urban Problems 3 s.h.
Geographical perspective on problems of urban life; processes involved and policy implications of topics such as sprawl, redevelopment, housing, segregation, transportation, crime, health care, air pollution. Prerequisite: 44:135 or consent of instructor.

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.
Patterns and processes of Third World development: spatial implications of regional growth and spatial diffusion; critical analysis of communication strategies in support of development projects. 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 Spatial Organization and Political Economy in the Third World 3 s.h.
Spatial implications of the economic, social, and political institutions affecting contemporary Third World countries; the political economy of development and underdevelopment are studied through reading major theoretical works and analyzing case studies.

44:163 Geography of the Newly Industrializing Countries 3 s.h.
Analysis of recent experiences of the so-called NICs in geographic and historic perspective; emphasis on resource, societal, political, and economic antecedents to Third World industrialization; case studies are developed.

44:165 The Changing 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 their 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.
Examination of the geographic aspects of development in Latin America; the relationship between urban growth and national development is explored through examining theories of regional development; discussion of urban primacy, dependency, and growth poles applied to South and Central America.

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.

44:175 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 s.h. 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. Same as 58:101, 12:114.

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 Only

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

44:201 Geographical Analysis I 1-4 s.h.
Four mini-courses on selected topics of current interest to faculty; focus is on methodological, theoretical, and substantive issues.

44:202 Geographical Analysis II 1-4 s.h.
Four mini-courses on selected topics of current interest to faculty. Continuation of 44:201.

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.
Non-regression 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.

44:220 Flood Studies: Hydrology and Management 3 s.h.
Theoretical concepts and empirical studies of flood problems incorporating aspects of human behavior and the natural environment. Hydrological analyses of stream-flow data, flood routing techniques, flood frequency and probability assessment, and flood risk calculations combined with analyses of floodplain management programs, federal and state supported policies, and individual behavior. Prerequisite: 44:228.

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.
The interaction of hydrological processes and the 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; socio-economic 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 equilibrium. 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 centres.

44:262 Political Economy of Regional Development 3 s.h.
Third World countries have their own history, and economic and political institutions. Theories of development and underdevelopment propose it is impossible to understand and appreciate contemporary development problems of these societies without paying due attention to the "unequal" relationship between these countries and the industrial world. This seminar examines the form and the function of that relationship, both in its external and internal dimensions. Prerequisite: consent of instructor.

44:263 Industrial Location and Regional Development in Latin America 3 s.h.
The experiences of Latin American countries are examined as examples of the industrial policies and plans employed by developing countries in their attempts at national development; comparison of different national strategies and examination of the role of multinational companies.

44:264 Agrarian Change and Rural Development in the Third World 3 s.h.
Introduces graduate students interested in Third World development to classical and contemporary theories that inform rural development projects and programs; explores the historical roots of contemporary rural development thinking. Using theoretical and historical knowledge gained, students do an in-depth research paper on the nature of rural development in a Third World nation.

44:285 Transportation Regulation and Finance 3 s.h.
Explores 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.

44:275 Development Policy and Planning in the Third World 3 s.h.
Interdisciplinary seminar focusing on comparing development policies and planning in Third World

countries. Examines important development problems and alternative perspectives on the 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, 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 Methods 2-3 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.

44:292 Location Theory 2 s.h.
Same as 6E:292 and 102:292.

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.

44:294 Geographic Perspectives on Development 3 s.h.
Theoretical and empirical studies of the regional development process with special emphasis on developing countries; examination of alternative regional development theories and changes in development theories as evidenced in the literature of geography and related disciplines. Required of all students in the regional development subprogram.

44:296 Regional Development: Mathematical Models 2 s.h.
Models of regional growth and development; central place associated with urbanization and development and the developing nations. Prerequisites: 6E:203 and consent of instructor. Same as 6E:296, 102:296.

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

44:315 Research Seminar: Political Geography arr.

44:321 Research Seminar: Urbanization and Environment 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.

44:335 Research Seminar: Urban arr.

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 with consent of instructor. Same as 34:279, 7D:301, 30:324.

44:350 Research Seminar: Staff arr.

44:380 Field Seminar arr.

44:390 Seminar in Regional Science 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: Gilbert Klapper

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: Eric H. Christiansen, Ann B. Foster

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

Adjunct assistant professors: R. Sanders Rhodes II, Brian Witzke

Research associate: Julie Golden

Degrees offered: B.A., B.S., M.S., Ph.D.

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, archeology, science education, or