THE COLLEGE
OF
EARTH AND MINERAL
SCIENCES
AT
PENN STATE

E. Willard Miller

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In the development of the first agricultural program at Pennsylvania State University, the study of geography was recognized as an important subject. This reflects a tradition that has evolved over centuries that an "awareness of place" is important in human endeavors. The study of physical geography provided practical information for agricultural students. In order to provide this needed knowledge about the earth, the first catalog in 1859 offered a course called "Geography and Meteorology." The course description read: "Embracing the general principles and the special application to agriculture, involving questions of the influence of temperature, rainfall and the general outline of the earth upon the production power of the soil for different vegetable substances."

At this early time it was known that physical patterns varied from place to place and that an understanding of these areal variations was essential to the agricultural development of the state. In 1860 the title of the course was changed to "Physical Geography" and remained a required course in the scientific and agricultural program until the late 1870s. During these early years geographic training was also required for admission to what was then known as the Pennsylvania State College.

Although the practical aspects of geography dominated the course offerings during these early years, it was also recognized that geography was an ancient discipline that had flourished during the height of Greek civilization. As a result, the study of ancient geography, focusing on how Greek philosophers and others viewed the world, was considered an appropriate focus for nineteenth-century college training. From time to time a course embracing these ideas appeared in the catalog. This course was taught by a faculty member, usually in philosophy or history, who had an interest in the ancient world.
Administration
Geography

In Charge
Raymond E. Murphy 1931–1945

Division of Geography
E. Willard Miller 1945–1954

Department of Geography
E. Willard Miller 1954–1963
Allan L. Rodgers 1963–1970
Wilbur Zelnisky 1970–1976
Ronald F. Abler 1976–1982
C. Gregory Knight 1982–1989
Ronald F. Abler 1989
Rodney A. Erickson 1990–

Little, if any, geography was taught at Penn State between 1880 and 1917, when the subject was reestablished in the School of Mines. The first two courses in geography’s revival were entitled “Physical and Commercial Geography” and “Geography of Mineral Resources.”

The importance of geography as a subject was recognized by Deans Elwood S. Moore and Elmer A. Holbrook, who taught geography on a regular basis. Throughout the 1920s Geography of Mineral Resources was a required course in the freshman year for students in the School of Mines and Metallurgy. Other geography courses were Physiography, introduced in 1922, and Geography of North America, coming in 1926. Both were taught by C. W. Robinson, associate professor of geology. During the summer session, geography courses were available for teachers in Pennsylvania’s public schools.

The geography courses of this period were primarily descriptive in nature. Their major goal was to impart information, and they did not have any distinctive disciplinary philosophy. Consequently, the instructors required little or no formal training in a geographic approach to knowledge.

ESTABLISHMENT OF THE DISCIPLINE

During Dean Edward Steidle’s restructuring of the School of Mineral Industries he wrote: “Since the study of geography, with its emphasis upon correlations and interrelationships between the physical and cultural aspects of the world, is the intellectual bridge or catalyst between technical earth studies and human institutions, it becomes imperative that continued advancements be made both in the field of geographic research and in the field of mass dissemination of geographic knowledge through our institutions of higher learning.”

Dean Steidle was well aware that geographic patterns are constantly changing and that these changes could affect every aspect of society:

Examples of the ways in which technological progress might conceivably remake the geography of the world by the year 2000, and rend asunder existing patterns of human institutions, are fantastic in their potentialities. It is well within the range of possibility that the end of the century will witness not the evolution of an “atomic age” but instead the full-blown blossoming of a “solar age” in which energy derived from the sun will be the overwhelmingly dominant source of industrial power. The human implications of such a development will be cataclysmic and will radiate through every facet of every individual’s life. The seat of world power will shift from the present coal-rich, middle-latitude nations, like the United States and the Soviet Union, to sun-rich tropical lands. Industrial pygmies, such as the Sahara and Australian deserts, may well evolve into the gigantic workshops of a nearby tomorrow.

It behooves the educational and political leaders of our nation to ponder long and well the possibilities of economic, social, and political repercussions to its technological advances, and to engage the most competent personnel available to analyze and predict the effects upon the future geography of the world of probable advancements in the physical sciences, so that this country may foresee and plan for such contingencies long in advance of possible adversaries dedicated to a way of life inimicable to the democratic tradition. Furthermore, instruction of the masses of the people, in both the present and possible future geography of the world, is essential in order to obtain an intellectually alert and receptive citizenry who will understand and support social, industrial, and political policies that will enable our nations, our way of life, and our very people themselves to exist and thrive in a rapidly changing world. (Steidle, 1952)

In order to provide geographic instruction on a permanent basis, Raymond E. Murphy was appointed assistant professor of economic geography in the fall of 1931 in the Department of Geology, Mineralogy, and Geography. Dr. Murphy thus became the first professionally trained geographer to serve on the faculty at Penn State. In the fall of 1932 a regular program of college geography was offered for the first time (Murphy, 1932). The first course in Geography of the World, North America, Europe, South America, and Pennsylvania; Geography of Mineral Resources; Principles of Geophysics; Geology Laboratory; Climatology; Physical Geography; and Geography of the United States. C. W. Robinson continued to teach physiography, but Dr. Murphy was responsible for all other geography courses. A normal teaching load was four three-credit courses per semester.

A major in geography was not yet developed, and geography courses were elected by students desiring a geographic perspective. During the 1930s, the world geography course attracted a large number of students seeking an elective course. By 1935 a minor and major in geography were established for education students under the science requirements in the School of Education. It was a weak program, requiring only four courses in geography. Although not a single geography course was listed as elective or required in the physical or social science program for teachers in the School of Education, many education students took geography courses as a general subject.

The program in geography grew during the 1930s, and in 1937 a second geographer, John R. Randall, was hired. Dr. Randall taught the geography of North America, Latin America, and
Europe, and regional climatology, as well as the lower-level courses but in 1940 he resigned to take a position in geography at Ohio State. He was replaced by Henry Bruman, a specialist in Latin America. Dr. Bruman remained at Penn State for four years, leaving in 1944 to take a position in the Department of Geography at the University of California at Los Angeles.

In 1937 a master of education degree program in geography was approved. The program was offered to public school teachers during the summer session, and the first M.Ed. degree in geography was granted in 1939.

In the World War II years, geography was a required course in the Arms Specialized Training Program (ASTP). In order to provide instruction for the hundreds of students in this program, geography was taught by many nongeographers. During this period, Phyllis R. Giess, a secretary to the dean of the graduate school but also a trained geographer with a master of arts from Wellesley College, entered the department and remained a faculty member until she retired in 1966. Hugh Spittal, a geographer who had acquired a master of education degree, was also hired to teach in the ASTP program, but in 1946 he resigned to take a position at the U.S. Army Map Service.

The course offerings in geography were expanded during the 1930s and 1940s, so that by 1944 the catalog listed eleven lower-level and eleven upper-level and graduate courses, and three courses at the graduate level only. Besides the regional courses, the program included such topical courses as Political and Cultural Geography, and Regional Climatology, and such methodology courses as Navigational Aids, Cartography, and Field Methods in Geography. These courses were elected by students in teacher training programs and as general education courses. During World War II a special course for one credit, Geography of the War Zones, was offered by Phyllis Giess. This course attracted hundred of students each semester, for it discussed the geography of the areas of immediate interest in the then-current world conflict.

EARLY RESEARCH ENDEAVORS

A research program that has been a continuous integral part of the geography program was initiated by Raymond Murphy as soon as he arrived at Penn State. In the December 1933 issue of Mineral Industries he outlined a program for the study of the geography of Pennsylvania: “Pennsylvania, until now, has remained a frontier insofar as geographic field work is concerned. With one or two minor exceptions, neither state-supported nor private work has been done on the geography of Pennsylvania... No exact detailed and quantitative information is available. For some time the geography division of the School of Mineral Industries has been planning a series of field surveys which, when carried out, will make available a complete and accurate picture of the geography of Pennsylvania.”

The initial step in this project was to determine the important geographic regions of the state. By December 1933 Dr. Murphy had tentatively defined the regions. The next step was to describe and analyze the geography of each region. Dr. Murphy stated: “The reports resulting from the geographic survey of a region or subregion will cover such topics as the following: the natural environment of the area; the distribution of population throughout the area; population trends; the principal economic activities together with their geographical bases and trends; other adjustments which people have made to the natural environment in the area; undeveloped resources and industries for which these resources might form a basis.”

The geographic survey of the state culminated in publication by Dr. Murphy and his wife, Marion Murphy, of the regional Geography of Pennsylvania in 1937. The approach taken by this book was copied by authors of most state geographies in the next thirty years. The text remains of historical value today for the information it provides on the state for the 1930s period.

As a response to the intensive field studies of Pennsylvania, Dr. Murphy concentrated his work on a number of urban areas, and therefore became one of the pioneer geographers in the study of urban centers. Two of his articles, “The Geography of Johnstown, Pennsylvania: An Industrial Center” (Murphy, 1934) and “Johnstown and York: A Comparative Study of Two Industrial Cities” (Murphy, 1935), are considered classics from the 1930s. The detailed analysis of land utilization presented a new approach to the study of urban areas.

Studies of minerals were also important research endeavors. For example, in 1938 Dr. Murphy wrote an article published in Economic Geography entitled “The Anthracite Region of Pennsylvania,” describing the spatial pattern of anthracite mining, analyzing the decline of the industry, and discussing the region’s prospects for the future.

GEOGRAPHY PROGRAM ESTABLISHED

In the 1930s and early 1940s, the geography program was part of the curriculum of the earth sciences along with geology, geophysics, and meteorology. While it was possible to secure a major in geography within the geology program, no students elected to do so. With the reorganization of the School of Mineral Industries in 1945, geography became a separate program offering B.S., M.S., and Ph.D. degrees. E. Willard Miller became the first chief of the Division of Geography in
Although teaching responsibilities were much wider. The research emphasis on economic geography developed a critical mass of publications in this single area. Only by this means could a national and international reputation be developed.

In 1945-46 the only faculty member with a professional rank was E. Willard Miller. In the late 1940s and 1950s he carried out a research program in the fields of minerals and manufacturing. These early endeavors culminated in the first book published in the United States in the field, *The Geography of Manufacturing* (1962). This book used both a topical and a regional approach to the study of manufacturing. The factors of localization and causal relationships that influenced the locational patterns were emphasized.

After World War II, Phyllis Griss continued on as a faculty member, receiving her Ph.D. from Penn State in 1949, the first doctorate granted in geography. She was particularly interested in the world flow of commodities and how this flow affected the economy of the Third World nations.

A growing student enrollment brought the first opportunity to build the program in 1947, when the Division of Geography was established. When the Division of Geography was established the program had two major objectives (Miller, 1952). The first was to train professional geographers to meet the needs of the period. The demands came from three areas of work. First, the demand for geographers in the federal government continued after World War II, not only in the military but in such civilian agencies as the Soil Conservation Service, the Weather Bureau, the Library of Congress, the Department of State, and others. There was also a growing demand for geographers in the business, commercial, and industrial world. Airlines, railroads, heavy and light industry, book and magazine publishers, and foreign trade companies employed geographers. Finally, there was a growing demand for instruction in geography at the collegiate and secondary levels. Geography programs were expanding rapidly in colleges and universities across the nation.

The second major objective of the Division was to provide a wide range of service courses for students at Penn State. As Dr. Miller wrote in a November 1952 Mineral Industries article: "Never in the history of the World has there been a greater need for an understanding of the ways in which different peoples live. Modern communications and transportation have made it possible for all people to be in close proximity. Getting to know one's neighbors, however, is a difficult and strenuous task which takes a great deal of time and much mental effort. At present much of the information of the average citizen on world relations is superficial and frequently based on false impressions. We need to spend more time in giving the average citizen sufficient information to discuss present-day world problems intelligently. So let us be assured of this, that the Russian question, the natural resources question, the South African race question, will never be solved until all people know a lot more about such basic matters."

**FACULTY DEVELOPMENT**

Research and teaching by the faculty have evolved over the years as the discipline has developed. Initially, the faculty was small and little known in the profession. After the establishment of the degree programs in 1945, faculty research concentrated in the branches of economic geography,
By the late 1950s the undergraduate and graduate program and service load had grown enough that the faculty needed to be increased. Although Penn State had gained national recognition for its work in economic geography, major changes in the field of geography which required a change in the philosophy of faculty recruitment were occurring. The topical specialties in human geography were becoming increasingly important, and methodological courses utilizing quantitative techniques were becoming essential for a well-rounded research and teaching department.

In 1958 Peirce Lewis joined the faculty. His focus has been "the American scene," and his fundamental goal is to teach students how to interpret landscapes and to understand how the basic framework of vernacular landscapes came to be through these evolutionary processes since colonial times. In two studies, "The Unprecedented City" (1979) and "The Galactic Metropolis" (1983), he argued that Americans have been creating an urban morphology that is unique on the face of the earth. The new morphology is "galactic"—that is, composed of bits and pieces that in preautomation times were necessarily concentrated around a nuclear downtown. But no more—residential, commercial, industrial, and recreational functions now float in space, held together by this mutual attraction for people who travel in automobiles.

Arriving a year later in 1959, Paul Simkins began devoting much time to the study of changing patterns of population distribution and characteristics and the effect these changes have on human conditions. Of special interest to Dr. Simkins is how recent trends in residential preference and lifestyles have significantly altered traditional demographic patterns. A second interest focuses on how different developing countries have attempted to adjust their inherited systems of organization to cope with rapidly changing world conditions. Dr. Simkins pursues this field of study by analyzing the impact of the expansion of Europeans, and their ideas and institutions, on Third World cultures, with special emphasis on Latin America, where regional variations in the nature and intensity of change is especially marked.

Wilbur Zeilinsky, coming to Penn State in 1963 as a "Red Star" professor, has spent his time thinking about teaching, and carrying out research on the cultural, social, and population geography of North America. He says, "It has been exciting to be a member of the trailblazing generation to begin exploring the many unexplored facets of our continent's human geography, including such topics as the spatial aspects of religion, town morphology, house types, popular regions, free and slave Black populations, rural depopulation and repopulation, memberships in voluntary organizations, place names, and personal names." His 1973 book The Cultural Geography of the United States has become one of the classic studies in the discipline. In the demographic community he is best known for his 1970 study The Hypothesis of the Mobility Transition. A second major interest of his has been the ethical, social, and ecological responsibilities of the geographer.

Peter Gould, who came to Penn State in 1963, has been closely involved with the development of quantitative methods in geography. He has worked closely with mathematicians on an algebraic topological "language of structure," a methodological perspective that challenges the transfer of rather constrained mathematical structures from the physical to the human sciences. Traditional mathematics describes the physical world adequately at classical scales, but it may be much too limited to describe the structural complexity of the human world. Dr. Gould conducts joint studies with colleagues in physical education, archaeology, and mathematics. In 1987 he became the first Evan Pugh Professor of Geography, the highest academic distinction the University can bestow on a faculty member.

E. Willard Miller on the banks of the Yukon River in 1930, where he was conducting environmental studies in Alaska for the U.S. Quartermaster Corps.
this I am suspicious. So, quite rightly, are the students. Whether a teaching style is sober or, as the students, I wonder whether a teacher takes delight in a calling that is a compelling privilege.

A calling? All very well for priests and poets, but what about geographers? Or material scientists? Or meteorologists? Or geochimists? Or any of those who form the rich intellectual fabric of the College? Very well, if you discard the notion of a calling, explain to me why a fourteen-year-old boy, birdwatching on the cliffs of South Devon, decided to become a geographer. There were, of course, many who helped on the way. A devoted schoolteacher who shared such a fascinations for the beauty of classical physics that it remains an amateur delight to this day. A grandfather who had the rhythms of English poetry so much a part of his being that he could pass his joy on to another. A professor of philosophy who opened up the questions that are posed again and again over the two-and-a-half millennia of our Western heritage. A geographer who let me go my own way when I was numbed by the sad banality that formed part of graduate work thirty years ago. And colleagues here at Penn State and around the world who gave more than they ever realized.

Privileged? Spoil rotten more likely.

The first path taken was methodological—a path toward a path (hodos) toward (meta) knowledge ( logos). Even now there are no regrets: those who took the same path, and cleared away some of the underbrush, were given a joyful freedom to move in "problem space." The way was mathematical, often made practical by the soaring power of computation. But the mathematics had grown over centuries from the longing to describe with fidelity the physical world of things. It often did so with a beauty that was shattering, a beauty that brought tears to your eyes when you lay there thinking in the quiet of the night. But what happened when you mapped the human world, the world of the human geographer, onto those mathematical structures devised for celestial mechanics, statistical mechanics, continuum mechanics, quantum mechanics . . . Could the human world be anything but mechanical? Would the "language" employed allow it to be anything else? Was artificial intelligence all we had left, when we so desperately needed real intelligence? Was there a gender, less tyrannical mathematics capable of describing the allowing, forbidding, but not requiring structures that make up the human world and its daily interaction with the world of physical things?

So it was back to the beginning again, back to mathematics and back to those who still wished to keep thinking open. If you had told me that I would spend six weeks on forty-five pages considering a dozen words of a fragment of a Greek text I would have said you were mad. But Anaximander entered the library to thinking about the constitutive grounds of being human. Not a bad place for a "human scientist" to start. But the questions and texts are difficult. You need help—teachers, colleagues and students. Teachers and colleagues who are students. And in this university you can find them, and also in the words and thoughts of "best brothers"—an old Swedish mode of academic address—at other universities. It is a privileged world. We are privileged to learn, and privileged to use our learning to help others to learn. We even get paid for doing it.

Privileged? Spoil rotten.

In 1966 Anthony Williams added strength to the quantitative aspects of the departmental program with his work in computer mapping—the application of techniques for handling large-to-very-large geographic data bases. These have wide practical applications, as shown by his contact with the Los Alamos Scientific Laboratory, where he carried out studies to enhance their offshore oil-leasing data base. An interest in interaction computer mapping led to his development of a pilot system written in the computer language APL (A Programming Language). Dr. Williams spent a year in the Department of Geography of the University of the Cameroons, where he was influential in establishing a computer system. In addition to his expertise in computer mapping, he teaches political geography.

Ronald Aber came to Penn State in 1967 and has been conducting pioneering research on the interplay of interpersonal communication techniques (postal, telegraph, telephone, etc.) and other relationships to the changing locations of economic activities. His studies have provided a useful perspective on the role of technology in society. He has also been interested in the development of cartographic techniques to display spatial variations. As a result of these efforts, he designed and edited a comprehensive atlas of America's twenty largest metropolitan regions. The atlas provided an innovative comparative study by using standard sets of variables across metropolitan regions that documented and explained the similarities and differences among American cities. From 1984 to 1988 he served as director of the Geography and Regional Science Program at the National Science Foundation. A major accomplishment during his term there was to expand the program to include physical geography. In 1990 he became executive director of the Association of American Geographers.

Roger M. Downs, arriving at Penn State in 1970, has had a major commitment to understanding the use and origin of maps. He has a long-term interest in the development of cartographic understanding by children. He is also interested in the nature of human wayfinding, with attempts to understand the creative use of space, graphics, and visualizations, and he is considering procedures to develop spatial thinking. He makes geographic learning a distinctive approach not only in acquiring knowledge but also in applying it to problem-solving.
C. Gregory Knight, a member of the faculty since 1971, carries on research and teaching on the human use of the environment with an emphasis on African studies. He states: "The sustenance and survival of human society depends on its organization and use of natural resources. Each society brings to that challenge its own perceptions, technologies, and aspirations. My research interest has focused on how societies appraise and utilize resources, seeking frameworks with which to view human-environment interactions." In developing these concepts he utilizes the field of "ethnography," through which a society's knowledge and beliefs are described and analyzed. In addition, his work has extended to the industrialized world, still asking the question of how we best assess, manage, and use resources. Because his work straddles the nebulous boundary between human and physical geography, he has brought to his teaching of physical geography an emphasis on implications for human society of environmental processes. In 1989 Dr. Knight became dean of undergraduate instruction and vice provost.

In 1977 Rodney A. Erickson and Lakshman Yapa, both economic geographers, were added to the faculty. Dr. Erickson's teaching and research involve theories and empirical applications related to the transmission of economic growth impulses both within and among regional economies; regional economic forecasting and impacts analysis; industrial location and location change using a product life-cycle and other theoretical frameworks drawn from economics and business administration; the evolution of geographic development patterns, particularly among economic activities in large metropolitan places; spatial patterns of economic welfare among minority groups in large cities; and the role of geography in international trade and business management.

About his teaching Dr. Erickson states: "I think that my greatest accomplishment has been to attract and interest a significant number of students from across the University and help them learn to 'read' the city around them, to develop the analytical concepts to make order out of the urban mosaic, and to be better informed about contemporary public policy discussions dealing with urban problems."

Besides his geographic interests, Dr. Erickson has made major contributions in the public service arena as director of the Center for Regional Business Analysis in the College of Business Administration. His research and ideas have been a part of state government policy-making on several occasions, and he has had the opportunity to advise and brief members of the state legislature, governors, and other senior administration officials. He has also worked closely with business and civic leaders across the state, and in the process demonstrated the value of the geographer's approach and analytical skills.

Lakshman Yapa's interests lie in the applications of quantitative geography and the economic development of the Third World. In quantitative geography he addresses the issues of areal sampling and the special problems of adapting bivariate multivariate techniques to geographical distributions. In his course on economic development he treats such aspects as underdevelopment as part of the historical process in a global system of international trade and commerce, the problems of transfer of technology from the developed world, and the role of appropriate technology in the production and provision of basic human necessities. The goal of his research is to demonstrate that countries of the humid tropics, where much poverty is present, contain a variety of resources that can provide the material and energy resources for the provision of basic goods. Dr. Yapa has carried out field research in many areas of the world, including Bolivia, Thailand, and Sri Lanka. From these experiences, he developed the use of microcomputers in regional planning. The concept was to develop a system of user interaction programs so that Third World regional planners could use the computer without extensive prior training.

In the past the cartography program of the department was directed by Ronald Ahler and Ronald Lyon (now at the University of Calgary). Alan M. MacEachren was appointed in 1984 to develop the cartography and remote-sensing program of the department. He is director of the George F. Deasy GeoGraphics Laboratory. In 1989 David DiBiase was appointed the first full-time cartographer in the laboratory.

Dr. MacEachren has primary interest in cartography and geographic information processing. This includes human cognitive processing of spatial information and related computer-processing associated with computer mapping and geographic information systems. In his teaching he utilizes a more conceptual-theoretical approach with an emphasis on map design and symbolization. His research has taken him into the study of historical applications of maps and the implications of the use of strip format maps. As a long-range project his research addresses the role of maps in spatial understanding. He is particularly interested in how people use maps in developing or altering regional images. A related project considers the more basic question of how maps convey geographic information.

With the development of the Earth System Science Center in the College, Brenton Yarnal and Robert Crane, both arriving at Penn State in 1984, became associated with this program. While maintaining strength in human geography in the department, the new Center provided the opportunity to strengthen physical geography. Dr. Knight states: "It seemed that there was a splendid opportunity to rebuild the department's role in the college by emphasizing a component of physical geography."

Dr. Yarnal has been developing an instructional and research program in climatology on a global scale. This includes the observation and dynamical theory of global teleconnections, especially El Nino/Southern Oscillation events, the relationships between the ocean-atmospheric system of the North Pacific and cyclonic distributions, relationships between the tropical atmospheric circulation and the deposition of snow in tropical mountains, and the methodological problems in the use of computers to evaluate climate patterns objectively.
THE UNDERGRADUATE CURRICULUM

With the establishment of geography as a separate discipline in 1945, there were increased efforts to develop the undergraduate major. In the April 1946 issue of Mineral Industries, Dr. Miller stated:

In any field of science, knowledge must be organized into systems, so that in attacking and solving problems the knowledge of facts, general concepts, and principles that bear on the problems are readily available. In geography, knowledge is organized into systems in two quite different ways—that of systematic geography and regional geography.

The organization of geographic knowledge in terms of individual phenomena of areal differentiation is called systematic geography of which physical and human geography are the two main branches. Physical geography deals with the components of the natural landscape and such special branches as physiography, climatology, geography of soils, biogeography, and cartography are developed. The field of human geography deals with the cultural landscape and is divided into four main branches, each of which has several subdivisions. Of the four, economic geography is without doubt the most important and has such subdivisions as industrial geography, mineral geography, agricultural geography, and geography of transportation. Political geography considers also military geography and geopolitics. The geography of peoples includes urban geography, rural geography, and studies of population distribution, and the fourth major subdivision is cultural geography, which has as its specialties social and anthropo-geography. . . It can be demonstrated by even a random conversation of the literature that the greatest emphasis, either in systematic or regional geography, consists of a combination of physical and human geography.

The integration of all or selected branches of systematic geography, focused on a particular place on the earth, is regional geography. Almost all geographers agree that the clearest view of geography is to be obtained in regional geography when the geographer observes, describes, and interprets the relationships between the natural environment and man's activities in a given area.

At the present time, there are two dominant developments in geography that are complementary. The first is philosophical and scientific and calls for the intensive study of regions involving the recognition, mapping, classification, interpretation, and comparison of areas. The second is social and practical in character and grows out of an active interest in economic and social problems, such as the wise utilization of natural resources and land.

In order to grasp and solve the many problems of the present-day world, the preparation of geographers calls for much greater accuracy and clearer thinking than in the past. A greater concentration on the exact sciences will introduce new types of measurement, will clarify present methods of interpretation, and will give us results quantitatively exact as well as qualitatively true. The interest of geographers must be directed more and more into the scientific aspects of the field in order to establish sound thinking.

In the initial planning of the undergraduate major it became evident that, although a wide variety of courses had been developed during the Murphy era, there were no courses in the field of economic geography, except mineral geography. Because economic geography had developed as the leading systematic field in the 1940s, this was a major deficiency, which literally prevented...
development of a modern curriculum: an agreement with the College of Liberal Arts prevented the establishment of courses in economic geography. Dr. Miller immediately protested to Dean Edward Steidle, indicating that the development of the new program had been stymied. Dean Steidle and Dr. Miller met with Dean Charles Stoddart of the College of Liberal Arts to resolve the problem. After less than an hour of discussion it was recognized that the Geography Department must have the responsibility of developing the field of economic geography. Initially, courses were established at the undergraduate level in economic geography, agricultural geography, and industrial geography, and at the graduate level an economic geography seminar and a research course were established.

The initial undergraduate curriculum in geography consisted of 37 credits in geography. The distribution among the different branches of geography reflected the philosophy of curriculum-building of the period. There was a balance of systematic, regional, and methodology courses with 12 credits in regional, 15 credits in systematic, and 10 credits in methodology courses. The course in aerial photogrammetry, taught from a geographic perspective, was one of the first, if not the first, course of this kind in the United States. The initial curriculum leading to the bachelor of science degree had a strong physical emphasis, with 8 credits in mathematics, 10 credits in chemistry, and 10 credits in physics. The other earth science fields—meteorology and the geological sciences—were also strongly represented.

In 1960 a bachelor of arts degree in geography was established in the College of Liberal Arts. This development reflects the fact that the field of geography has major components in the social sciences as well as the physical sciences. The B.A. program was devised for students who wanted a stronger human emphasis. The geography faculty in the College of Earth and Mineral Sciences advises students in the Liberal Arts program.

A major change in the philosophy of structuring the curriculum came in the 1960s with the development of human geography and particularly with the influence of the quantification "evolution" in geography (Miller, 1982). The emphasis shifted to topical and methodological courses, which included such new topical geography courses as population geography, the geography of manufacturing, cultural and anthropo-geography, regional physiography, and the geography of transportation and communications. New methodological courses emphasized spatial analysis, computer mapping, digital terrain models, remote-sensing, and cartographic symbolization and design.

The undergraduate majors grew steadily in the 1950s and the early 1960s to about fifty students, but in the late 1960s and early 1970s enrollment declined to as few as fifteen. The department recognized that a sound undergraduate enrollment was necessary if geography was to flourish on the campus. In order to strengthen the undergraduate program, Frederick-Wernstedt was appointed undergraduate officer in the early 1970s. A major responsibility of his was to coordinate the advising of students in the department. Students began to recognize that the geography program had advisers who were concerned with their welfare.

To make the geography major more attractive to students who wanted to concentrate in a particular branch of the field, options were created in 1981. In the B.S. program three options were approved. The general option is designed to serve the needs of students who want to learn about the various topics and perspectives that comprise the discipline. This option is appropriate both for students who intend to pursue postgraduate degrees and for students who want to emphasize a topic for which no option exists. For students who want to pursue positions in public and private mapping agencies and firms, an option in cartography, remote-sensing, and geographic information systems has been prepared. Finally, the physical geography option is designed for students who seek a broad understanding of the earth and environmental sciences. This option is designed to develop competence in the description, analysis, explanation, and management of problems arising from human use and exploitation of the natural resources and natural systems.

For the B.A. program in the College of Liberal Arts, two options have been developed. The general option ranges across a diversity of topics that comprise the disciplines of geography, and the economic and development option is especially appropriate for students who intend to pursue careers in business and industry in the economically developed nations and in the Third World.

Besides the continued updating of the undergraduate geography programs and the introduction of an effective system of advising geography students, several special programs have been inaugurated to enhance the undergraduate program. During the summer a number of students work in planning offices as interns, an opportunity that provides practical training. Special geographic field trips are planned periodically to provide experiences in studying spatial problems. Special readings and research courses are available for advanced undergraduate students. The department has a career placement service that aids students in finding a position upon graduation. Enrollment has grown steadily to between 115 and 130 in recent years.

THE GRADUATE PROGRAM

Programs leading to the M.S. and Ph.D. degrees were begun in 1946. The first M.S. was granted in 1947, and the first Ph.D. was conferred in 1949. Between 1947 and 1963 forty-three master of science degrees, one doctor of education, and seven doctor of philosophy degrees were granted. The overwhelming percentage of these degrees were in the field of economic geography, with mineral and manufacturing geography dominating. By 1961 on a peer evaluation of geography
graduate programs in the Roose-Anderson survey in the United States, Penn State stood in
eleventh position. The quality of the program has continued to improve, and in 1983 the Jones
Lindsay survey ranked the graduate program second in the nation—convincing evidence of a
productive faculty and exceptional students over a long period of time.
In order to attract geography students, there is a need for adequate financial aid as well as for
outstanding faculty. Initially this aid came through graduate teaching assistantships. The assis-
tants taught in physical geography laboratories and led human geography recitation sections.
The number of graduate students grew from two in 1946 to thirty-four in 1960 to a peak of
fifty-nine in 1970. The significant growth in the 1960s was largely attributable to graduate
student aid received from the National Defense Education Act, the National Science Founda-
tion, and university fellowships. Graduate students were attracted from the most prestigious American
universities, but there was also a major influx of foreign students, particularly from Great Britain
and the Commonwealth nations. These people came because the graduate program combined
quality instruction not only in the traditional facets of the field but also in the newer, quantitative
branches that blossomed in the 1960s.

The graduate program continues to be a major endeavor of the faculty. Since 1970, enrollment
has varied between forty and fifty students each year. The theses and dissertations reflect modern
graphic trends. Recent titles include "Modeling the Evolution of Suburbanization in a Metro-
politan Region," "Two-Variable Mapping: A Practical Case for the Soil Map," "Equity of Bus
Transit Subsidies: A Case Study of Dayton, Ohio," "Spatial Development and Internal Spatial
Organization of the Southeastern Pennsylvania Plain Dutch Community," and "Geomorphology
of the Fall Stretch of the Potomac River."
The graduate program functions under a set of regulations set by the graduate school and the
department. A graduate officer coordinates the selection of new students. While a faculty committee
makes certain that each graduate student has achieved the minimal level for graduate work, a major
feature of the graduate program is that each student has a program that is developed specifically for
him or her. An important facet of the graduate program is a seminar in which each faculty member
presents his area of research and becomes acquainted with the new graduate students. Discussions
on new concepts and trends in the field are also planned. In the spring semester the students present
proposals for their theses research to faculty and other graduate students. These meetings become
lively sessions that hone a student's geographic understanding of his research program.
The graduate program is enriched by a number of special programs. In the 1960s a tradition of
inviting distinguished American, British, and Swedish scholars to present lectures and develop
seminars in the graduate program began. Throughout the academic year a Friday coffee hour
brings outstanding speakers to the department. These coffee hours are attended by undergradu-
ates and the general public as well as by graduate students. To encourage scholarship at both the
undergraduate and the graduate level, the department established the E. Willard Miller Award in
geography. Given annually, the award consists of a monetary gift and a plaque. The recipient must
prepare a paper that is judged by a faculty committee. In order to maintain relations with both
graduates and undergraduates who have been students in the department, the PSUDOG series—
the departmental newsletter—has become a hobby perennial.

IDEOLOGICAL DIALOGUE

The field of geography has been dynamic in its attempts to provide an ideological framework for
understanding spatial distributions on the earth. These include such approaches as environmental
determinism, human ecology, and regionalism among other major themes. At Penn State the basic
philosophy has been to be at the cutting edge of the development of the discipline. Beginning in
the late 1950s the field of geography experienced a "quantitative revolution" that advocated a
rigorous scientific approach to the subject. Faculty were recruited accordingly to develop these
new concepts.
As a result, in the Department of Geography, as throughout the nation and even the world, an
ideological controversy ensued between the newly arisen so-called "quantifiers" and the more
traditional practitioners, many of whom subscribed to a more humanistic philosophy. Teaching
and research were polarized along these lines. These two approaches raised fundamental ques-
tions that could not be resolved in a short time. The debates in the department extended well over
a decade. Discussions occurred among individual faculty members as well as at times during
faculty meetings. From these debates it became evident that a monolithic ideology did not exist. The study of spatial distribution, for example, could be carried on from a variety of methodological and philosophical approaches. As professors presented a case for their particular approaches to the discipline, they sharpened their concepts, which made each member of the faculty a better teacher and researcher. The geography program may have suffered some slight setbacks during the early stages of the ideological debates, but the department made remarkable gains throughout the middle and later stages. Enrollment in the undergraduate and graduate programs increased, and research productivity grew. Although the debates were rigorous, there was an overriding philosophy that the unity of the program must be preserved. During these dynamic times the skillful administration of the department heads was extremely important in holding the department together. The department heads not only kept the department functioning but also provided guidance for its continuing growth.

GEOGRAPHY AND GENERAL EDUCATION

The geography faculty has always recognized that general education is an avenue for providing students with a geographer's perspective. The unique perspective of geography makes it the only discipline that has as its core the study of the spatial dimensions of a problem. Because physical geography is part of the physical sciences, and human geography is part of the social sciences, general education courses have been developed in both of these major branches.

General education courses provide students with a geographic perspective by using a number of different themes. One traditional approach of the geographer is to describe, analyze, and interpret spatial patterns and to compare and contrast these patterns found in nature as well as those formed by the work of men and women. A student approaches the study of geography with three basic questions: Where are the patterns on the earth located? Why are they located there? What are the consequences of their locations? Although the first question is fundamental to the geographic approach, scholars recognized centuries ago that where simply defines the location to be analyzed and interpreted. If the study ends there, geography becomes a sterile field of memorization. The vitality of the discipline lies in the attempt to explain the existence of incredibly complex geographic patterns. The answers are rarely obvious, but seeking to solve these puzzles makes the geographic approach exciting.

Theoretical as well as empirical approaches to knowledge are used to provide students with an understanding of the spatial aspects of the physical, economic, cultural, and political systems existing on the earth. The study of the functions of regions, also long established in geographic work, gives students an understanding of spatial structures that involve both patterns and linkages in complex interrelationships. Approximately 1,800 to 2,000 students who are not geography majors take geography courses each year to satisfy a part of the general education requirements.

Students learn that a geographic approach to knowledge is exciting for its own sake. It provides a way to interpret some of the events that are happening in the world every day. It provides a framework for raising such issues as why different densities of people exist on the earth, why some regions are important to us and other regions are of lesser importance, why industry is concentrated in a few places and why the location of industry is dynamic, why

some people are poor in material goods while others are rich, and why there are differences in agricultural productivity from place to place. There is a spatial perspective to such questions. The geographer's approach provides the student with the methodology to view problems. The geography general education course can thus open for students vistas that can enrich their lives.

As the general education requirements of the University have evolved since the 1930s, the Geography Department has prepared courses to meet the changing trends. The most recent changes occurred in 1987 with the development of the concept of "breadth" courses. A student can no longer satisfy the general education requirement by taking only the beginning-level courses. Students must take at least one breadth course in each distribution category, and then they can complete the category with breadth or depth courses. The geography faculty has prepared courses for the breadth and depth levels to meet the new requirements.

THE GRADUATE PROGRAM FOR TEACHERS

The graduate program in geography began in the 1930s during the summer sessions. Public school teachers who wanted to improve their geographic knowledge in the classroom took the courses. A master of education degree could be earned when 30 credits were completed over a series of summers. The first M.Ed. degree in geography was awarded in 1938. The department continued to offer courses for teachers during the summer sessions until the mid-1970s. Many of the courses were taught by visiting faculty from such universities as Illinois, Ohio, Bowling Green, Texas, and Michigan State. In the 1970s the program was discontinued as in-service programs developed in the public school systems.

The D.Ed. degree program was begun in the early 1950s. This program, primarily during the academic year, was always small, but its graduates secured positions in institutions where teacher training was emphasized, such as Bloomsburg University and Frostburg College. In the 1960s the
National Defense Education Act programs recognized the importance of geographic training in the public schools. In 1967–68 Peirce Lewis and Frederick Wernstedt developed an academic year program for fifteen public school geography teachers. The program was devoted entirely to the development of geographic concepts and the teaching of geography to students at the junior and senior high school levels. Although the program was not a degree-granting program, more than half the students wrote an acceptable paper, and M.Ed. degrees were awarded.

THE GEOGRAPHY LABORATORIES

The Department of Geography has established two major laboratories for teaching and research. These are the Dasey GeoGraphics Laboratory and the Advanced Geographic Information Systems Laboratory.

DEASY GEOGRAPHICS LABORATORY

The Dasey GeoGraphics Laboratory was established in 1984 to support the research and teaching activities of faculty and graduate students in the university. Alan MacEachren is director of the laboratory, and on January 1, 1989, an associate director, David DiBiase, was appointed to consult with students and supervise a staff of student cartographers. The staff is familiar not only with geographic techniques but also with the geographic arts, the psychology of visual perception and cognition, statistical methods, computer graphics, and the theories and techniques of spatial information display. The Dasey GeoGraphics Lab offers the technical capability to manage data of various formats and scales, and the expertise necessary to judge the appropriateness of various techniques in the context of a particular problem. The maps and diagrams in the laboratory have been published in numerous professional journals and books, some of which have been recognized in national design competitions.

The laboratory consists of several components for instruction and research. A classroom is available for cartography and remote-sensing courses, including a fully equipped darkroom facility for use by students and faculty. A second component of the laboratory is the computer facility, which contains both an instructional lab and a research lab. For research, there are two DEC MicroVax computers devoted to image analysis and geographic information systems; two IBM ATs, each equipped with a vector color graphics system; and an IBM PS/2 model 60. On the MicroVax, in addition to standard programming languages and related software, the NASA Goddard Land Analysis System, which makes use of the laboratory’s Raster Technologies monitor as a color-image display device, has been acquired. The laboratory also has 9,600-baud direct lines to the University IBM mainframe, Vax and Sun computers, allowing access to a variety of software as well as to the computer center’s monochrome and color electrostatic plotters. An instructional computer laboratory contains an additional five IBM ATs with color graphic capabilities. Three digitizers are available for data input, and there are several printers and plotters for hardcopy output.

A third component is the cartographies production laboratory, which contains a separate darkroom facility with a large-format vertical process camera as well as a microcomputer system with both black-and-white and color displays. A dot-matrix printer, Apple LaserWriter Plus, HP Paintjet, and HP plotter are available for output, and a variety of geographic and text-processing software is installed on the system.

THE ADVANCED GEOGRAPHIC INFORMATION SYSTEMS LABORATORY

The Advanced Geographic Information Systems Laboratory is a state-of-the-art, high-level workstation laboratory specifically designed to provide an integrated teaching and research environment for the study of Earth-related phenomena. The laboratory provides sophisticated cartographies, image-processing and geographic information systems, software integrated in a multi- processor local area network where the operating system is also specially configured for the special operational requirements to this application.

The laboratory includes eight SUN 4/65FGX (SPARC station 1+) desktop workstations converted to a SUN 4/490 S file server. Each workstation has a 16-inch color monitor with accelerated graphics, mouse, 4MB central memory, two 100MB local hard disks, and a 3½-inch floppy drive. The server has 32MB of main memory, a 16MB IPI, and a two-cartridge tape drive. Graphics hard copy within the laboratory is provided by an Apple LaserWriter and a page-size QMS color plotter.

Application software supported in the laboratory includes geographic information systems, image-processing systems, and other software needed to support advanced spatial data analysis and graphics directly. It is intended that the Advanced Geographic Information Systems Laboratory provide a public access resource for faculty and students in all disciplines within the university that have a need for this specialized environment. The laboratory is directed by Dr. Pequod. Because of the work of this laboratory in the Department of Geography, The Pennsylvania State University is in a unique position to become the lead university in North America in geographic information systems instruction and research. These facilities provide a threefold opportunity for training students in modern, computer-assisted spatial analytical techniques, a service to industry and the community in offering training opportunities for current professional staff in the use of new analytical techniques, and a continuing source of relevant expertise and research in the area of geographic information systems.

COMMUNITY SERVICE

Many members of the geography faculty have been participants in community activities. Peirce Lewis has long been active in State College borough planning in both official and unofficial capacities. In the early 1970s he protested a proposal to remove trees from a number of streets by actually climbing a tree to prevent its removal. Ronald Able served for a number of years on the borough council. Gregory Knight served and chaired the Ferguson Township Planning Commis-
sion. Roger Downs was a member and chair of the Borough Planning Commission. E. Willard Miller has been active in the development of the Heritage Museum in Boalsburg. All these services have a spatial dimension to them, and the geographer brings a particular perspective to the solving of community problems.

DEPARTMENTAL FUNCTIONS

The coffee hour at 4:00 P.M. on Friday afternoons has become a major tradition of the Department of Geography. The lead-off speaker in the fall semester is the dean of the College of Earth and Mineral Sciences. Speakers during the year are not only from the University Park campus but also from all over the nation and occasionally even from other countries. There is no theme to the topics, which vary from art to zoology. Attendance is voluntary, but the room is packed every Friday, with people even standing in the hall. The audience is from all over the campus, not just geographers. To be asked to speak at the Friday coffee hour is now considered an honor.

The department also prepares a newsletter, *PSUDOG*, to provide information about the faculty and students, both present and past. Faculty and students are asked to write about their lives during the past year. *PSUDOG* provides a nostalgic view of the present but also—and perhaps even more important—news about past graduates.

FACULTY AWARDS AND HONORS

The geography faculty has received numerous awards and honors both from within and from outside the University. Five—Anthony Williams, Paul Simkins, Roger Downs, Frederick Wernstedt, and Peirce Lewis—have received the Matthew J. Wilson Award presented annually to an outstanding teacher in the College of Earth and Mineral Sciences. Peirce Lewis received the Christian R. and Mary F. Lindbach Award for distinguished teaching (the highest teaching honor given to a faculty member at Penn State) and the Distinguished Achievement Award of the National Council for Geographic Education. Peter Gould was honored with the Faculty Research Medal, the highest honor for research in the University, and has been further honored by being made Evan Pugh Professor of Geography, the most distinguished professorship in the University. In 1983 he received an honorary doctorate from the Louis Pasteur University of Strasbourg, France. E. Willard Miller, Wilbur Zelinsky, and Peirce Lewis received the Honors Award from the Association of American Geographers. E. Willard Miller is one of the few geographers listed in *Who's Who in the World* for his work on international affairs. In 1990 the Penn State Alumni Association made Dr. Miller and his wife honorary alumni. Ronald F. Abler was awarded the Centenary Medal of the Royal Scottish Geographical Society in 1990.

The faculty has played an active role in the geographic profession. E. Willard Miller was secretary and president of the American Society for Professional Geographers, and he was a founder of the Pennsylvania Geographical Society, serving as president and a member of the council for nearly forty years. In 1983 he received the Meritorious Service Award from the Society, and in 1988 he was made a life member of the Council. Dr. Miller also served as president of the Pennsylvania Academy of Science. In 1982 and 1986 the Academy presented its Distinguished Service Award to Dr. Miller. Wilbur Zelinsky, Peirce Lewis, and Ronald Abler have been presidents of the Association of American Geographers. George F. Deasy was treasurer of the American Society for Professional Geographers and the Association of American Geographers. Rodney A. Erickson is a councilor of the American Geographical Society.

A number of organizations have honored the faculty. E. Willard Miller received the Distinguished Service Award from the Office of Strategic Services. Ronald Abler was honored by the Geographical Society of Chicago for being editor of the *Comparative Atlas of America's Great Cities*. Dr. Miller was given a citation from the governor of Pennsylvania as well as Pennsylvania’s Department of Commerce Secretary’s Meritorious Service Award for contribution to the Commonwealth. Alan M. MacEachren has received the Andrew McNally Award presented by Rand McNally Company. Wilbur Zelinsky received the Distinguished Service Award from the North American Cultural Society.

The faculty has received a number of grants to pursue their professional careers. Allan Rodgers, Wilbur Zelinsky, and Peirce Lewis have held Guggenheim fellowships. Rodney Erickson has been a Fulbright Senior Research Scholar and a Simon Senior Research Fellow. Gregory Knight has been an honorary visiting scientist at the International Institute of Tropical Agriculture at Ibadan, Nigeria. Frederick Wernstedt has held a Fulbright grant as external examiner at the University of Malaysia. Paul Simkins and Fred Wernstedt have held National Science Foundation grants for study in the Philippines.

A number of faculty members have served as editors of professional journals and books. Gregory Knight has been the editor of the *Resource Publications of the Association of American Geographers*. Roger Downs and Gregory Knight have been members of the editorial board of the *Annals of the Association of American Geographers*. E. Willard Miller has been contributing editor to *Producers Monthly*, *The Pennsylvania Geographer*, the *Journal of Geography*, and is an
THE DEPARTMENT'S MISSION

The mission of the Department of Geography is to maintain the highest creativity and excellence in geographical research, scholarships, teaching, and public service at several scales of spatial resolution.

THE GLOBAL LEVEL

At the world level the mission of the Geography Department is to remain one of the major centers of innovation and training in human geography and geographical methodology. The crisis of underdevelopment in the Third World, as well as in lagging areas of the industrialized world, has created significant employment and research opportunities for geographers in regional and interregional development. These factors are already affecting Penn State geography through demands for faculty and graduate expertise in development-related issues. Several faculty members serve as consultants to the World Bank and to American and United Nations development institutions. A growing awareness of a singular global environmental system signals a change from a broad recognition of the unity of the biosphere to a commitment to detailed scientific investigation of global processes. A plethora of international research programs, including current efforts of NASA, the Department of Energy, and similar groups, is evidence of this trend. Important in this research is both fundamental physical understanding of global environmental processes and understanding of the implications of and for human activities. Technical skills of geography (cartography, remote-sensing, spatial analysis, geographical data systems), basic research interests in physical geography (climatology, biogeography, water resources, geomorphology, glaciology), and a continuing human/environment focus within human geography (resource management, cultural ecology, environmental impact assessment, environmental perception, spatial organization) all point to significant opportunities for geography to play a focal role in the study of global environmental systems.

THE NATIONAL LEVEL

Geography's fundamental role in public education and current affairs is being increasingly recognized. Important initiatives are under way to improve secondary-level geographical education in the United States. College and university faculty positions in geography are increasing, particularly in the areas emphasized at Penn State—geographical methodology and human geography.

There are significant opportunities for B.S.-level employment for students who are more technically oriented, with work in spatial analysis, geographical data systems, cartography, computer mapping, and remote-sensing. Recent experience has shown that U.S. military and civilian governmental agencies rank Penn State's department of geography as among their most important recruiting sites. Similarly prepared graduates going to the private sector are now receiving entry-level salaries usually associated only with the physical sciences, engineering, and computer sciences. Regional planning agencies remain an important source of employment for B.S. degree students. Job opportunities in these areas are enhanced when the student has undertaken an internship during his student days.

Kevin Koll digitizing a computer-based map.

THE STATE LEVEL

Environmental quality and economic development are two critical imperatives in the state of Pennsylvania. Issues in these areas offer substantial opportunity for geographical research, and some employment opportunities, with direct benefit to the state. There is also a significant need to improve the quality of geographical education at the elementary and secondary level. This challenge requires a more active role of the University and College geography faculty in cooperating with state and local authorities in curriculum design and with colleagues in education in preparation of future educators.

UNIVERSITY-WIDE

A renewed Penn State commitment to general education represents, in the view of the geography faculty, an important reaffirmation of the basics of a liberal education. Geography is clearly a focal subject in general education courses. A steady upward trend in enrollment and number of majors is anticipated. This trend, although modest, possesses significant challenges to maintain a quality program.
In specialized geographical courses there is a demand for traditional and digital cartographic research and teaching as well as for related areas of computer graphics, geographic information systems, spatial data analysis, and digital terrain modeling. Science and research opportunities in these areas have the potential to increase the scope and quality of research across the different disciplines, not just within geography. Similarly, students experienced in the activities of the Deasy GeoGraphics Laboratory can provide important career development for B.S. and graduate students.

Geography has an important role in interdisciplinary research units and instructional programs. Among these are area study programs (e.g., Black studies, Russian area), environmental programs (e.g., ecology, land, and water), and the programs focused on research methods and techniques (e.g., operations research). Faculty must be encouraged to participate in these activities and to foster interaction in newly emerging areas of interest.

THE COLLEGE LEVEL

The quality of research and graduate programs in the College of Earth and Mineral Sciences in disciplines related to geography (e.g., meteorology, geosciences, mineral economics) suggests opportunity for research collaboration within the College. A College focus on global environmental systems provides an excellent avenue for development of such collaboration. It also significantly enhances recruitment efforts in physical geography.

Chapter 6 | The Department of Geosciences

The teaching of geology at Penn State began in 1859 with the first class at the Farmers’ High School. In the study of agriculture it was recognized that a knowledge of geology was necessary. President Evan Pugh gave high priority to geology and mineralogy, and one of the school’s first faculty members, J.S. Whitman, professor of natural science, taught geology as one of his courses. In the period between 1860 and 1890, geology was taught by a number of faculty members from the biological sciences. In 1867 the catalog listed Henry James Clark as professor of zoology, botany, and geology. He was followed by J. Trimble Rothrock, professor of human anatomy and physiology, botany, and geology, and later by William A. Buckhout, professor of geology, zoology, and botany. The early faculty also included Albert H. Tuttle, professor of geology and physiology. The catalog first mentions a Department of Geology and Zoology in 1882, but there is no evidence that a true program in geology was developed. In 1889 Franklin E. Tuttle joined the faculty as instructor in chemistry and mineralogy.

When the bachelor of mining engineering degree was established in 1890, geology assumed a more important role. Magnus C. Ihleng, head of the new mining department, was also professor of mining engineering and geology, and Thomas C. Hopkins was appointed instructor in geology. The teaching of mineralogy also appears to have been located in the mining program. The 1894–95 catalog shows that the degree of engineers of mines was offered with a specialty in geology and petrology.

The mining engineering program encountered many problems in the following years, and the growth of the geosciences was tied closely to progress in mining. In 1896 geology was listed as a