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NON-CIRCULATING

The University of Missouri-Columbia

BULLETIN

Graduate School

UNIVERSITY OF MISSOURI

NOV 22 '77



November 18, 1977

UNIVERSITY OF MISSOURI-COLUMBIA
Calendars for 1977-78 and 1978-79

First Semester

New Student Orientation and Registration
 Registration
 Classwork begins, 7:40 a.m.
 Labor Day
 Thanksgiving Recess begins, 12:30 p.m.
 Classwork resumes, 7:40 a.m.
 Classwork First Semester ends, 5:30 p.m.
 Stop Day
 Final Examinations begin
 First Semester closes, 5:00 p.m.

1977

Mon., Aug. 22
 Tues., Aug. 23
 Wed., Aug. 24
 Mon., Sept. 5
 Wed., Nov. 23
 Mon., Nov. 28
 Thurs., Dec. 8
 Fri., Dec. 9
 Sat., Dec. 10
 Sat., Dec. 17

1978

Mon., Aug. 21
 Tues., Aug. 22
 Wed., Aug. 23
 Mon., Sept. 4
 Tues., Nov. 21
 Mon., Nov. 27
 Thurs., Dec. 7
 Fri., Dec. 8
 Sat., Dec. 9
 Sat., Dec. 16

Second Semester

New Student Orientation
 Registration
 Classwork begins, 7:40 a.m.
 Spring Recess begins, 12:30 p.m.
 Classwork resumes, 7:40 a.m.
 Classwork Second Semester ends, 5:30 p.m.
 Stop Day
 Final Examinations begin
 Second Semester closes, 5:30 p.m.
 Annual Commencement

1978

Thurs., Jan. 12
 Fri., Jan. 13
 Mon., Jan. 16
 Sat., March 25
 Mon., April 3
 Wed., May 3
 Thurs., May 4
 Fri., May 5
 Fri., May 12
 Sat., May 13

1979

Thurs., Jan. 11
 Fri., Jan. 12
 Mon., Jan. 15
 Sat., March 24
 Mon., April 2
 Wed., May 2
 Thurs., May 3
 Fri., May 4
 Fri., May 11
 Sat., May 12

Summer Session

Eight-Week Session

Registration and Orientation
 Classwork begins, 7:30 a.m.
 Independence Day Recess
 Summer Session closes, 5:00 p.m.
 Summer Commencement

Mon., June 12
 Tues., June 13
 Tues., July 4
 Fri., Aug. 4
 Fri., Aug. 4

Mon., June 11
 Tues., June 12
 Wed., July 4
 Fri., Aug. 3
 Fri., Aug. 3

Four-Week Session I

Registration and Orientation
 Classwork begins, 7:30 a.m.
 Independence Day Recess
 Session I closes, 5:00 p.m.

Mon., June 12
 Tues., June 13
 Tues., July 4
 Fri., July 7

Mon., June 11
 Tues., June 12
 Wed., July 4
 Fri., July 6

Four-Week Session II

Registration
 Classwork begins, 7:30 a.m.
 Session II closes, 5:00 p.m.
 Summer Commencement

Mon., July 10
 Tues., July 11
 Fri., Aug. 4
 Fri., Aug. 4

Mon., July 9
 Tues., July 10
 Fri., Aug. 3
 Fri., Aug. 3

BULLETIN

UNIVERSITY OF MISSOURI-COLUMBIA

Volume 78

Number 24

November 18, 1977

General 1977 Series

Number 24

Robert E. Kren, *Director*, Office of Public Information
 Louise H. Stephens, *Editor*

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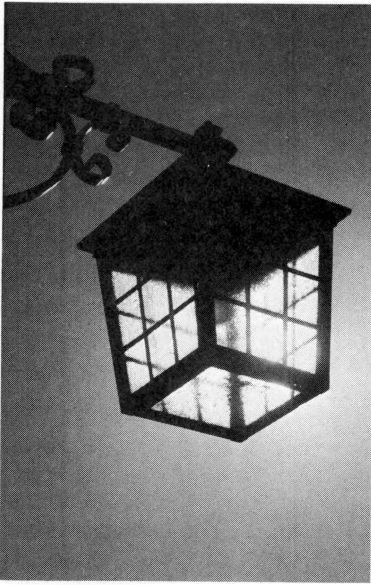
1977-1978

Graduate School Announcement

UNIVERSITY OF MISSOURI-COLUMBIA

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Administrative Officers

Herbert W. Schooling, A.B., M.A., Ed.D., Professor of Education; Chancellor of the University of Missouri-Columbia

Lloyd E. Berry, A.B., M.A., Ph.D. (Cantab), Professor of English; Dean of the Graduate Faculty and Director of Research

Andrew C. Minor, A.B., M.M., Ph.D., Professor of Music; Associate Dean of the Graduate Faculty—Humanities, Academic Programs

Richard L. Wallace, B.S., Ph.D., Professor of Economics; Associate Dean of the Graduate Faculty—Social Sciences; Administration, Fellowships and Scholarships

Ronald E. Barr, B.S., M.S., Ph.D., Associate Professor of Ophthalmology; Associate Dean of the Graduate Faculty—Biological, Mathematical, and Physical Sciences; Assistant Director of Research; Associate Investigator, Dalton Research Center

X. J. Musacchia, B.S., M.S., Ph.D., Professor of Physiology; Director of Research Park; Associate Director of Research; Director and Investigator, Dalton Research Center

Bruce J. Biddle, A.B., Ph.D., Professor of Psychology and Sociology; Director, Center for Research in Social Behavior

Calendar for Special Graduate School Deadlines for 1977-78

1977

FIRST SEMESTER (FALL)

- October 10 Final date for Comprehensive Examinations for the Ph.D. and matriculation for the Ed.D. (May Commencement)
- November 1 Final date for filing applications for Master's degrees and Certificates of Specialization for those who expect to receive degrees at the close of the next semester. (May)
- November 9 Final date for submitting theses and dissertations for advanced degrees.
- December 5 Final date for Comprehensive Examinations for the Ph.D. and Matriculation for the Ed.D. (August Commencement)
- December 9 Delayed grades and *final oral examination* results for candidates for advanced degrees this semester are due in the Graduate Office.
- December 9 Master's students not otherwise enrolled must have completed enrollment by this date.

1978

SECOND SEMESTER (WINTER)

- March 24 Final date for filing applications for Master's degrees and Certificates of Specialization for those who expect to receive degrees at the close of the next semester. (August)
- April 10 Final date for submitting theses and dissertations for advanced degrees.
- May 10 Delayed grades and *final oral examination* results for candidates for advanced degrees this semester are due in the Graduate Office.
- May 10 Master's students not otherwise enrolled must have completed enrollment by this date.

1978

SUMMER SESSION

- May 15 Final date for Comprehensive Examinations for the Ph.D. and matriculation for the Ed.D. (December Commencement)
- June 30 Final date for filing applications for Master's degrees and Certificates of Specialization for those who expect to receive degrees at the close of the next semester. (December)
- July 5 Final date for submitting theses and dissertations for advanced degrees.
- August 2 Delayed grades and *final oral examination* results for candidates for advanced degrees for this session are due in the Graduate Office.
- August 2 Master's students not otherwise enrolled must have completed enrollment by this date.

Dual enrollment applications are due in the Graduate Office one month after the first day of classes (for fall, winter, and three weeks after first day of classes for summer).

The Graduate School

The University of Missouri granted its first Master's degree in 1846. A Graduate Department was first established in 1896 and the first doctor of philosophy was granted in 1899. The Graduate School at Columbia now offers degree-granting programs in 75 departments and areas. It is a member of the Association of Graduate Schools and the Council of Graduate Schools. Enrollment is in excess of 4,400 graduate students, of whom approximately 40 per cent are doctoral candidates. The campus in recent years has ranked among the 27 institutions in the country granting the largest number of doctorates.

The objective of the Graduate School is to provide the atmosphere, the resources, and the programs which will permit a superior education for students interested in advanced work. An atmosphere encouraging academic inquiry and stimulating intellectual creativity has long been recognized on the campus as fundamental to the attainment of this objective.

It is further the philosophy of the Graduate School at the University of Missouri-Columbia that our advanced educational programs must be designed by the faculty to provide quality programs tailored to the particular intellectual objectives of the individual graduate student. This has required the careful development of responsible and highly qualified faculties in the various degree-granting programs along with the very substantial support services and facilities available for graduate students on this campus. In addition, the Graduate School is committed to interdisciplinary studies. Some professors, for example, have joint appointments in Business Administration and Medicine, and their students benefit accordingly. We encourage innovative curricula at the graduate level.

The increasing importance of graduate education and research on the campus led to a reorganization of the Graduate School in 1967-68. The basic concept underlying this reorganization has been to assure that

the traditional objectives of the Graduate School will continue to be achieved in the future. Steps have been taken to enable the Graduate Faculty to exercise its leadership in the development of educational policy making. Provisions have been made to enable recommendations and advice from graduate students to be received regularly by the Graduate Faculty and the Graduate School.

Communication channels between the Graduate School and each degree-granting program have been improved so that program responsibility can be vested increasingly with the faculty members of the program, while central review procedures have been further developed and refined. Finally, the administration of campus research has been housed in the Graduate School to assure that research and graduate education programs can provide maximum support for each other.

The campus is a major recipient of federal support for its research and educational programs, and ranks 19th nationally in research and development monies. In addition, it receives substantial financial support for these activities from both industry and foundations, as well as from the state of Missouri. These multiple sources of support help enable the University of Missouri-Columbia to offer a broad pattern of financial assistance to meritorious students.

Still another opportunity, at present limited to seniors at Central Methodist College, Stephens College, William Woods College, and the University of Missouri-Columbia, is afforded by dual enrollment. Seniors at these institutions may enroll concurrently for both undergraduate and graduate credit (see Dual Enrollment).

The prospective graduate student is invited to write to me or to the department or area of his academic interest for such information as may not be provided by this *Graduate School Bulletin*.

Lloyd E. Berry
Dean & Director
Graduate School

UMC

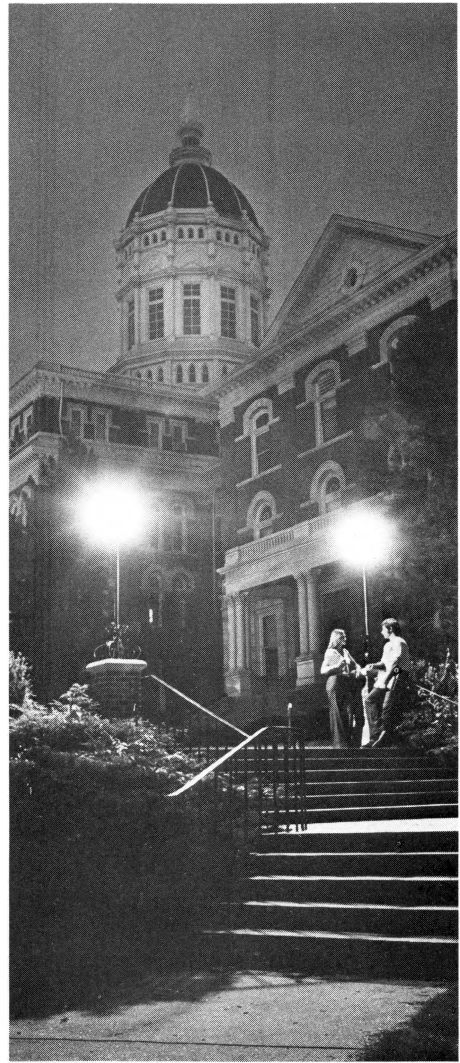
UMC, the University of Missouri-Columbia, is the oldest state university west of the Mississippi River and largest of the four campuses of the University of Missouri. In 1839, the University was established on the Columbia Campus; the designation was changed to UMC in 1963 when the University expanded to four campuses.

Located on the Columbia campus are the Colleges of Arts and Science, Agriculture, Business and Public Administration, Engineering, Education, Home Economics, Public and Community Services, and Veterinary Medicine; the School of Forestry, Fisheries, and Wildlife in the College of Agriculture; the Schools of Law, Library and Informational Science, Journalism, Medicine, and Nursing; the Graduate School and the Extension Division.

LIBRARY RESOURCES

The libraries on the Columbia campus contain 1,850,000 volumes, 1,660,000 micro-forms, and 20,000 maps. In addition to the main library building, which has a shelf capacity of more than a million volumes, informational resources are housed in eight libraries located in other buildings: Research Park, Engineering, Geology, Journalism, Law, Mathematical Sciences, Medicine, and Veterinary Medicine. In addition, there are a number of laboratory collections which are supervised by staff of the respective departments. The library system is organized by subjects. Within the Elmer Ellis Library building, in addition to an Undergraduate Library, are the following collections: Art, Archaeology, and Music; Geography, History, and Philosophy; Education and Psychology; Business and Public Administration; Social Science; Library Science; Language and Literature; and Science.

Supplementing the resources of the UMC libraries are the library of the State Historical Society of Missouri and the Western Historical Manuscripts Collec-



tion, both located in the Ellis Library building.

The research collections and teaching materials of the library have been developed with a view to placing at the disposal of investigators and scholars generally the published results of investigations made all over the world. Special collections are acquired as they become available. Likewise, gaps in the collections of journals are constantly being filled. Some of the outstanding gifts and collections in the library are described below.

Bibliographic specialists are available to aid graduate students in their research. This service includes the location of printed and manuscript materials in other libraries in the United States and abroad, and the acquisition for students and faculty of photo and microfilm copies of scarce items which cannot be secured in any other form. In addition, the UMC Library is a member of the Center for Research Libraries of Chicago, through which the member libraries store and/or acquire cooperatively one copy of lesser-used research materials, and the Association of Research Libraries, which sponsors a foreign newspaper microfilm project. The library's collection of bibliographic books is strong, containing more than 6,000 volumes including the library catalogs of most of the world's outstanding libraries. With these are the standard American and British national bibliographies and the principal ones of France, Germany, Italy, and Spain, together with those of several of the Latin America countries. Of equal importance are the great subject bibliographies and abstracting and indexing services which lighten the labor of the investigator. Most of those covering the fields emphasized at UMC may be found here.

Ellis Library, which occupies an entire city block, is air-conditioned and provides seating capacity for 2,400 readers in its reading rooms. For the use of graduate students are some 300 carrels and more than 800 individual lockers. Some 30 seminar rooms, each seating 10 to 14 people, are available for use as specialized graduate study rooms. Many types of microfilm readers are available to the student. The library also maintains reproducing equipment with which, for a small fee, copies may be made of most library materials.

More important than total volume numbers in a library is the percentage held by the library of the monumental sets and journals of the several fields of knowledge. By the measuring sticks available, the UMC collection of books and journals in the fields in which it offers graduate

instruction ranges from adequate to strong. It is not practicable here to measure the book collections of each department in this manner, so a numerical summary will be given. For this purpose the collections are divided into the Social Sciences, Humanities, Biological Sciences, and Physical Sciences.

SOCIAL SCIENCES AND LAW

The combined Social Sciences and Law collections contain about 500,000 volumes, divided roughly in this way: Economics, 55,000; Education, 70,000; History, 100,000; Law, 125,000; Political Science, 100,000; and Sociology, 25,000. Over 800 current journals fall into this classification. Several thousand federal and state documents are included in the figures for Economics and Political Science. This division of the library is fairly strong in early journals and treatises on Education. Materials on modern Europe and Great Britain and America provide the major strength of the historical section of the library. A special collection of bibliographic tools and journals serves the School of Library and Informational Science.

The Law Library in Tate Hall contains both the original and the reprints of the English reports of the British Empire consisting of the Australian, Canadian, Irish, Indian, Scottish, South African, and Colonial reports; an almost complete collection of the federal and state reports and statutes, as well as the necessary digests, encyclopedias, and treatises. There is a good general selection of the various services reporting administrative regulations and rulings, new court decisions, new statutes, and amendments to existing laws which are rich in materials for students in the study of administrative bodies. The collection on International Law is currently being strengthened.

THE HUMANITIES

The Humanities, to which we may assign Literature, Philosophy, Religion, Fine Arts, and Journalism, are next in size

with 175,000 volumes. Literature, which contains a particularly strong Shakespeare collection, has 95,000 volumes. American Literature has been strengthened by the acquisition in recent years of numerous files of early American literary periodicals and works of minor writers. Most of the literary journals of any importance before 1875 have been acquired in the original or on microfilm. Included in Literature are the materials of Speech, a field which is currently undergoing growth. The Paul LeJay Library, with 6,000 volumes, represents the outstanding special collection in the field of Humanities.

Fine Arts, with strength in art history, painting, and music, contains 30,000 volumes; Philosophy, 25,000; and Religion, 20,000. The gift to UMC of the 5,500 volume library of the Bible College of Missouri in 1937 greatly strengthened the holdings in this field.

The Frank Lee Martin Memorial Library, named after the second Dean of the School of Journalism, is housed in Walter Williams Hall, one of the three Journalism buildings. It contains over 15,000 volumes relating to Journalism, and receives virtually all of the periodicals devoted to this subject in any of its phases, including radio, television, advertising, and freelance writing. The library receives regularly at least one daily newspaper from each state in the Union, and one or two from each of the important foreign countries. The bound files of newspapers and microfilm copies of back files have been mentioned elsewhere. It is well to remember that the Journalism Library contains primarily the materials used in everyday instruction. It is supplemented by related research material shelved in the general and other divisional libraries on the campus. The same condition holds for all branch libraries.

THE BIOLOGICAL SCIENCES

The biological sciences of Agriculture, Botany, Medicine, Psychology, Zoology, and related fields maintain some 125,000 volumes. The Medical Library, which now

contains approximately 85,000 volumes, is being developed rapidly to support the medical program of UMC. The Veterinary Medicine Library, a 15,000-volume library, is a small but select collection chosen for veterinary practice and research. The library is particularly strong in the basic sciences; at present, subscriptions are in effect for 1,200 journals.

THE PHYSICAL SCIENCES

The volumes in Physical Sciences may be estimated at 100,000, which is exclusive of society and other general publications. Engineering leads with 35,000 volumes, most of which are housed in its library in the Engineering building. Among the periodicals received are the standard publications in the field. Geology is next with 15,000 volumes; Chemistry, 15,000; Physics, 10,000; and Mathematics 7,000. Most of the strength naturally is in journals. A special library serving professors and graduate students in Atomic and Space Sciences is maintained in the Research Park.

SPECIAL COLLECTIONS

The Library of the State Historical Society, which shares the Ellis Library building, has an extensive collection of Missouriana and the early West. This collection comprises 375,000 volumes, including 15,000 bound volumes of Missouri newspapers and 5,200 bound volumes of Missouri magazines and college periodicals; 5,200 items in the Bay Collection of the Society which is a unit in itself; 185,000 duplicate volumes of Missouri official publications; 18,000,000 pages of Missouri newspapers on positive microfilm; 300,000 pages of original manuscripts; 3,060 rolls of United States Census covering Missouri and 46 other states; 496,800 pages of manuscripts on microfilm; 150,000 items of Missouri state archives; over 19,500 engravings, lithographs, paintings, photographs, pictures, portraits, and original drawings of cartoons; and 86,000 maps, scrapbooks, and World War I and II letters, records, and clippings. The library is

available to faculty, students, and the public.

The Western Historical Manuscripts Collection, established in the UMC library in 1943 with the assistance of the Humanities Division of the Rockefeller Foundation, was consolidated in 1962 with the State Historical Society as a Joint Collection. The primary objective is the preservation of materials relating to the region of the Missouri River and the Great Plains. Letters, diaries, personal accounts of travelers, business and professional records, memoirs of early western people, and other papers of interest to this region are among the materials being collected. Photographic equipment is available for reproducing rare papers which cannot be acquired in the original.

Western Americana. Emphasis here has been on Missourians and materials relating to the Great Plains. Similar general boundaries have been set up for the manuscripts collection. The book collection naturally spills over to follow the Oregon and Santa Fe Trails and the westward movement to California. Missouri's part in the development of the West brings much of western historical materials within the field of Missouriana and ties the State closely with all phases of the early history of the West. The collection has been developed in close connection with the Library of the State Historical Society, which is especially strong in western materials, so that duplication has been held to a minimum. In 1942 the Society acquired the J. Christian Bay Collection of Western Americana comprising 2,900 volumes, containing many of the rarest printed items relating to the West. The Society's library is also noted for its outstanding collections of Mark Twain and Eugene Field.

In 1940 Ellis Library acquired a special collection of about 1,000 volumes of Western Americana, bringing its holdings in this special field to about 6,000 volumes. Several hundred volumes a year are being added. Already then, the libraries of the two institutions contain

original or film copies of a large percentage of the important titles relating to the West. The collections are especially rich in travel narratives and contemporary accounts of life among the pioneers. They also contain some unusual Indian items.

Advertising. This area has been set aside as one in which the library will specialize. The more than 1,500 volumes on advertising available in the Frank Lee Martin Memorial Library at the School of Journalism constitute only the beginning of what the University of Missouri-Columbia and the School are resolved to make into a comprehensive and distinguished collection of books on this subject. New advertising publications are added as rapidly as they appear, and search continues for out-of-print volumes in the field.

American Speeches and Sermons. The collection contains approximately 1,200 speeches and sermons printed in America before 1800 and about 500 Fourth of July orations delivered during the first half of the 19th century. Its development will be continued.

Crime and Criminology. The Lawson collection of crime and criminology consists of about 1,500 volumes. These publications for the most part are reports on famous trials written in popular style. They were used by Judge Lawson in the preparation of his *American Trials*. It is part of the Law Library and is housed in Tate Hall.

Federal Documents. The library has been a depository for Federal documents since the turn of the century and has full sets of its publications. The documents of Missouri and of the states of this region are collected along with a selection from all the states of the Union. In the last decade or so there has been a great increase in the number of documents issued; federal documents, especially, have increased in number and importance. The library receives microprint copies of all federal and United Nations publications.

Among the documentary publications of other countries to be found in the li-

brary are: *Hansard's Parliamentary Debates, Parliamentary Papers-1910-date, Journals of the House of Lords and House of Commons, and Foreign State Papers of Great Britain; Journal Officiel and Archives Parlementaires* of France; and the German *Stenographischer Bericht. . .des Reichstags*. There are also miscellaneous files of documents from these and other foreign countries, especially Latin American.

Flach Collection. This collection was assembled by Professor Jacques Flach, a French jurist, historian, and teacher, and acquired by the library in 1920. It contains 6,000 volumes, and is especially strong in early French law, comparative law, and legislation; also it is rather strong in the history of Alsace-Lorraine and medieval France. Additions in these fields are being made regularly.

Johnson Collection. A gift of approximately 1,600 volumes from the library of the late Thomas Moore Johnson of Osceola, Missouri, was received in 1947. The collection consists principally of classical literature, philosophy, and medieval Christian theology. It is rich in works of the 16th and 17th centuries and adds greatly to the resources of the library in the fields covered.

LeJay Collection. This is a private library of 6,000 volumes purchased by the library in 1921. The collector was a professor of the Catholic Institute of Paris, a member of the Institute of France, and an editor and author of note. The collection's strength lies chiefly in classical philology and literature, and in theology. It represents 30 years of collecting by Professor Paul LeJay. Included in the collection are many 16th and 17th century imprints, rare editions and products of early presses.

Other Gifts and Special Collections. The library is strengthened each year by the donations from friends of the University. Not many years ago the William Benjamin Smith library of 3,000 volumes in mathematics, physics, philosophy, and religion was presented to the University. In 1937 the Bible College of Missouri gave

its library of about 5,500 volumes on religion; and later the Luther M. Defoe mathematics library of 3,000 volumes came from the estate of the late Professor Defoe. The Theophil W. H. Irion collection is a professional library in education, and funds are provided annually for its increase. Recent outstanding gifts include a previously unpublished manuscript of Charlotte Brontë; the library and manuscripts of John Neihardt; and the libraries of the late Dr. Frank Luther Mott, of Judge Laurance M. Hyde of the Missouri Supreme Court, of Methodist Bishop Ivan Lee Holt, and of former governor Henry S. Caulfield.

COMPUTING FACILITIES

Instruction and research programs, as well as medical and management systems computer processing needs, are supported by the University computer services delivery system consisting of a communications network and a central facility with an integrated IBM 370/168 and IBM 370/158 computer system. The Columbia Campus Computing Center provides user interface, as well as direct access to computing facilities through several remote job entry sites including one site open 24 hours a day. These facilities are available to graduate students for work on assigned educational problems and on dissertation research, with program error consultation provided by the Campus Computing Center.

In addition, several departments and divisions support specialized minicomputers and other computer-based support facilities: The Computer Science Department has a minicomputer; the College of Engineering supports a number of completely equipped minicomputer systems; the College of Business and Public Administration has a computer-based business and social science research support facility, the Public Affairs Information Service. There are also other small computers on campus for specialized research work and data acquisition in various departmental laboratories.



the Museum Gallery at 100 Swallow Hall contains collections of American Indian archaeological and ethnological materials, as well as anthropological specimens from other areas of the world. Also, the Division of American Archaeology and the Missouri Archaeological Survey, located at 15 Switzler Hall, display at the Museum some of their findings concerning the archaeology of Missouri and surrounding areas.

The Museum publishes the *Museum Briefs Series* and other occasional papers.

Museums and Collections

Museum of Art and Archaeology

The Museum is located in Pickard Hall on Francis Quadrangle, where the entire second floor is given over to exhibition. The collections are comprised of more than 6,500 art objects, representative of all parts of the world and all periods from palaeolithic to the present. The collections of greatest strength are in primitive art—African, Oceanic, pre-Columbian of Central and South America; ancient art of the Near East, Egypt, Greece, and Rome; old master paintings, with the Kress Study Collection of Italian Renaissance painting as its core, drawings, and prints; art of South and Southeast Asia. Recent additions include hundreds of objects found in the Museum's excavations at Tel Anafa in Upper Galilee, Israel, in 1968, 1969, 1970, 1972 and 1973 under the direction of Dr. Saul S. Weinberg, Professor of Classical Archaeology and Director of the Museum. The museum publishes *Muse*, *Annual of the Museum of Art and Archaeology*, which includes articles by staff, faculty, and students.

The Gallery of Casts of Greek and Roman Sculpture, exhibiting some 50 full-size plaster copies of many of the most famous Classical statues, is located on the first floor of Pickard Hall.

Museum of Anthropology

Open 9:30-12:00 and 1:00-4:30 Monday through Friday during school sessions,

Entomology Museum

The collections of over a million specimens, housed in 3-38 Agriculture Building, are primarily for research and teaching programs, with only a very small portion exhibited. Besides insects there are other groups of Arthropoda, notably spiders and mites. The Director is Wilbur R. Enns.

Geology Museum

Among the more than 100,000 specimens in the museum are the invertebrate collections rich in fossils of Devonian, Mississippian, and Pennsylvanian rocks of Missouri and the midcontinent; the vertebrate collections, largely of Pleistocene mammals; the collection of Conodonts, the most varied and nearly complete of its kind in the world; the collections of fossil Charophytes, representing all known localities in North America and containing reference material from South America, Europe, Asia, and Africa. The paleontologic collections of the Missouri Geological Survey are also located here.

The mineral collections contain: the most complete suite extant of materials from the famous Crestmore locality in California, many of them in crystal form; one of the finest collections of boron minerals in this country; a fine set of garnets; many excellent crystals from the lead and zinc mines of southwest Missouri. The clay mineral collections contain a complete set of A.P.A. reference

clay minerals, as well as type clay materials from most of the important clay deposits of the world.

More than 1,800 species are represented in the Dana collection. The De Muth collection contains especially fine specimens of polished fossil woods. The curator of the paleontological collections is Dr. James H. Stitt; the curator of the mineralogical collections is Dr. Alden B. Carpenter.

The Herbarium

The plant collection in 226 Tucker Hall is valuable for regional research, but teaching materials include a general collection, largely from North America, with approximately 20,000 specimens from Central America. Areas of specialization include desert ecology, agrostology, and the genera *Crataegus*, *Lupinus* and *Quercus*.

The collections of approximately 180,000 specimens include about 35,000 mycological specimens, plus over 50,000 not processed, and the entire private collection of Ernest J. Palmer, a noted authority in the genera *Crataegus* and *Quercus*. The Herbarium Curator is David B. Dunn.

Fishery and Wildlife Collections

The School of Forestry, Fisheries, and Wildlife maintains an extensive teaching and research collection of the vertebrate animals of Missouri and surrounding states. The bird and mammal collections (both skins and skulls) are curated by Dr. William H. Elder, Stephens Hall. The Glen Smart waterfowl collection, consisting of more than 100 species of mounted waterfowl of the world, is on display in the lower corridor of LeFevre Hall.

Curated by Dr. Arthur Witt, Jr., Stephens Hall, the freshwater and saltwater fish collection contains some 25,000 preserved specimens, including fishes from Missouri and the Midwest; saltwater fishes from the Atlantic, Pacific, and Gulf coasts; and about 3,000 fresh- and saltwater fishes from Thailand.

Cultural Activities

Since graduate education cannot be limited to the classroom, laboratory, or library, students should avail themselves of the broad and rich intellectual experiences offered on the Columbia campus and in the community. Concerts, lectures, art exhibits, and dramatic productions presented at UMC and on other college campuses in Columbia enable students to gain personal contact with some of the most vital personalities and forces of our age. Qualified students may participate in local musical and dramatic productions on this campus.

Research Centers and Resources

CENTER FOR RESEARCH IN SOCIAL BEHAVIOR

The Center for Research in Social Behavior is a research and training facility operated by social science faculty on the UMC campus. It was established on July 1, 1966, to incorporate the activities of an earlier, less formally constituted Social Psychology Laboratory. The Center is supported by research contracts and grants, and by state funds administered through the Graduate School.

The major goals for the Center are: (1) to conduct and (2) to promote social science research at the University of Missouri-Columbia.

In order to conduct programs of social science research, the Center provides facilities, equipment, office accommodation, and services needed in programs of field and laboratory investigation; maintains a social environment in which research and graduate training in the social sciences are facilitated; and sponsors lectures, seminars, and visits from scholars in the social sciences from this campus and other campuses in this country, and from abroad.

B&PA RESEARCH PROGRAMS

The College of Business and Public Administration's facilities and resources

for research promote both individual and team projects in the subject areas of regional economic analysis, decision-making processes, judicial and legislative processes, organization and administration, consumer behavior, forecasting, operations analysis, population and manpower studies, urban affairs, and state and local fiscal analysis. The College maintains close relations with university research groups throughout the nation through memberships in the Associated University Bureaus of Business and Economic Research, Public Affairs Administration Research Section of the National Association of Schools of Public Affairs and Administration, the National Tax Association, and disciplinary associations.

Public Affairs Information Service

The Public Affairs Information Service (PAIS) is a computer-based research support facility of the College of Business and Public Administration at UMC. PAIS provides data and data management services, data analysis, software development, consultation on data applications, statistical analysis, and instruction in the use of various data sets and associated retrieval software to: University faculty, staff, and students; federal, state, and local government agencies; private enterprises; and the public. In addition, PAIS maintains a large and varied data base of financial, economic, and demographic information describing characteristics of the nation, the states, and their subdivisions. Major data holdings include the 1970 Census, Bureau of Economic Analysis Regional Economic Information System, Missouri Economic Information Retrieval System, National Bureau of Economic Research Time Series Data Bank, and COMPUSTAT. Much of these data pertain to Missouri and the Midwest.

Technical assistance is available on a contractual basis at cost to research organizations or individual researchers at all stages of their projects. These services are provided free for the unfunded research projects of the faculty and students in the

College of Business and Public Administration at Columbia.

State and Regional Fiscal Studies Unit

The State and Regional Fiscal Studies Unit (SRFSU), formally organized in 1972 as a unit within the College of Business and Public Administration, maintains computer-assisted historical data files on tax collections and socioeconomic variables, and several models for forecasting state tax collections and economic activity.

First priority is research related to the state's fiscal structure. This research entails development of analytical models for assessing the soundness of the state fiscal structure, identifying significant present or emerging weaknesses in that structure, calculating the effects of various changes in the taxation or expenditure components of the state fiscal system, and making annual or semiannual estimates of future revenues. The major publications of the unit are the Statistical Abstracts of Missouri published annually, and the Business and Government Outlook which is published quarterly.

Administrative Behavior and Survey Research Laboratory

Recognizing that the availability of a behavioral laboratory is a necessary condition for rigorous and scientific inquiry into the behavioral dimensions of administration, the College of Business and Public Administration established an Administrative Behavior and Survey Research Laboratory in 1974. The laboratory, utilized for research and instructional activities, is equipped with a complete audio-video tape system and observation booths, which permits a wide variety of experimentation on individual and small group activities such as decision making, problem solving, conflict resolution, and communication.

FREEDOM OF INFORMATION CENTER

The Freedom of Information Center in Walter Williams Hall of the School of Journalism maintains a day-to-day

study of the more notable actions by government, media, and society affecting the movement and content of information. Some results of the Center's study are published either in a monthly report series or a bi-monthly newsletter received by approximately 2,000 newspapers, broadcast stations, libraries, and scholars.

UNIVERSITY PRESS

The University of Missouri Press, 107 Swallow Hall, publishes 20 scholarly books per year. Submissions are accepted from scholars across the nation.

PHYSICAL AND BIOLOGICAL SCIENCES

UMC has excellent resources in equipment and services to support research in the natural sciences. Most of these facilities are related to individual departmental and area programs described in listings elsewhere in this catalog. However, several unique resources available on a campus-wide basis are described below.

DALTON RESEARCH CENTER

The John M. Dalton Research Center at Columbia, a multidisciplinary facility devoted to basic biological research and to graduate and postgraduate training, is supported by the state of Missouri as well as by funds from Federal agencies and foundations. Housed in a new building in Research Park, just south of the main campus, the Center has excellent facilities for research programs in physiology, biochemistry, and bioengineering, focused on the areas of environmental physiology and control/information theory as applied to biological systems. Faculty members and researchers from other educational institutions in the United States and Europe have utilized these facilities in collaboration with UMC staff.

Center research includes in-depth programs in cardiovascular and respiratory

functions, which range from biochemical studies of the role of cyclic nucleotides in regulation of heart and lung metabolism to mechanisms of oxygen toxicity; in elucidating basic mechanisms in animal-depressed metabolism and thermoregulation; in microcirculatory control, and mechanisms of electronic applications in biological problems, including studies of bio-compatible materials for implantation into the body and the development of microelectrodes for measuring tissue oxygen levels; and in mammalian cell genetics and the role of mutagenic and carcinogenic agents.

In addition to individual projects carried out by investigators, the Center is now supporting broad-based interdisciplinary studies and seminars in a variety of biomedical areas.

SINCLAIR RESEARCH FARM

The Sinclair Research Farm, a University-wide facility aiding research on aging and chronic disease, is designed to house and care for farm and laboratory animals under controlled conditions.

In the past, most biological research information has come from work with the smaller, shorter-lived animals. At the Sinclair Research Farm, research also is conducted using longer-lived animals which have organ systems, basic food requirements, societal stresses, and diseases somewhat more similar to those of humans.

Examples of research at the Sinclair Farm include alcoholism, atherosclerosis, diabetes, cancer, immunological response to undernutrition, diseases and aging, toxicology, hemophilia, nutritional studies and others.

The Farm is located on 563 acres just outside the city and adjacent to the Columbia campus.

RESEARCH REACTOR

Another University-wide facility, the Research Reactor is a high-flux, water-cooled and moderated reactor designed to operate at a power of 10 MW and reflected with beryllium metal and graphite.

The reactor services the following experimental facilities:

1. center test hole, or "flux trap";
2. three 6-inch beam tubes;
3. three 4-inch beam tubes;
4. four pneumatic tube irradiation positions;
5. eight reflector region irradiation positions;
6. a 4 x 4 foot graphite thermal column use for neutron radiography.

RESEARCH FARMS

College of Agriculture

Near Columbia UMC has many research farms with field and horticultural crops and livestock. In addition, land, laboratory, greenhouse, and large animal facilities at four outlying centers in the state implement agricultural research on problems peculiar to the areas surrounding them.

The most famous area of these farms is the Experiment Station's Sanborn Field, where aureomycin was discovered in the soil of plot number 23.

College of Veterinary Medicine

The 90-acre veterinary medicine research farm, located within a 15-minute drive of the UMC campus, has pasturage and other facilities for holding several

species of domestic and companion animals for research.

Research emphasizes improving health and productivity of domestic livestock and poultry; preventing disease epidemics; minimizing losses due to sicknesses and disease of livestock; protecting human health through control of animal diseases transmissible to humans; and improving the health of companion animals.

WHOLE BODY COUNTER

The Low Level Radiation Laboratory, located in Agricultural Experiment Station Research Park and operated by the College of Agriculture, houses a large whole body liquid scintillation counter. This unique facility, shielded in a large steel chamber, is capable of detecting minute amounts of naturally occurring radiation that occur in animals and man, as well as detecting very low levels of isotopes that may be administered to a subject on an experimental program. Facilities are available for monitoring human babies, as well as adults, and animals ranging in size from small laboratory animals up to 600 kg. farm animals.



Admission and Continuation Regulations

To be accepted for work towards an advanced degree, a student must fulfill both the Graduate School minimum admission requirements and the departmental admission requirements. A GPA of at least 3.0 or the equivalent during the last two years of undergraduate work may alone assure admission. However, individual departments may establish higher GPAs and additional requirements for acceptance into their degree programs.

Students with GPAs lower than 3.0 are expected to support their admission by submitting with each application superior test scores, work experience, and letters of recommendation. Upon review, a student may be recommended for admission or admission on probation by the department; prior review by the Graduate School is required. Only in exceptional cases is a student with a GPA of 2.5 or less admitted, even on probation.

Admission to the Graduate School does not in itself entitle the student to candidacy for an advanced degree. A student fulfills the requirements of a graduate program of study under the auspices of a Department or Area of the Graduate School. Further, for an advanced degree to be granted, the requirements and regulations of both the Graduate School and the department must be satisfied.

Application for Admission

The prospective student completes and returns the application forms, obtainable from the Director of Admissions, 130 Jesse Hall, UMC, Columbia, Mo. 65201. In addition, official transcripts from each undergraduate or postgraduate institution must be sent to the Director of Admissions. All credentials, including the results of the Test of English as a Foreign Language (TOEFL) in the case of students from other countries, must be in the admissions office four weeks before graduate work is expected to begin.

Students seeking admission to the degree program are invited to write the department or area Director of Graduate Studies for answers to specific queries regarding admission, courses, financial aid, or other information.

Foreign Students

For information and forms concerning admission, scholarships, housing, and approximate expenses, prospective students living outside the United States and its possessions are advised to write the Foreign Student Coordinator, Read Hall, Columbia, Mo. 65201, at least a year prior to the date of desired admission. Application papers and official records of previous school work must be sent to the Director of Admissions.

Prospective students should not make plans to leave their countries without first receiving Form I-20 from the Foreign Student Coordinator.

Students from countries where English is not the native language must take the Test of English as a Foreign Language (TOEFL), given by the Educational Testing Service, Princeton, N.J. 08540, approximately four times each year in test centers in almost every country of the world. The test should be taken from six to nine months before the opening of the session in which the student expects to enroll. A satisfactory score must be made before formal application forms are sent.

The Graduate Record Examination and Other Required Tests

Except those in departments using Miller Analogies, Terman Concept Mastery, or GMAT (Graduate Management Admissions Test), all graduate students are required to submit the aptitude test score of the Graduate Record Examination. Either at the request of the department or of their own volition, applicants may send additional scores on one or

more advanced subject matter tests of the GRE.

The requisite test results must be on file in the Graduate Office prior to official action by the Admissions Office concerning the application. However, a student may be admitted on probation with permission of the Graduate Dean if the test is taken during the first semester of enrollment. Students are not permitted to enroll for a second semester of graduate work at UMC unless their GRE or other test scores are available at the Graduate Office.

Applications are required several weeks prior to, and scores are received about a month after taking the GRE, which is given in October, December, January, February, April, and July at many locations in the United States (including Columbia) and in many foreign countries. Hence, it is necessary to apply for the GRE in early September for admission in January and in early March for admission in September. To determine exact dates and the most convenient locations, students should write to the Educational Testing Service, Princeton, N.J. 08540.

Description of Courses

All courses, graduate and undergraduate, offered at UMC are described in the *Description of Courses*. The *Schedule of Courses*, issued just prior to the opening of each semester, lists the period, building, and room assigned to each course offered in that semester.

The University of Missouri-Columbia reserves the right to cancel without further notice any course listed in the schedule or to withdraw any course which does not have an adequate enrollment at the close of the registration period.

ENROLLMENT CATEGORIES

Admission to a Degree Program

Students seeking admission to degree programs must be (1) eligible for admission to the Graduate School and (2) accepted by the proposed major department.

Admission as an Unclassified Student

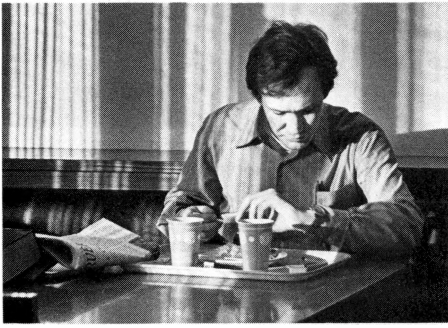
A student eligible for admission to the Graduate School who has not been recommended for acceptance into a degree program by a departmental faculty may be admitted as unclassified. If this student is subsequently accepted by the department, into a departmental graduate degree program, the credit earned as an unclassified student may be applied toward degree requirements upon the recommendation of the department.

Admission as a Post-Baccalaureate Student

A student who has a baccalaureate degree from an accredited college or university, but who does not qualify either for admission to a graduate degree program, or as an unclassified student, may be permitted to enroll in a post-baccalaureate program of continuing education. Although graduate credit will be earned by completing courses numbered 200 and above, such credit is not applicable toward a graduate degree at UMC while the student is enrolled in the post-baccalaureate program. Post-baccalaureate students who complete a minimum of 9 semester hours of graduate work with grades of *B* or better and maintain a *B* average may be changed to unclassified status or, with approval of the appropriate department, transfer into a degree program.

Admission on Senior-Graduate Basis (Dual Enrollment)

Upon the approval of the appropriate deans, last-semester seniors in the upper half of their classes and within 15 hours of completing graduation requirements may enroll dually in their undergraduate schools/colleges and the Graduate School for courses sufficient to make a full program. Dual enrollment must be completed within one month after the start of the fall and winter semesters and within three weeks of the start of the summer session.



Students who graduate with excess credits without registering in the Graduate School will not receive graduate credit for that work.

This program is also available to seniors in other Missouri colleges. Additional information may be obtained through the Graduate School Dean.

Registration Procedures

Permits to Enroll. New students who qualify for admission and who have submitted an advance payment on their incidental fees are issued a permit to enroll along with a registration packet. The student can pick up packets and permits in the Graduate Office. An application for admission and all transcripts must be on file not later than: August 1 for graduate students who enter the fall semester, December 1 for the winter semester, and May 1 for summer session.

Permits and packets for the winter semester are made automatically for all students enrolled in UMC during the fall semester; those enrolled during the winter semester are issued a packet automatically for the following fall semester.

Graduate students who are enrolled for the winter semester or for the previous summer session are automatically issued a packet for the summer session.

Preregistration. Enrolled students may complete registration for the ensuing semester during the pre-registration periods, usually held in November and April. New students may register in advance for the fall semester during the pre-registration period in June and July.

Payment of Fees. Student registration is not complete until all University fees are paid.

Late Enrollment. A student who registers late for the fall or winter semester must pay a \$25 late registration fee in addition to the regular fee.

Petitioning into or out of a Course. Both the student's adviser and Dean must approve a petition to withdraw from one course or enter another during a semester. Blank petition forms and instructions are available in the Dean's office. Only under extenuating circumstances may a student enter a course after six class meetings have elapsed.

No grade is assigned to a student who ceases for any reason to be a member of a course prior to the beginning of the seventh week of a semester, or an equivalent period of time in a summer session. A student who officially withdraws from a course after the beginning of the seventh week and who is doing failing work is assigned the grade *WF*. If the quality of the student's work is not judged to be failing at the time of withdrawal, the grade *W* is assigned.

A \$5 fee is charged for one or more petitions in change of course filed at any one time. Absolutely no changes may be made on the "Stop Day" or during Final Exam Week. There are no exceptions to this rule.

Maximum Registration

The maximum registration in the Graduate School is 16 credit hours per semester, or 8 credit hours for the Summer Session.

Attendance

A record of class attendance, in general, is not kept for graduate students; however, students finding it necessary to be absent, especially before or after holidays, are advised to so inform their instructors.

Veterans who wish to claim subsistence are expected to attend classes regularly.

Auditing Courses. Students who wish merely to attend lectures, including vet-

erans who do not intend to receive subsistence for a given course, are expected to enroll as "hearer."

Enrollment Required

Students working toward advanced degrees are required to enroll in the Graduate School not only for courses which are part of the advanced degree program but also for those undergraduate courses which receive no graduate credit, and for those courses which a graduate student may be taking as a hearer. This requirement includes those seniors who are enrolled concurrently in an undergraduate college and in the Graduate School and who wish to receive graduate credit for part of their programs. Enrollment is expected to reflect the course work and research in which students are engaged. Even though they may not need the credit, or may have met their residence requirement for the doctoral degree, they are still expected to enroll for an amount of work that reflects their activities.

Withdrawals

Formal withdrawal from UMC is arranged through the Graduate Office, 205 Jesse Hall. Students who leave the Columbia campus without filing a statement of formal withdrawal are given a failing grade of *F* in all courses. If the reason is so urgent that an official withdrawal cannot be obtained, the student should notify the Graduate Dean as soon as possible and officially request to be withdrawn.

If the student is making a *C* or better at the time of withdrawal a *W* is recorded. If the student is making a *F* at the time, a grade of *WF* is recorded. Students are responsible for notifying their instructors of their intention to withdraw and for determining if their work qualifies them for a *W* grade.

If students are forced to withdraw for the purpose of entering the armed forces of the United States, and have been enrolled for three-fourths or more of the term, they may receive full credit in those

courses in which they were making a grade of *C* or better, provided they have covered the essentials of such courses and submit written proof of immediate induction. *F* grades are recorded as *W*.

GRADING AND SCHOLASTIC REQUIREMENTS

Grading

Graduate students' grades in all courses counting toward an advanced degree are reported as *A*, 4 points; *B*, 3 points; *C*, 2 points; and *WF*, 0 points. The grade *A* means that the student's work in a course is of outstanding merit; *B*, the work is entirely satisfactory; *C*, acceptable only to a limited extent in fulfilling the requirements for advanced degrees. There is no *D* grade for graduate students, and *F*, means the work in a course has not satisfied the minimum necessary for passing. *W* is withdrawn passing and *WF* withdrawn failing.

Incomplete Grade

An incomplete grade may be recorded when the student's work is incomplete but otherwise worthy of credit, or when the instructor feels unable to assign a grade at the end of the semester. The student must finish this work within the next calendar year of residence, or the *I* will remain and will not be removed. This last rule does not apply to course numbers 400, 450, or 490.

Scholastic Standing

The grade point average in the Graduate School is based on the student's entire graduate record in courses numbered 200 and above taken at UMC. To remain in good standing, a graduate student must maintain a cumulative grade point average of 3.0 or better.

Probation

At the end of any semester, a graduate student with a grade point average below 3.0 is placed on probation. If at the end of the following semester the cumulative grade point average is 3.0 or better,

probation status is removed. A student on probation failing to raise the cumulative GPA to 3.0 may, on the recommendation of the department or area, be allowed a second and final probationary semester. A student is subject to dismissal upon failure to raise the cumulative GPA to 3.0 by the end of the second probationary semester, or at any time that the semester or cumulative GPA falls below 2.0.

Graduation

To graduate, a student must have a grade point average of 3.0 or better in all graduate courses.

MASUA and Inter-UM Traveling Scholars

The Mid-America State University Association, of which UMC is a member, sponsors a traveling scholar program in which advanced doctoral candidates may spend a term of study at another MASUA university.

Under the program, doctoral students may cross state and institutional lines for work in highly specialized areas at neighboring campuses while paying fees, registering, and receiving credit at their home universities. Generally, the program is available for one semester.

In this program, UMC cooperates with the Universities of Kansas, Oklahoma, and Nebraska; and Kansas State, Oklahoma State, and Iowa State universities.

To participate in the program a student first makes certain that the resources are not available on the home campus, and then requests permission from the graduate adviser to spend a semester on a campus housing the resource. Arrangements then are made by the adviser with a counterpart professor at the host university, followed by application for approval to the administrative office on each campus designated to handle such applications.

Limited financial support is available. Interested students should contact the Graduate School for details.

A similar program is available for students on other University of Missouri

campuses. See the Graduate School for further information.

Master's Degrees

The University of Missouri-Columbia confers the Master of Arts, Master of Science, Master of Science for Teachers, Master of Business Administration, Master of Education, Master of Music, and Master of Social Work degrees. For successful completion, the student must satisfy the general regulations for master's degrees; special requirements of the particular master's degree sought; and the individual departmental or area requirements.

GENERAL REGULATIONS

Candidacy

In order to become a candidate for a master's degree, the student must follow these procedures:

1. *Admission to Graduate School*—The student must give evidence (a) of completing an undergraduate course of study such as that offered by colleges of good standing, and (b) of earning a baccalaureate degree equivalent to that granted by the University of Missouri.

2. *Acceptance for Advisement*—Departmental or area acceptance for advisement is based upon prior academic record, scores on Graduate Record Examination or other tests, and letters of recommendation as prescribed by the department or area of interest.

3. The student selects a consenting adviser from faculty members of the department or area in which the major work is planned. Prior to each semester registration, the student consults the adviser concerning a program of courses.

4. After performing satisfactory work for the first half of a semester or for an entire summer session, the student, with the adviser's assistance, completes the form "Application for the Master's Degree," an outline of the course of study for the student's graduate program. Although this form may be revised by a letter from the adviser to the Graduate Dean, no course once taken may ever be removed from the program. This degree application form must be filed no later than the session preceding the session in which the student expects to receive the degree.

Course of Study

To graduate, a student must have a grade point average of 3.0 or better in a minimum of 30 hours beyond the bachelor's degree, selected from courses carrying graduate credit. (See Special Regulations for master's degrees requiring more than 30 hours.)

The course of study may be chosen from one or more departments provided it constitutes a unified program approved by the major adviser, the departmental Director of Graduate Studies, and the Dean of the Graduate School. If offered, a minor must include at least 10 hours of course work, be approved by an adviser in the minor subject, and be included in the final examination.

A student is required to complete 24 hours of advanced study offered by University of Missouri-Columbia faculty. However, 8 hours of UMC residency credit may be used toward a second master's degree.

If UMC residence requirements are fulfilled, credit may be transferred from other institutions or campuses on the recommendation of the student's adviser and with the approval of the Graduate Dean. Students should first consult with their advisers about work taken off the Columbia campus.

Although correspondence or extension course credit earned at any other campus is NOT accepted by the Graduate School, the School will accept up to 8 hours of correspondence courses offered through the Columbia campus University of Missouri Extension Division. Before any correspondence extension center course is taken, it must be approved for graduate credit and be approved by the adviser and the Dean of the Graduate School for inclusion in the course of study. To apply such courses toward a master's degree, the student must have completed at least one summer of satisfactory residence work. Exception is made for men in the armed services who receive, in advance, approval by the adviser for correspondence work before establishing residence on the Columbia campus.

For academic advice or degree program planning, students should contact their major departments, or the Dean of the Graduate School.

Although included in the minimum 30-hour requirement for the degree, credit allowed for research, problems, special investigations, and special readings may not total more than 12 hours. Upon recommendation of the adviser and approval by the Graduate School Dean, a student may enroll for off-campus research, credit of which may not total more than 8 hours. The results of this research ordinarily forms part of a thesis presented to the graduate faculty in partial fulfillment of the requirements for an advanced degree.

To enroll for off-campus research, a student must have been in residence in the Graduate School at least one summer term on a full-time basis or one semester part-time. Candidates for a master's degree may not register for off-campus research for more than 4 hours per semester or 3 hours per summer term.

Thesis Preparation and Submission

When required, the thesis must be the student's own work and must demonstrate a capacity for research and independent thought. A student writing a thesis should obtain (a) from the Graduate Office in Jesse Hall, a copy of the regulations governing the preparation of theses and (b) from the departmental Director of Graduate Studies, the departmental requirements for theses. The following gives the procedure for thesis acceptance.

1. The student has the thesis approved by the major adviser and a second reader from the department.
2. The thesis is submitted to the Graduate Dean on or before the official deadline date preceding expected graduation. (Consult the calendar in this catalog for deadline dates.)
3. The Graduate Dean appoints from outside the department a third reader, upon whose approval the thesis is accepted.
4. The Dean appoints the Final Examining Committee. If the committee recommends that the Thesis Abstract be included in *Dissertation Abstract*, the student prepares an abstract of not more than 150 words for this purpose.

Final Examination

Each candidate must pass a final examination to demonstrate mastery of the fundamental principles of the work included in the course of study offered for the degree. A student must be enrolled during the semester in which the final examination is signed by three committee members of the examining board and sent to the Graduate Office.

Graduation Confirmation

During the first six weeks of the semester in which the "Application for a Master's Degree" course of study is expected to be completed, a student should personally confirm with the Graduate Office all graduation arrangements.

Time Limitation

The program for the master's degree must be completed within a period of eight years after first post-baccalaureate enrollment; however, time spent in the armed services does not count. For any extension of this time limitation, the student must petition the Graduate Dean. Such petitions must be received in the Graduate Office prior to the expiration of the normal period.

SPECIAL REGULATIONS FOR MASTER'S DEGREES

In addition, to the departmental master's programs, master's degrees are offered in the following areas: linguistics, laboratory animal medicine, and South Asian language area. In the fields of study section in this catalog, specific requirements can be found under the department or area offering a particular degree. Only special regulations for the various master's degrees are summarized below.

The *Master of Arts* degree, offered in more than 30 fields of study, represents the successful completion of a unified program of course work designed to provide a high level of broad competence in a discipline. Thirty hours of graduate credit, including at least 15 hours in courses numbered 400 or above, are required. An

M.A. program does not normally include a thesis.

More than 35 fields of study lead to the *Master of Science*. This degree is oriented toward research, and normally a thesis or research paper is required. The program must include 30 hours of graduate credit, with at least 15 hours of these being in courses numbered 400 or above.

The *Master of Science-Physical Sciences* program is designed for those preparing to teach more than one science, or for those broadening their foundation in science before proceeding to the doctoral degree. No thesis is required. Of the required 40 hours of graduate credit, 32 hours are distributed among the departments of physics, chemistry, and mathematics; 8 hours are elected from other lines of work approved by the candidate's advisers. A student takes 8 hours in courses numbered 400 or above, and not over 3 hours in seminar courses. This advanced work must be in the fields mentioned above. Math 80 and Math 175 or their equivalents should be presented for admission to candidacy, or taken without credit toward the degree. If not presented for admission, Math 201 or its equivalent must be included in the program for the degree.

As distinguished from the *Master of Arts in Education*, the *Master of Education* degree does not emphasize research. Designed to prepare professional educators at a broad level of competence, it requires a minimum of 32 hours of graduate courses, of which 16 hours consist of courses numbered 400 or above.

The *Master of Business Administration* degree provides advanced professional training in finance, management, and marketing for persons preparing for careers in business. Graduate work totaling 59 hours, with at least 24 hours of courses numbered 400 or above, is normally required. Part of this may be waived for students having the proper undergraduate background.

The *Master of Music* degree, which represents an advanced level in achieve-

ment in applied music, requires 32 hours of graduate work, including at least 16 hours in courses numbered 400 or above. All candidates must give a recital.

The *Master of Science for Teachers* is designed to strengthen the subject matter competence for high school teachers in those sciences commonly taught in the nation's high schools. It is not intended to qualify the recipient for a junior college or college teaching position, nor count as a full year's work toward the doctoral degree. At least 24 semester hours of acceptable credit in college-level sciences and a teaching certificate are required for admission to the program. This degree is offered in the areas of mathematics, physical science (physics), and economics, and requires 30 hours of graduate work, including one 400-level course in the area. Only subject matter courses can be used to satisfy the requirement, although the program is quite flexible in order to meet the needs of individual students.

Students receiving the *Master of Social Work* have attained a beginning leadership competence in professional social work practice. The M.S.W. degree requires 60 hours of graduate work, except for holders of the B.S.W. degree from UMC who, if accepted for admission to the graduate program, may complete M.S.W. requirements in one year.

Dual Degree Programs for Medical Students

Utilizing the flexibility of the medical curriculum, the *Master's-M.D. program* enables medical students to pursue and receive a master's degree in an area of their choice within the 4-year span of enrollment in medical school.

The objective of this program is to allow interested qualified students to seek in-depth involvement in disciplines of their choice, based upon their future role and earlier background and interests. Master's programs are available in all the basic sciences and public health in the School of Medicine and in the various other disciplines throughout the campus,



including science, humanities, engineering, agriculture, journalism, and the arts.

Financial support may be provided for the graduate portion of the dual degree program.

The *M.D.-Ph.D.* is a six-year program for the student seeking a biomedical research career. After acceptance into medical school, students must be accepted by the graduate program of their choice. Two additional years are to be worked into the medical curriculum to satisfy requirements for the Ph.D. This is usually accomplished by a post-sophomore year and a post-M.D. year.

Ph.D. programs are available in anatomy, biochemistry, microbiology, nutrition, pharmacology, physiology, psychology, pathology, and medical sociology with School of Medicine faculty and in various other disciplines of other colleges and divisions of the campus.

Fellowship support may be provided for the Ph.D. portion of this program, while loan and scholarship funds may be available (based on need) for the M.D. curriculum.

Inquiries should be made in the office of the Dean of Medicine.

Specialist Degree

The Educational Specialist degree is a 30-hour program beyond the master's degree; 24 hours must be taken with the UMC faculty. A student is required to take a final examination, the results of which must be signed by a majority of the Advisory Committee members and submitted to the Graduate Dean.

DEPARTMENTAL OR AREA REQUIREMENTS

Refer to specific department in the Fields of Study section, or to the Area Programs section, of this catalog.

Doctoral Degrees

The University of Missouri-Columbia Graduate School grants two doctoral degrees, the Doctor of Philosophy and the Doctor of Education. For successful completion of a doctoral degree, a student must fulfill the general regulations common to both doctoral degrees; special requirements of the particular degree sought; and the individual departmental or area requirements. It is the student's responsibility to make sure all regulations and requirements are satisfied. No individual who, at any time, has held on this campus the rank of assistant professor or higher is eligible for a doctoral degree from UMC.

GENERAL REGULATIONS

Candidacy

In order to become a candidate for a doctoral degree, the student must follow these procedures:

1. *Admission to Graduate School*—Students must give evidence (a) of completing an undergraduate course of study such as that offered by colleges of good standing and (b) of earning a baccalaureate degree equivalent to that granted by the University of Missouri.

2. *Acceptance for Advisement*—Departmental or area acceptance for advisement is based upon prior academic record, scores on Graduate Record Examination or other tests, and letters of recommendation, as prescribed by the department or area of interest.

3. The student selects a consenting adviser from doctoral faculty members who are dissertation supervisors in the department or area in which the major work is planned. Prior to each semester registration, the student consults the adviser concerning a program of courses.

4. By the end of the first year of doctoral work, a student should file a formal Application for the degree of Doctor of Philosophy or Education, obtainable in the Graduate Office, 205 Jesse Hall. The student's adviser

and the departmental director of Graduate Studies sign the form which is then submitted to the Dean of the Graduate School. With the consent of the adviser and the Graduate Dean, students having done graduate work elsewhere may file this form at a later stage.

5. Candidacy for a Ph.D. degree requires satisfactory performance on a special doctoral qualifying examination, which the department or area prescribes as written or oral. The Advisory Committee may require a similar qualifying examination for Ed.D. degree candidacy.

6. To be an official candidate, the student must satisfactorily pass the comprehensive examination for the Ph.D., or the matriculation examination for the Ed.D.

Dissertation

Since a dissertation is required, every doctoral candidate should (a) obtain, from the Graduate Office in 205 Jesse Hall, the Graduate School Regulations governing the preparation of theses and dissertations and (b) consult the departmental Director of Graduate Studies for departmental style requirements.

The dissertation must be written on a subject approved by the candidate's advisory committee, must embody the results of original and significant investigation, and must be the candidate's own work.

On or before the official deadline date preceding expected graduation, the candidate must submit the following to the Graduate Dean:

(1) the dissertation; (2) an approval sheet appropriately signed; (3) a receipt for the micro-filing and binding fee; (4) a brief title for the binding, not to exceed 50 letters and spaces; (5) an abstract of not more than 600 words; and (6) a brief biographical sketch in paragraph form.

For special procedures and policies, students should read the specific regulations for the Ph.D. or Ed.D. degree program.

The publication of a dissertation must include suitable acknowledgment indicating that it is a dissertation or portion of a dissertation submitted to the graduate faculty of the University of Missouri-Columbia in partial fulfillment of the requirements for the degree of Doctor of Philosophy or Doctor of Education.

Residence Requirements

As a minimum, a student is required to have the equivalent of three full years of graduate work taken beyond the bachelor's degree. All acceptable graduate work, including work for a master's degree, is computed for meeting the three-year requirements for the doctoral degree on the basis of the following table:

<i>Semester Credit Hours</i>	<i>Year Fractions</i>
12 to 16 hours .....	.50 year
9 to 11 hours .....	.375 year
6 to 8 hours .....	.25 year
3 to 5 hours .....	.125 year
0 to 2 hours .....	.0 year

If any graduate work has been taken in residence at other than the University of Missouri-Columbia, the faculty decides in each case whether, to be acceptable for transfer credit, the work was conducted under suitable guidance and favorable conditions. Correspondence and Extension courses are not used for meeting requirements for the doctoral degree, except to the extent that they are allowed for a master's program.

Each doctoral student must spend at least "one continuous year" beyond the master's degree level in full academic involvement (study, teaching, research) on the Columbia campus, and must devote one's self primarily to the graduate program. "One continuous year" is defined as either two 12-semester hour or three 8-semester hour enrollment periods successfully completed within 18 months. This period of full-time reading, reflection, study, teaching, and research is considered necessary to give the student program continuity and to fulfill the spirit and special demands of the doctoral program.

A student who is a graduate assistant, or who is engaged in other activities that reduce the time available for graduate work, may need more time to meet course and dissertation requirements.

Time Limitations

Excluding work toward the master's degree or its equivalent, the program for the doctoral degree must be completed within eight years. Before the expiration



of the normal period, the student must petition the Graduate Dean for any extension of time.

Off-Campus Research

To enroll for off-campus research, a student must already have completed 32 semester hours of acceptable graduate work. Off-campus research work for Doctor of Education candidates is limited to 3 semester hours during a given semester and a total of 6 semester hours toward the degree.

Continuous Registration

Continuous registration, requiring enrollment in each fall, winter, and summer term, is mandatory for all doctoral students who have passed their comprehensive or matriculation requirements. Failure to comply with this regulation results in the cancellation of candidacy.

If in residence, a student must enroll for credit commensurate with academic activity, but in no case for less than 3 credit hours in any semester. When all requirements except the dissertation have been completed, a candidate, even though away from campus, must continue to enroll for at least one hour of credit each registration period until the degree is awarded.

In-residence students who have completed all degree requirements except the dissertation may request postdoctoral fellowships. Recipients of these fellowships are reimbursed beyond the first 3 hours for up to 9 hours of enrollment in research and/or seminar credit each semester and summer term.

Commencement

Candidates for doctoral degrees are expected to attend Commencement exercises. When such attendance constitutes a hardship, the candidate may petition the Graduate School to be excused.

REGULATIONS FOR THE PH.D. DEGREE

The Qualifying Examination and Program of Study

The student's adviser officially recommends for the approval of the Graduate Dean a five-member advisory committee, including one member from outside the major department. This committee administers the Qualifying Examination, which aids in assessing the student's background and prospects for success in working toward a Ph.D. degree. If successfully completed, this examination then serves as a guide to the student and advisory committee in planning a program of study.

The program of study must constitute a definite plan of training for research or scholarly investigation in a particular field. In addition to specifying course requirements for its Ph.D. candidates, the department or area determines the language requirement, which, in general, may be satisfied by one of the following options:

1. ability to translate into English two foreign languages; or
2. a high order of ability to read, write, and converse in one foreign language, and to translate that language into English and English into that language.

However, certain departments do have special language requirements or substitutions.

From the results of the study program planning, the chairman of the Advisory Committee submits to the Graduate Office a report which includes:

- (1) a copy of the proposed course of study;
- (2) recommendations for the language preparation and other special requirements; and (3) any request for transfer of graduate credit, if the Committee so recommends.

The student must complete the course work as outlined in the formal program of study to the satisfaction of the Advisory Committee and the Graduate Dean before being considered for the Comprehensive Examination.

The original advisory committee must be reappointed in order to serve as the Comprehensive Examination Committee and/or the Final Oral Examination Committee.

Comprehensive Examination

The major adviser applies to the Graduate Dean for an examining committee to administer the Comprehensive Examination when the doctoral candidate has (1) passed the qualifying examination; (2) met the language or special requirements, if any; (3) essentially completed all the planned course work; and (4) completed two years of residence, as detailed elsewhere in these regulations. The Comprehensive Committee, totaling at least five members, shall consist of the Advisory Committee and such others as the Dean may select, including one member from outside the major department or area.

The Comprehensive Examination must be completed at least seven months before the Final Oral Examination (see Graduate School Calendar). The most advanced examination posed by UMC, the written section is arranged and supervised by the major adviser. This examination terminates within one month after its start and consists of written questions prepared and graded by members of the Comprehensive Committee.

Upon satisfactory completion of the written examination, the candidate is orally examined by the Committee. A report of this examination carrying the signatures of all members of the Committee is sent to the Graduate School Dean.

For the Comprehensive Examination to be successfully completed, all or all but one of the Committee must vote that the candidate has passed. If failure is reported, the Committee recommends suggested work or other remedial measures.

The candidate who has failed to pass may not take a second examination until at least 12 weeks have elapsed. Failure to pass two comprehensive examinations automatically terminates candidacy at UMC.

Dissertation

PLAN I

1. The student must first have the dissertation approved by the adviser and by a second reader in the department, upon whose approval it is submitted to the Graduate Dean on or before the official deadline date preceding expected graduation, along with the following: (1) an approval sheet signed by the first and second readers; (2) a receipt for the micro-filming and binding fee; (3) for the binding, a brief title not to exceed 50 letters and spaces; (4) an abstract of not more than 600 words; and (5) a brief biographical sketch in paragraph form.

2. The Graduate Dean appoints a third reader who must be outside the department and may be from other than the Columbia campus. A dissertation will not be sent to a third reader when UMC is not officially in session.

3. Upon approval of the dissertation, the Graduate School Dean appoints, at the request of the adviser, a Final Examination Committee, which may or may not be the same as the Advisory Committee.

4. The final examination can be written and/or oral; if oral, it may be open to the general faculty. The candidate must be enrolled to take this examination, which cannot be administered when UMC is not officially in session.

5. The adviser reports the results to the Graduate Office before the acceptance deadline.

The following is an alternate plan for handling the Ph.D. Dissertation Examination Committee:

PLAN II

1. A Dissertation Committee will be appointed by the Graduate Dean upon submission of a request by the dissertation supervisor with a detailed proposal of the dissertation topic. The membership of the committee should be appropriate to the student's research. At least one member must be from outside the dissertation supervisor's department.

2. This committee may be appointed any time after the student has passed the qualifying examination.

3. The Dissertation Committee reviews the dissertation proposal and reports its recommendations to the Graduate Dean. The approval of the dissertation proposal must be filed with the Graduate Dean at least six (6) months prior to graduation.

4. The members of this committee may be appointed to serve as the Advisory Committee and Comprehensive Examining Committee as well. However, *a request for such action must be approved by the Graduate Dean and proper reports must be submitted.*

5. All members of the committee are expected to take an active part in the preparation of the dissertation.

6. The finished dissertation, approved by the dissertation supervisor, must be submitted to the

Graduate Dean, and after approval the dissertation is sent to other members of the committee for reading and approval. Before the final examination can be held, a short written evaluation by each member of the committee is sent to the Graduate Dean. If the approval of the dissertation is not unanimous, the Graduate Dean may send the dissertation to another reviewer for recommendations. After the reports are made, the Graduate Dean authorizes the holding of the final oral examination and the date, time, and place of the examination is announced and published.

The candidate must be enrolled to take this examination which cannot be administered when UMC is not officially in session.

DOCTOR OF EDUCATION DEGREE REGULATIONS

Requiring minimum course work of 82 semester hours beyond the Bachelor's degree, the degree of Doctor of Education is especially intended to meet the professional needs of the candidate. The program of studies is planned with this objective in view.

To be accepted for advisement, the student must have attained the degree of Master of Arts with a major in education or a degree of Master of Education, or the quantitative and qualitative equivalent of one of these degrees, from a college or university of recognized standing.

The Qualifying Examination and Program of Study

The student's adviser officially recommends for the approval of the Graduate Dean an advisory committee consisting of at least five members. In addition to planning the doctoral program with the student, this committee administers, if it is deemed desirable, a qualifying examination, which helps assess the student's general background and prospects for the Ed.D. degree as well as to guide the planning of the study program.

If required, the Qualifying Examination must be successfully completed before the study program is determined by the adviser and the student in cooperation with the Advisory Committee. This program must constitute a well-organized plan of professional specialization in one of the major fields of education, with one or more supporting fields.

Matriculation Examination

As well as pursuing course work in the professional areas of specialization, the candidate, in order to understand and utilize educational research reports, acquires sufficient knowledge of statistics and educational research techniques by taking courses in educational statistics, advanced educational statistics, and methods of educational research. Foreign languages are not required except as may be determined by the candidate's major adviser.

When the student's adviser deems the needed course work completed, the Advisory Committee plans the pattern of the Matriculation Examination, a written and oral comprehensive examination, including the candidate's major field of interest for the degree. This examination must be taken no earlier than the second year of graduate work and be completed at least seven months before the Final Oral Examination (see Graduate School Calendar).

For the Matriculation Examination to be successfully completed, all or all but one of the Advisory Committee must vote that the candidate has passed. If failure is reported, the Committee recommends suggested work or other remedial measures.

The candidate who has failed to pass may not take a second examination until at least 12 weeks have elapsed. Failure on two Matriculation Examinations shall automatically terminate candidacy at UMC.

Dissertation and Final Examination

The dissertation, for which not less than 8 hours of credit may be granted, has no maximum credit restriction, providing that more than 70 graduate hours of other approved courses are completed and granted toward the Doctor of Education degree. The dissertation must be reviewed and approved by the candidate's Advisory Committee.

In addition, the Advisory Committee, along with the adviser, conducts a final oral examination on the work included in

the dissertation. The candidate must be enrolled for this examination, which cannot be taken when UMC is not officially in session.

Graduate Assistantships, Fellowships, Scholarships

Graduate fellowships and scholarships are limited to students of outstanding ability who have completed, or expect to complete before the opening of the next academic year, the requirements for a Bachelor's degree.

The deadline for submission of applications for the fellowships administered by the Graduate School (described below) is February 15. These applications must be accompanied by scores on the Graduate Record Examination or other comparable examinations. Deadlines for submission of applications for the departmental fellowships, traineeships, and other financial assistance (described on pages 28-30) are set by the Departments. Obtain more specific information concerning these programs by writing directly to the Departments responsible for the programs.

Assistantships

Approximately 1,000 graduate teaching and research assistantships in various departments and areas are available to graduate students. Stipends for half-time 9-month appointments start at \$3,690.

A graduate assistant, normally on half-time appointment, may take a maximum of 12 hours of course work. Holders of at least quarter-time graduate teaching, research, and extension assistantships are required to pay incidental and student activity fees; however, they are exempt from out-of-state tuition.

Applications for assistantships and fellowships are made directly to the Chairperson or Director of Graduate Studies in the department or area in which the student intends to work.

Information concerning positions as resident assistants is available from the Housing Office, 123 Jesse Hall.

NON-DEPARTMENTAL FELLOWSHIPS AND SCHOLARSIPS (Administered by the Graduate School)

GREGORY FELLOWSHIPS currently provide stipends of \$1,000 for new students enrolling in UMC graduate programs. A Gregory Fellow is exempt from non-resident tuition and is allowed to hold a half-time departmental teaching or research assistantship. Application forms may be obtained from the department or area in which the student intends to work, and must be completed and returned by February 15.

NDFL FELLOWSHIPS are financed through Title VI (Modern Foreign Languages) of the National Defense Educational Act. UMC participates in programs of the South Asian Language and Area Studies. These fellowships, restricted to citizens or permanent residents of the United States, are intended for students planning careers in college or university teaching or in area studies. The fellowship stipend, which is renewable, is \$2,925 for the academic year. Title VI fellowships also provide for the payment of fees and out-of-state tuition. Inquiries should be made by February 1 through the South Asia Center, 124 General Classroom Bldg.

POST-RESIDENCE DOCTORAL FELLOWSHIPS are available for students who, having passed the Comprehensive (or Matriculation) Examination, are engaged in full-time research. (For details see subsection entitled "Continuous Registration" in Regulations for the doctoral degrees.)

The D. R. FRANCIS FELLOWSHIP is open to undergraduate seniors planning to attend UMC Graduate School, or to graduate students already enrolled at UMC. Applicants must be planning to study in the areas of public affairs or creative literature, and are required to submit along with the application form a brief statement describing plans for study. The stipend is \$1,400 for one academic year of graduate study. The Fellow is also exempt from out-of-state tuition during the award period. Application forms are available from the Graduate School, 205 Jesse Hall, and must be submitted by February 15.

CURATORS GRANTS-IN-AID TO FOREIGN GRADUATE STUDENTS are limited in number and are open to campus-wide competition. The grants-in-aid are equal to the amount of the incidental fee for one academic year and include a waiver of the out-of-state tuition. Obtain application blanks and detailed information from the Foreign Student Coordinator. Deadline for fall semester applications is March 15.

DEPARTMENTAL FELLOWSHIPS, SCHOLARSHIPS, AND PRIZES

The awards listed below are administered by the individual departments; application should be made directly to the Department Chairperson or Director of Graduate Studies. Most awards are restricted to those majoring in the particular department and are based on scholarship. Obtain information concerning the deadlines for application from the departments.

ACCOUNTANCY: Alumni with Arthur Andersen & Co.—variable awards; Ernst & Ernst—variable awards; Haskins & Sells Foundation—variable awards; Lybrand Foundation—variable awards; The Peat, Marwick, Mitchell Foundation—variable awards; Price Waterhouse Foundation—variable awards; John W. Rader Fund—variable awards; Touche Ross Foundation—variable awards; Arthur Young & Co.—variable awards.

AGRICULTURE: William Henry Hatch Fellowship—\$6,200 to a doctoral candidate supervised by a department in the College of Agriculture. George W. Carver Fellowship—\$5,620 for a master's student and \$6,200 for a doctoral graduate student supervised by a department in the College of Agriculture, with preference given to Black Americans.

ANTHROPOLOGY: Teaching Fellowships—\$1,733 (¼ FTE), teaching in anthropology; Research Assistantships—\$3,465 (½ FTE), archaeological research; Graderships—variable amounts, grading Extension courses.

ART: Columbia Art League Scholarship—\$300 awarded annually to a senior or graduate student recommended by the Department of Art. The William B. Ittner Fine Arts Prize is awarded annually for the most meritorious work in music or art; the \$50 prize is awarded in alternate years by the Departments of Art and Music.

ART HISTORY AND ARCHAEOLOGY: Kress—\$3,000 and \$2,000; renewable.

BOTANY: Ernest J. Palmer Memorial—\$400 for cataloging and caring for Palmer collections of rocks and minerals.

BUSINESS ADMINISTRATION: B&PA Alumni Fellowships—variable awards for qualified doctoral students; Missouri Bankers Assn. Fellowships—variable awards; Risk and Insurance Fellowships—variable awards; Henry Hatch Green Memorial Scholarships—variable awards for students in one of the B&PA professional programs.

CHEMICAL ENGINEERING: Several industrial fellowships are awarded to graduate students, depending on the student's academic competitiveness. Some of the available fellowships are: Monsanto Co.—\$2,000; Esso Research & Engineering Foundations—\$4,000; and Celanese Corp.—\$3,000.

CIVIL ENGINEERING: Associated General Contractors of Missouri—two graduate scholarships, one for \$1,000 and the Morris E. DeWitt Memorial Scholarship for \$1,000, both for students in the field of construction-management who are Missouri residents; Joe Clark A. G. C. Scholarship—\$1,000 for graduate students in construction management.

CLASSICAL STUDIES AND ARCHAEOLOGY: Walter Miller Classical—\$1,000 available each year to a graduate student interested in an M.A. or Ph.D. in Classical Languages or in Classical Archaeology. This fellowship is alternated each year between the Departments of Classical Studies and Art History & Archaeology.

COMPUTER SCIENCE: John Byers Memorial Scholarship Fund—\$600 annual award to a computer science student on the basis of superior scholarship, professional promise, and financial need. Application should be made before March 1 to the Chairman of the Computer Science Department.

EDUCATION: E. M. Carter Memorial—\$100 to a Missouri graduate student in Education on the basis of need, superior scholarship and professional promise as a teacher. Peabody Scholarship in Education for graduate study granted on basis of financial need—amount varies; one awarded each year. Ruth E. Norris Scholarship—awarded for graduate study in Education; amount varies.

ENGINEERING: The Union Electric Co. provides support for a number of Energy Systems and Resources traineeships for graduate students. These traineeships pay \$2,267 per academic year for one-third time appointments. They are open to students interested in energy systems and their technological and socioeconomic benefits as well as their problems.

ENGLISH: (3) M.A. Fellowships—approximately \$2,813; (15) Ph.D. Teaching Fellowships—approximately \$4,926. Application should be made before March 1 to the Director of Graduate Studies, Department of English.

ENTOMOLOGY: Leonard Haseman—\$100 (2) Awarded yearly to two outstanding Entomology graduate students; Philip C. Stone—\$100 (1) Awarded yearly to either an outstanding undergraduate student or to an outstanding beginning Entomology graduate student.

FOOD SCIENCE: Two Eugene V. Nay Awards of \$250 each to outstanding M.S. or Ph.D. candidates; Harold P. Dugdale Award of up to \$1,000 for outstanding graduate students emphasizing the study of meat science.

FORESTRY, FISHERIES AND WILDLIFE: Research Fellowships in Fisheries and Wildlife Biology—Edward K. Love—\$3,900-up (2-3), plus provision for field expenses; E. Sydney Stephens Memorial—\$3,900-up to a student in the field of wildlife biology; Rudolf Bennett—\$3,900-up to a student in the field of fishery biology.

GEOLOGY: A. P. Green Co.—\$2,800 plus \$500 for fees and \$200 for travel or other incidentals to a graduate student working on a problem in clay mineralogy; M. G. Mehl prize—approximately \$700 awarded annually by faculty recommendation to a graduate student working in paleontology or stratigraphy; W. A. Tarr prize—approximately \$500 awarded by faculty recommendation to a graduate student working in mineralogy, geochemistry, or economic geology. E. J. Palmer Award—approximately \$350 awarded bi-annually to a graduate student in paleontology.

HEALTH SERVICES MANAGEMENT: Equitable Life Assurance Society Scholarship—\$1,000 for one student or divided between two students in Health

Services Management. Foster G. McGaw Scholarship—\$1,000 for one student or divided between two first-year students in Health Services Management.

HISTORY: Frank F. & Louise I. Stephens History Scholarship—approximately \$1,300; Allen Cook White, Jr., Fellowship—approximately \$700; Norman Maclaren Trenholme History Scholarship; Jonas & Ruth H. Viles Scholarship—approximately \$200—outstanding graduate student in American History; Lewis E. Atherton Research Fund—grants to history graduate students to aid in dissertation research; Mary Ruigh History Scholarship Fund—approximately \$100—grants to graduate students in History to aid in research; the John Rainbolt Fund—for excellence in teaching and scholarship among History graduate students; Thomas A. Brady Graduate Fellowship in Ancient History; Walter V. Scholes History Scholarship Fund.

HOME ECONOMICS: Teaching and research assistantships for 9 or 12 months at \$385-\$433 per month .5 time, or one-half of the above amount per month for .25 time. Appointments for shorter periods and other time bases may be arranged. Information about American Home Economics Assn. Fellowships and Phi Upsilon Omicron Scholarships and other awards is available in 114 Gwynn.

INDUSTRIAL ENGINEERING: A number of graduate traineeships are made available by the National Center for Health Services Research, H.E.W., and by the Veterans Administration, each year for students enrolled in the graduate program of industrial engineering who are working toward the Ph.D. degree and specializing in Health Care Systems Design. The amount of the award is dependent on previous education, professional experience, and number of dependents. The amount ranges from \$3,300 to \$6,000 per year. In addition, teaching assistantships and research assistantships are also available.

JOURNALISM: Frank Luther Mott Fellowship—\$2,500 to a Master's candidate with interest in magazines and evidence of scholastic achievement and professional potential; the Frank Luther Mott Historical Research Graduate Scholarship—\$1,000 to an outstanding student whose thesis topic involves historical research; the Morris E. Jacobs Fellowship—\$500 for Master's candidate in advertising; Walter Williams Memorial Fellowship in International Press Problems—about \$800—must have M.A. in Journalism, have passed language examinations, and be proceeding for the Ph.D. degree.

LIBRARY SCIENCE: Ruth Tandy Royle Fellowship in Library Science—an award of \$500, donated by Mrs. Royle of St. Louis, is made annually to a graduate student in library science on the basis of academic record, potential for development as a librarian, and financial need. Preference is given to a student who has completed a bachelor's degree at UMC, with an area of concentration in library science. Make application before March 1 to the Dean of the School of Library & Informational Science.

MECHANICAL AND AEROSPACE ENGINEERING: Procter & Gamble Co.—\$6,000 to a graduate student in Mechanical & Aerospace Engineering.

MUSIC: Paul W. Mathews & Gertrude Mathews Scholarship in Music Education—\$500 awarded annually to an undergraduate or graduate. Information is available from the department.

NUCLEAR ENGINEERING: Each year a number of Energy Research and Development Administration Traineeships are made available to qualified students interested in earning the M.S. degree in Nuclear Engineering. The basic stipend is \$3,600 per year, with all tuition and fees paid by the ERDA.

NURSING: Department of Health, Education, and Welfare Public Health Service Traineeships—fees and tuition, plus living allowance of from \$200 to \$325 per month. Must be a United States citizen.

PHYSICS: James L. Kolopus Prize—\$50 to \$100 awarded annually to the graduate student whose contributions to research have been most outstanding. Harry E. Hammond Prize—\$50 to \$100 awarded annually to the graduate student who has made the most significant contributions to undergraduate teaching in physics. O. M. Stewart Fellowships—available annually. Stipends up to \$3,500/academic year, \$900/summer.

PHYSIOLOGY: U. S. Public Health Service Pre-doctoral Traineeships—student stipend plus tuition and fees. Support is available for four students each year.

POLITICAL SCIENCE AND PUBLIC ADMINISTRATION: William L. Bradshaw Scholarship: a gift from relatives and friends of former Dean of the School of Business & Public Administration and Professor of Political Science, William L. Bradshaw. This endowment provides scholarships for outstanding students in political science or public administration. Michael A. Kinney Scholarship Fund: This endowment, from the many friends of Michael A. Kinney (known as the dean of Missouri's Senate, in recognition of his long years of service in the Missouri Legislature), provides scholarships for worthy students in political science or public administration.

RECREATION AND PARK ADMINISTRATION: Missouri Park and Recreation Association—\$50 to \$300 (approximately 10) to undergraduate and graduate students majoring in recreation.

ROMANCE LANGUAGES: Jacob Warshaw—\$100 to an outstanding student who has maintained a high scholastic record in Spanish or Portuguese and who will agree to continue a study of that language at UMC.

SOCIAL WORK: Traineeships—The School will probably have some federally-sponsored traineeships under its direct control, subject to review by the Department of Health, Education, and Welfare and yearly congressional appropriations. Traineeships are granted only to a citizen or a national of the United States, or one who has been lawfully admitted to the United States as a permanent resident. Traineeship applications will be sent upon request. *Community Mental Health NIMH Grant*—This social work training grant is supported by funds from the National Institute of Mental Health to provide manpower for the field of community mental health. Funding is contingent yearly on federal legislative appropriations. Stipends are made available to graduate students on a competitive basis of merit and need. The stipend award is for \$2,925 for first- and second-year students for the academic year. All stipends pay the student's fees and tuition. Stipends are not automatically continued from one year to the next for individual students, but are renewed on the basis of the stated criteria. The

acceptance of this stipend obligates the recipient to follow a course of study with special emphasis on social work in Community Mental Health, and upon graduation to seek employment in that field. *Title XX—Social Work Education Grant*—This grant is made possible by the joint funding of the Missouri Division of Family Services, the UMC School of Social Work, and the Social & Rehabilitation Services of HEW. Funding is contingent on yearly state and federal regulations and legislative appropriations. Stipends are made available to both undergraduates and graduate students and include a monthly stipend, tuition and fees. The amount of the stipend is variable, depending on the student's academic level and relevant paid work experience. Students who participate in this program of financial support must sign a legal contract with the Missouri Division of Family Services to work for them, or at their direction in another agency rendering Title XX services, for a specified period of time dependent on the financial commitment involved. The school recommends candidates for these awards and the final decision for selection rests with the Missouri Division of Family Services which handles all aspects of the contractual agreement. *Child Welfare Long-term Training Grant*—This social work training grant is supported by the Social and Rehabilitation Services of HEW to provide social work manpower for the field of child welfare. Funding is contingent yearly on federal legislature appropriations. Stipends are available to undergraduate and graduate students on a competitive basis of merit and need. There is a differential in stipend support, depending on academic level and previous related work experience in the field of child welfare. The traineeship pays the student's fees and tuition. Stipends are not automatically continued from one year to the next for individual students, but are renewed on the basis of the stated criteria. The acceptance of this stipend obligates the recipient to follow a course of study with special emphasis on child welfare and upon graduation to seek employment in that field.

Living Accommodations

All students may reside in any available housing they may select. The University of Missouri-Columbia has residence halls available for both men and women students—all accommodations include room and board. One-bedroom and two-bedroom apartments are available for married students. Application blanks and additional information may be obtained by writing to the Housing Office, 123 Jesse Hall.

Residence hall accommodations for single men and women also are available in the Mark Twain Residence Hall. This privately-owned building is air-conditioned and equipped with semi-private baths. For further details, write directly

to the Mark Twain Residence Hall, 515 South Fifth St., Columbia, Mo. 65201.

Student Health Service

Health has an important relationship to a student's total educational endeavor. If ill, incapacitated by accident, or in generally poor health, the student is unable to study, attend class, and learn as effectively. Consequently, the University offers a two-part health program consisting of (1) a Student Health Service and (2) a supplementary sickness and accident insurance policy.

1. All students enrolling in UMC for the first time are required to submit the completed form Report of Medical History, obtainable from the Director of Admissions, and, in some instances, further information in the form of medical reports from physicians who have treated the applicant. Since it is confidential, all medical information should be sent directly to the Director of the Student Health Service; a delay may result in a delay in enrollment.

Facilities of the Student Health Service, located in the Student Health Center west of Francis Quadrangle, includes a full time professional medical staff with consulting specialists. Clinic hours are 8 a.m.-5 p.m., Monday-Friday and 8 a.m.-noon, Saturday.

Except for employees on the Educational Assistance Program, all students in residence at UMC for one or more hour(s) of credit are entitled to Student Health Service care, provided only at the Student Health Center. The services include at a small charge the usual ancillary services, such as laboratory, X-ray, and pharmacy. The services provided are in accordance with established UMC regulations.

Several immunizations including poliomyelitis, influenza, typhoid, and tetanus toxoid, are offered on a minimum-cost basis. Tetanus toxoid inoculations should be taken by veterinary, forestry, and geology students, as well as those with allergies such as asthma, hay fever, and hives. Certain other immunizations are given to students who must take special risks in their courses of study.

When needed services are not provided at the Center, responsibility reverts to the student, who may request assistance from the Student Health Service in arranging these services.

The Student Health Service does not routinely issue excuses for classes missed while attending the outpatient clinic. Unless acutely ill, the student should make every effort to visit

the clinic during a free period. Recommendation for an excuse may be made in exceptional cases upon the request of the instructor or the divisional dean. In addition, the Student Health Service does not validate absences for students when their illnesses are treated somewhere other than the clinic.

2. The *Supplemental Sickness and Accident Insurance Plan*, which must be purchased at the time of enrollment, is sponsored by the University of Missouri. It is obtainable at a reasonable cost and, for the most part, covers the student's needs for hospitalization and surgery, including medical and surgical treatment while at home during weekends, holidays, and summer vacation period. This insurance can be purchased to cover spouse and dependents at an extra cost. Details are available at the Cashier's Office or the Student Health Center.

Student Organizations and Special Services

All graduate students are members of the Graduate Student Association, 208 Read Hall (phone: 882-8357).

Within the Association, the Graduate Student Council consists of elected representatives from the various graduate departments and the Executive Board. The officers of the Executive Board (President, Vice-President, Secretary, and Treasurer) are elected by the Association each winter semester; each September six additional members are elected to the Board by the Council. The current President is Chuck LaJeunesse, 208 Read Hall, 882-8357; Vice President, Theophil W. Ross, 129 Fine Arts, 882-2021; and the Adviser, Assoc. Dean Richard L. Wallace, 205 Jesse Hall, 882-6311.

The purpose of the Graduate Student Council is to promote the welfare of graduate students and to act as the official voice for the Graduate Student Association. Any graduate student may gain a hearing either by attending the general meetings (held approximately once a month), or through the departmental representative at these meetings.

The Executive Board allocates Association funds for departmental, interdepartmental, and campus activities. Services currently provided by GSA include short-

term loans of hand calculators and a résumé printing service. More specific information concerning the support and services available from GSA may be obtained through the Association's office in Read Hall.

Placement assistance at a number of campus locations is provided for graduate students seeking employment after obtaining their degrees.

1. The College of Business and Public Administration placement office, 101 Middlebush Hall, is of interest to many graduate students in the social sciences and administrative disciplines. Representatives from more than 350 local, national, and international business organizations, as well as state and national government agencies, visit this office.

2. The College of Engineering placement office, 1009 Engineering, serves students majoring in engineering, chemistry, geology, mathematics, physics, and other fields.

3. The Professional Teacher Placement Service, 111 Hill Hall, assists any student seeking academic employment. Approximately 2,000 students and alumni per year are enrolled.

In addition, each department maintains a placement service for its own graduates.

Fees and Expenses

All statements as to fees are not to be regarded as offers to contract; the University expressly reserves the right to change any and all fees and other charges at any time, without any notice being given in advance of such change.

Time of Payment of Fees. All University fees must be paid at the time of registration as a condition of admission to classes. Students who preregister must pay fees by the announced deadline or the advance registration is cancelled and the student must register again and pay fees during the regular registration period as indicated on the Columbia campus calendar. Registration is not complete until all fees are paid.

Personal Checks. Personal checks in payment of fees or other obligations to the University are accepted only when the amount of the check does not exceed the amount due from the student. Students whose checks remain unpaid after they

have been notified are reported to the Office of the Dean of Student Affairs for disciplinary action. Furthermore, if the check must be turned over to the General Counsel's Office for collection, a service charge of \$3 is assessed.

A student presenting a check to the University in payment of student fees which is returned unpaid and remains unpaid after the close of the regular registration period is considered a late registrant, and is subject to the late registration fee.

Additional information regarding fees and expenses is furnished in the *UMC Bulletin, General Information*, and the *Schedule of Courses*. A pamphlet, *Tuition and Residence Rules*, is available from the Cashier's Office 123 Jesse Hall.

Credit Cards: Master Charge and VISA credit cards are acceptable toward payment of fees to the credit limit of the cardholder.

INCIDENTAL FEE

All students enrolled in the University are required to pay an Incidental Fee as follows:

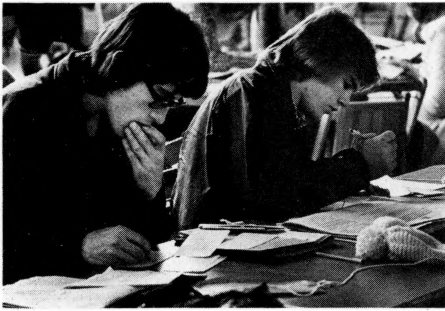
For one semester of approximately 16 weeks
(9 or more hours)\$300
For one term of 4, 6 or 8 weeks (5 or more hours) 150

For any other sessions not specified above and for partial enrollments, the Incidental Fee shall be calculated at the rate of \$34 per credit hour.

Advanced degree candidates who have completed in a previous semester or term all requirements but the final examination and the submission to the graduate faculty of a thesis (if required) and who are not regularly enrolled in the Graduate School must enroll in the Graduate School before the examination may be given or the thesis read. Such students must enroll for examination for no hours credit and pay a fee of \$34; they are not entitled to Student Health Service benefits.

Pre-payment on Incidental Fee: Students accepted for admission on the Columbia campus are required to deposit the following pre-payment:

Law School\$50
Other Divisions & Programs\$20



This payment is non-refundable but may be used as part-payment of fees if the applicant enrolls at UMC within a year following payment.

NON-RESIDENT TUITION

NOTE: Residency requirements for determination of tuition are different from residency requirements for completion of advanced degrees.

Tuition for graduate students is the same as for undergraduate students. It is not charged to:

1. any student who has been a Missouri resident for at least one year at the time of registration;
2. non-resident graduate students who are graduate teaching, research, or extension assistants on a 25 per cent full-time equivalent or more appointment (also applies to full-time hourly employees); and
3. non-resident graduate students holding a fellowship which does not include payment of tuition.

Prospective graduate students who believe that any of the above categories applies in their specific cases may contact the Graduate School or chairman of the proposed major department to determine the fees.

In addition, tuition is free to full-time academic or administrative staff members of this University, or the unmarried minor child or spouse of such staff members.

Although usually charged, non-residents in some cases are exempt from tuition, or tuition is at a reduced amount, as provided in the detailed *Tuition and Residence Rules*, which the Manager of Cashiering, 123 Jesse, or the Director of Admissions, 130 Jesse, will furnish on request. For further information about

tuition, refer to rule 5.0107 of the Collected Rules and Regulations of the University; for information regarding fees contact the Cashier's office.

Each student is responsible for registering under the proper residence and paying proper tuition fees; consequently, each student who may possibly be subject to such fees must raise the question.

Non-Resident Tuition Charges

REGULAR SEMESTER (16 WEEKS)

<i>Number of Hours Credit</i>	<i>Non-Resident Fee</i>
10 or more hours	\$600
9 hours .....	.450
8 hours .....	.350
7 hours .....	.175
1-6 hours inclusive .....	.none

SUMMER SESSION (4, 6 OR 8 WEEKS)

5 or more hours	\$300
4 hours .....	.155
1-3 hours inclusive .....	.none

STUDENT ACTIVITIES FEE

Each student registered for resident work on the Columbia campus is required to pay a Student Activities Fee as follows:

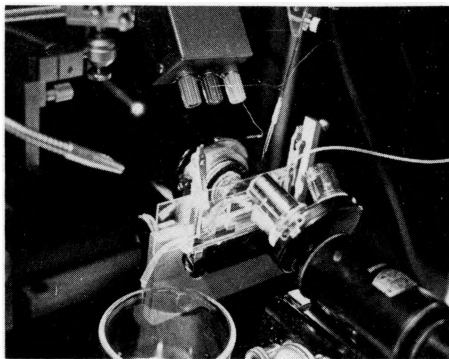
- For one semester of approximately 16 weeks (11 or more hours)\$22
- For one term of 4, 6 or 8 weeks (6 or more hours) \$11
- For any other session not specified above and for partial enrollments the Student Activities Fee shall be calculated at the rate of \$2 per credit hour or fraction thereof.

This \$22 Student Activities Fee is allocated to the following:

Memorial Union Bond Retirement	\$6
Warren E. Hearnes Multipurpose Building Bond Retirement	4
Missouri Students Association Student Activities ..	.5
Divisional Student Council Programs .....	.1
Student Activities Capital Improvements .....	.4
Associated Students of the University .....	.1
Intramural Program .....	.1
	\$22

No Student Activities Fee shall be charged:

1. for a special intersession if the student is enrolled simultaneously in a session or semester;
2. during the period beginning with the close of regular summer session and ending with the beginning of the fall registration;
3. for evening courses or courses offered off campus.



SUPPLEMENTAL FEES

Late Registration Fee: Any student registering after the close of the regular registration period shall pay a late registration fee of \$25.

Fee for Change in Course: A fee of \$5 must be paid for one or more petitions for change in course filed at any one time.

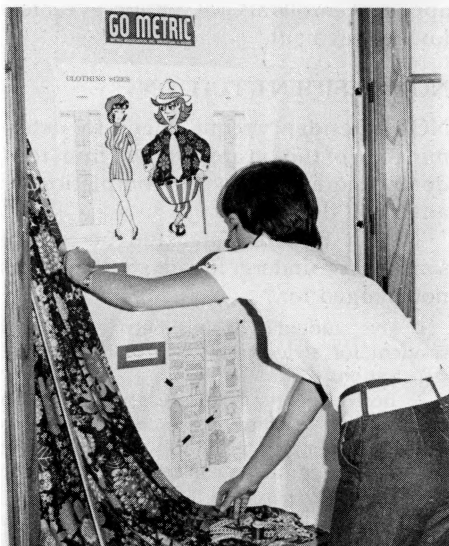
Reinstatement Fee: A student whose enrollment is terminated for any reason, and who later requests readmission within the same semester or term shall be required to pay a \$5 reinstatement fee in addition to regular fees.

Transcript Fee: A fee of \$1 is charged for each official transcript of credits; a fee of 50 cents is charged for all unofficial copies of credits.

Fees for Thesis or Dissertation: The following fees are charged in connection with the submission of a thesis or dissertation:

Master's degree: \$2 thesis binding fee; \$3 microfilming fee.

Doctor's degree: \$31 doctor's dissertation, microfilming, and binding fee.



EXPENSES

Students need to estimate their own individual needs for clothing, transportation, and personal expenses. The other basic costs for one semester for an unmarried graduate student are estimated as follows:

Incidental Fee	\$300
Student Activities Fee	22
Room & Board in a UMC Residence Hall	610
Books and academic supplies (estimate)	90

Total for one semester	\$1,022
Tuition (see Non-Resident section)	\$ 600



Fields of Study

Departments

Accountancy
Agricultural Economics
Agricultural Engineering
Agronomy
 Crop Science/Soil Science
Anatomy
Animal Husbandry
Anthropology
Art
Art History and Archaeology
Atmospheric Science
Biochemistry
Biological Sciences
 Botany
 Zoology
Chemical Engineering
Chemistry
Civil Engineering
Classical Studies
Dairy Husbandry
Economics
Education
Electrical Engineering
English
Entomology
Extension Education
Family & Community Medicine
Food Science and Nutrition
Forestry, Fisheries and Wildlife
Geography
Geology
Germanic and Slavic Studies
Health Services Management
History
Home Economics
Horticulture
Industrial Engineering
Journalism
Library Science and Information Science
Mathematics
Mechanical and Aerospace Engineering
Microbiology
Music
Nursing
Pathology
Pharmacology
Philosophy
Physics
Physiology
Plant Pathology
Political Science
Poultry Husbandry
Psychology
Recreation and Park Administration
Regional and Community Affairs
Romance Languages
Social Work
Sociology and Rural Sociology
Speech and Dramatic Art
Statistics
Veterinary Anatomy-Physiology
Veterinary Medicine and Surgery
Veterinary Microbiology
Veterinary Pathology

Accountancy

Joseph A. Silvano, Ph.D., Missouri-Columbia. CPA; Director; Prof.
Wilber C. Haseaman, Ph.D., Syracuse. Director of Graduate Studies; Prof.
Robert L. Kvam, Ph.D., Louisiana State. CPA; Coordinator of M.A. Program; Prof.
Eugene L. Zieha, Ph.D., Illinois. CDP; Coordinator of M.S. Program; Prof.
Royal D. M. Bauer, M.B.A., Northwestern. CPA; Prof. Emeritus
Paul A. Kohler, Ph.D., Iowa. Prof. Emeritus
James E. Parker, Ph.D., Michigan State. CPA; Prof.
Raymond C. Dockweiler, Ph.D., Illinois. CPA; Assoc. Prof.
James C. Lampe, Ph.D., Michigan. CPA; Assoc. Prof.
Charles R. Litecky, Ph.D., Minnesota. CDP; Assoc. Prof.
Donald C. Marshall, Ph.D., Louisiana State. CPA; Assoc. Prof.
William E. McTeer, Ph.D., Missouri-Columbia. CPA; Assoc. Prof.
Loren A. Nikolai, Ph.D., Minnesota. CPA; Assoc. Prof.
Ralph E. Skelly, Ph.D., Alabama. CIA; Assoc. Prof.
James C. Stallman, Ph.D., Illinois. Assoc. Prof.
A. R. Elam, Ph.D., Missouri-Columbia. Asst. Prof.
Walter L. Johnson, Ph.D., Texas. CPA; Asst. Prof.
Kenneth R. Lambert, Ph.D., Arkansas. Asst. Prof.
John E. McEnroe, DBA, Kentucky. CPA; Asst. Prof.

The School of Accountancy offers graduate work leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees. Graduate programs in Accountancy prepare students for advanced professional careers in public, private, and governmental accounting and for careers in teaching and research.

Being alert to change, and being intent that accounting education at the graduate level should be somewhat ahead of current practice, the School offers course work stressing advanced knowledge in data processing, quantitative methods, economics, and business. Opportunities exist, both on and off the campus, for interchanging ideas with practicing accountants and for participating in the solution of their professional problems.

Among the special facilities are a comprehensive collection of accounting and investment services, technical journals, and microfilm copies of annual reports, government documents, and doctoral dissertations. Outstanding computing facilities include the COMPUSTAT service of Standard Statistics Company.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. Submit applications by March 1.

For additional information, including an individually prepared tentative program of study and application forms, write the Director of Graduate Studies, School of Accountancy.

MASTER'S DEGREES

The School offers two master's programs. The Master of Arts (M.A.) degree is designed for students who have an undergraduate degree in accountancy. The Master of Science (M.S.) degree is limited to those with a baccalaureate degree in a field other than accountancy.

Entrance requirements for both degrees are based upon the following criteria:

1. a 3.0 or higher overall grade point average in undergraduate work ($A=4.0$), with consideration given to grade trends, performance in the student's major area, class rank, maturity, experience, and other criteria bearing on a student's probable success in advanced professional study; and
2. acceptable performance on the Graduate Record Examination (GRE), or Graduate Management Admission Test (GMAT).

M.A. in Accountancy

The Master of Arts degree in Accountancy is a one-year program of advanced professional study covering the environment of accountancy, advanced accountancy, and accountancy practice fields. It is the fifth year of the professional accountancy program. A limited amount of specialization is permitted to meet individual career objectives of students.

For the M.A. degree, a candidate must:

1. complete substantially all course requirements for the accountancy undergraduate degree at UMC, or their equivalent. Courses taken as a graduate student to fulfill undergraduate prerequisites do not carry graduate credit, except that a maximum of 6 semester hours of such courses may be counted;
2. complete 30 semester hours of graduate course work, including at least 20 hours numbered 400 or higher and at least 6 hours must be from outside the School of Accountancy;

3. maintain a grade average of *B* (3.0) or better; and

4. comply with residence, time limitations, and other matters specified in this catalog.

M.S. in Accountancy

A four-semester professional program for the M.S. degree is built around a core of accelerated courses inaugurated specifically for the mature student.

In addition to Accountancy courses, the curriculum consists of balanced coverage of the following major areas; economics; electronic data processing; law; organization, functions, and problems of business; mathematics; and statistics.

The first year of study consists of foundation courses to provide basic concepts, techniques, and analytical thought processes for advanced study of accounting. A foundation course may be waived for students whose undergraduate records indicate that they have already successfully mastered the equivalent subject matter.

Second-year courses cover the advanced educational requirements of the professional accountant or accounting-oriented business manager. They stress the theory and practice of accounting and give balanced consideration to the various accounting areas in relationship to the organization, functions, and problems of business.

To complete requirements for the M.S. degree, a student must:

1. complete the professional program of study with an average grade of *B* (3.0) or better; and

2. comply with residence, time limitations, and other matters specified in this catalog.

DOCTORAL DEGREE

Acceptance of a student by the School of Accountancy to commence work on a Ph.D. program is based upon a combination of the following criteria:

1. a 3.0 or higher overall grade point average in undergraduate work ($A=4.0$), and ranking in the upper fifteen per cent of the undergraduate class. Consideration is also given to class rank, grade trends, experience, maturity, and other factors bearing upon probable success in the program;

2. a 3.0 or higher grade point average in at least 30 hours of graduate work, and ranking in the upper one-third of the graduate class;

3. superior performance on the Graduate Record Examination (GRE), or Graduate Management Admission Test (GMAT).

To be admitted, a student must complete the equivalent of the Master of Arts in Accountancy and demonstrate competency in the following areas: financial accounting and auditing, cost and managerial accounting, data processing, taxation, and governmental accounting. Course work equivalent to the master's degree may be transferred from another institution. Competency is demonstrated by a written and oral qualifying examination conducted by an Advisory Committee. The written examination is given once each year, early in the fall semester, and is used together with other credentials by the student's advisory committee to determine the course of study to be fulfilled.

The Ph.D. program in Accountancy requires at least two years beyond the master's degree and consists of:

1. a course of study;

2. practical experience in teaching and research;

3. examination over accumulated knowledge in a major and two supporting fields; and

4. demonstration of research and writing ability by completing a doctoral dissertation on an approved research topic.

Acceptable work completed in a master's program (or its equivalent) is included in a student's course of study, which is composed of the following categories (all hours are minimal): accountancy, the primary field, 24 hours; research techniques, 12 hours; first supporting field, 12 hours; second supporting field, 12 hours; elective area, 6 hours.

Supporting fields are selected from behavioral science, data processing, economics, finance, management, marketing, organization theory, public administration, quantitative methods, or other definable areas related to accounting and acceptable to the advisory committee. One supporting field must be from outside the College of Business and Public Administration.

Agricultural Economics

Charles L. Cramer, Ph.D., Missouri-Columbia.

Chairman; Director of Graduate Studies; Prof.

Robert J. Bevins, Ph.D., Michigan State. Prof.

Melvin G. Blase, Ph.D., Iowa State. Prof.

Kenneth B. Boggs, Ph.D., Wisconsin. Prof.

Curtis H. Braschler, Ph.D., Purdue. Prof.

Harold F. Breimyer, Ph.D., American University. Prof.

Thomas G. Brown, Ph.D., North Carolina State. Prof.

Robert M. Finley, Ph.D., Illinois. Prof.

Glenn A. Grimes, M.S., Missouri-Columbia. Prof.

Albert R. Hagan, Ph.D., Michigan State. Prof.

Joseph C. Headley, Ph.D., Purdue. Prof.

Victor E. Jacobs, Ph.D., Kansas State. Prof.

Stanley R. Johnson, Ph.D., Texas A&M. Prof.

Elmer R. Kiehl, Ph.D., Harvard. Prof.; Dean, College of Agriculture

J. Wendell McKinsey, A.M., Missouri-Columbia.

Prof.; Asst. Dean, College of Agriculture

Coy G. McNabb, Ph.D., Ohio State. Prof.

Donald D. Osburn, Ph.D., North Carolina State. Prof. (on leave)

C. Brice Ratchford, Ph.D., Duke. Prof.

V. James Rhodes, Ph.D., Harvard. Prof.

Kenneth C. Schneberger, Ph.D., Oklahoma State. Prof.

Philip F. Warnken, Ph.D., Michigan State. Prof.

Jerry G. West, Ph.D., Michigan State. Prof.

Herman E. Workman, Ph.D., Oklahoma State. Prof.

Myron D. Bennett, M.S., Missouri-Columbia. Assoc. Prof.

Gary T. Devino, Ph.D., Pennsylvania State. Assoc. Prof.

Carrol L. Kirtley, Ph.D., Missouri-Columbia. Assoc. Prof.

Stephen F. Matthews, Ph.D., Missouri-Columbia. Assoc. Prof.

Francis P. McCamley, Ph.D., Iowa State. Assoc. Prof.

Joseph C. Meisner, Ph.D., Missouri-Columbia. Assoc. Prof.

David E. Moser, Ph.D., Columbia University. Assoc. Prof.

Leroy F. Rottmann, M.S., Missouri-Columbia. Assoc. Prof.

Richard K. Rudel, Ph.D., Colorado State. Assoc. Prof.

Randall E. Torgerson, Ph.D., Wisconsin. Assoc. Prof. (on leave)

Edward R. Wiggins, M.S., Missouri-Columbia. Assoc. Prof.

Patrick R. Cantlon, Ph.D., Wisconsin. Asst. Prof.

Ervin F. Dauenhauer, M.B.A. Missouri-Columbia. Asst. Prof.

David E. Ervin, Ph.D., Oregon. Asst. Prof.

Norlin Hein, Ph.D., Minnesota. Asst. Prof.

James B. Kliebenstein, Ph.D., Illinois. Asst. Prof.

John A. Kuehn, Ph.D., Missouri-Columbia. Asst. Prof.

The Department of Agricultural Economics offers graduate work leading to the Master of Science and Doctor of Philosophy degrees in such specialty areas as farm management, and production economics, marketing, economic development, agribusiness, and resource eco-

nomics. The Ph.D. program emphasizes preparation for research, teaching, and extension. The M.S. program may be a step toward the Ph.D., but is frequently used as a terminal program for those interested in agribusiness, extension, or government. Programs are flexible—while all Ph.D. and most M.S. students become involved in the research program, those whose career interests lie in other directions find the department willing to accommodate them. Facilities and staff include a computer programming staff, a statistical pool for projects not involving the computer, research technicians, and a reference room where journal series, statistical publications, and other recent publications are readily available.

A 3.0 GPA (A=4.0) is generally a minimum requirement for financial assistance in the form of fellowships and assistantships for research and teaching. Support for research is available from the Agricultural Experiment Station and other granting agencies. Further, after one semester, the records of graduate students without assistantships are evaluated, and financial assistance is offered to those students who show superior performance and promise. Write the Department Chairman.

MASTER'S DEGREE

Students with grade averages much below 2.75 are discouraged from applying. Before admission to the M.S. program, a student should have completed 9 hours of agricultural economics and/or economics.

For the M.S. degree, a minimum of 30 hours selected from courses receiving graduate credit must be completed. The program must include at least two graduate-level courses in micro- and macro-economic theory and one graduate-level statistics course in multiple regression. Credit for research (usually 6 to 8 hours) is included in the minimum 30 hours. A minor in Regional Science is one of the options under this program (see Index for page number).

There is no foreign language requirement for the M.S., and a thesis is optional.

A technical paper or additional courses may be substituted with the permission of the Department.

Each candidate for the M.S. degree is required to take a final oral examination upon completion of other requirements.

DOCTORAL DEGREE

Departmental acceptance of the student as a Ph.D. candidate is based upon satisfactory performance on a Master's examination or Ph.D. qualifying examination, written and/or oral.

The size, quality, and diversity of the faculty permits a broad choice of advisers and research topics. In addition to the usual areas of farm management-production economics, marketing, and resource-economics, there are opportunities for specializing in marketing policy, quantitative methods, and domestic and international economic development.

The student and advisory committee have considerable latitude in planning a program of study. There is no requirement for language, or for total hours, although the program usually includes about 15-18 courses (excluding research) beyond the bachelor's degree. The courses should prepare the student to pass departmental and comprehensive examinations, as well as to emphasize any area of the student's particular interest.

The department has these general course requirements: agricultural economics—a well-balanced selection of courses, including at least five at the 400-level; economic theory—courses in micro- and macro-theory at the intermediate and advanced levels; quantitative methods—at least one course in calculus and courses in statistics, introductory mathematical economics, and econometrics; outside field—a minimum of 9 hours graduate-level course work in an outside area, or beyond the requirements listed above.

During graduate work each student must pass standardized departmental examinations in agricultural economics, economic theory, and a specialty area.

A dissertation embodying the results of original research must be written on a subject approved by the candidate's advisory committee. A final oral examination over the dissertation completes the degree requirements.

Agricultural Engineering

C. LeRoy Day, Ph.D., Iowa State. Chairman; Director of Graduate Studies; Prof.

Donald B. Brooker, M.S., Missouri-Columbia. Prof.

James C. Frisby, Ph.D., Iowa State. Prof.

Carroll E. Goering, Ph.D., Iowa State. Prof.

Kenneth L. McFate, M.S., Missouri-Columbia. Prof.

Milton D. Shanklin, Ph.D., Missouri-Columbia. Prof.

Charles C. Cromwell, M.S., Missouri-Columbia. Assoc. Prof.

H. David Currence, Ph.D., Iowa State. Assoc. Prof.

Maurice R. Gebhardt, Ph.D., Missouri-Columbia. Assoc. Prof.

G. LeRoy Hahn, Ph.D., Missouri-Columbia. Assoc. Prof.

Neil F. Meador, Ph.D., Michigan State. Assoc. Prof.

Glen C. Shinn, Ph.D., Missouri-Columbia. Assoc. Prof.

James M. Gregory, Ph.D., Iowa State. Asst. Prof.

Robert W. Schottman, M.S., Cornell. Asst. Prof.

Dennis M. Sievers, Ph.D., Missouri-Columbia. Asst. Prof.

James M. Steichen, Ph.D., Oklahoma State. Asst. Prof.

M. M. Jones, M.S., Iowa State. Prof. Emeritus

Harold V. Walton, Ph.D., Purdue. Prof. Emeritus

J.C. Wooley, M.S., Iowa State. Prof. Emeritus

The Department of Agricultural Engineering offers graduate study leading to the Master of Science and Doctor of Philosophy degrees.

The Master's degree, when it is the terminal degree, generally prepares the student for a position in extension, industry, or government, while the Ph.D. degree prepares the student for a research position in industry, government, or college research and teaching.

Active research programs in the Department include the following areas: bio-engineering, crop processing, materials handling, power and machinery, soil and water control, structures and environment, tillage, waste disposal, and pest control.

Special facilities for research include:

(1) the Missouri Climatic Laboratory; (2) the Missouri partitioned calorimeter; (3) an agricultural pollution and water quality research laboratory; (4) an electronics laboratory; and

(5) complete weather instrumentation, fluorometer, and instrument van for pesticide drift studies.

Informational resources include:

(1) a departmental library; (2) the UMC Ellis Library; (3) a microfiche collection of papers presented at major technical society meetings since 1968; and (4) the Computer Network.

Research assistantships are available to qualified graduate students. Write the Department Chairman for specific information.

MASTER'S DEGREES

The Master of Science degree in Agricultural Engineering requires an undergraduate degree in agricultural engineering, or its essential equivalent, for entry. The Master of Science degree in Agricultural Mechanization requires an undergraduate degree in agriculture, with a major in agricultural mechanization.

All applicants for master's degrees are considered on the basis of undergraduate GPAs, grade trends, class rank, and faculty recommendations. All students are required to take the GRE.

A student must complete a minimum of 30 hours of graduate work, with at least 15 in 400-level courses. Up to 12 hours may be in research or special problems. A thesis is required of students supported on research assistantships and is optional for others.

DOCTORAL DEGREE

The program for the degree of Doctor of Philosophy is designed to prepare students for research and for college teaching in agricultural engineering. This program normally requires three years beyond the Bachelor's degree, and the student must demonstrate the ability to carry out independent research by presenting a dissertation embodying the results of original investigation.

Departmental acceptance of the candidate is based upon satisfactory performance on a Master's examination or Ph.D. qualifying examination—written and/or oral. Candidacy of a student who has earned a master's degree elsewhere shall be determined by an examination ad-

ministered by the Department. The other requirements for admission and continuation are basically the same as those given above for the M.S. degrees in Agricultural Engineering.

The departmental language requirement for the Ph.D. may be satisfied by any of the following options:

1. the ability to translate into English one foreign language; or
2. nine hours of college-level course work in a foreign language passed with a grade of C or better; or
3. substitution of a Research Technique or Collateral Field. This requirement may be satisfied by an examination covering the Research Technique or Collateral Field, or may comprise 9 hours of graduate-level course work taken as a graduate student.

Agronomy

Edward C.A. Runge, Ph.D., Iowa State. Chairman. Prof.

Laurel Anderson, Ph.D., Minnesota. Prof.

Robert W. Blanchar, Ph.D., Minnesota. Prof.

Lloyd E. Cavanah, M.S., Missouri-Columbia. Prof.

Edward H. Coe Jr., Ph.D., Illinois. Prof.

O. Hale Fletchall, Ph.D., Missouri-Columbia. Prof.

Ellis R. Graham, Ph.D., Missouri-Columbia. Prof.

Robert B. Grossman, Ph.D., Illinois. Prof.

R. Dwain Horrocks, Ph.D., Pennsylvania. Prof.

C. J. Johannsen, Ph.D., Purdue. Prof.

Gordon Kimber, Ph.D., University of Manchester. Prof.

Gary F. Krause, Ph.D., Virginia Polytechnic. Prof.

Kenneth L. Larson, Ph.D., Wisconsin. Prof.

Arthur G. Matches, Ph.D., Purdue. Prof.

William J. Murphy, M.S., Missouri-Columbia. Prof.

C. Jerry Nelson, Ph.D., Wisconsin. Prof.

Myron G. Neuffer, Ph.D., Missouri-Columbia. Prof.

Elroy J. Peters, Ph.D., Wisconsin. Prof.

John M. Poehlman, Ph.D., Missouri-Columbia. Prof.

Gyorgy P. Redei, C.Sc., University of Budapest. Prof.

William P. Sappenfield, Ph.D., Missouri-Columbia.

Prof.

Clarence L. Scrivner, Ph.D., Missouri-Columbia.

Prof.

Ernest R. Sears, Ph.D., Harvard. Prof.

Dale T. Sechler, Ph.D., Missouri-Columbia. Prof.

George E. Smith, Ph.D., Missouri-Columbia. Prof.

George H. Wagner, Ph.D., Missouri-Columbia. Prof.

Howell N. Wheaton, Ph.D., Kentucky. Prof.

Marcus S. Zuber, Ph.D., Iowa State. Prof.

James R. Brown, Ph.D., Iowa State. Assoc. Prof.

Gary W. Colliver, Ph.D., Illinois. Assoc. Prof.

Gregory G. Doyle, Ph.D., Illinois. Assoc. Prof.

Roger G. Hanson, Ph.D., Minnesota. Assoc. Prof.

Harold D. Kerr, Ph.D., Washington State. Assoc.

Prof.

Earl M. Kroth, Ph.D., Ohio State. Assoc. Prof.

Russell L. Larson, Ph.D., Illinois. Assoc. Prof.

James A. Roth, M.S., Missouri-Columbia. Assoc.

Prof.

Joe H. Scott, B.S., Mississippi State. Assoc. Prof.
Viola M. Stanway, M.A., Missouri-Columbia. Assoc. Prof.
William J. Upchurch, Ph.D., Missouri-Columbia. Assoc. Prof.
Jack B. Beckett, Ph.D., Wisconsin. Asst. Prof.
Joe M. Bradford, Ph.D., Iowa State. Asst. Prof.
J. Grover Shannon, Ph.D., Purdue. Asst. Prof.
David R. Slexer, Ph.D., Wisconsin. Asst. Prof.
William R. Teague, Ph.D., Texas A & M. Asst. Prof.

The Department of Agronomy offers graduate study leading to the degree of Master of Science and Doctor of Philosophy. The M.S. degree in Agronomy may emphasize crop science and genetics, or soil science. The Ph.D. is offered in six general program areas: crop breeding and genetics, crop physiology and management, soil chemistry and biochemistry, soil pedology and mineralogy, soil-plant relationships, and weed science.

The Department maintains field, greenhouse, and laboratory facilities for research. Supporting analytical chemistry, statistical, and computer services are available on campus.

Candidates for graduate study must have a baccalaureate degree from an accredited college and have demonstrated capability to perform graduate-level work. Students are selected from among Agronomy majors and others educated in the biological or physical sciences.

Financial assistance, available to qualified students at both the M.S. and Ph.D. levels, includes fellowships, and teaching and research assistantships. Research projects funded by the Experiment Station or by grants may provide an additional source of support for graduate students.

MASTER'S DEGREE

Students entering the program with an interest in crop science or genetics should have completed courses in botany, genetics, inorganic and organic chemistry, biochemistry, statistics, physics, and advanced mathematics. Those planning to major in soil science should have completed courses in calculus, physics, geology, atmospheric science, inorganic, and analytical and organic chemistry. In-

adequacies can be remedied through additional course work immediately after admission. A grade point average of at least 3.0 ($A = 4.0$) in the last two years of undergraduate study is desirable.

A successful program combines both general and detailed knowledge with originality, reliability, and industry. A scholarly program of study, developed by the student and the adviser, consists of a minimum of 30 credit hours selected from courses accepted for graduate credit in accord with Graduate School regulations; 15 or more hours must be in courses numbered 400 or above. Not more than 12 of the 30 hours minimum is permitted for research, problems, special investigations, and special readings. At least 12 credits of agronomy courses in the 300 or 400 series or equivalent are included in the student's graduate and/or undergraduate program; 9 credits are in the student's major area (crops and genetics, or soils) and 3 in the alternate area.

Most students study under the program requiring a thesis, which must demonstrate a capacity for research and independent thought and must be original work. A program without thesis, designed for those who have need for a broad range of agronomic knowledge, is also offered, and includes a special problem of 3 or 4 credit hours presented in a well-written report. The non-thesis M.S. program does not serve in preparing a student for candidacy in a Ph.D. program.

DOCTORAL DEGREE

Students may be admitted to the Ph.D. program after completion of a master's degree program (or its equivalent) of such quality that candidates show definite promise of becoming capable investigators in their chosen fields. In addition, all candidates must complete a qualifying examination.

The curriculum, developed by a five-member advisory committee, constitutes a definite plan of education for research and teaching in some particular area of agronomy. The program generally includes 30 or more hours in graduate

courses beyond those taken for the M.S. degree.

There is no departmental foreign language proficiency requirement.

The Advisory Committee may grant one year of residence credit for the M.S. degree from another institution toward fulfilling the three-year residence requirement.

A comprehensive examination, including both written and oral performance, must be passed after successfully completing the program of study with a grade point average of 3.0 or better.

The dissertation must be a substantial scholarly report of original research conducted by the student in a specialized area of agronomy.

Anatomy

C. Roland Leeson, M.D., Ph.D., Cambridge University. Chairman; Prof.

James A. Green, Ph.D., Illinois. Director of Graduate Studies; Prof.

J. Harry Cutts, Ph.D., University of Western Ontario. Prof.

Edward W. Lowrance, Ph.D., Stanford. Prof.

Herbert E. Brown, Ph.D., Utah. Assoc. Prof.

John D. Decker, Ph.D., Upstate Medical Center; S.U.N.Y. Assoc. Prof.

William R. Goodge, Ph.D., University of Washington. Assoc. Prof.

Barrie D. Smith, Ph.D., Iowa. Assoc. Prof.

Gary B. Dunkerley, Ph.D., Texas, Medical Branch-Galveston. Asst. Prof.

William J. Krause, Ph.D., Missouri-Columbia. Asst. Prof.

Neil Granader, Ph.D., Michigan. Asst. Prof.

The Department of Anatomy offers courses of study at the graduate level leading to the degrees of Master of Arts and Doctor of Philosophy. These programs are designed to prepare students for teaching anatomy and to carry on research in morphology.

Specific areas of concentration are histology, embryology, hematology, endocrinology, reproductive biology. The department also cooperates with the Department of Veterinary Anatomy-Physiology in presenting an individually arranged course of study for the Ph.D., with emphasis in veterinary anatomy.

The Department of Anatomy has an electron microscope laboratory in addition to other facilities of the Medical Sci-

ences Building and of the UMC Medical Center.

Queries concerning financial aids and/or pertaining to the program should be addressed to the department chairman.

MASTER'S DEGREE

The Master's program is primarily designed to lead to the doctoral program of study. However, selected professional students seeking to expand their knowledge of morphology and to gain research training are accepted into the program. This program is aimed at providing the candidate with training in the fundamentals of anatomy, and contains an introduction to function and research.

An applicant must have an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work. In addition to an overall undergraduate GPA of 2.75(A=4) to be accepted for advisement in the Anatomy Graduate Program, the candidate should have at least 24 semester hours of course work in biological science, including comparative anatomy. Outside the biological sciences, the candidate is expected to have taken courses in chemistry, including inorganic, analytical and organic, and further to have credits in college physics and mathematics (college algebra and trigonometry). All candidates must have taken the Graduate Record Examination and show evidence or rank above the fiftieth percentile.

Applicants for admission to candidacy should address their applications to the Department of Anatomy, UMC. These applications should contain a complete transcript of college credits and a copy of the GRE score. In addition, the applicant should arrange for two professors who have taught courses to the applicant to transmit letters of recommendation to the Department Chairman. Upon receipt of this material, it will be evaluated by the Department, and the applicant will be immediately notified as to acceptance or otherwise.

If an incoming candidate has not decided upon an adviser by the beginning of the initial semester, the Departmental

Director of Graduate Studies serves as an interim adviser. The candidate should select a faculty adviser no later than by the end of the second semester's study.

During the first academic year of the program the candidate completes departmental courses in gross anatomy, microscopic anatomy, developmental anatomy, and neuroanatomy, in addition to a course in biochemistry and at least one other scientific course.

The second year of the program is designed by the candidate's adviser, with the help of the advisory committee composed of the adviser and two other members, one of whom must be from a department other than Anatomy. This year is devoted to continued course work and preparation of a thesis. The candidate must take at least 9 hours of course work at the 300 level or above (this does not include thesis or problem courses).

During the Master's program each candidate must have 15 hours or more in 400-level courses; no more than 12 hours in research, problems, special investigations, and special readings may be counted in fulfilling this requirement.

DOCTORAL DEGREE

Candidates seeking acceptance to this program should submit transcripts of graduate and undergraduate credits, and copies of their GREs and of their Master's theses (if applicable) to the Department Chairman. Also, arrangements should be made for each applicant's Master's adviser (if applicable) and one other professor to transmit letters of recommendation supporting candidacy to the Department. After evaluation of this material, the Department determines the acceptability of a candidate.

The Advisory Committee must be chosen from the Graduate Faculty; at least two members must be from the Department of Anatomy and at least one must be from a department other than Anatomy. The committee, with the help of the adviser, constructs a study program for the candidate, using guidelines set forth in the rest of this section.

The following subjects are basic to the program and are required of all students: gross anatomy, microscopic anatomy, developmental anatomy, and neuroanatomy. Some students, completing these courses during their earlier programs, have fulfilled these requirements before entering the doctoral program.

In addition, the candidate must pursue formal course work in the following subjects: cell biology (this is to include cellular physiology and cytology); general biochemistry and one biochemical course at the graduate level beyond biochemistry; mammalian physiology and one physiological course at the graduate level beyond mammalian physiology; genetics; and seminar. Earlier course work completed in these subjects may be applied to these requirements.

Lastly, there is a language, or language and collateral field, requirement that must be fulfilled by either of the following two methods:

1. The candidate must successfully pass each of two foreign languages on examinations administered by the UMC Counseling Services, 4 Parker Hall. These tests are given and graded on a national basis.

2. The candidate must successfully complete a foreign language examination administered by the UMC Counseling Services. In addition, 9 hours of graduate-level course work in a collateral field or a research technique must be completed. This course work must be approved by the Advisory Committee and the Department, and does not count toward residency.

The candidate is required to maintain at least *B* work and only one *C* grade is permitted. However, *C* grades are acceptable in those courses in the collateral field chosen as an option.

After completion of most of the course work, two years of residence, and the completion of the language requirement or language and collateral field requirement, a comprehensive examination is given. This examination, conducted by the candidate's Advisory Committee, contains both a written and an oral portion.

Each candidate initiates and completes an independent and original research project that is worthy of publication, with

the results of this research embodied in the doctoral dissertation. In addition to the three readers required by the Graduate School for dissertation approval, the Anatomy Department requires a fourth reader. This person, recommended by the candidate's adviser, must be a recognized authority in the field of research of the thesis and must not be a member of the UMC faculty. After the four readers have approved the dissertation, the advisory committee is convened to conduct a final oral examination.

Animal Husbandry

W. H. Pfander, Ph.D., Illinois. Chairman; Director of Graduate Studies; Prof.
J. Malcolm Asplund, Ph.D., Wisconsin. Prof.
C. Melvin Bradley, Ph.D., Oklahoma State. Prof.
Billy N. Day, Ph.D., Iowa State. Prof.
John F. Lasley, Ph.D., Missouri-Columbia. Prof.
J. H. Longwell, Ph.D., Illinois. Dean Emeritus; Prof.
John Massey, Ph.D., Missouri-Columbia. Prof.
John C. Rea, Ph.D., Missouri-Columbia. Prof.
Clarence V. Ross, Ph.D., Illinois. Prof.
James E. Ross, M.S., Missouri-Columbia. Prof.
Homer B. Sewell, Ph.D., Kentucky. Prof.
Larkin Langford, M.A., Assoc. Prof.
Trygve L. Veum, Ph.D., Cornell. Assoc. Prof.
Maurice Alexander, M.S., Missouri-Columbia. Asst. Prof.
R. J. Lipsey, Ph.D., Kansas State. Asst. Prof.
Ronald E. Morrow, Ph.D., Tennessee. Asst. Prof.

The Department of Animal Husbandry provides graduate study leading to the degrees of Master of Science and Doctor of Philosophy. Areas of concentration a student may pursue are: animal breeding, animal nutrition, livestock production and management, and reproductive physiology.

Graduate programs in Animal Husbandry are designed to prepare students for research, or advanced professional scientific careers in nutrition, reproductive physiology, genetics or other fields in the biological sciences, or in advanced systems in production and management of beef, horses, sheep, or swine. The M.S. degree prepares a student for a position in industry, teaching, or agricultural extension and also provides training toward the Ph.D. degree. The Ph.D. program leads to research in various fields and to college and university teaching.

The Agricultural Experiment Station laboratory is helpful to all the researchers whose work involves chemical analysis. The Agricultural Experiment Station statistician provides excellent counsel in planning and interpretation. Facilities and land for red-meat animal research are available at Columbia and at branch stations. The Animal Science Research Center was completed in 1970; basic research in nutrition, physiology and waste management are conducted there.

There are 20 graduate assistantships within the department. Other students may be supported by grants established by animal science related industries. Write the Department Chairman for information and application forms.

DEGREE REQUIREMENTS

A candidate for advanced degree must:

1. meet Graduate School admission requirements;
2. preferably have a B.S. in Agriculture; and
3. complete the principal courses required of UMC undergraduates majoring in each area of concentration.

When necessary, students may enroll in graduate and needed undergraduate courses at the same time.

There is no language requirement for the M.S. Course requirements include 30 credit hours, of which 6 in research are required. A thesis is generally required, but a non-thesis program of 36 credit hours of course work, 3 of which must be in research, is available.

For the Ph.D. degree, admission requirements are those of the Graduate School. The nature of the qualifying examination is determined by the graduate student's Advisory Committee.

The number of credit hours in formal course work and in research varies with the student's background, training interests, and the nature of the research.

The language requirement for the Ph.D. degree may be fulfilled by showing proficiency in two foreign languages or in one foreign language and one collateral field or in two collateral fields. A research technique may substitute for a collateral field.

A dissertation or a paper suitable for publication in a scientific journal or as an Experiment Station bulletin is required of each candidate for an advanced degree.

Anthropology

James A. Gavan, Ph.D., Chicago. Chairman; Prof.
Michael C. Robbins, Ph.D., Minnesota. Director of Graduate Studies; Prof.

Robert A. Benfer, Ph.D., Texas. Prof.

Carl H. Chapman, Ph.D., Michigan. Prof.

Richard A. Diehl, Ph.D., Pennsylvania State. Prof.

Ralph M. Rowlett, Ph.D., Harvard. Prof.

Robert F. G. Spier, Ph.D., Harvard. Prof.

H. Clyde Wilson, Ph.D., California at Los Angeles. Prof.

W. Raymond Wood, Ph.D., Oregon. Prof.

Peter M. Gardner, Ph.D., Pennsylvania. Assoc. Prof.

James W. Hamilton, Ph.D., Michigan. Assoc. Prof.

Robert T. Bray, M.A., Missouri-Columbia. Asst. Prof.

Louanna Furbee-Losee, Ph.D., Chicago. Asst. Prof.

Dena Lieberman, Ph.D., Wisconsin-Madison. Asst. Prof.

William H. Marquardt, Ph.D., Washington University. Asst. Prof.

Samuel D. Stout, Ph.D., Washington University. Asst. Prof.

The Department of Anthropology offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy. The Master's degree program of study is designed to provide broad training in anthropology. The student proceeds to individual specialized study at the doctoral level.

The four recognized sub-fields of anthropology provide the areas of study for the graduate student. The doctoral candidate normally specializes in one of these or, in consultation with an advisory committee, chooses an area of specialization that cuts across some of the four recognized divisions or that includes some area outside traditional anthropology. These areas are:

1. *cultural anthropology*: ethnohistory, technology, social anthropology, theoretical anthropology, psychological anthropology;
2. *physical anthropology*: behavior, growth and morphology, primatology, osteology, human evolution;
3. *archaeology*: sociocultural interpretation, experimental archaeology, field techniques and research, museology; and
4. *linguistic anthropology*: socio-linguistics, ethno-linguistics, linguistic reconstruction.

Training in methods of inductive and deductive procedures is provided for all fields. Computer-assisted research is emphasized.

The Department of Anthropology, which emphasizes training in research, maintains the Museum of Anthropology, a laboratory for thermoluminescence analysis of lithics, skeletal collections of human and non-human primates, a comparative faunal collection for ecological studies, and data on *Macaca mulatta*. Other research facilities are the Lyman Archaeological Research Center, Hamilton Archaeological Field School, and the Center for Research in Social Behavior. Wider University facilities include the Museum of Art History and Archaeology, the State Historical Archives, the nuclear reactor, the Computer Center with extensive libraries of programs, and the South Asia Center. Graduate students from the department have conducted research in Canada, the United States, Mexico, Guatemala, Peru, the Caribbean area, West and Central Europe, East Africa, and the Middle East.

Teaching, research, and student assistantships, fellowships, and scholarships are available to qualified graduate students of anthropology. Applications for financial assistance should accompany applications for admittance to the graduate program and should be submitted no later than April 1 each year. Write for forms and additional information to Director, Graduate Studies Committee, Department of Anthropology, 210 Switzler Hall.

MASTER OF ARTS

Admission to the graduate program is not limited to students with undergraduate degrees in anthropology. However, an entering student should have had an introductory (general) course and first-level specialized courses in cultural anthropology, archaeology (or prehistory), linguistics, and physical anthropology. Students deficient in background may be admitted as provisional candidates and must make up their deficiencies without graduate credit during the first

year of graduate study. In addition, all students are required to have at least one course in quantitative methods.

The basic standards for admission are a 3.25 ($A=4.0$) grade point average for the last 60 hours of undergraduate courses, and a score of 1000 on the Graduate Record Examination. These requirements may be waived in exceptional cases.

A program tailored to each student's educational objectives is worked out by the student and the student's Advisory Committee. The course of study must include at least one graduate level course in each of the four sub-fields of anthropology. After 27 hours of graduate courses, the student must pass a M.A. Final Examination. This examination includes, but is not limited to, the material on the departmental M.A. reading list.

A thesis or formal project is required for the Master's degree, for which work a maximum of 6 hours credit may be granted.

Students must fulfill the requirements of the M.A. degree before admittance to the Ph.D. program.

DOCTORAL DEGREE

To be admitted to the doctoral program in Anthropology, a student must show superior performance on the Aptitude Test of the GRE, have a Master's degree, and a 3.5 or higher ($A=4.0$) GPA in graduate work to that point. Further, a faculty member who is a member of the Doctoral Faculty must agree, as a condition of admission, to accept the student as a Ph.D. advisee. These qualifications apply to all applicants, including those with a M.A. degree from this department.

Students must pass an oral Qualifying Examination during their first semester of graduate work. The examination is given by the student's Advisory Committee. After students have successfully qualified for the Ph.D. program, their status will be that of "applicant for the Ph.D." The student's Advisory Committee is responsible for the student's program of study. This program shall in-

clude at least one foreign language appropriate to the student's area of specialization.

All Ph.D. candidates are required to serve as teaching assistants for at least one semester or one summer session.

The Ph.D. degree is primarily oriented toward research competence. Therefore, the student is judged and passed or failed on research promise and ability.

There is no fixed requirement of courses, but most students amass 48 to 60 hours of graduate study beyond the M.A. The objective is to produce an anthropologist with some competence in all fields, but with a special competence in a chosen field for purposes of teaching, research, and evaluation of the results of other researchers.

An applicant for the Ph.D. normally takes a comprehensive examination at the end of the second year of the Ph.D. program. After students have successfully passed the comprehensive examination, their status is that of "candidate for the Ph.D."

The Ph.D. in Anthropology is awarded after an accepted dissertation has been submitted and successfully defended in a Final Examination.

Art

Donald L. Bartlett, M.F.A., Cranbrook Academy of Art. Chairman; Prof.

John S. Weller, M.F.A., Illinois. Director of Graduate Studies; Prof.

Robert Bussabarger, M.A., Michigan State. Prof.

Lawrence McKinin, M.F.A., Cranbrook Academy of Art. Prof.

Lawrence Rugolo, M.F.A., Iowa. Prof.

Jerry D. Berneche, M.F.A., Ohio. Assoc. Prof.

Elizabeth T. Montminy, B.A., Radcliffe. Studied Art Student's League. Assoc. Prof.

Erica Rutherford, London University, England. Assoc. Prof.

Frank H. Stack, M.A., Wyoming. Assoc. Prof.

Brooke B. Cameron, M.A., Ohio. Asst. Prof.

James J. Froese, M.A., Wichita. Asst. Prof.

Jean Garrett, M.F.A., Chicago Art Institute. Asst. Prof.

Maynard Gunter, Ed.D., Pennsylvania State. Asst. Prof.

Larry Kantner, Ed.D., Pennsylvania State. Asst. Prof.

Robert M. Pringle, M.F.A., Kansas. Asst. Prof.

Oliver Schuchard, M.F.A., Southern Illinois. Asst. Prof.



The Department of Art, with studio courses in drawing, design, ceramics, jewelry, painting, photography, print-making, sculpture, and weaving, offers the Master of Arts degree. Or the student may choose to work toward the Master of Arts in Education, with art as a teaching field.

Laboratory facilities are available in all media areas, as well as a limited number of individual graduate studios for students working in special problems courses.

The Art Department gallery schedules regular exhibitions which provide an opportunity for students to experience and relate to a variety of traditional and contemporary art examples. Ellis Library has extensive and excellent holdings of books, periodicals, and reference materials pertaining to art and art history.

Art collections and exhibitions are maintained locally at Stephens College and Columbia College. UMC art collections, which include the Museum of Art History and Archaeology, are described in a separate section on Resources and Research.

The Department offers a number of teaching assistantships to qualified grad-

uate students working toward a degree of Master of Art, Master of Education, or Doctor of Education. Non-teaching assistantships in various studio areas are also available.

Departmental eligibility is determined by an examination of the student's undergraduate performance and examples of undergraduate art work. A minimum of 40 hours of undergraduate studio art work is ordinarily required of the M.A. candidate. Several examples of work in a variety of areas must be submitted, with emphasis on the area in which the student intends to major. Examples of representational drawing (including figure drawing) must be included.

Upon acceptance, the student must report to the chairman of the departmental Committee on Graduate Studies for assignment to an adviser. The program of study is ordinarily planned by the student and adviser prior to registration, but it must be filed within a month after admission, or work done that semester is not applied toward the degree.

Special students accepted by the Graduate School, but not yet accepted by the Department, are assigned advisers who help plan a program of study.

Of the 40 hours required for the M.A., 28 are in studio art, including a minimum of 15 hours in the major area; 6 hours in a minor field; and an independent project (Problems, 3 hours) to be evaluated by the student's graduate committee. The remaining 12 hours are in academic subjects related to the major field; of these 12, as many as needed are in art history to complete a total of 15 hours taken in both undergraduate and graduate work. The remaining hours may be in 200-level or above courses related to a special interest of the student. Usually these courses are in history, literature, anthropology, archaeology, and philosophy. Of the total course work, at least 15 hours must be in 400-level courses.

There is no language requirement, and an exhibition is presented in lieu of a thesis. An oral examination follows completion of the course of study.

Art History and Archaeology

William Biers, Ph.D., Pennsylvania. Chairman; Assoc. Prof.

Edzard Bauman, Ph.D., University of Vienna. Director of Graduate Studies; Assoc. Prof.

Hellmut Lehmann-Haupt, Ph.D., University of Frankfurt. Prof.

Homer Thomas, Ph.D., University of Edinburgh. Prof.

Saul S. Weinberg, Ph.D., Johns Hopkins. Prof.

Osmund Overby, Ph.D., Yale. Assoc. Prof.

David Soren, Ph.D., Harvard. Assoc. Prof.

Vera B. Townsend, Ph.D., Emory. Assoc. Prof.

Patricia Crown, Ph.D., California at Los Angeles. Asst. Prof.

Norman E. Land, Ph.D., Virginia. Asst. Prof.

Albert Leonard, Jr., Ph.D., Chicago. Asst. Prof.

Ralph T. Coe, M.A., Yale. Research Assoc. at Kansas City

Ross T. Taggart, M.A., Harvard. Research Assoc. at Kansas City

The Department of Art History and Archaeology offers the M.A. and the Ph.D. degrees in Art History and in Archaeology, as well as an M.A. degree in either field in combination with the Museum Training Program, given in cooperation with the William Rockhill Nelson Gallery of Art in Kansas City, Mo.

The UMC Museum of Art and Archaeology brings students in close contact with original works of art; its archaeological collection has much material from University-sponsored excavations. Excellent library facilities (books, photographs, slides) are also available.

For students admitted to the Ph.D. program in Art History, the Kress Foundation Fellowships carry stipends up to \$3,000 and are renewable. One or more Travel Fellowships are also granted each summer. Other assistantships and fellowships, with stipends ranging from \$1,700 to \$3,400, are available to graduate students. These have application deadlines of February 11.

For more detailed information, write the Director of Graduate Studies, Department of Art History and Archaeology.

Of the limited number of persons admitted annually to the graduate programs, preference is always given to candidates for Ph.D. degrees. Candidates must have, from an institution

recognized by the University, a B.A. degree or its equivalent in art history or art, in archaeology or classical languages, or in related fields of the humanities. Applications accompanied by GRE results and three recommendations should be submitted before February 11 for the following fall semester.

MASTER'S DEGREE

The Department considers the M.A. a broad training program and stresses diversification of courses. This degree qualifies students for work in museums and for teaching positions in junior colleges. The minimum 30 credit hours must include 15 hours in the 400 level, and not more than 12 in reading courses or special problems.

To be accepted for candidacy for the Master's degree, the student must be formally interviewed. Application for this departmental Interview for Candidacy may be made only after a student

1. fulfills the language requirements,
2. passes the Qualifying Examination, and
3. decides on a specific field for the master's thesis with the assistance of an adviser of the individual's own choice.

In this interview, the thesis is discussed and admission of the student to candidacy for the degree is decided upon. Only after being admitted to candidacy may students take courses numbered 480 and 490. Candidates must demonstrate in written language examinations a proficiency in reading German, and French or Italian. At present, a passing score in the E.T.S. Foreign Language Examination is considered to fulfill this requirement. Students in classical archaeology are expected, in addition, to have a reading knowledge of both Greek and Latin. Without meeting these requirements, no student will be admitted to seminars (except 401 and 402), nor be granted an interview for candidacy.

The qualifying examination is given once each semester. This examination must be taken by the second semester of residence in which a student is taking courses for graduate credit; the student is

expected to have passed it during the third semester in residence. Students in art history must show their familiarity with key monuments of the art of the Western world, from Egypt to the present. For students in Archaeology, a knowledge of key monuments of the ancient Near East—Egypt, Greece, Rome and of the Early Christian and Byzantine periods—is required.

A thesis is required. The student must submit a draft to the adviser at least two months before the final one is due. The final oral examination includes defense of the thesis and general questions in related fields.

The Department offers, in cooperation with the William Rockhill Nelson Gallery of Art in Kansas City, Mo., an M.A. degree combining Art History and/or Archaeology with museum training. The program is scheduled for at least two years. All requirements for the M.A. degree, except the thesis, must be satisfied before a student can take up internship at the Gallery. Simultaneously with this internship a student takes reading courses with the Department (480) and writes an M.A. thesis.

The department also offers, in cooperation with related departments, an M.A. degree designed to prepare teachers in an interdisciplinary approach to Humanities. The program differs from the regular departmental M.A. in that 40 hours of graduate-level work are required, and comprehensive examination replaces the thesis requirement. While intended for those who plan to teach immediately, it is not the intent of the program to stress a dichotomy between teaching and research, and recipients of the degree would be considered for the doctoral program upon completion of a second language and thesis.

DOCTORAL DEGREE

For the Ph.D. in both Classical Archaeology and Art History, an M.A. is prerequisite. However, one may apply for the Ph.D. degree initially, in which case the

Department reserves the right to require that an M.A. thesis be written. Without the M.A. degree, 72 hours are required; with the M.A., 48 hours are required.

A student arranges a program of courses in close consultation with an adviser and with the approval of an advisory committee.

The language requirement for the Ph.D. degree is the same as for the M.A., *plus* reading knowledge for preparation of the dissertation.

During their first semester at UMC, students having M.A. degrees from other institutions must pass the Department's qualifying examination.

A formal interview is required for admission to Ph.D. candidacy, and is granted only upon fulfillment of language and qualifying examination requirements and after a formal petition.

The comprehensive examination consists of both oral and written examinations in the major and minor areas of Art History or Archaeology which have been decided upon in consultation with the advisory committee.

The dissertation is expected to be an original contribution to scholarship in the field. The final examination, in the form of an oral defense of the dissertation, tests the candidate's knowledge of the special field.

Atmospheric Science

Wayne L. Decker, Ph.D., Iowa State. Chairman; Director of Graduate Studies; Prof.

Grant L. Darkow, Ph.D., Wisconsin. Prof.

G. LeRoy Hahn, Ph.D., Missouri-Columbia. Prof.

Ernest C. Kung, Ph.D., Wisconsin. Prof.

James D. McQuigg, Ph.D., Missouri-Columbia. Prof.

Norton D. Strommen, Ph.D., Michigan State. Assoc. Prof.

Sharon K. LeDuc, Ph.D., Missouri-Columbia. Asst. Prof.

Stephen E. Mudrick, Ph.D., Massachusetts Institute of Technology. Asst. Prof.

The Atmospheric Science Department offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. Graduate programs are designed to prepare students for professional careers in research and/or teaching

in both the basic and applied aspects of the science. Because of the interdisciplinary nature of meteorology, study programs include course offerings of other departments, particularly those in the physical and mathematical sciences. Students with undergraduate education in atmospheric science, earth sciences, physics, mathematics, engineering, statistics, and biology may qualify for admission.

Each graduate student is required to participate in one of the departmental research areas which currently include: dynamical and physical meteorology, the general circulation, cumulus dynamics, biometeorology, statistical climatology and applied meteorology, the energetics of the general circulation; the dynamics of cumulus clouds and severe storms, biometeorology with emphasis on crop production, water utilization, and animal response; the social and economic impact of climate and climatic modification; climatological expectancies; and the mesoscale and macroscale dynamics of the free atmosphere. Special resources include a unique and extensive collection of meteorological and related data from state, national, and international sources, the Missouri Climatic Laboratory for environmental studies with animals; mobile micrometeorological facilities, access to data from the National Weather Service's upper air sounding and radar facilities, and the facilities of the National Center for Atmospheric Research. Mutually beneficial exchange in both research and graduate teaching exists between this department and the Graduate Center for Cloud Physics Research on the Rolla campus.

A limited number of fellowships, scholarships, and graduate assistantships are available to qualified graduate students. Those interested in applying should write the Chairman, Atmospheric Science Department, 701 Hitt St.

MASTER'S DEGREE

To be qualified, the student's undergraduate degree program should include mathematics through integral calculus

and at least one year of college physics. Additionally, a student should provide two references from faculty members, and the scores from the GRE.

To satisfy degree requirements, at least 30 hours of graduate credit must be completed in accordance with Graduate School regulations. There is no foreign language requirement. A candidate must submit an acceptable thesis. A final examination covering the thesis and other graduate work completes the requirements. This examination may be oral, or written and oral, depending on the recommendations of the examining committee.

DOCTORAL DEGREE

Students entering the doctoral degree program should have a Master's degree or equivalent. Students transferring from other institutions are required to take a written qualifying examination.

The program of study is presented by the student and doctoral adviser to a planning committee selected from the Department of Atmospheric Science and related areas. The Planning Committee is responsible for approval of a program of study and for identifying additional required academic or research related skills.

Candidates must successfully complete the general requirements for the Ph.D. as presented in this catalog.

Biochemistry

James L. Gaylor, Ph.D., Wisconsin. Chairman; Prof. John M. Franz, Ph.D., Iowa. Assoc. Chairman; Assoc. Prof.

Milton S. Feather, Ph.D., Purdue. Prof. Benedict J. Campbell, Ph.D., Northwestern. Prof. George B. Garner, Ph.D., Missouri-Columbia. Prof. Charles W. Gehrke, Ph.D., Ohio State. Prof. Owen J. Koeppel, Ph.D., Illinois. Provost for Academic Affairs; Prof.

S. Roy Koirtzyohann, Ph.D., Missouri-Columbia. Prof. Thomas D. Luckey, Ph.D., Wisconsin. Prof. Arlene P. Martin, Ph.D., Rochester. Prof. Dennis T. Mayer, Ph.D., Missouri-Columbia. Prof. Emeritus.

Merle E. Muhrer, Ph.D., Missouri-Columbia. Prof. Boyd L. O'Dell, Ph.D., Missouri-Columbia. Prof. Edward E. Pickett, Ph.D., Ohio State. Prof. Marie L. Vorbeck, Ph.D., Cornell. Prof. Arnold A. White, Ph.D., Georgetown. Prof. Robert L. Wixom, Ph.D., Illinois. Prof. Camillo A. Ghiron, Ph.D., Utah. Assoc. Prof. Russell L. Larson, Ph.D., Illinois. Assoc. Prof.

Ezio A. Moscatelli, Ph.D., Illinois. Assoc. Prof.
William D. Noteboom, Ph.D., Illinois. Assoc. Prof.
Beryl J. Ortwerth, Ph.D., Missouri-Columbia. Assoc.
Prof.
Douglas D. Randall, Ph.D., Michigan State. Assoc.
Prof.
David B. Shear, Ph.D., Brandeis. Assoc. Prof.
Wynn A. Volkert, Ph.D., Missouri-Columbia. Assoc.
Prof.
Warren L. Zahler, Ph.D., Wisconsin. Director of
Graduate Studies; Assoc. Prof.
Creighton N. Cornell, D.V.M., Missouri-Columbia.
Asst. Prof.
James H. Wyche, Ph.D., Johns Hopkins. Asst. Prof.

The Department of Biochemistry offers Master of Science and Doctor of Philosophy graduate programs, designed to prepare students for professional careers as biochemists or biophysicists in industry or in research or teaching institutions.

Almost every aspect of biochemistry and certain aspects of molecular biophysics are represented in the research interests of the faculty. Students are given a major role in the choice of research advisers. The areas of concentration include enzyme reaction mechanisms, peptide synthesis, hormonal control mechanisms, growth factor identification, analytical biochemical methodology, photochemistry of proteins and nucleic acids, developmental biochemistry, comparative biochemistry, lipid metabolism, membrane chemistry, plant metabolism, muscle contraction, biochemistry of cancer, induced enzymes, metal ion interaction with proteins, mineral metabolism, biochemistry of the eye, and nutrition.

The department has laboratories located in the Chemistry and the Medical Sciences buildings, Schweitzer Hall, Eye Research Foundation, Dalton Research Center, Agricultural Experiment Station Chemical Laboratories, Trace Substances Research Center, and Harry S. Truman Veterans Hospital.

All students gain experience in presenting biochemical principles to individual students, classes, and seminar groups. This supervised teaching experience is correlated with course work and creative research in programs individually planned for each student. Students are expected to complete courses in selected areas of modern biology and chemistry, as well as in biochemistry.

Various types of assistantships and fellowships are available each semester. For information regarding these and application forms for admission to the department, write the Director of Graduate Student Admissions, 322A Chemistry Building.

MASTER'S DEGREE

The following prerequisites must be met before any degree can be obtained: mathematics (through differential and integral calculus), biological sciences (at least one course), one year of physics, general chemistry, quantitative analysis, one year of organic chemistry (with a laboratory), and a physical chemistry course with a calculus prerequisite. Preferably these prerequisites will have been met during undergraduate studies; however, some may be made up after acceptance as a graduate student. After a student's acceptance, ACS standard chemistry tests will be employed in order to place the student in the correct courses.

The *minimal* departmental course requirements for the Master of Science degree are: 6 hours of General Biochemistry (320/322), Biochemistry Laboratory (305), 1 hour of Biochemistry Seminar (410), 4 hours of Biochemistry Research (490), and one graduate-level course in an area outside the department. Other requirements include a thesis based upon original research, a final oral examination and a public seminar given prior to the final exam based on thesis material, and some teaching. A student is expected to complete an M.S. degree within a 24-month period. Students receiving financial assistance can expect no more than two-years funding towards the M.S. degree.

DOCTORAL DEGREE

Prerequisites to acceptance for the Ph.D. program are the same as those stipulated for the M.S. degree. In addition, a required departmental qualifying examination is normally given at the end of the first academic year of graduate study.

The *minimal* departmental requirements for the Ph.D. are: 6 hours of General Biochemistry (320/322); Biochemistry Laboratory (305); 4 hours of Biochemistry Seminar (410); 3 hours of Biophysics (301); 6 hours of Advanced Biochemistry, including 2 hours of a Methods and Laboratory Techniques course; 2 hours of a Metabolism course and 2 hours of another type of Advanced Biochemistry course; two courses in biology beyond the prerequisite requirements; 6 hours of 300- or 400-level course work in another department; and a minimum of one semester of teaching experience, a comprehensive exam, a dissertation based upon original research, and a final examination.

The usual residency of a student with a baccalaureate degree is four and one-half years, a student with a Master's degree is three years. Students receiving financial assistance can expect no more than five-years funding during study toward the Ph.D. degree.

M.S.-M.D. AND PH.D.-M.D. DEGREE PROGRAMS

Students already accepted into the UMC School of Medicine may apply to the department for acceptance into the M.S.-M.D. or the Ph.D.-M.D. program.

Biological Sciences

Abraham Eisenstark, Ph.D., Illinois. Director; Prof.
 Robert P. Breitenbach, Ph.D., Wisconsin. Assoc. Director; Prof.
 Paul F. Agris, Ph.D., Massachusetts Institute of Technology. Director of Graduate Studies; Asst. Prof.
 Allan B. Burdick, Ph.D., California. Prof.
 Billie G. Cumbie, Ph.D., Texas. Prof.
 Roger M. deRoos, Ph.D., California. Prof.
 David B. Dunn, Ph.D., California at Los Angeles. Prof.
 John N. Farmer, Ph.D., Iowa State. Prof.
 Warren R. Fleming, Ph.D., Oregon. Prof.
 Charles S. Gowans, Ph.D., Stanford. Prof.
 Arthur P. Harrison, Ph.D., Maryland. Prof.
 Clair L. Kucera, Ph.D., Iowa State. Prof.
 Dan Mertz, Ph.D., Texas. Prof.
 Joseph M. Wood, Ph.D., Indiana. Prof.
 Armon F. Yanders, Ph.D., Nebraska. Dean, College of Arts & Sciences; Prof.
 Linda F. Chapman, Ph.D., California at Los Angeles. Assoc. Prof.
 Donald J. Farish, Ph.D., Harvard. Assoc. Prof.
 Donald H. Hazelwood, Ph.D., Washington State. Assoc. Prof.

Gary Y. Kikudome, Ph.D., Illinois. Assoc. Prof.
 Dean E. Metter, Ph.D., Idaho. Assoc. Prof.
 C. Donald Miles, Ph.D., Indiana. Assoc. Prof.
 M. Wesley Sorenson, Ph.D., Missouri-Columbia. Assoc. Prof.
 Jack Twente, Ph.D., Michigan. Assoc. Prof.
 Richard Wang, Ph.D., Colorado. Assoc. Prof.
 James E. Carrel, Ph.D., Cornell. Asst. Prof.
 Stephen J. Chaplin, Ph.D., Cornell. Asst. Prof.
 Susan B. Chaplin, Ph.D., Cornell. Asst. Prof.
 John D. David, Ph.D., Vanderbilt. Asst. Prof.
 John R. Faaborg, Ph.D., Princeton. Asst. Prof.
 H. Carl Gerhardt, Ph.D., Texas. Asst. Prof.
 Philip H.-S. Jen, Ph.D., Washington University. Asst. Prof.
 Donald L. Riddle, Ph.D., California at Berkeley. Asst. Prof.
 Louis A. Sherman, Ph.D., Chicago. Asst. Prof.
 George Smith, Ph.D., Harvard. Asst. Prof.
 James H. Wyche, Ph.D., Johns Hopkins. Asst. Prof.

The Division of Biological Sciences offers graduate study leading to the degrees of Master of Arts, either with or without thesis, and Doctor of Philosophy. The programs are designed to prepare students for advanced professional careers. Graduate study is provided in the areas of cell biology, comparative endocrinology, comparative ethology, comparative vertebrate reproductive physiology, cytology, developmental genetics, ecology and ecosystems analysis, endocrinology, genetics, herpetology, human cell biology, invertebrate zoology, limnology, mammalogy, microbial physiology and biochemistry, microbiology, molecular biology, oncology, paleobotany, parasitology, photobiology, plant anatomy, plant biochemistry, plant biosystematics, plant growth and development, plant physiology, and virology.

Applicants for graduate study should write to the Director of Graduate Admissions-Biological Sciences, Tucker Hall, for forms. Complete applications include: transcripts, letters of recommendation, and scores on the GRE (including advanced biology).

Applications for Graduate Teaching Assistantships are made directly to the Division. Graduate students may apply for fellowships, traineeships, and teaching and research assistantships, available from University funds, and from federal and other granting agencies; research assistantships are financed through grants awarded to individual

faculty members. Applications for financial assistance are submitted to the Director of Admissions.

Admission Requirements: (1) A grade point average of 3.0/4.0 or better is strongly recommended; (2) an undergraduate degree in one of the biological sciences is not necessary, but the minimum course work requirement is: 10 hours biology; 10 hours chemistry, including organic chemistry; 5 hours mathematics; and 5 hours physics. The applicant is expected to be familiar with the current concept of biology and the physical sciences as reflected in our undergraduate curriculum.

All graduate students in Biological Sciences are expected to take a full and active part in divisional activities. Routine participation in divisional seminar (B410), appropriate sectional seminars, divisional special lectures, and colloquia are considered a normal part of the graduate program.

Because many students pursue teaching careers, all candidates for graduate degrees must have regular teaching experience during their tenure of graduate studies.

Special facilities for graduate study include:

1. a new, modern building, including an Electron Microscope laboratory, radioisotope laboratories, tissue and cell culture laboratories and several controlled-environment chambers and rooms;
2. modern research greenhouses;
3. a 150,000-specimen herbarium with areas of specialization in desert ecology, agrostology, and the genera *Crataegus*, *Lupinus*, and *Quercus*;
4. a 14-acre botany preserve, located on the campus, with many native woody plants; and
5. a 160-acre prairie research station within 20 minutes of the Columbia campus.

The Division also maintains:

1. a marine aquarium for marine invertebrates;
2. a herpetology collection of amphibians and reptiles;
3. extensive teaching and research collections of vertebrate animals of Missouri; and
4. on public display in LeFevre Hall, the Glen Smart Bird Collection.

Other basic research facilities in the Division include culture rooms for

microorganisms (including especially algal species), modern cell and molecular biology equipment, an X-ray unit, spectrophotometers, fluorimeters, scintillation spectrometers, ultracentrifuges, biological hazard containment hoods, freeze drying units, and electrophoresis units. Stadler Memorial Library contains an extensive collection of classic and contemporary papers in biological disciplines.

MASTER'S DEGREE (with thesis)

To satisfy requirements for the degree of Master of Arts, a student must have completed the course requirements for the Division of Biological Sciences undergraduate degree. Students entering the M.A. program who received their undergraduate degree elsewhere or who, for any other reason, may not have completed these requirements are expected to satisfy them in the initial stages of their graduate training.

Degree requirements for the M.A. in biology with thesis are 30 hours of advanced study, 15 of which must be in courses numbered 400 or higher, and with no more than 12 hours in research and problems; i.e., at least 3 hours of this 400-level work should be a regular course (not a seminar). The Master's student is required during training to present one seminar in 410, 411 or 412. Each candidate must present an acceptable thesis on a topic approved by the adviser, and pass a final examination covering graduate work. This examination, an oral or written defense of the thesis, should demonstrate the student's mastery of the fundamental principles of the work included in the course of study.

MASTER'S DEGREE (non-thesis)

The Master of Arts degree in biology non-thesis is normally considered to be a terminal degree. The program is arranged for each student on the basis of background, career goals, and needs. A student must complete a minimum of 35 semester hours of graduate course work, including a minimum of 5 hours in Problems 400, if possible under the guid-

ance of at least two faculty members. The 15-hour rule for the M.A. with thesis also applies to the M.A. non-thesis. The final examination may be written and/or oral.

The proposed course of study is presented for consideration and approval by a Guidance Committee selected by the adviser early in the program—normally before the end of the first semester of graduate study. The course of study is selected to develop breadth consonant with current and possible alternative goals of the candidate, who may expect to be examined for this breadth at the final examination.

DOCTORAL DEGREE

Acceptance of a student for the Ph.D. program is based upon a combination of the following criteria: (1) academic background, grade average, maturity, experience, and other factors bearing upon probable success in the program; and (2) acceptable performance on the GRE. Students are formally accepted for Ph.D. programs at the time they are admitted to candidacy. Each student must successfully complete a written and/or oral qualifying examination conducted by an advisory committee.

In addition to fulfilling Graduate School requirements, a student must present two seminars of the 410, 411, and 412 type during the first two years of graduate work. The final oral examination covers primarily a defense of the dissertation, but also includes all of the candidate's experience in biological sciences. The Division of Biological Sciences requires that the doctoral degree candidate present a public seminar attended by the Advisory Committee as a major portion of the final examination. The seminar includes the student's original research work and appropriate background information. The presentation may be immediately followed by the formal committee meeting, or the formal meeting may be held at a later time. The announcement of this degree seminar is distributed on campus.

Graduate students may apply for fellowships, traineeships, and teaching and research assistantships, available from University funds and from federal and other granting agencies; research assistantships are financed through grants awarded to individual faculty members. Applications for financial assistance are submitted to the Director of Admissions.

Chemical Engineering

George W. Preckshot, Ph.D., Michigan. Chairman; Director of Graduate Studies; Prof. P.E.
L. E. Marc deChazal, Ph.D., Oklahoma State. Assoc. Director of Graduate Studies; Prof. P.E.
James R. Lorah, Ph.D., University of Washington. Prof. Emeritus. P.E.
Ralph R. Luebbers, Ph.D., Iowa State. Prof. Emeritus. P.E.
Richard H. Luecke, Ph.D., Oklahoma. Prof. P.E.
Truman S. Storvick, Ph.D., Purdue. Robert Lee Tatum Prof. of Engineering. P.E.
John B. Sutherland, Ph.D., Pittsburgh. Director, University System Industrial Research & Extension; Prof. P.E.
Jack Winnick, Ph.D., Oklahoma. Prof. P.E.
Richard M. Angus, Ph.D., Princeton. Assoc. Prof. P.E.
Charles E. Dunlap, Jr., Ph.D., Louisiana State. Asst. Prof. P.E.
David G. Retzlaff, Ph.D., Pittsburgh. Asst. Prof.

The Department of Chemical Engineering offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. Areas of study in the department are non-ideal fluid mechanics, rheology, solvent extraction, process control, adaptive control, process optimization, reaction kinetics, catalysis, solid state physics, heat transport (boiling, convective, condensation), phase equilibria, fertilizer technology, bio-oxidation, Newtonian fluid mechanics, applied mathematics to chemical engineering problems, mass transport (vibrating and non-vibrating systems), thermodynamics, transport properties of gases, heat and mass transfer, high pressure properties of liquids and gases, biological temperature control problems, biologically oriented engineering research, food production, air pollution monitoring and control, energy resource and production, and biochemical engineering research.

Research students have use of the following excellent facilities: an equation



of state and transport properties laboratory, with computer data logging and control; a heterogeneous catalysis, reaction kinetics, and fuel cell laboratory; a heat and mass transport laboratory; an air pollution monitoring and control laboratory; a water pollution control laboratory; a biochemical engineering laboratory; a non-Newtonian fluid mechanics laboratory; and interfacial mechanics and phenomena laboratory.

Excellent library facilities provide the latest domestic and foreign journals, specific for chemical engineering and physical sciences research.

Research assistantships are available to qualified students for academic year and summer periods. The academic year stipend for a half-time appointment is \$3,750, and the student is subject to in-state tuition and fees. Additional scholarship awards may be received by academically qualified students. The half-time appointment permits 12 credit hours of advanced study per semester. Grant research assistantships and some industrial and Graduate School fellowships are also available. The applicant's academic record and research potential determine the financial assistance offered. A program of support for three years is offered to highly qualified Ph.D. candidates. All of these permit the student to carry a full schedule of 16 semester hours. Financial assistance for students who wish to continue their study during the Summer Session is usually available. This assistance amounts

to approximately 20 per cent of the stipend for the academic year and in many cases there is full-time support for the Summer Session for two months.

MASTER'S DEGREE

To be accepted for advisement, a student must have completed a chemical engineering undergraduate curriculum, or its substantial equivalent, at a school accredited by the American Institute of Chemical Engineers, or must hold the degree of B.S. in Chemical Engineering. Graduates holding degrees in physics, chemistry, applied mathematics, and related fields may also be considered for candidacy. In general, additional course work is required of these.

For admission to the Chemical Engineering Graduate Program, applicants should have a minimum of 2.75 overall GPA in undergraduate work with consideration given to grade trends, performance in the area of chemical engineering and mathematics, and other criteria bearing on a student's probable success in graduate study. Selected students with less than a 2.75 GPA may be considered on a probationary basis. Financial support is competitive and a 3.0 is required. No financial support is available for probationary students.

If a Master's candidate accepted on a probationary basis receives C (or below) grades in 6 or more of the 12 hours taken the first semester, the student may not continue. Satisfactory progress, however, changes the status to that of a regularly enrolled student.

A diagnostic or screening examination must be taken on or before the first day of registration in the College of Engineering. This assists in planning the student's program for the first semester. The Graduate School requires the GRE which, if not taken before entrance, must be taken the first semester of residence.

There is no foreign language or collateral requirement for the Master's degree; 30 hours, including research, are required. Each student participates in seminars. An individual program pre-

pared by consultation between the student and adviser includes advanced courses in chemical engineering and mathematics, and not more than 12 hours of research or other unscheduled work. The course work and research may be oriented toward various objectives dependent upon the considerable variety of research projects available.

A thesis is required and a Master's candidate must pass a terminal examination in defense of this thesis.

DOCTORAL DEGREE

In addition to the diagnostic examination required of entering students, a Ph.D. program applicant to be admitted must pass a qualifying examination at a level sufficiently high as determined by the department. Later, a comprehensive examination must be successfully passed before being admitted to candidacy and before proceeding to prepare a dissertation.

In consultation with the thesis adviser, a comprehensive two-year plan of courses is prepared for each student; one or two languages may be included if the adviser decides they are a necessary requirement.

The candidate must pass the comprehensive examination, which involves original and creative work in delineating a research problem of some substance within a 30-day period.

Original research of high quality suitable for a Ph.D. candidate must be presented as a thesis.

The Department requires a GPA of above 3.0. Usually the qualifying and comprehensive examinations are sufficient to assure good academic performance by students.

Chemistry

David E. Troutner, Ph.D., Washington University.
Chairman; Prof.

Elmer O. Schlemper, Ph.D., Minnesota. Director
of Graduate Studies; Prof.

Henry E. Bent, Ph.D., California. Prof. Emeritus

Dorothy V. Nightingale, Ph.D., Chicago. Prof.
Emeritus

John E. Bauman, Jr., Ph.D., Michigan. Prof.

Edwin M. Kaiser, Ph.D., Purdue. Prof.

Robert R. Kuntz, Ph.D., Carnegie Institute of
Technology. Prof.

Stanley E. Manahan, Ph.D., Kansas. Prof.

R. Kent Murmann, Ph.D., Northwestern. Prof.

Norman Rabjohn, Ph.D., Illinois. Prof.

Scott Searles, Jr., Ph.D., Minnesota. Prof.

Lloyd B. Thomas, Ph.D., Minnesota. Prof.

Richard C. Thompson, Ph.D., Maryland. Prof.

Anthony M. Dean, Ph.D., Harvard. Assoc. Prof.

Robert E. Harris, Ph.D., California. Assoc. Prof.

Hyunyong Kim, Ph.D., California. Assoc. Prof.

Richard N. Loeppky, Ph.D., Michigan. Assoc. Prof.

John M. Malin, Ph.D., California-Davis. Assoc. Prof.

John P. McCormick, Ph.D., Stanford. Assoc. Prof.

Jerome W. O'Laughlin, Ph.D., Iowa State. Assoc.
Prof.

G. Stephen Kelsey, Ph.D., Pittsburgh. Asst. Prof.

The Department of Chemistry offers course work leading to the degrees of Master of Arts and Doctor of Philosophy in Chemistry. The Department, with the Departments of Physics and Mathematics, also offers graduate work leading to the degree of Master of Science in Physical Science. Designed for those planning to teach in junior colleges, this degree requires 40 hours of course work and no thesis.

The Department offers areas of concentration in analytical, inorganic, nuclear, organic, and physical chemistry, as well as interdisciplinary programs with the biological, environmental, and other physical sciences. Well-equipped research laboratories and facilities which contain standard and specialized equipment for research are maintained in these areas.

Other campus facilities widely used by the Department include a central instruments shop, glass blowing shop, electronics shop, large computing center, and the ten megawatt nuclear reactor. The latter provides a high neutron flux for radioisotope and activation analysis. A Co⁶⁰ γ -ray source for radiation damage studies is also located at the reactor. For departmental faculty and graduate students, several laboratories are available on a continuing basis as their research requires.

Fellowships and research assistantships are available for highly qualified applicants. These are in addition to the departmental teaching assistantships. Applica-

tion forms, obtained from the Chairman of the Chemistry Department, should be submitted no later than March 1 of each year.

GRADUATE DEGREE REQUIREMENTS

An applicant for graduate work in chemistry must have either an A.B. or B.S. degree in chemistry, essentially equivalent to those awarded at UMC, with a *B* average or a score in the 70 percentile of the GRE. Prerequisite course requirements are those required for a B.S. as certified by the American Chemical Society.

The following regulations govern graduate work in chemistry: all new graduate students are required to take (1) departmental entrance examinations shortly before registration, and (2) departmental qualifying examinations over the four fields of chemistry either at the end of the first or second semester. These must be passed before a Master's degree is awarded and before application for candidacy for the Ph.D. degree.

The Master's degree program requires a minimum of 30 hours of graduate-level course work, including 8-12 hours of research credit, passing the qualifying examinations, and an acceptable thesis. There is no language requirement. A final oral examination covering both the thesis and course work is given before the degree is awarded.

To become candidates for the Ph.D. degree, students must be accepted by the Chemistry Department and their course work and research programs must be approved by an advisory committee; departmental acceptance is based on the applicant's previous course records and their performance on qualifying examinations.

Written cumulative examinations are given beginning in the second year. These written tests are followed by an oral examination which emphasizes the major field but also includes related branches of chemistry. Before admittance to the oral examinations, a Ph.D. candidate must

give satisfactory evidence of the ability to translate German or an acceptable substitute.

The candidate must submit a dissertation describing the results of successful and original research in one of the branches of chemistry. After the dissertation has been accepted, there is a final oral examination, primarily in the field of the candidate's research.

Civil Engineering

John T. O'Connor, Eng. D., Johns Hopkins. Chairman; Prof.

Karl H. Evans, M.S.C.E., Illinois. Assoc. Chairman; Prof.

Mark P. Harris, M.S.C.E., Georgia Institute of Technology. Prof. Emeritus

Walker W. Milner, M.S., Iowa State. Prof. Emeritus
Lindon J. Murphy, M.S., Iowa State. Prof. Emeritus

Harry Rubey, C.E., Illinois. Prof. Emeritus

Horace W. Wood, M.S., Michigan. Prof. Emeritus

James W. Baldwin, Jr., Ph.D., Illinois. Prof.

Neal B. H. Benjamin, Ph.D., Stanford. Prof.

Richard T. Douty, Ph.D., Cornell. Prof.

Mriganka Ghosh, Ph.D., Illinois. Prof.

Allen T. Hjelmfelt, Jr., Ph.D., Northwestern. Prof.

Henry Liu, Ph.D., Colorado State. Prof.

Jay B. McGarraugh, Ph.D., Purdue. Prof.

John T. Novak, Ph.D., University of Washington. Prof.

Cenap Oran, Ph.D., Illinois. Prof.

Harold J. Salane, Ph.D., Texas. Prof.

John R. Salmons, Ph.D., Arizona. Prof.

Shankha Banerji, Ph.D., Illinois. Assoc. Prof.

David L. Guell, Ph.D., Northwestern. Assoc. Prof.

Louis Hemphill, Ph.D., Missouri-Columbia. Assoc. Prof.

Charles W. Lenau, Ph.D., Stanford. Assoc. Prof.

George H. Stickney, Ph.D., Michigan. Assoc. Prof.

Jimmie Hinze, Ph.D., Stanford. Asst. Prof.

The Department of Civil Engineering offers the Master of Science degree in Civil Engineering, the Master of Science degree in Sanitary Engineering, and the Doctor of Philosophy degree.

Specific programs of study have been developed in six discrete areas:

1. *Structures*, including structural mechanics, soil mechanics, and foundations, emphasize advanced aspects of structural design.

2. *Sanitary and Environmental Engineering*, with a principal emphasis on water pollution control, water purification, waste water treatment, and the disposal of residues from these processes, concentrates on the application of chemical and microbiological principles to design for water pollution control.

3. *Construction Planning and Management* consists of course work integrating a combination of business administration, cost accounting, and economics tailored to the needs of the construction engineer or manager.

4. *Transportation and Urban Systems Engineering* emphasizes course work ranging from highway and pavement design to land use planning, and the development of advanced transportation systems for urban areas.

5. *Hydraulic Engineering and Water Resources Planning and Management* combines classical hydraulic design with systems analysis and optimization techniques for enhanced planning of large scale water resources systems. A new emphasis is given to the social, political, and regional economic effects of large scale water projects.

6. *Municipal and Public Works Engineering*, designed for engineers who plan to work in urban administration and management, is broad in scope and oriented towards legal and political administration, cost management regulation, and enforcement for environmental control.

The department has well-equipped laboratories for experimental research in structures, sanitary (environmental) engineering, soil mechanics, and fluid mechanics. As an example, the structural laboratory contains closed-loop-servo-controlled hydraulic loading apparatus and automatic data acquisition equipment. The environmental engineering laboratories are equipped with analytical equipment for the complete chemical and biological analysis of water and wastewater. In addition, a separate sanitary engineering laboratory building, located adjacent to the nuclear reactor facility, is used for pilot plant testing and larger scale studies related to water purification, waste water treatment, and pollution control. A laboratory for research on *Advanced Water Treatment Processes* is under development. The Civil Engineering department also maintains fully-equipped shop facilities with full-time technicians for the fabrication of test and pilot plant equipment.

Approximately 30 graduate research and teaching assistantships are available each year, in addition to the fellowships and traineeships supported by NSF, EPA, and other governmental agencies. Half-time appointments pay \$4,000 to \$4,400

and permit the recipient to take 12 credit hours per semester.

Information regarding availability of financial support and further details about specific programs may be obtained by writing to Dr. John T. O'Connor, Chairman, Dept. of Civil Engineering, UMC, Columbia.

MASTER'S DEGREE

An applicant with a B.S. degree in engineering from an ECPD accredited program, and an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the program leading to the Master of Science in Civil Engineering. Candidates for the M.S. in Sanitary Engineering can have a B.S. degree in the physical or biological sciences; however, non-engineers may be required to make up certain program deficiencies.

The GRE must be taken prior to admission, or during the first semester of enrollment.

Each of the Master's programs requires a minimum of 30 credit hours; a minimum of 15 hours of this credit must be in courses numbered 400 or higher. At least one week prior to the final oral examination, a candidate must submit to an examining committee a thesis, a formal report, or a design of professional quality applying the knowledge gained in course work to the solution of an engineering problem. Students who receive research appointments or traineeships are required to submit a thesis. The final oral examination is required of all Master's candidates.

DOCTORAL DEGREE

Formal acceptance to candidacy for the Ph.D. degree is based on a written qualifying examination, administered by faculty members in the student's area of concentration during the first semester of post-Master's work. In cases where students desiring Ph.D. candidacy take a Master's degree with thesis option in this department, the Master's oral examining committee conducts an oral qualifying

examination concurrently with the final examination for the Master's degree.

Doctor of Philosophy programs are committee-administered and tailored to fit the needs of each individual student; specific requirements are held to a minimum of two years of course work and one year of research beyond the Bachelor's degree. One year of credit is given for the Master of Science degree and the second year comprises approximately 30 credit hours of additional course work. The candidate must pass a comprehensive qualifying examination, and submit and defend a dissertation at a final qualifying examination.

Classical Studies

John C. Thibault, Ph.D., Illinois. Chairman; Prof.
Charles F. Saylor, Ph.D., California. Director of
Graduate Studies; Prof.

Eugene N. Lane, Ph.D., Yale. Prof.
Meyer Reinhold, Ph.D., Columbia. Prof.
Theodore A. Tarkow, Ph.D., Michigan. Assoc. Prof.
Victor A. Estevez, Ph.D., Wisconsin. Asst. Prof.

The Department of Classical Studies offers graduate work leading to the degrees of Master of Arts in Classical Languages, and Doctor of Philosophy in Classics and Classical Archaeology jointly with the Department of Art History and Archaeology. The M.A. in Classical Languages is normally the degree taken by students who intend to continue to the Ph.D. degree.

Graduate programs in Classical Studies are designed to prepare students for professional careers as teachers and scholars of classical literature and ancient civilization. In addition to acquiring expertise in the traditional classical disciplines, students are encouraged to acquire some familiarity with other areas, such as later literatures and cultures, on which the classical tradition has exercised a decided effect. At the end of their graduate work, it is consequently hoped, though not required, that students will be academically equipped to ask new questions of the Classics, thereby broadening both their teaching and research perspectives.

Since the UMC is a contributing member of the American Academy in Rome

and the American School of Classical Studies in Athens, their facilities are available to graduate students from Missouri. It is often feasible to study in Athens or Rome after completing the work for a Master's degree. On campus, students have at their disposal Ellis Library facilities which are excellent in the major fields of Greek and Latin literature, as well as in the various ancillary fields. This collection is supplemented by the Walter Miller collection in one of the departmental offices. The Museum of Art and Archaeology also contains much that is of interest to classicists.

MASTER'S DEGREE

The basic minimum requirements for admission to the M.A. program are an A.B. degree from an accredited college or university, a reading knowledge of Greek and/or Latin, and a GPA of at least 3.0 ($A = 4.0$) or the equivalent during the last two years of undergraduate work.

The minimum course of study requirements are 30 hours of course work, of which at least 15 must be at the 400 level, in Greek, Latin, Classics, and related fields; and 10-12 hours should be in courses in other departments. At least 18 hours must be in Latin and Classics or in Greek and Classics or in Latin, Greek, and Classics. A student may minor in a related field or may spread related work over several areas. A minor shall consist of no less than 10 and no more than 12 hours.

The Introduction to Graduate Study in Classics (Classics 409) is required of all students in their first year of graduate study.

During the first month of graduate study the student and adviser should plan a reading list, consisting of works in translation and in the original which pertain to the student's major interests. An examination on the reading list is part of the final examination for the degree.

An hour-long final oral examination is given by a faculty board. If a thesis has been submitted, this examination will include defense of the thesis and general

questions within fields related to the thesis. The examination cannot be administered during the summer session.

DOCTORAL DEGREE (Area of Classics and Classical Archaeology)

The minimum requirements for admission to the Ph.D. program include:

1. an A.B. degree from an accredited college or university;
2. a reading knowledge of Greek and/or Latin,
3. sufficient reading knowledge of German and/or French (or, in justifiable instances, Italian).

The minimum course of study requirements for the degree are:

1. in the Classical Studies, 36-42 hours at the 300 and 400 levels;
2. at least 8 hours of dissertation credit not included in formal course work;
3. a passing grade of *A* or *B* in at least 24 hours of graduate-level courses outside the major department, of which at least 15 must be in one department, field, area, or program.

The precise details of the student's program are worked out by the student and adviser. At least one course in Classical Archaeology must be taken at some time during the student's program.

Though some command of German and/or French (or Italian) is necessary from the outset, students are required to have passed both E.T.S. Foreign Language Examinations by final registration for their third year of graduate study.

By the beginning of the second year, the student should ask the adviser to recommend officially a five-man Advisory Committee to administer the two-part departmental qualifying examination. The written examination consists of translations of passages from Greek and Latin literature, based on a reading list composed by the student and adviser. The oral consists of an examination in the major authors and works of the classical periods of Greek and Latin literature.

After the successful completion of residence, language, and course requirements, the student must pass the comprehensive examinations consisting of

five examinations in the following fields: (1) Greek literature, (2) special author (Greek), (3) Latin literature, (4) special author (Latin), and (5) minor field. A special topic may be substituted for one of the special authors.

The student should then complete a dissertation and secure approval according to regulations. The candidate must furnish to the Department of Classical Studies a bound copy of the dissertation, and pass a final oral examination on the thesis of the dissertation and on related subjects.

Dairy Husbandry

Harold D. Johnson, Ph.D., Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.

John R. Campbell, Ph.D., Missouri-Columbia. Prof. Frederic A. Martz, Ph.D., Purdue. Prof.

Fred H. Meinershagen, M.S., Missouri-Columbia. Prof.

Charles P. Merilan, Ph.D., Missouri-Columbia. Prof. John D. Sikes, Ph.D., Missouri-Columbia. Prof.

Ralph R. Anderson, Ph.D., Missouri-Columbia. Prof.

Rex E. Ricketts, Ph.D., Missouri-Columbia. Assoc. Prof.

H. Allen Garverick, Ph.D., Purdue. Assoc. Prof.

Laurence W. Hedlund, Ph.D., Pittsburgh. Asst. Prof.

The Department of Dairy Husbandry offers graduate study leading to the degrees of Master of Science and Doctor of Philosophy. Additionally, faculty members participate in the Area Programs of Nutrition and Physiology which also offer Ph.D. degrees. Those programs are described elsewhere in this catalog.

Graduate programs in Dairy Husbandry prepare students for advanced professional scientific careers in the fields of dairy production, physiology, endocrinology, nutrition, and reproductive physiology. Students trained in Dairy Husbandry go not only into positions in agriculture, but also into research in the fields of medical science, space science, and biological science.

The M.S. degree prepares a student for a position in industry, teaching, or agricultural extension, and also provides training toward the Ph.D. The areas of research include dairy cattle manage-

ment, dairy production, nutrition, environmental physiology, endocrinology, lactation physiology, and reproductive physiology. The Ph.D. program is designed to prepare students for research in various fields and for college and university teaching.

The Department cooperates closely with all phases of the dairy industry, both state and national. The University farms and herds offer many opportunities to students interested in relating their studies to problems of the industry. Special facilities for research in Dairy Husbandry include:

1. environmental physiology-climatic laboratory facilities for both large and small laboratory animals;
2. altitude chamber;
3. endocrine and nutrition facilities for digestion and lactation physiology studies on cattle;
4. special laboratories for bioassay and tracer endocrine and metabolism research;
5. special equipment for metabolism studies on a broad spectrum of species;
6. cooperative use of the Low Level Radiation Laboratory, Nuclear Reactor, Sinclair Comparative Medicine Research Farm, Research Center facilities, and the Agricultural Engineering Department thermo-electric partition calorimeter;
7. the Computer Network, with consultation service for statistical analysis of research data; and
8. the Agricultural Experiment Station Chemical and Spectrographic Laboratories.

Fellowships, scholarships, and teaching and research assistantships are available to qualified dairy husbandry graduate students. These forms of financial assistance are supported by funds from state and national governmental agencies, industry, and from the College of Agriculture. Applications should be submitted by March 1 each year. Additional information may be obtained from the Chairman, Department of Dairy Husbandry, College of Agriculture, 104 Eckles Hall.

MASTER'S DEGREE

Whether the B.S. in Agriculture or some other baccalaureate degree is offered, the candidate must have included in under-

graduate work a minimum of 25 credit hours in the following specified subjects or their equivalent: chemistry, physics, zoology, bacteriology, economics, mathematics, physiology, and such technical subjects as the Department may deem essential for graduate study in the branch of dairy husbandry in which the student intends to specialize. In addition, a student should show acceptable performance on the GRE, and a 3.0 or higher overall GPA ($A=4$) is recommended, with consideration given to other criteria.

The degree requirements are those of the Graduate School with at least 16 of the 30-hour minimum requirement to be in 400-level courses. There is no language requirement. A candidate is required to submit a manuscript suitable for publication in a scientific journal.

DOCTORAL DEGREE

To become a Doctor of Philosophy degree candidate, a student must pass a qualifying examination administered by the Dairy Husbandry Department and the Advisory Committee, and/or qualify for the degree in the areas of Physiology and Nutrition.

The program for the Ph.D. degree requires a minimum of two years beyond the Master's degree, or three years beyond the B.S. degree. Normally, candidates are required to:

1. complete an individually arranged program of study;
2. pass an oral and written comprehensive examination;
3. demonstrate proficiency by examination in two foreign languages, or in one foreign language and one collateral field, or in two collateral fields;
4. demonstrate ability to do original research and suitably prepare material for publication in a scientific journal; and
5. pass a final oral examination.

Supporting fields for dairy husbandry are engineering, endocrinology, neurophysiology, behavioral sciences, biochemistry, chemistry, environmental physiology, metabolism, statistics, biology, nutrition, and microbiology.

Economics

W. Whitney Hicks, Ph.D., Stanford. Chairman; Prof. Maw Lin Lee, Ph.D., Wisconsin. Director of Graduate Studies; Prof.

Mona E. Dingle, Ph.D., California-Berkeley. Prof. John P. Doll, Ph.D., Iowa State. Prof. Floyd D. Harmston, Ph.D., Missouri-Columbia. Prof. Stanley R. Johnson, Ph.D., Texas A & M. Prof. John M. Kuhlman, Ph.D., Wisconsin. Prof. Wayne A. Leeman, Ph.D., Wisconsin. Prof. E. E. Liebhafsky, Ph.D., Illinois. Prof. Carmen F. Menezes, Ph.D., Northwestern. Prof. John C. Murdock, Ph.D., Wisconsin. Prof. Robert W. Paterson, Ph.D., Virginia. Prof. Paul E. Smith, Ph.D., Michigan. Prof. David W. Stevens, Ph.D., Colorado. Prof. Richard L. Wallace, Ph.D., Vanderbilt. Prof. Walter L. Johnson, Ph.D., Duke. Assoc. Prof. David Loschky, Ph.D., Harvard. Assoc. Prof. Donald J. Schilling, Ph.D., North Carolina. Assoc. Prof. Charles G. Geiss, Ph.D., North Carolina. Asst. Prof. Ronald A. Ratti, Ph.D., Southern Methodist. Asst. Prof. Edward H. Robb, Ph.D., Michigan State. Asst. Prof.

The Department of Economics offers graduate work leading to the Master of Arts, the Master of Science in Teaching, and the Doctor of Philosophy. The program educates students for careers in colleges, universities, research institutions, government, and business. From the study of economic theory and its applications, students develop facility in economic analysis, in the interpretation of empirical data, and in the appraisal of public policy.

Fields emphasized are macro- and microeconomic theory, econometrics, public finance and income stabilization, industrial organization, health and medical economics, manpower, economic education, and areas of public interest that involve economic analysis.

The UMC Ellis Library has a large collection of books and current periodicals in economics—in English, German, Russian, and other languages. Faculty and students in economics have access to an IMB 370/168. Programming assistance and access to specialized software is available through the college.

Applicants for graduate study in economics should write the Director of Graduate Studies (Economics), Middlebush Hall, for specific information about the graduate program and application forms

for teaching and research assistantships. Admission forms for Graduate School may be obtained directly from the campus Admissions Office or through the Department. March 1 is the deadline for applications for assistantships for the school year beginning in August, but earlier submissions are desirable. Late applications will be accepted, subject to the availability of openings and funds. Admission may be granted at any time to qualified students.

MASTER'S DEGREE

A student may be admitted to candidacy upon successful completion of an undergraduate major in economics, or upon demonstration of adequate preparation in economics and mathematics. A strong undergraduate grade-point average is required, along with an acceptable performance on the Graduate Record Examination.

To fulfill requirements for the M.A. degree, a candidate must complete a 30-hour approved program of study with a minimum of 15 hours in 400-level courses. The program must include Economics 451 (microeconomics); Economics 453 (macroeconomics); and Economics 472 (economic methods). The program also requires a minimum of 18 hours in economics, and may include 6 to 12 hours in related social sciences, business administration, mathematics, statistics, or other supportive areas outside of economics. No foreign language is required. A minor in regional science is also one of the options under this program.

The M.A. student must elect one of the following options:

1. completion of a thesis for which up to 6 semester hours of credit in Economics 490 may be granted, or
2. completion of a research paper in lieu of a thesis for which up to 3 semester hours of credit in Economics 400 is granted.

Ordinarily, the paper in lieu of thesis is written in conjunction with a 300- or 400-level graduate course in which a paper is required. Hence, the paper is more substantial than the usual term paper and satisfies both the requirement of the course and the M.A. requirement of a paper in lieu of thesis.

Students electing to write a thesis must present an oral defense of the thesis before an Examining Committee. Students electing to write a paper in lieu of a thesis must pass an oral examination covering three areas of economics. These areas are normally selected by the student and a faculty adviser. Areas commonly offered include macroeconomics, microeconomics, econometrics, comparative economic systems, economic development, history of economic thought, international economics, public finance, labor economics, mathematical economics, manpower, and agricultural economics, regional and urban economics, structure of industry, and monetary economics.

While the examination tests for breadth and depth of understanding and hence covers more than simply the content of courses, it assumes that the student has a thorough knowledge of the material covered in the first 400-level courses taught in the various fields. Alternatively, a student may choose to present research results of the thesis or research paper to a seminar open to all faculty and students in the Department. In this case, the Examining Committee attends and evaluates the student's performance. As a final option the student may elect to take the written Ph.D. qualifying examinations as an alternative to the examinations suggested above.

DOCTORAL DEGREE

The Ph.D. is granted only to those who have gained a comprehensive knowledge and understanding of theoretical and applied economics. Thus, only those who show definite promise of superior attainment are admitted to candidacy.

Ordinarily, for admission to the Ph.D. program, a student must have the M.A., or be able to meet qualifications for admission similar to those for the M.A. program. Two semesters after beginning course work toward a Ph.D., the student must qualify for the doctoral program. The purpose of the qualifying procedure is to assess the new student's background and prospects for successful attainment

of the Ph.D. The Graduate Studies Committee is responsible for determining students' qualifications based upon a careful evaluation of:

1. grades earned in Economics 451 and 453;
2. overall performance, including grade-point average, delayed grades received, and progress made toward degree requirements;
3. performance as a teaching or research assistant.

The Ph.D. program in Economics is purposely designed to offer maximum flexibility. Students may choose a sequence of formal course work and independent readings uniquely tailored to their individual interests and intended careers. Ordinarily, the program includes:

- (1) microeconomics and macroeconomics—451 and 453;
- (2) 6 hours of course work, or readings in each of three areas of economics in which the student chooses to specialize;
- (3) 6 hours of course work, or readings in the intended dissertation area;
- (4) 12 hours in an outside field—Mathematics, Statistics, Philosophy, History, Political Science, etc.;
- (5) 6 hours of quantitative skills—Economics 370 and 472;
- (6) 6 hours of course work or readings in electives;
- (7) 6 hours of readings or dissertation research—400, 480, 490;
- (8) 12 hours of dissertation research—490.

A total of 72 hours is required, including 30 hours that may have been earned for the M.A. Of the 72-hour total, a maximum of 54 hours of formal course work is required. This maximum may be reduced substantially by substituting independent study (Economics 400), and by starting dissertation research early in the program and thereby earning extra dissertation credit (Economics 490). Competence in a foreign language is not required.

The three areas of specialization are selected from the areas listed under the Master's degree.

The student must pass written and oral comprehensive examinations and, at the oral comprehensive, offer a detailed plan for dissertation research. A final oral examination or dissertation defense is also required. This examination is open to interested faculty and graduate students.

Education

- Bob G. Woods, Ph.D., Iowa. Dean; Prof.
Wilbur R. Miller, Ed.D., Missouri-Columbia. Assoc. Dean; Prof.
Charles H. Koelling, Ed.D., Missouri-Columbia. Asst. Dean; Prof.
John W. Alspaugh, Ed.D., Missouri-Columbia. Prof.
Robert L. Burton, Ed.D., Oklahoma. Prof.
Robert Callis, Ph.D., Minnesota. Prof.
Richard Caple, Ed.D., Teachers College, Columbia University. Prof.
Corrine S. Cope, Ph.D., Ohio State. Prof.
James L. Craigmile, Ed.D., Nebraska. Prof.
Floyd G. Delon, Ed.D., Arizona. Prof.
Ralph C. Dobbs, Ed.D., Indiana. Prof.
Robert J. Dollar, Ed.D., Oklahoma State. Prof.
Wayne Dumas, Ed.D., Arkansas. Prof.
Arni T. Dunathan, Ed.D., Utah. Prof.
Richard English, Ph.D., Arizona. Prof.
Carl C. Fehrle, Ph.D., Iowa. Prof.
John L. Ferguson, Ed.D., Missouri-Columbia. Prof.
Thomas L. Good, Ph.D., Indiana. Prof.
Norman C. Gysbers, Ph.D., Michigan. Prof.
Veralee B. Hardin, Ed.D., Missouri-Columbia. Prof.
James E. Hart, Ed.D., Missouri-Columbia. Prof.
Robert Harth, Ed.D., George Peabody College for Teachers. Prof.
Howard W. Heding, Ph.D., Wisconsin. Prof.
Joseph A. Johnston, Ph.D., Michigan. Prof.
Lloyd P. Jorgenson, Ph.D., Wisconsin. Prof.
Hercules C. Kazanas, Ph.D., Michigan. Prof.
Paul T. King, Ph.D., Pennsylvania State. Prof.
Joseph T. Kunce, Ph.D., Missouri-Columbia. Prof.
Mary J. Lang, Ed.D., Missouri-Columbia. Prof.
Christopher J. Lucas, Ph.D., Ohio State. Prof.
John F. McGowan, Ed.D., Missouri-Columbia. Prof.
Ben F. Nelms, Ph.D., Iowa. Prof.
Donald D. Osburn, Ph.D., North Carolina State. Prof.
Robert F. Reys, Ed.D., Missouri-Columbia. Prof.
Paul C. Ritchie, Ed.D., Missouri-Columbia. Prof.
John A. Roberts, Ph.D., Iowa. Prof.
Joseph L. Saupe, Ed.D., Illinois. Prof.
Richard G. Schofer, Ed.D., Colorado State College. Prof.
Herbert W. Schooling, Ed.D., Missouri-Columbia. Chancellor; Prof.
Warren R. Seymour, Ph.D., Missouri-Columbia. Prof.
Carey T. Southall, Jr., Ed.D., Florida. Prof.
Bob R. Stewart, Ed.D., Maryland. Prof.
Ralph E. Stewart, Ed.D., Missouri-Columbia. Prof.
A. W. Sturges, Ph.D., Iowa. Prof.
Terry D. TenBrink, Ph.D., Michigan State. Prof.
Richard W. Thoreson, Ph.D., Missouri-Columbia. Prof.
Frank Wellman, Ph.D., Nebraska. Prof.
Curtis R. Weston, Ed.D., Missouri-Columbia. Prof.
Nicholas A. Adams, Ed.D., American University, Washington, D. C. Assoc. Prof.
Reuben Altman, Ph.D., Texas. Assoc. Prof.
James L. Ballinger, Ed.D., Missouri-Columbia. Assoc. Prof.
Beryl B. Blain, Ed.D., Indiana. Assoc. Prof.
Donn E. Brolin, Ph.D., Wisconsin. Assoc. Prof.
James D. Brown, Ph.D., Illinois. Assoc. Prof.
Betty M. Burchett, Ed.D., Indiana. Assoc. Prof.
Irvin W. Cockriel, Ed.D., Missouri-Columbia. Assoc. Prof.
Joan Doherty, Ed.D., Missouri-Columbia. Assoc. Prof.
John E. Elias, Ed.D., Nebraska. Assoc. Prof.
Alice I. Fitzgerald, Ed.D., Missouri-Columbia. Assoc. Prof.
Edmund A. Ford, Ed.D., Missouri-Columbia. Assoc. Prof.
Gary C. Fox, Ph.D., Michigan State. Assoc. Prof.
Judith K. Grosebeck, Ph.D., Kansas. Assoc. Prof.
Douglas A. Grouws, Ph.D., Pennsylvania State. Assoc. Prof.
Roger D. Harting, Ed.D., Missouri-Columbia. Assoc. Prof.
Peter Hasselriis, Ph.D., Syracuse. Assoc. Prof.
Richard Hatley, Ed.D., New Mexico. Assoc. Prof.
Merlyn Herrick, Ed.D., Indiana. Assoc. Prof., Family & Community Medicine
Walter E. Hunter, Ed.D., Colorado. Assoc. Prof.
Leon Johnson, Ed.D., West Virginia. Assoc. Prof.
Larry A. Kanter, Ed.D., Pennsylvania State. Assoc. Prof.
Franklin J. King, Ed.D., Missouri-Columbia. Assoc. Prof.
James R. Koller, Ph.D., Missouri-Columbia. Assoc. Prof.
Linnea Lilja, Ph.D., Minnesota. Assoc. Prof.
Norman S. Lawnick, Ed.D., Missouri-Columbia. Assoc. Prof.
John B. Leake, Ed.D., Oklahoma State. Assoc. Prof.
Benjamin R. Londeree, Ed.D., Toledo. Assoc. Prof.
James A. Middleton, D.M.Ed., Oklahoma. Assoc. Prof.
F. M. Miller, Ed.D., Missouri-Columbia. Assoc. Prof.
Larry E. Miller, Ph.D., Purdue. Assoc. Prof.
Earl J. Moore, Ed.D., Nebraska. Assoc. Prof.
Neila T. Pettit, Ed.D., Missouri-Columbia. Assoc. Prof.
Mark D. Reckase, Ph.D., Syracuse. Assoc. Prof.
John C. Reid, Ph.D., Missouri-Columbia. Assoc. Prof.
Robert H. Reifschneider, Ed.D., Nebraska. Assoc. Prof.
Richard D. Robinson, Ed.D., Georgia. Assoc. Prof.
Robert Shaw, Ed.D., Missouri-Columbia. Assoc. Prof.
Mel Sheehan, Ph.D., St. Louis. Director of Athletics; Assoc. Prof.
Glenn C. Shinn, Ph.D., Missouri-Columbia. Assoc. Prof.
Robert R. Trimble, Ph.D., Oklahoma State. Assoc. Prof.
John A. Voth, Ph.D., Minnesota. Assoc. Prof.
Sandra Alper, Ph.D., Iowa. Asst. Prof.
Jane G. Bennett, M.S., Wisconsin. Asst. Prof.
William J. Bunge, M.Ed., Missouri-Columbia. Asst. Prof.
Robert F. Busch, Ph.D., Missouri-Columbia. Asst. Prof.
William M. Busch, M.S., Southern Illinois. Asst. Prof.
Marilyn Chandler, Ph.D., Iowa. Asst. Prof.
Russell Cassidy, Ed.D., Indiana. Asst. Prof.
Robert Denker, M.Ed., Missouri-Columbia. Asst. Prof.
Dabney B. Doty, M.Ed., Missouri-Columbia. Asst. Prof.
Lonn E. Echternacht, Ed.D., Missouri-Columbia. Asst. Prof.

Jacqueline S. Ellis, Ph.D., Missouri-Columbia. Asst. Prof.
 Prentice Gault, Ph.D., Missouri-Columbia. Asst. Prof.
 Ralph E. Glauert, Ph.D., Missouri-Columbia. Asst. Prof.
 Joseph M. Goldfarb, M.S., Indiana. Asst. Prof.
 Maynard Gunter, Ed.D., Pennsylvania State. Asst. Prof.
 Murray L. Hardesty, Ed.D., Missouri-Columbia. Asst. Prof.
 Lorraine Hilgedick, Ed.D., Missouri-Columbia. Asst. Prof.
 Marilee Howell, M.Ed., Missouri-Columbia. Asst. Prof.
 James B. Karnes, Ed.D., Missouri-Columbia. Asst. Prof.
 James Leigh, Ph.D., Southern California. Asst. Prof.
 Clifford Magnusson, Ed.D., Wayne State. Asst. Prof.
 Marilyn Markel, Ed.D., Missouri-Columbia. Asst. Prof.
 Betty Martin, Ph.D., Missouri-Columbia. Asst. Prof.
 Stephen McCarney, Ed.D., Florida. Asst. Prof.
 John P. McCarthy, Ph.D., Missouri-Columbia. Asst. Prof.
 Donald McKay, Ph.D., Missouri-Columbia. Asst. Prof.
 Mary M. Meredith, M.S., Missouri-Columbia. Asst. Prof.
 Marvellee Michel, Ed.D., Missouri-Columbia. Asst. Prof.
 David B. Moody, Ed.D., Missouri-Columbia. Asst. Prof.
 Mary V. Morgan, M.Ed., Missouri-Columbia. Asst. Prof.
 Edward J. O'Brien, M.Ed., Missouri-Columbia. Asst. Prof.
 Carol A. Odor, M.S., Tennessee. Asst. Prof.
 James Oglesby, Ph.D., Missouri-Columbia. Asst. Prof.
 James Pershing, Ph.D., Missouri-Columbia. Asst. Prof.
 Frank Quattrocchi, Ed.D., Missouri-Columbia. Asst. Prof.
 Joan Quilling, Ph.D., Michigan State. Asst. Prof.
 Charles I. Rankin, Ph.D., Kansas State. Asst. Prof.
 C. David Roberts, Ph.D., Arizona. Asst. Prof.

Mary M. Roberts, Ed.D., Missouri-Columbia. Asst. Prof.
 Gary L. Smith, Ed.D., Missouri-Columbia. Director of Admissions; Asst. Prof.
 Harry E. Smith, M.Ed., Missouri-Columbia. Asst. Prof.
 Jean Y. Smith, M.Ed., Missouri-Columbia. Asst. Prof.
 Charles Snethen, Ed.D., Missouri-Columbia. Asst. Prof.
 William Ed Stephens, Ph.D., Missouri-Columbia. Asst. Prof.
 Norman E. Stewart, M.Ed., Missouri-Columbia. Asst. Prof.
 James N. Thompson, Ed.D., Missouri-Columbia. Asst. Prof.
 Keener A. Tippin, Ed.D., Missouri-Columbia. Asst. Prof.
 Billie H. Tritschler, M.Ed., Missouri-Columbia. Asst. Prof.
 Carter Ward, Ph.D., Missouri-Columbia. Asst. Prof.
 Virginia Wheeler, Ed.D., Missouri-Columbia. Asst. Prof.
 Vernon L. Whitney, M.Ed., Missouri-Columbia. Asst. Prof.
 Carl G. Willis, Ed.D., Oklahoma State. Asst. Prof.
 Melchior Zelenak, Ph.D., Iowa. Asst. Prof.

DEGREE PROGRAMS

Graduate programs in Education are administered on a departmental basis with coordination at the divisional level. The departments provide programs which lead to a common set of degrees: Master of Education, Master of Arts, Educational Specialist, Doctor of Education, and Doctor of Philosophy. The following programs are available:

COUNSELING AND PERSONNEL SERVICES

Master of Arts or Master of Education

- Program IElementary School Counseling
- Program IISecondary School Counseling
- Program IIICollege Student Personnel Services
- Program IVEmployment Service Counseling
- Program VRehabilitation Counseling

Educational Specialist

- Program IGuidance & Counseling
- Program IICollege Student Personnel Services
- Program IIIEmployment Service Counseling
- Program IVRehabilitation Counseling

Doctor of Education or Doctor of Philosophy

- Program ICounseling Psychology
- Program IICollege Student Personnel Services

CURRICULUM AND INSTRUCTION

Master of Arts or Master of Education

- Program IElementary Education
- Program IIReading: Elementary
- Program IIISecondary Education
- Program IVReading: Secondary
- Program VInstructional Media



- Program VIMusic Education
- Program VIIArt Education
- Program VIIIScience Education
- Program IXMathematics Education
- Program XEnglish Education
- Program XISocial Studies Education

Educational Specialist

- Program IElementary Education
- Program IISecondary Education
- Program IIICurriculum & Instruction
- Program IVInstructional Media

Doctor of Education or Doctor of Philosophy

- Program IElementary Education
- Program IISecondary Education
- Program IIIScience Education
- Program IVMathematics Education
- Program VEnglish Education
- Program VISocial Studies Education

EDUCATIONAL ADMINISTRATION

Master of Arts or Master of Education

- Program IElementary School Administration & Supervision
- Program IISecondary School Administration & Supervision
- Program IIIGeneral School Administration & Supervision

Educational Specialist

- Program IElementary School Administration & Supervision
- Program IISecondary School Administration & Supervision
- Program IIIGeneral School Administration & Supervision

Doctor of Education or Doctor of Philosophy

- Program IElementary School Administration & Supervision
- Program IISecondary School Administration & Supervision
- Program IIIGeneral School Administration & Supervision

EDUCATIONAL PSYCHOLOGY

Master of Arts or Master of Education

- Program IEducational Psychology

Educational Specialist

- Program ISchool Psychology

Doctor of Education or Doctor of Philosophy

- Program IEducational Psychology
- Program IISchool Psychology

HEALTH AND PHYSICAL EDUCATION

Master of Arts or Master of Education

- Program ISecondary School Physical Education
- Program IIElementary School Physical Education
- Program IIIAdapted/Special Physical Education

Educational Specialist

- Program IElementary/Secondary School Physical Education Supervision

Doctor of Education or Doctor of Philosophy

- Program ICollege of Physical Education
- Program IIPhysical Education Administration/Supervision
- Program IIIHuman Performance/Motor Development and Learning

HIGHER AND ADULT EDUCATION

Master of Arts or Master of Education

- Program IAdult Education Teaching
- Program IIAdult Education Administration
- Program IIIHigher Education
- Program IVJunior College Education

Educational Specialist

- Program IAdult Education
- Program IIJunior College Teaching
- Program IIIHigher Education

Doctor of Education or Doctor of Philosophy

- Program IHigher Education

PRACTICAL ARTS AND VOCATIONAL-TECHNICAL EDUCATION

Master of Education

- Program IHome Economics Education
- Program IIAgricultural Education
- Program IIIIndustrial Arts Education
- Program IVBusiness and Office Education
- Program VDistributive Education
- Program VITrade and Technical Education
- Program VIISupervision & Administration of Occupational Education

Educational Specialist

- Program IHome Economics Education
- Program IIAgricultural Education
- Program IIIIndustrial Arts Education
- Program IVBusiness and Office Education
- Program VDistributive Education
- Program VITrade & Technical Education
- Program VIISupervision & Administration of Occupational Education

Doctor of Education or Doctor of Philosophy

- Program IHome Economics Education
- Program IIAgricultural Education
- Program IIIBusiness Education
- Program IVIndustrial & Technical Education
- Program VDistributive Education
- Program VIResearch in Occupational Education

SPECIAL EDUCATION

Master of Arts or Master of Education

- Program IMental Retardation
- Program IIEmotionally Disturbed
- Program IIIOrthopedically Handicapped
- Program IVLearning Disabilities

Educational Specialist

- Program IMental Retardation
- Program IIAdministration & Supervision of Special Education

Doctor of Education or Doctor of Philosophy

- Program IMental Retardation
- Program IIAdministration & Supervision of Special Education

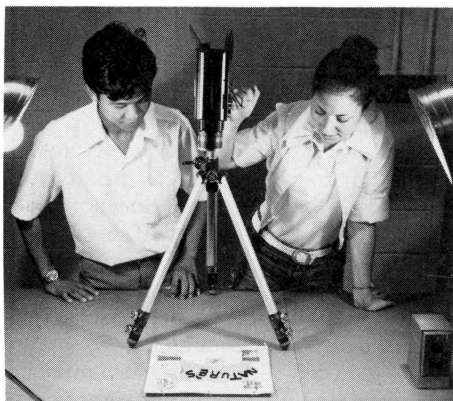
EDUCATION (SOCIAL AND PHILOSOPHICAL FOUNDATIONS)

Master of Arts or Master of Education

- Program IHistory of Education
- Program IIPhilosophy of Education

Doctor of Education or Doctor of Philosophy

- Program IHistory of Education
- Program IIPhilosophy of Education



ENTRANCE REQUIREMENTS

All graduate students in Education are required to take the standardized test or tests (Graduate Education Advisory Battery, Miller Analogies Test, Graduate Record Examination) designated by the department in which they are enrolled. The examination should be taken prior to the initial registration. If this is not possible, it must be taken during the first session of enrollment. To be accepted for advisement for the degree of Master of Education or Master of Arts, students must have been regularly admitted to the Graduate School and must have completed a minimum of 15 semester hours in courses in education or its equivalent in an accredited institution. An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on the basis of this record alone.

Prospective graduate students should make application to the Office of Admissions, 130 Jesse Hall, UMC, Columbia, Mo. 65201, at least 60 days prior to the initial enrollment. The student who fails to make application prior to this deadline may be admitted conditionally pending determination of qualifications.

To be accepted for advisement for the M.Ed. or the M.A. in Education, students must have advisers in their areas of specialization. They must also have acceptable scores on the required examinations. A student with an undergrad-

uate GPA of between 2.2 and 3.0 will be considered for advisement if other background information or circumstances indicate the likelihood of success in the graduate program. For a student with a GPA of between 2.2 and 2.5, the adviser may request a review of the student's credentials, including the graduate battery examinations, by a committee of three appointed by the Dean of the College of Education. The ultimate decision regarding admission to candidacy shall be by vote of the committee.

M.ED. DEGREE

Residence: The equivalent of two 16-week semesters, each devoted to advanced courses of study, is required for the M.Ed. degree. This requirement may be met in part by transfer of credit earned at an institution accredited to offer graduate work, or by correspondence offered by the University of Missouri. A maximum total of such work is 8 hours, with prior approval of a student's adviser and the Dean of the Graduate School. Graduate work from more than two campuses of the University will not be counted toward the M.Ed. degree. To provide an opportunity for a closer and less interrupted relationship between candidates and their advisers than is possible in summer sessions, it is strongly recommended that candidates for the Master's degree spend at least one full semester in residence.

Program of Study: Over and above the prerequisites, a program of study must include a minimum of 32 semester hours of approved graduate credit. A minimum of one-half of the program (16 hours) must consist of courses numbered 400 or above. At least 75 per cent of the courses in the student's graduate program, as well as in the graduate record, must be passed with a grade of *A* or *B*. The program must include not less than 16 hours of graduate courses in education. The program may consist entirely of courses in education, or may be made up, in part, of courses from other disciplines selected to fit the candidate's professional needs.

A thesis is not required, but the major adviser may require written reports of field work or special investigation.

The department may require a final comprehensive examination or its equivalent. The examination is approximately four hours in length, and is conducted under the direction of the major adviser. The examination encompasses the major areas of emphasis on the student's program of study. A student must be enrolled for at least "examination only" during the semester in which the comprehensive examination is taken.

M.A. DEGREE IN EDUCATION

Many of the regulations governing the degree of M.A. in Education are similar to those governing the degree of M.Ed., but there are differences. The M.A. degree is planned to emphasize research. Students should read carefully the regulations governing the degree of Master of Arts.

Prerequisites and admission requirements are the same as for the Master of Education. The choice of adviser is the same except that for the M.A., the candidate may have a major and a minor field, with advisers in both. The procedure for filing an application for the degree is the same as in the residence requirement.

The program of study for the M.A. in Education may include major and minor fields and must include a course in Statistics and one in Methods of Research. The program emphasizes courses dealing with research.

A thesis is required. See the general statement of requirements for a thesis for the Master's degree. A final examination is required and also follows the requisites for the M.A. degree as given elsewhere in this catalog.

ED.S. DEGREE

The Educational Specialist degree represents a program of organized and approved graduate work consisting of a minimum of 30 semester hours beyond the requirements for the Master's degree. It is anticipated that the program will be in

the same area of Education in which the Master's degree was taken. The program is one of specialization, and is built on the foundation represented by the Master's degree or comparable training.

A candidate for the degree completes an application to be approved by the adviser, the Dean of the College of Education, and the Dean of the Graduate School. The program is directed by an advisory committee appointed by the Dean of the Graduate School, with the major adviser acting as chairman of the committee.

The required 30-hour program must be completed within a period of eight years; the work may be taken in summer sessions. No more than 6 hours may be accepted in transfer from institutions accredited to offer post-master's degrees. Off-campus courses offered through UMC Extension may be included in the Ed.S. program, but such courses are not applicable to doctoral programs.

A candidate may be required to take a qualifying examination, as determined by the advisory committee. If required, the examination must be administered during the initial semester of enrollment and prior to the filing of the Application for Degree.

A final examination is required. The results are signed by a majority of the members of the advisory committee and submitted to the Graduate Dean.

ED.D. DEGREE

The degree of Doctor of Education (Ed.D.) is offered to students who have pursued advanced courses of study without serious interruption for a period of at least six semesters. Ed.D. candidates must have attained the degree of Master of Arts with a major in Education, or the degree of Master of Education, or the quantitative and qualitative equivalent of one of these degrees from a college or university of recognized standing. See Table of Contents for page numbers of the general regulations for this degree.

The program of study is determined by the major adviser in cooperation with a consulting committee appointed by the Dean of the Graduate School. The pro-

gram constitutes a well-organized plan of professional specialization in one of the major fields of education. A minimum of 82 semester hours of work above the Bachelor's degree is required for the Ed.D. degree. Continuity of effort must be obtained by at least two semesters beyond the Master's degree in which the registration has been 12 hours or more. During these semesters a student may not be employed for more than half-time teaching. With the approval of the major adviser and the Dean of the Graduate School, a maximum of two years of graduate work completed in other institutions with recognized graduate schools may be accepted toward the requirements. In any event, the candidate must be enrolled in residence on the UMC campus for a minimum of one year.

Non-resident Research: When the facilities or materials necessitate that work be done away from the UMC campus, a student, upon the recommendation of the adviser and the approval of the Graduate School, may regularly enroll for off-campus research. To enroll for non-resident research, a student must have already completed 32 semester hours of acceptable graduate work. Candidates for the Ed.D. may not register for more than 3 semester hours of non-resident work during a given semester; the total amount of non-resident research counted toward the Ed.D. degree is limited to 6 semester hours. The results of non-resident research should be included in a dissertation.

Apprentice Training: A candidate majoring in some aspect of education administration and supervision, or in a special field of teaching, who has not had acceptable experience in the field may be required (as part of the program studies) to work one semester as an apprentice. This apprentice work, supervised by the candidate's major adviser, is conducted in a school system approved by the College of Education faculty; not more than 12 hours credit (the equivalent of one semester) may be granted for such work. Only students who have completed a minimum of 12 hours beyond the M.A. or M.Ed. degree (or the equivalent) are eligible for apprentice training.

A matriculation examination must be taken no earlier than the second year of graduate work, and no later than October 15 preceding the May in which the candidate plans to complete the requirements

for the degree, or preceding December 15 if the requirements are to be completed in August. This examination is given only to students who have completed the requirement in statistics and research methodology mentioned below. The comprehensive examination includes the candidate's major fields of interest, and is conducted by the major adviser and consulting committee. The candidate will be advised to pursue further graduate study if results of the examination so indicate. Before admittance to the matriculation examination, the candidate must give satisfactory evidence of sufficient knowledge of statistics and educational research techniques to enable understanding and utilization of research reports in the field of education. To satisfy this requirement, the student shall have earned credit in courses in Educational Statistics II, and Methods of Educational Research. There are no foreign language requirements except as may be determined by the candidate's major adviser.

A dissertation is required, with no less than 8 hours credit granted; there is no maximum credit restriction, provided that more than 70 graduate hours of other approved courses are completed and granted toward the Ed.D. degree. The dissertation must be reviewed and approved by the candidate's consulting committee.

A final oral examination on work included in the dissertation is also required. This examination is conducted by the major adviser and the consulting committee.

PH.D. IN EDUCATION

The program for the degree of Doctor of Philosophy (Ph.D.) with a major in Education, a research degree, is based on work for the degree of Master of Arts with a major in Education or the equivalent.

The dissertation (offered in partial fulfillment of the requirements) must give evidence of satisfactory control of the technical instruments and research procedures in the field of education. Candidates for the Ph.D. in Education must

demonstrate competence in a research foundations area by earning credit with grades of *B* or better in the following courses (or their equivalents): Educational Statistics I, Educational Statistics II, Computer Application of Educational Research, and Methods of Educational Research. Exceptions to one or more of the research foundation courses (for specific applications) must be approved by the College of Education Policy Committee.

Languages and/or language substitutes are not required for the Ph.D. in Education. When these items are not elected, the College of Education requires a research support area; competence must be demonstrated in a designated area of study in UMC departments or academic areas other than Education by:

1. offering a minimum of 12 hours of credit with a grade point average of 3.0 or better in courses approved by the student's advisory committee, or
2. examination by the department offering the support area.

The research support area shall be formulated as complementary to research in the major area of specialization. The research support area shall:

1. provide a command of a specialized research technique, or
2. be relevant to theoretical concepts that will provide added depth and structure to research in the area of specialization.

Electrical Engineering

Earl J. Charlson, Ph.D., Carnegie-Mellon. Acting Chairman; Director of Graduate Studies; Prof.
 Gayle E. Adams, Ph.D., Wisconsin. Prof.
 Carmelo Calabrese, Ph.D., Missouri-Columbia. Prof.
 Robert L. Carter, Ph.D., Duke. Prof.
 David H. S. Cheng, Ph.D., Missouri-Columbia. Prof.
 Samuel Dwyer III, Ph.D., Texas. Director, Bio-engineering; Prof.
 Cyrus O. Harbourt, Ph.D., Syracuse. Prof.
 Charles A. Harlow, Ph.D., Texas. Prof.
 Richard G. Hoft, Ph.D., Iowa State. Prof.
 Gladwyn V. Lago, Ph.D., Purdue. Prof.
 John F. Lamb, Sc.D., Michigan. Prof. Emeritus
 Friedrich W. Leonhard, Dr. rer. nat., University of Tubingen. Prof.
 Byron W. Sherman, Ph.D., Missouri-Columbia. Prof.

Charles R. Slivinsky, Ph.D., Arizona. Prof.
 James R. Tudor, Ph.D., Illinois Institute of Technology. Prof.
 Rex A. Waid, Ph.D., Wisconsin. Undergraduate Program Director; Prof.
 Donald L. Waidelich, Ph.D., Iowa State. Prof.
 Clifford M. Wallis, Sc.D., Harvard. Prof. Emeritus
 Arthur J. Carlson, Ph.D., Iowa. Assoc. Prof.
 Robert G. Combs, Ph.D., Florida. Assoc. Prof.
 Huber L. Graham, Ph.D., Massachusetts Institute of Technology. Assoc. Prof.
 Robert W. McLaren, Ph.D., Purdue. Assoc. Prof.
 James E. Rathke, Ph.D., Kansas. Assoc. Prof.
 Lewis N. Walker, Ph.D., Missouri-Columbia. Assoc. Prof.
 Michael J. Devaney, Ph.D., Missouri-Columbia. Asst. Prof.
 Robert W. Leavene, Ph.D., Missouri-Columbia. Asst. Prof.
 Edward J. Vredenburg, M.S., Missouri-Columbia. Asst. Prof.

The Electrical Engineering Department offers degree programs leading to a Master of Science and to the Doctor of Philosophy.

Graduate study, designed to prepare students for research and advanced design work in industry and for university research and teaching, provides opportunities for theoretical study and for experimental work in several major areas. Areas of study include artificial intelligence, automatic control, antennas and wave propagation, energy systems and resources, bioengineering, solid state, network theory, information systems, integrated circuits and systems, advanced automation and digital and hybrid computer systems.

To supplement classroom work, laboratories are well equipped with modern test and measuring equipment necessary for advanced design and research. Access to an IBM 370/168 at the campus computer center is available through a terminal located in the Electrical Engineering Building. PDP 11's, also located in the Electrical Engineering Building, are available for special research programs. There are library facilities in the Engineering Library and in Ellis Library.

Fellowships, scholarships, and teaching and research assistantships are available to qualified students. Applications should be submitted by March 1, each year. Additional information including

applications for financial support can be obtained from the Director, Electrical Engineering Graduate Program, Electrical Engineering Department.

MASTER'S DEGREE

Acceptance for advisement in Electrical Engineering is based on a 2.75 or higher GPA in all undergraduate work ($A=4$). Preferably, the student should have a B.S. in Electrical Engineering or other science-based curriculum. Consideration is given to grade trends, performance in the student's major area, class rank, experience, and other criteria bearing on probable success in graduate study. A student should also have taken the verbal, quantitative, and advanced engineering sections of the GRE.

To fulfill the requirements for the M.S. degree, a candidate must complete 30 hours, including at least 15 hours of 400-level courses. It is recommended that all students take 3 hours of Electrical Engineering 400, Problems, with no more than 6 hours being accepted for credit. A grade average of *B* or better is required by the Department in all course work.

DOCTORAL DEGREE

Before applying for admission to candidacy, a student must be accepted for advisement in Electrical Engineering by showing superior performance on the verbal, quantitative, and advanced engineering parts of the GRE and by having a 3.0 or higher GPA in all previous graduate course work ($A=4$). Consideration is given to grade trends, experience, maturity, and other criteria bearing on the student's probable success in the program.

To be accepted as a candidate, the student must complete the equivalent of an M.S. in Electrical Engineering and demonstrate competency by a written and/or oral qualifying examination conducted by an advisory committee.

The Advisory Committee sets the total hours; generally about 60 hours of courses beyond the B.S. are required. Research work for and the writing of the doctoral

dissertation generally takes about one full year of work.

The candidate must pass a written comprehensive examination in Electrical Engineering, and must complete a doctoral dissertation on a topic approved by the committee and defend it in an oral, final examination.

English

John R. Roberts, Ph.D., Illinois. Chairman; Prof.
Thomas D. Cooke, Ph.D., Pittsburgh. Director of Graduate Studies; Assoc. Prof.
Donald Anderson, Ph.D., Duke. Prof.
Lloyd E. Berry, Ph.D., Cambridge University. Prof.
J. Donald Crowley, Ph.D., Ohio State. Prof.
W. C. Daniel, Ph.D., Bowling Green State. Prof.
Leon T. Dickinson, Ph.D., Chicago. Prof.
Howard W. Fulweiler, Ph.D., North Carolina. Prof.
Milton McC. Gatch, Ph.D., Yale. Prof.
Richard A. Hocks, Ph.D., North Carolina. Prof.
James V. Holleran, Ph.D., Louisiana State. Prof.
William V. Holtz, Ph.D., Michigan. Prof.
Charles M. Hudson, Ph.D., Yale. Prof. Emeritus
Willoughby Johnson, M.A., Vanderbilt. Prof. Emeritus
William M. Jones, Ph.D., Northwestern. Prof.
James T. McAfee, M.A., Missouri-Columbia. Prof.
George B. Pace, Ph.D., Virginia. Prof.
William M. Peden, Ph.D., Virginia. Prof.
Edward H. Weatherly, Ph.D., Yale. Prof. Emeritus
J. Robert Barth, S.J., Ph.D. Harvard. Assoc. Prof.
Robert M. Bender, Ph.D., Michigan. Assoc. Prof.
Albert J. Devlin, Ph.D., Kansas. Assoc. Prof.
Howard H. Hinkel, Ph.D., Tulane. Assoc. Prof.
Charles H. Hinnant, Ph.D., Columbia University. Assoc. Prof.
Mary M. Lago, Ph.D., Missouri-Columbia. Assoc. Prof.
Donald M. Lance, Ph.D., Texas. Assoc. Prof.
Timothy Materer, Ph.D., Stanford. Assoc. Prof.
Ben F. Nelms, Ph.D., Iowa. Assoc. Prof.
M. Gilbert Porter, Ph.D., Oregon. Assoc. Prof.
Norma Jean Fisk, Ph.D., Texas. Asst. Prof.
Daniel L. Greenblatt, Ph.D., Michigan. Asst. Prof.
Winifred B. Horner, Ph.D., Michigan. Asst. Prof.
Larry P. Levis, Ph.D., Iowa. Asst. Prof.
Russell J. Meyer, Ph.D., Minnesota. Asst. Prof.
Speer Morgan, Ph.D., Stanford. Asst. Prof.
Catherine N. Parke, Ph.D., Stanford. Asst. Prof.
John W. Roberts, Ph.D. Ohio State. Asst. Prof.
Robert Sattelmeyer, Ph.D., New Mexico. Asst. Prof.

The Department of English offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. Normally, the Master's degree is completed in one calendar year and the Ph.D. within four or five years of full-time study beyond the baccalaureate degree. This does not imply that a candidate must

be enrolled full time during the entire duration of doctoral work.

Low grades or a pattern of incomplete and delayed work causes a candidacy to be terminated. The lowest passing grade for graduate work is *B*. Consistent *B* or near-*B* work is not interpreted as satisfactory evidence of Ph.D. ability, and the student with such a record is not encouraged to pursue work beyond the M.A. level. No grade of *C* is counted for credit toward the M.A. or the Ph.D. degree. If a candidate for either degree receives three grades of *C* or *F*, from at least two different instructors, the Department will not continue the candidacy.

MASTER'S DEGREE

An M.A. candidate should have:

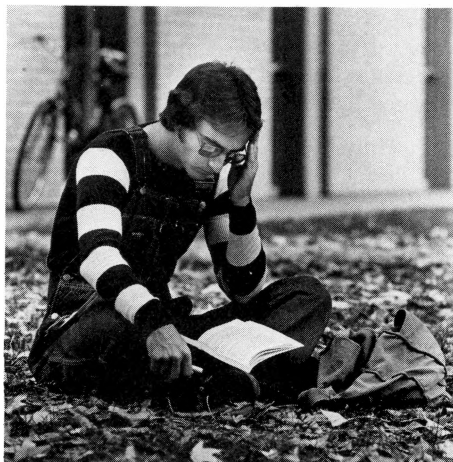
1. a baccalaureate degree in English with a distribution of courses comparable to that required at UMC, that is, a minimum of 32 hours, including at least 18 hours in the fields of advanced writing, linguistics and medieval, renaissance, seventeenth-century, eighteenth-century, nineteenth-century, twentieth-century, and American literature, and at least 8 hours in such related fields as classics, European history, philosophy, and art history.

2. an undergraduate GPA of at least *B* (3.0 on 4.0 scale), with a record in English higher than this minimum.

A student whose undergraduate major is not in English, or not comparable to that offered by UMC, may be required, as a condition of acceptance, to take more than the normal course load for the M.A., as determined by the Admissions Committee.

There are three plans by which a student may earn the M.A. degree. *Plan A* requires a student to take 30 or more hours of course work, of which at least 15 hours must be in courses numbered 401 or higher. At least one course must be taken in six of the seven fields:

- (1) linguistics and medieval literature (319, *The Structure of American English*, or a comparable course, being required unless already taken); (2) the Renaissance; (3) the seventeenth century; (4) the eighteenth century; (5) the nineteenth century; (6) American literature; and (7) criticism and the twentieth century.



The program may not include more than 6 hours in writing courses or in courses outside the Department in fields related to English literature. All courses for the M.A. degree should be taken in residence at UMC.

When at least 24 hours of work have been or are being completed, a student must pass a final written examination composed of two parts:

- A. 1-hour essays on two questions relating to two of the seven literary periods listed above. A student writes on two questions chosen from seven provided at the time of the examination;

- B. a 1-hour critical essay on an unannounced work, such as a lyric poem, which is provided at the time of the examination.

A student must give written notice to the Director of Graduate Studies at least one month before the desired date of the final examination, which is normally given in November, April, and July of each year. A student is not allowed to take the examination more than twice.

Designed primarily as a degree for teachers of English in secondary schools and junior colleges, *Plan B* requires a student to take 30 hours of course work, of which at least 15 hours must be in courses numbered 401 or higher. The total program is composed of:

- A. 12 hours in seminars designed particularly for teachers of English: 404, *Rhetorical Theory and the Teaching of English*; 416, *Critical Approaches to Literature*; 417, *Studies*

in the English Language; and D410, Seminar in Secondary Education;

B. 12 hours consisting of one course in four of the following seven fields: medieval (exclusive of linguistics), the Renaissance, the seventeenth century, the eighteenth century, and the nineteenth century, American literature, and the twentieth century (exclusive of courses in criticism);

C. 6 hours in additional courses in English or in fields related to the teaching of English, such as art history, classical languages, education, history, journalism, library science, linguistics, music, philosophy, sociology, and speech.

Students must have completed or be completing at least 24 hours of work before taking the final examination composed of two parts:

1. a 1-hour critical essay on an unannounced work, such as a lyric poem, which is provided at the time of the examination; and
2. two 1-hour essays on two of four offered topics treated in the four required seminars.

Plan C, the M.A. in English and Creative Writing, first requires submission of a sample of creative work (approximately 20 pages of poetry, 30 pages of fiction, or a one-act play). If admitted to the program, a student then takes 30 hours of course work, including 12 hours in creative writing, and in language and literature either 18 hours, or 15 hours with a 3-hour elective in a related area outside the department, with consent of the advisory committee. The 12 hours in creative writing must consist of 6 hours in 300-level courses and 6 hours in 400-level courses. Of the 15 hours in language and literature, a student must take at least 9 hours of courses numbered 401 or higher, and at least one course in five of the seven fields listed under *Plan A*.

Each student completes a substantial body of work (approximately 70 pages of fiction or drama, or 40 of poetry or some reasonable combination) of professional quality, which must be approved by the advisory committee in the final semester. A student must also pass the final examination composed of a 1½-hour critical essay on an announced work, such as a lyric poem, which is provided at the time of the examination.

A thesis, counting as 6 hours of the student's M.A. program, may be written on a topic approved by the adviser and the department.

DOCTORAL DEGREE

A Ph.D. candidate must hold an M.A. degree in English, or have completed at least 30 hours of graduate work in the field. Transcripts for all college work, three letters of recommendation, results of the Graduate Record Examination (both Aptitude Test and Advanced Test in Literature), and a substantial sample of written work (such as term papers) must be submitted for admission. Only those applicants who evidence a clear likelihood of successful doctoral work are admitted. Before registering for courses, the student must confer with the Director of Graduate Studies who acts as adviser until a regular adviser is assigned.

For candidacy acceptance, the Advisory Committee, appointed by the Director of Graduate Studies, must certify the student and approve the course of study. In addition, the student is required to meet with the Advisory Committee for a qualifying examination during the first semester of Ph.D. course work.

A student remains a candidate in good standing so long as work reflects good progress toward the degree. Progress is evaluated on the basis of written reports submitted by each of the candidate's professors at the end of each semester. These reports serve as an opportunity for the adviser to note strengths and weaknesses in the student's work and are ordinarily used to help the student and adviser determine future work in the program. However, should these reports and the student's grades indicate that the work falls below the quality expected of a Ph.D. candidate, the adviser, after consultation with the Advisory Committee, may recommend that the student's candidacy be terminated. The procedure applies to all students applying for candidacy after January, 1975.

The Ph.D. candidate must take approximately 64 hours of graduate work beyond the B.A., of which half should be at the 400 level. (Credit granted for English 490 is excluded from this total; and a maximum of 3 hours can be granted for English 400 only after written permission is obtained from the Graduate Studies Committee). Excluding research hours, a minimum of 24 hours of course work beyond the M.A. must be completed in residence at the Columbia campus, must be in English, and are usually the last hours taken. At least one course of graduate work must be taken in each of the seven fields:

1. linguistics and/or medieval literature
2. the Renaissance
3. seventeenth century
4. eighteenth century
5. nineteenth century
6. American literature
7. criticism and the twentieth century

In addition, the candidate must have had or will be required to take:

1. a course in structure of the English language (319, 417, or an equivalent course elsewhere);
2. a course in the historical aspects of the English language (320, 418, or an equivalent course elsewhere);
3. a course in bibliography and methods of research (401 or its equivalent elsewhere).

A candidate is urged to take at least one, but not more than two, of the doctoral seminars numbered 499 A-I, and 9 hours of course work outside the Department in a field or fields related to the program of study.

The foreign language requirement is satisfied in either of two ways:

1. A student may demonstrate knowledge of one foreign language and its literature at the fourth-year level by passing with a grade of *B* two upperclass literature courses in the language chosen, or by passing a high-level proficiency test agreed upon by the language department concerned and the English Department. Upper-class courses in a foreign language used to fulfill the language requirement may not count toward fulfilling requirements in a related area of the degree program. French, German, or Latin is automatically accepted; another language may be substituted with the Advisory Committee's consent; or

2. a student may pass ETS examinations in two foreign languages (French, German, or others approved by the Advisory Committee).

All language requirements must be satisfactorily completed before the candidate is eligible to take the comprehensive examination; consequently, students are urged to do so early in their programs.

At least seven months before taking the final oral examination, the candidate must pass the comprehensive examination, consisting of two 4-hour examinations in one of the seven fields. Upon satisfactory completion of the written part, the student is given an oral examination of approximately 2 hours duration by the examining committee.

The dissertation and the final oral examination on the dissertation and its field complete the requirements for the Ph.D. in English.

Entomology

- Mahlon L. Fairchild, Ph.D., Iowa State. Chairman; Prof.
- William H. Kearby, Ph.D., Wisconsin. Director of Graduate Studies; Prof.
- G. Michael Chippendale, Ph.D., Wisconsin. Prof.
- Wilfred S. Craig, Ph.D., Iowa State. Prof.
- Wilbur R. Enns, Ph.D., Kansas. Prof.
- Carlo M. Ignoffo, Ph.D., Minnesota. Prof.
- A. Lee Jenkins, M.S., Colorado State. Prof. Emeritus
- Armon J. Keaster, Ph.D., Missouri-Columbia. Prof.
- Charles O. Knowles, Ph.D., Wisconsin. Prof.
- Curtis W. R. Wingo, Ph.D., Iowa State. Prof.
- Thomas R. Yonke, Ph.D., Wisconsin. Prof.
- James L. Huggans, Ph.D., Iowa State. Assoc. Prof.
- Ralph E. Munson, Ph.D., Iowa State. Assoc. Prof.
- George W. Thomas, M.A., Missouri-Columbia. Assoc. Prof.
- Keith Harrendorf, M.S., Arkansas. Asst. Prof.
- Flernoy G. Jones, Ph.D., Mississippi State. Asst. Prof.
- Reed L. Kirkland, Ph.D., California-Riverside. Asst. Prof.

The Department of Entomology offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees. A student can select training from a wide range of courses and research programs to fit the needs for a career in any of the many areas of professional entomology, including research, teaching, industry, and extension work. Current research programs in the department emphasize

the following areas: biological and chemical control, ecology, forest entomology, host-plant relations, insecticidal residues, medical and veterinary entomology, morphology, nutrition, physiology and biochemistry, systematics, acarology, and toxicology. The Department includes eight major research laboratories totalling 7,000 square feet, as well as preparation rooms, classrooms, and teaching laboratory facilities. The research laboratories are equipped with a wide range of instruments and environmental growth chambers for advanced study. The Department also has access to the Experiment Station electron microscopes, chemical, and spectroscopic laboratories. Occupying 2,000 square feet, the entomology research museum provides many opportunities for research in systematic entomology; the collection, including insects, spiders, and mites, is the largest in the state.

Excellent library facilities on campus include Ellis Library, and up-to-date medical and veterinary branch libraries. The computing center and nuclear reactor also offer facilities for more specialized research.

Field research scientists are well served by a bank of new greenhouses on campus and the 40-acre entomology farm located near Columbia. Eight other Experiment Station farms provide many opportunities for studying the various insect problems which exist throughout the state. For those interested in ecology, the state offers a large acreage of natural wildlife reserves, including Tucker Prairie and Ashland Arboretum, both within 25 miles of Columbia.

The Department also conducts cooperative research projects with the USDA Biological Control of Insects Research Laboratory and the USDI Fish Pesticide Research Laboratory, both located in Columbia.

Research assistantships are currently available to qualified students. The annual stipend is \$4,620 for students with the B.S. degree and \$5,200 for those with the M.S. degree. In addition, several scholarship

awards are given annually. For further information write to the Chairman or a specific staff member, Department of Entomology, 1-87 Agriculture Building.

MASTER'S DEGREE

A screening committee determines admission to the Department. The applicant must submit official transcripts from all colleges attended, two letters of recommendation from professors, and a letter of intent. The degree program is arranged in a committee with the adviser and two other entomology department faculty members. To fulfill the degree requirements a candidate must (1) meet all Graduate School requirements, (2) prepare a thesis, though some exceptions are made, and (3) complete a final oral examination.

DOCTORAL DEGREE

For admission to the department the same policy holds as for the M.S. applicant. The flexible Ph.D. program is also arranged by the student's Advisory Committee. Special emphasis is placed on developing the student's research aptitude. Although a qualifying examination is required for all transfer students, the final one for the M.S. degree may serve in lieu of this examination for those students who continue in the department's graduate program. The language requirement can be met by appropriate credit in one language or one collateral field. A written and oral comprehensive examination, a dissertation, and a final oral examination are required.

Extension Education

John G. Gross, Ph.D., Nebraska. Chairman;
Director of Graduate Studies; Assoc. Prof.
Delmar Hatesohl, Ph.D., Oklahoma State. Prof.
Richard L. Lee, Ph.D., Iowa. Prof.
Randel K. Price, Ph.D., Wisconsin. Prof.
John L. Mowrer, Ph.D., Missouri-Columbia. Asst.
Prof.

The Department of Extension Education provides graduate work leading to the Master of Science degree.

The program is designed for students whose interests lie in the fields of exten-

sion and/or informal adult education. Course work includes program development, evaluation, adult learning, educational methods, organization and administration.

The department, cooperating closely with related areas of study, encourages degree candidates to select a minor or at least an area of concentration from such departments as Regional and Community Affairs, Sociology, Recreation and Park Administration, and in related courses in Education. Appropriate emphasis is given to research and its relationship to the extension function of a university.

The department provides access to numerous non-cataloged extension and adult education materials prepared by state and national organizations.

Staff members hold joint appointments in the Department and in the UMC Extension Division. This arrangement gives students access to field training and other opportunities for direct experience and education in the programs of the Extension Division.

Admission is limited to those students having a baccalaureate degree and a minimum of two years extension or related informal teaching experience.

In addition, an applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted on the basis of this record alone. However, acceptable performance on the GRE required by the Graduate School may qualify a student where the undergraduate grade point is questionable. Consideration is given to grade trends, performance in the major area of study, experience, and maturity.

The M.S. program, requiring a minimum of 32 semester hours of course work, with at least 16 hours at the 400 level, is selected in consultation with an assigned adviser.

A thesis is not required, but each candidate must complete a Special Problem Research report, carrying a maximum of 4 credit hours.

Family and Community Medicine

- Jack M. Colwill, M.D., Rochester. Chairman; Prof.
William C. Allen, M.D., Nebraska. Prof.
A. Sherwood Baker, M.D., Illinois. Prof.
Donald Blenden, D.V.M., M.S., Missouri-Columbia. Prof.
Herbert R. Domke, Dr.P.H., Harvard. Prof.
Margaret Flynn, Ph.D., Missouri-Columbia. Prof.
Daryl Hobbs, Ph.D., Iowa State. Prof.
Maw Lin Lee, Ph.D., Wisconsin. Prof.
Carl J. Marienfeld, M.D., Illinois. Prof.
Hans O. Mauksch, Ph.D., Chicago. Prof.
Charles Middleton, D.V.M., M.S., Missouri-Columbia. Prof.
Arthur Rikli, M.D., Illinois. Prof.
James M. A. Weiss, M.D., Minnesota. Prof.
William D. Bradshaw, M.D., Kansas. Assoc. Prof.
C. Richard Dorn, M.P.H., Ohio State. Assoc. Prof.
Derek G. Gill, Ph.D., University of Aberdeen. Director, Behavioral Sciences Section; Assoc. Prof.
Richard Hessler, Ph.D., Pittsburgh. Assoc. Prof.
Michael Hosokawa, Ed.D., Oregon. Director, Community Health Education Section; Assoc. Prof.
James A. Irvin, Ph.D., Missouri-Columbia. Assoc. Prof.
James O. Pierce, Sc.D., Cincinnati. Assoc. Prof.
Georgia Nolph, M.D., Woman's Medical College of Pennsylvania. Assoc. Prof.
Jerry A. Royer, M.D., Indiana. Assoc. Prof.
Lloyd A. Selby, D.V.M., Dr.P.H., Colorado State. Assoc. Prof.
Warren A. Thompson, Ph.D., Missouri-Columbia. Assoc. Prof.
Andrew C. Twaddle, Ph.D., Brown. Assoc. Prof.
D. Thomas Vernon, Ph.D., Chicago. Assoc. Prof.
Edward E. Brent, Ph.D., Minnesota. Asst. Prof.
Robert Chester, M.S.W., M.S.P.H., Boston. Director of Social Services; Asst. Prof.
Alan Cowles, M.D., Ph.D., Rochester. Asst. Prof.
John K. Glenn, Ph.D., Missouri-Columbia. Asst. Prof.
Roger Hofmeister, M.D., M.S.P.H., Illinois. Asst. Prof.
William E. Johnson, M.S.P.H., Missouri-Columbia. Asst. Prof.
William Lower, Ph.D., California-Berkeley. Asst. Prof.
Carol Panicucci, R.N., Ph.D., Wisconsin. Asst. Prof.
George Poehlman, M.D., Missouri-Columbia. Asst. Prof.
Philip F. Rust, Ph.D., California-Berkeley. Asst. Prof.
Jerry Sappington, M.S.P.H., North Carolina. Asst. Prof.
Herbert I. Sauer, M.S.P.H., Missouri-Columbia. Asst. Prof.
James Watson, M.S., Stanford. Asst. Prof.
Mary G. Williams, M.S.W., Missouri-Columbia. Asst. Prof.
Harley Wright, M.S.P.H., Missouri-Columbia. Asst. Prof.

A program leading to a Master of Science in Public Health (M.S.P.H.) degree is

administered by the Department of Family and Community Medicine. The educational objective of this interdisciplinary program is to provide students an opportunity to acquire the background, knowledge, attitudes, values, and skills in one of several areas of Community Health that are essential for positions of quality service and leadership in community health facilities and organizations.

Teaching and research facilities of the department are located on the fifth floor of the Medical Sciences Building. In addition, the academic resources of the entire University are used, and the state of Missouri is the field laboratory for this community health training program.

Program

The Master's program in community health, a 32-hour program of graduate credit leading to the Master of Science in Public Health (M.S.P.H.) degree, includes a combination of research and/or field experience. Original research leading to a formal thesis is required in some elective areas. Various course requirements are designed to cover the specialized content necessary for professional practice in particular areas of public health. A minimum of 9 to 11 months of full-time enrollment should be anticipated by the student.

The degree requirements are those established by the Graduate School, the Department of Family and Community Medicine, and the elective areas of concentration. At present, the elective areas of concentration include Community Health Education, Environmental Sciences, Epidemiology, and Public Health.

Admission

To qualify for admission, an applicant must present: (1) a prior doctoral degree from an approved school, or (2) a bachelor's degree, having maintained a 3.0 grade point average ($A=4$) in the final two years of academic work. Those submitting bachelor's degrees must also take the Graduate Record Examination. The

qualified applicant must also submit three letters of recommendation.

SECTION OF COMMUNITY HEALTH

The Section of Community Health includes the departmental programs in environmental sciences, epidemiology, and the programs of individualized study in public health. Each of the areas of concentration has specific requirements and opportunities as follows:

Environmental Sciences

Both the general and area degree programs for the M.S.P.H. with emphasis on environmental sciences require meeting departmental requirements. In addition, area program candidates must fulfill such requirements as the directors of the area degree program might specify. For either program, the number of hours required for attaining the degree vary according to the previous background of the student. Individuals who have demonstrated (generally on the basis of experience) competence in some aspect of environmental science are not required to complete redundant field training or academic course work. Students without previous experience are required to demonstrate both academic and practical competence before completing the degree. Details of this program are individualized according to the student's needs.

Epidemiology

The epidemiology program emphasizes the study of differences of disease frequency between and within populations and the causes for such differences. A major paper based on original research or re-analysis of existing data is required. Students work closely with faculty in such areas as hospital epidemiology, studies of Missouri mortality and morbidity, and epidemic investigations. Only a limited number of students are accepted, with preference given to those who have (or will have) another professional degree in the health field (e.g., D.D.S., D.D., D.V.M., M.D., R.N.). Students without

professional health degrees should plan on a curriculum that includes at least one year, plus one semester.

Public Health

The M.S.P.H. degree with concentration in Public Health is a general degree of the department; it is available to candidates with professional degrees in another discipline (not necessarily health-related) who wish to become involved in some aspect of public health not specifically covered by the other areas of concentration within the department. The degree program is planned on an individual basis, considering the candidate's career goals, prior professional preparation, and experience. An advisory committee is assigned, based on professional interests compatible with the candidate's interests and goals.

For additional information concerning these degree programs, write the Director, Section of Community Health, Department of Family and Community Medicine, UMC Medical Center, Columbia, Mo. 65201.

SECTION OF COMMUNITY HEALTH EDUCATION

Preparation to become a professionally qualified community health educator is offered as an area of concentration with the M.S.P.H. degree program. This training includes the attainment of special skills to understand the factors which influence health-related behavior and how such understanding is applied to modify health practices.

In addition to M.S.P.H. degree admission requirements, preparation on the bachelor's level or above in one of the sciences or social sciences is preferred for those interested in entering the health education program. However, study in such areas as education, social work, and journalism will be considered. Experience at the community level in working with people toward the solution of health or other social problems is also preferred. Applicants without such experience may be required to undertake an additional

semester of field experience and course work.

There are no language, thesis, or other collateral requirements. The course of study consists of 35 hours of graduate credit, including field experience consisting of the equivalent of one day per week of concurrent field work during the winter semester and a 12-week block of full-time field experience during the summer. All field experience is supervised, either by the health education faculty or practitioners approved by the faculty.

The Community Health Education program is accredited by the American Public Health Association.

Finance

Lewis Davids, Ph.D., New York University. Chairman; Prof.

The Departments of Finance, Marketing, and Management in the School of Business jointly offer the Master of Business Administration and the Doctor of Philosophy in Business Administration interdisciplinary degrees. Program information and requirements are given under the area heading "Business Administration" in this catalog.

Food Science and Nutrition

H. Donald Naumann, Ph.D., Missouri-Columbia. Chairman; Prof.

Harold B. Hedrick, Ph.D., Missouri-Columbia. Director of Graduate Studies; Prof.

Milton E. Bailey, Ph.D., Louisiana State. Prof.

Ruth E. Baldwin, Ph.D., Wisconsin. Prof.

Harold J. Bassett, Ph.D., Wisconsin. Prof.

Owen J. Cotterill, Ph.D., Ohio State. Prof.

J. E. Edmondson, Ph.D., Iowa State. Prof.

Marion L. Fields, Ph.D., Purdue. Prof.

Robert T. Marshall, Ph.D., Missouri-Columbia. Prof.

William C. Stringer, Ph.D., Missouri-Columbia. Prof.

Robert F. Lukowski, Ed.D., Massachusetts. Assoc. Prof.

Nan Unklesbay, Ph.D., Wisconsin. Asst. Prof.

Graduate work in the Department is designed to develop students for research or advanced professional careers in the food industry—the largest industry in the world. Selected careers include teach-

ing and research at the college level, research for private industry or the federal government, food plant supervision, technical operation, quality control, product development, distribution, sales, food service, public lodging, and regulatory work.

Departmental cooperation with the food industry is excellent in both on- and off-campus programs. Special facilities for food science study and research include:

1. chemical and microbiological laboratories equipped with the latest basic and analytical equipment; and
2. pilot plants to study heat processing, concentrating, dehydration, and freezing of meats, milk products, egg products, fruits and vegetables.

Teaching and research assistantships are available to qualified students from funds provided by the Agricultural Experiment Station, research contracts, and/or grants. Fellowships supported by industry and professional societies, based on national competition, are also available. Submit applications for assistantships and/or fellowships to the Department of Food Science and Nutrition, 1-74 Agriculture Building, by January 1 of each year. Additional information pertaining to courses of study, assistantships, or other material can be obtained from the Department Chairman.

MASTER'S DEGREE

The Master's degree is primarily designed for individuals who are interested in specializing in areas of food science, food service, or food distribution. The individual program is built around a core of courses in Food Science, with supporting courses from the disciplines of chemistry, microbiology, physiology, economics, marketing, management, and statistics.

Admission requires a B.S. or A.B. degree and an undergraduate record which indicates promise for successful completion of graduate studies. Departmental selection of students is based on consideration of grade trends, performance in major area of study, and other criteria.

To satisfy degree requirements, a candidate must:

1. complete the program of study as proposed by the advisory committee and student;
2. pass a comprehensive written and/or oral examination covering the program;
3. prepare a thesis or, if a non-thesis option is chosen, prepare a research paper in the format required for submission to a reference journal; and
4. pass a final oral examination over course work and research problem.

The thesis or research paper is reviewed by each member of the final examining committee.

DOCTORAL DEGREE

Requiring at least two years beyond the Master's, the Doctor of Philosophy prepares students for teaching, research, or other professional careers in food science, food service, or food distribution.

A student must have satisfactorily completed a Master's degree program (or its equivalent). Acceptance is based on:

1. satisfactory completion of the Master's degree program or its equivalent with a GPA equal to or higher than that required by the Graduate School;
2. satisfactory completion of the written and/or oral qualifying examination;
3. evidence of satisfactory performance in the major area of study, inclusive of grade trends; and
4. compliance with other Graduate School requirements for formal admittance to candidacy for the Ph.D.

The study program planning, under the guidance of an advisory committee, consists of:

1. a course of study designed to fit the individual student's academic background and objectives, and consisting of approximately one-third research credit (the remainder of courses to be selected from Food Science and other supporting areas of chemistry, microbiology, physiology, economics, marketing, management, and statistics);
2. acceptance of the completed Master's degree program;
3. approval of a language, collateral field, or research technique; and
4. acceptance of a dissertation topic as proposed and defended by the student.

To satisfy degree requirements, a candidate must complete the program of study; pass the comprehensive examination over the approved course of study; propose and defend a research project; and present an acceptable dissertation and defend it in a final examination.

Forestry, Fisheries and Wildlife

Donald P. Duncan, Ph.D., Minnesota. Director; Prof.

FORESTRY

Richard C. Smith, D.F., Duke. Director of Graduate Studies; Prof.

Gene S. Cox, Ph.D., Duke. Prof.

E. Allen McGinnes, Ph.D., New York State College of Forestry. Prof.

Andrew J. Nash, Ph.D., New York State College of Forestry. Prof.

Hardeep S. Bhullar, Ph.D., Georgia. Assoc. Prof.

Merton F. Brown, Jr., Ph.D., Iowa. Assoc. Prof.

Alan R. Everson, Ph.D., Texas A & M. Assoc. Prof.

Harold E. Garrett, Ph.D., Missouri-Columbia. Assoc. Prof.

Thomas M. Hinckley, Ph.D., University of Washington. Assoc. Prof.

William H. Kearby, Ph.D., Wisconsin. Assoc. Prof.

William B. Kurtz, Ph.D., Arizona. Assoc. Prof.

J. Milford Nichols, M.S., Missouri-Columbia. Assoc. Prof.

James P. Pastoret, M.W.T., Michigan. Assoc. Prof.

Lee K. Paulsell, M.S., Missouri-Columbia. Assoc. Prof.

R. Brooks Polk, M.F., Montana. Assoc. Prof.

Carl D. Settergren, Ph.D., Colorado State. Assoc. Prof.

David R. DeYoe, Ph.D., Missouri-Columbia. Asst. Prof.

FISHERIES AND WILDLIFE

Arthur Witt, Jr., Ph.D., Missouri-Columbia. Director of Graduate Studies; Prof.

Thomas S. Baskett, Ph.D., Iowa State. Prof.

Robert S. Campbell, Ph.D., Michigan. Prof.

William H. Elder, Ph.D., Wisconsin. Prof.

Richard O. Anderson, Ph.D., Michigan State. Assoc. Prof.

Leigh Fredrickson, Ph.D., Iowa State. Assoc. Prof.

John R. Jones, Ph.D., Iowa State. Asst. Prof.

James B. Reynolds, Ph.D., Iowa State. Asst. Prof.

Fred B. Samson, Ph.D., Utah State. Asst. Prof.

The School of Forestry, Fisheries and Wildlife offers graduate work leading to the designations Master of Science and Doctor of Philosophy in Forestry, and to Master of Science and Doctor of Philosophy in Fisheries and Wildlife. In addition, a master's-level student without a pre-

vious forestry degree may complete supplemental courses leading to competence as a professional forester.

Forestry

Graduate education in forestry has three primary objectives:

1. to provide, through either master's- or doctoral-level education, forest scientists to meet the research and teaching needs basic to the forestry profession;

2. to provide greater depth in specialized fields for forestry graduates desiring a fifth year of professional education at the master's level; and

3. to offer opportunity for professional forestry education at the master's level to the holder of the baccalaureate degree with a major in one of the biological, physical, or social sciences.

Forestry graduates interested in research or teaching may concentrate much of their course work in one or more of the related sciences with a thesis subject appropriate to forestry. The dissertation may be directed toward the solution of problems faced by the practicing forester or may consist of fundamental investigations pertinent to the solution of such problems.

Specialized graduate education is available in several subfields of Forestry: ecology, economics, entomology, genetics and tree improvement, hydrology, land-use planning, mensuration, pathology, photogrammetry, physiology, policy, recreation, silviculture, soils, timber management, and wood science.

The School works closely with the Columbia Forest Research Center, Forest Service, USDA. In addition, excellent cooperation is maintained with the Missouri Department of Conservation and the State Park Board.

The School and the University have direct control over some 9,600 acres of forested lands on which forestry research is underway. These are in three tracts near Columbia and Poplar Bluff, and represent a variety of forest types and conditions. Access to other forest lands, both state and federal, is available through co-

operative agreements. Facilities on the Columbia campus include: a chemical analytical laboratory, a large nuclear reactor, an IBM 370-168 computer, electron microscopes, and other specialized laboratories and equipment; and the UMC Ellis Library.

Admission for graduate work in Forestry is based upon three criteria:

1. undergraduate scholastic performance. (A grade point average of 3.0 [B] or better is highly desirable. Particular attention is given to the record of the last two years of undergraduate study, or in the case of one who has been employed for several years, the type and quality of experience since completion of the undergraduate degree);
2. letters of recommendation by individuals qualified to evaluate scholarly capacity; and
3. performance on the Graduate Record Examination.

A somewhat higher level on each of these criteria is expected for doctoral candidates than for master's degree candidates.

Some graduate students qualify for McIntire-Stennis funds or state research support for assistantships, or for NSF or other fellowships. Write the Director of Graduate Studies—Forestry, 1-30 Agriculture Bldg., for information.

MASTER'S DEGREE

The M.S. degree with a forestry major is designed for students with an undergraduate degree in forestry, or in one of the biological, physical, or social sciences basic to forestry. Students with previous professional education in forestry may wish to undertake preliminary preparation for both research and teaching, or may wish to obtain greater depth in a specialized area of forestry. Those without a previous baccalaureate degree in forestry may wish to further their education in forest science or to attain professional competence by completing required course work.

Course work required of students without a previous Forestry degree who desire a professional forestry education includes: natural resource organizations, dendrology, utilizing forest resources, resource

measurements, forest inventory, forest fire control and use, silvics, silviculture, forest photogrammetry, watershed management, timber management, forest economics, recreational land management, tree genetics and improvement, public resource policy, management-utilization trip, and land use planning. Several of these courses do not carry graduate credit.

To attain the Master's degree, 30 hours of course work must be completed, of which 15 hours or more shall be numbered 400 or above. Research, problems, special investigations, and special readings courses shall not exceed 12 of the 30 hours. Research toward a thesis normally shall not exceed 8 hours. The GPA of all course work submitted for the degree shall be B (3.0) or better.

A thesis, or a minimum of 5 semester hours of non-thesis research acceptable to the student's graduate committee, shall be completed prior to the final examination. A final oral examination is given all candidates prior to completion of the degree.

DOCTORAL DEGREE

The Ph.D. degree with a forestry major is designed to prepare students for research, college teaching, or other advanced scientific or professional careers. The student pursuing the doctoral program is expected to complete satisfactorily qualifying, comprehensive, and final examinations. The qualifying examination is intended to determine whether the student's background is adequate to enter the Ph.D. program, and to ascertain areas of weakness in which a candidate will be required to gain background through appropriate course work. The comprehensive examination also has two objectives: to ascertain whether a student has acquired sufficient depth and breadth of knowledge in selected areas of concentration, and to evaluate the candidate's capacity to apply knowledge in new situations, and to integrate that knowledge toward the solution of problems theoretical or applied. The final examination is

directed primarily towards exploration of the dissertation.

Requirements concerning foreign languages and knowledge of a collateral field, if any, is determined by the student's Advisory Committee. Each advisory committee is expected to make a realistic assessment of the student's needs as they relate to the student's background and educational objectives.

An independent scholarly dissertation on a subject approved by the student's adviser and committee must be completed in a form acceptable to the final examining committee, which must represent at least two disciplines in addition to the major field.

The requirements for this degree are not completely specified in terms of time or course work. Instead, the degree is conferred only upon those students who, after extensive study, have demonstrated high attainment in their particular specialization in forestry and who have completed independent research contributing to knowledge in the field.

Fisheries and Wildlife

Graduate programs in Fisheries and Wildlife are designed to prepare students for professional careers in either area with state and federal agencies, consulting firms, or academic institutions.

The programs are administered and directed through a cooperative agreement between the University of Missouri, Missouri Department of Conservation, and the United States Fish and Wildlife Service. The agreements are formalized in the Missouri Cooperative Fishery Research Unit and the Missouri Cooperative Wildlife Research Unit.

The Fisheries and Wildlife group has limited, well-equipped laboratories and aquarium facility on campus. In addition, the Ashland Wildlife Area, 2,400 acres with a 20-acre lake, offers a diversity of habitat for field-oriented studies. The Charles W. Green Wildlife Research and Management Area, administered by the Missouri Department of Conservation, is available for cooperative studies in Fish-

eries and Wildlife. The Fish-Pesticide Research Laboratory, U.S.D.I., a modern laboratory with a large fish pond facility, offers excellent opportunities for cooperative studies. These facilities are located within a few miles of campus. The University has established near Puxico, Missouri, the Gaylord Memorial Wildlife Research Laboratory. Located on the Missouri Department of Conservation's Duck Creek Wildlife Area, the laboratory is in the last of the swamps of Missouri, and adjacent to the Mingo National Wildlife Refuge.

An applicant contemplating graduate work in Fisheries and Wildlife should have a good background in the biological and physical sciences, including biology or botany and zoology, ecology, physiology, and genetics. In addition, such taxonomic courses as plant taxonomy, invertebrate zoology, ichthyology, ornithology, and mammalogy are highly desirable, as is a background in chemistry, mathematics, and physics. A background of 25-30 hours in biological courses is desirable and major deficiencies in this area will be remedied during the graduate program.

Admission is based upon three criteria:

(1) the Graduate Record Examination, including the advanced test in biology; (2) three letters of recommendation from persons who can attest to the candidate's scholastic ability; and (3) the undergraduate scholastic performance.

A grade point average of 3.0 or above is highly desirable; however, particular attention will be given the record of the last two years of undergraduate study or experience subsequent to graduation.

There is a limited number of fellowships, and teaching and research assistantships for qualified students. Applications for graduate study may be obtained by writing to the Director of Graduate Studies, Fisheries and Wildlife, Stephens Hall.

MASTER'S DEGREE

To attain the Master's degree a student must complete, with a *B* (3.0) average or better, 30 hours of course work, with 15

hours or more numbered 400 or above. Research, problems, special investigations, and special readings courses shall not exceed 12 of the 30 hours.

A thesis acceptable to the student's graduate committee shall be completed prior to the final oral examination, which is given all candidates prior to completion of the degree.

DOCTORAL DEGREE

The student pursuing the doctoral program is expected to complete satisfactorily a qualifying examination, a comprehensive examination, and a final examination. The qualifying examination is intended to determine whether the student's background is adequate to enter upon the Ph.D. program, and to ascertain areas of weakness in which a candidate will be required to gain background through appropriate course work. The comprehensive examination also has two objectives: to ascertain whether the student has acquired sufficient depth and breadth of knowledge in selected areas of concentration, and to evaluate the candidate's capacity to apply knowledge in new situations and to integrate that knowledge towards the solution of problems, theoretical or applied. The final examination is directed primarily toward exploration of the dissertation.

The required course work and language requirements or collateral field are determined on an individual basis by the advisory committee.

An independent scholarly dissertation on a subject approved by the adviser and committee must be completed in a form acceptable to the final examining committee, represented by at least two disciplines in addition to the major field.

The requirements for this degree are not completely specified in terms of time or course work. Instead, the degree is conferred only upon those students who, after extensive study, have demonstrated high attainment in their particular specialization and who have completed independent research contributing to knowledge in the field.

Geography

Richard G. Boehm, Ph.D., Texas. Chairman; Asst. Prof.

Jesse H. Wheeler, Jr., Ph.D., Chicago. Director of Graduate Studies; Prof.

Wayne L. Decker, Ph.D., Iowa State. Prof. (Atmospheric Science)

J. Trenton Kostbade, Ph.D., Michigan. Assoc. Prof.

William A. Noble, Ph.D., Louisiana State. Assoc. Prof.

The Department of Geography offers two plans leading to the Master of Arts degree. *Plan I* includes a thesis; *Plan II* does not. Both, requiring 32 hours of graduate credit, prepare students for teaching at the high school, junior college, and college levels; for jobs in urban and regional planning; and for various positions in government service in such areas as resource management, cartography, and intelligence.

The Department emphasizes close contact between staff and graduate students and individualized graduate programs allowing latitude in areas of specialization, such as regional, physical, economic, or urban geography; cartographic design; applied geography; environmental studies; and geographic education. Strong collateral course work in such fields as anthropology, atmospheric science, computer science, economics, geology, history, planning, and sociology contributes to the special interests of many graduate students.

An exceptional departmental collection of reference materials—including maps, journals, books, and aerial photographs—is available to graduate students. The holdings of Ellis Library in geography and related fields are extensive, and the UMC computer facilities are readily available.

Awarded on a competitive basis, graduate teaching assistantships and a correspondence grading assistantship are available. Applicants desiring consideration for one of these positions should indicate this in their applications to the Department.

Applicants for the Master of Arts program with an undergraduate GPA of at least 3.0 ($A=4$) during the last two years of undergraduate work may be admitted

on the basis of this record alone. Certain circumstances may qualify some applicants with lower grade point averages. Letters of recommendation may be used to strengthen applications. All applicants should submit scores on the Graduate Record Examination to the department as early as possible. These scores should include the Verbal and Quantitative parts of the examination and may include the Geography part or other subject-matter part. Address inquiries to Director of Graduate Studies, Department of Geography, Stewart Hall, UMC, Columbia, Mo. 65201.

MASTER'S DEGREE

Undergraduate preparation for graduate work in Geography should normally include a minimum of 18 semester hours in undergraduate courses in geography. Students with excellent undergraduate records, including considerable work in fields closely related to geography, may sometimes be admitted to graduate work with fewer undergraduate hours, but may be required to extend their graduate programs to remedy deficiencies.

The Master of Arts degree requires completion of 32 semester hours of course work, 8 of which may be thesis research if the student is on *Plan I*; 15 or more of these hours must be in courses numbered 400 or above. The program of courses is selected jointly by the student and the staff member chosen as adviser during the first semester in residence. All candidates must pass a comprehensive written and/or oral examination at the end of their graduate work. In addition, Plan I students must defend their theses.

Geology

James H. Stitt, Ph.D., Texas. Chairman; Prof.
John M. Sharp, Ph.D., Illinois. Director of Graduate Studies; Asst. Prof.
Walter D. Keller, Ph.D., Missouri-Columbia. Prof. Emeritus
Raymond E. Peck, Ph.D., Missouri-Columbia. Prof. Emeritus
Alden B. Carpenter, Ph.D., Harvard. Prof.
David K. Davies, Ph.D., University of Wales. Prof.
Raymond L. Ethington, Ph.D., Iowa. Prof.
Thomas Freeman, Ph.D., Texas. Prof.
Glen R. Himmelberg, Ph.D., Minnesota. Prof.

William D. Johns, Ph.D., Illinois. Prof.
George W. Viele, Ph.D., Utah. Prof.
Clayton H. Johnson, Ph.D., Cornell. Assoc. Prof.
Russell F. Burmester, Ph.D., Princeton. Asst. Prof.
Michael G. Foley, Ph.D., Cal. Tech., Asst. Prof.

The Department of Geology offers graduate work leading to the Master of Arts and the Doctor of Philosophy degrees. The areas of specialization are carbonate petrology, clay mineralogy, X-ray crystallography, engineering geology, geochemistry, geomorphology, geophysics, groundwater geology, igneous petrology, metamorphic petrology, micropaleontology, ore deposits, invertebrate paleontology, sedimentation, stratigraphy, structural geology, and tectonics.

Adequate space and excellent facilities are available for research in the Geology Building, which also houses the Geology Library. Modern and sophisticated equipment is available for supervised student use in many fields. The Department maintains one of the best conodont collections in the world for teaching and research. The Geology Field Camp with permanent cabins is in the Wind River Mountains near Lander, Wyoming.

Several scholarships, assistantships, fellowships, and other sources of financial aid are available. Write for information and forms to Department Chairman, Geology Building, UMC, Columbia, Mo. 65201.

GRADUATE PROGRAMS

Preparation for graduate work in Geology should include a minimum of 24 semester hours in geology, plus at least 6 semester hours in an approved field course (or equivalent field experience); 8 semester hours of chemistry (physical chemistry for students specializing in mineralogy, petrology, or geochemistry); 5 semester hours in physics; 8 semester hours in analytical geometry, calculus, or statistics; and 5 semester hours in zoology or biology. Students specializing in paleontology should have work in invertebrate zoology and genetics. A reading knowledge of at least one foreign language is desired.

Students enrolled for graduate credit in any course are required to have shown proficiency in the course or courses specifically listed as prerequisites. Normally this is interpreted to mean attainment of a grade of at least C (undergraduate) or B (graduate).

Candidates for the Master of Arts and Doctor of Philosophy degrees are required to submit GRE aptitude and advanced scores as a prerequisite for registration in course 490 (thesis or dissertation research).

Germanic and Slavic Studies

Ernst Braun, Ph.D., Wisconsin. Chairman; Prof.
Adolf E. Schroeder, Ph.D., Ohio State. Director of Graduate Studies; Prof.

James M. Curtis, Ph.D., Columbia. Assoc. Prof.
Dennis M. Mueller, Ph.D., Washington University. Assoc. Prof.

Luverne Walton, Ph.D., Indiana. Assoc. Prof.
Ruth H. Firestone, Ph.D., Colorado. Asst. Prof.
Ingeborg Henderson, Ph.D., California. Asst. Prof.
Friedel Maasdorf, Ph.D., Missouri. Asst. Prof.
James F. Peters, Ph.D., University of Washington. Asst. Prof.

Naomi Ritter, Ph.D., Harvard. Asst. Prof.

The Department of Germanic and Slavic Studies offers a course of study leading to the Master of Arts in German. The program is designed to prepare students for admission to Ph.D. programs, as well as for professional language careers in a number of fields. Courses in language, linguistics, literature, and teaching techniques and skills, seminars in various specialized aspects of German studies, and directed study and research provide candidates with an opportunity to acquire a comprehensive background in the subject area.

Resources include extensive library holdings in Germanic literature and linguistics, periodical and book collections in methodology, and an electronically-equipped audiovisual laboratory for language training. Opportunity for supervised teaching is available to teaching assistants.

Applicants for admission to the Graduate Program must have an undergraduate degree from an accredited college or

university, or the equivalent; a grade average of B or better; and an undergraduate German major, or the equivalent. The department reserves the right to evaluate the work presented for admission, and to determine the student's academic needs.

Students must complete with a grade average of B or better a minimum of 30 hours, selected from courses carrying graduate credit. No fewer than 24 hours are to be earned in German courses, and at least 15 hours must be taken in German courses numbered 400 or above. A thesis, with a maximum of 6 hours credit, is optional.

Courses taken outside the department are to be selected to complement the student's program of study, and require the approval of the departmental adviser. No language other than German is required.

Information regarding specific course requirements can be obtained by writing to the Department Chairman.

Candidates for the M.A. degree must pass comprehensive written and oral final examinations based on course work and the departmental reading list.

Health Services Management

Stuart A. Wesbury, Jr., Ph.D., Florida. Director; Prof.

Warren A. Thompson, Ph.D., Missouri-Columbia. Prof.

T. Charles McKinney, Ph.D., Wisconsin. Assoc. Prof.

Thomas C. Dolan, Ph.D., Iowa. Asst. Prof.

Alan L. Cowles, M.D., Ph.D., Rochester. Asst. Prof.

John K. Glenn, Ph.D., Missouri-Columbia. Asst. Prof.

Harold M. Kane, M.A., Missouri-Columbia. Asst. Prof.

Myron M. Kraff, Ph.D., Iowa. Asst. Prof.

John E. Mosher, M.H.A., Minnesota. Asst. Prof.

Michael J. Stotts, M.Ed., Hartford. Asst. Prof.

Kenneth D. Bopp, M.A., Washington University. Lecturer

Paul B. Guptill, M.B.A., Missouri-Columbia. Lecturer

An interdisciplinary and joint program of the College of Business and Public Administration, the School of Medicine, and the Graduate School is offered in Graduate Studies in Health Services

Management. The program draws freely from many UMC departments to meet its purposes and goals; it has a full complement of educational and research resources at its disposal. Clinical and field experience facilities are provided by hospitals and other health agencies in Columbia, St. Louis, Kansas City, and throughout the state and region.

A fundamental premise of Graduate Studies in Health Services Management is that administration of all health services is similar to other types of organizational management; however, there are certain vital phases of the health field which pose policy, procedural, technical, and community differences that are not usually confronted in the private sector. The program is interdisciplinary, so that each student may obtain a balance between the public health, hospital and medical care organization, and the business and public administration study areas. The program is a member of the Association of University Programs in Health Administration. The Graduate Program in Health Services Management has been accredited since 1968; continued full accreditation was awarded in 1973 by the Accrediting Commission on Education for Health Services Administration.

REQUIREMENTS FOR THE DEGREE

The Master's program in Health Services Management consists of four semesters on campus, plus a three-month summer externship in a hospital or other health facility. The externship occurs between the first and second years of the program.

M.B.A., M.S.P.A., M.S.P.H. DEGREES

The University of Missouri-Columbia offers specialized training in Graduate Studies in Health Services Management through three graduate degree programs: Master of Business Administration, Master of Science in Public Administration, and the Master of Science in Public Health. Regardless of the degree, the specialized training in health services

management is similar in its course content.

The purpose of offering multiple kinds of degree programs is to supplement rather than duplicate previous training and experience. Those familiar with the basic sciences and health field generally need additional training in business or public administration; those with business and social science backgrounds need more emphasis in the health field. In all cases, the approach is to tailor the program to the individual student's needs.

The M.B.A. program encourages a broad perspective of organized activity and an awareness of management, economic, social, and political problems related to the operation of enterprises. Tools of analysis and judgment required for competent management are emphasized.

The M.S.P.A. degree program is intended for students interested in administration of health programs in the public sector. Emphasis is on broad problems confronting administrators of public agencies, facilities, and services. It develops the tools of analysis and judgment for governmental service management.

The objective of the M.S.P.H. program is to prepare an individual to assume a management and leadership role in health services management. The student may elect to pursue either the administration curriculum or the planning curriculum. Within the administration curriculum, the program also offers an area of specialization in mental health administration.

DUAL DEGREES

In cooperation with other UMC departments, the Health Services Management program offers a number of dual degree programs to provide the student with an additional area of expertise within the field of health administration. Structure of the programs is determined by students and their advisers. For students to receive dual degrees, they must meet the requirements for a different concentration in each degree.

SUMMER EXTERNSHIP

After completing the first two semesters of the academic program, students serve (under the guidance of a qualified preceptor) a three-month summer externship in an approved hospital, health department, planning agency, or other health-related program. This permits students to become familiar with the field, cognizant of some of the issues and problems in day-to-day operations, and practice some of the skills obtained during the first nine months in the classroom.

Each individual externship program is carefully planned in early spring at a conference between the faculty and student. In general, some measures of observation, departmental or area rotation, project assignment, and administrative responsibilities are included, the emphasis on each varying with the student's background and need. Faculty members visit the extern at least once during the summer, and periodic evaluation reports are requested of the preceptor. Preceptors are invited to the Columbia campus for discussions, and every effort is made to establish and maintain a close working relationship between the student, preceptor, and faculty.

During the summer externship, students are generally paid a monthly stipend of \$600 to \$900, the amount varying among institutions.

REQUIREMENTS FOR ADMISSION

To qualify for admission, an applicant must have earned a baccalaureate, master's, or doctoral degree, and should have maintained an overall grade point average of at least 3.00 ($A=4.0$). In addition, all applicants for the M.S.P.H., and M.S.P.A. programs must submit scores from the Graduate Record Examination. Applicants applying to the M.B.A. program are required to take the Admissions Test for Graduate Study in Business; both tests are given several times a year, and applications must be received at least four weeks before the test date.

Work experience in hospitals or other health facilities before admission is desirable. Students intending to enter the program should, whenever possible, plan to work in a hospital or health-related system during summer vacations.

For further information concerning the program, contact: Admissions Director, Graduate Studies in Health Services Management, 403 Noyes Building, UMC, Columbia, Mo. 65201.

History

Winfield J. Burggraaff, Ph.D., New Mexico. Chairman; Assoc. Prof.
Thomas B. Alexander, Ph.D., Vanderbilt. Director of Graduate Studies; Prof.
Charles G. Nauert, Jr., Ph.D., Illinois. Director of Undergraduate Studies; Prof.
Lewis E. Atherton, Ph.D., Missouri-Columbia. Prof. Emeritus
N. Gerald Barrier, Ph.D., Duke. Prof.
Noble E. Cunningham, Jr., Ph.D., Duke. Prof.
Charles B. Dew, Ph.D., Johns Hopkins. Prof.
W. Francis English, Ph.D., Missouri-Columbia. Prof. Emeritus; Dean Emeritus
George Fasel, Ph.D., Stanford. Prof.
Claudia Kren, Ph.D., Wisconsin. Prof.
John Lankford, Ph.D., Wisconsin. Prof.
Fordyce W. Mitchel, Ph.D., Yale. Prof.
Charles F. Mullett, Ph.D., Columbia. Prof. Emeritus
Paul C. Nagel, Ph.D., Minnesota. Prof.
Robert J. Rowland, Jr., Ph.D., Pennsylvania. Prof.
Robert E. Ruigh, Ph.D., Harvard. Prof.
Arvarh E. Strickland, Ph.D., Illinois. Prof.
David P. Thelen, Ph.D., Wisconsin. Prof.
William M. Wiecek, Ph.D., Wisconsin. Prof.
Richard T. Bienvenu, Ph.D., Harvard. Assoc. Prof.
Gerard H. Clarfield, Ph.D., California-Berkeley. Assoc. Prof.
Susan Flader, Ph.D., Stanford. Assoc. Prof.
Konrad J. Jarausch, Ph.D., Wisconsin. Assoc. Prof.
Edward A. Purcell, Ph.D., Wisconsin. Assoc. Prof.
Charles E. Timberlake, Ph.D., University of Washington. Assoc. Prof.
Russell Zguta, Ph.D., Pennsylvania State. Assoc. Prof.
Kerby A. Miller, Ph.D., Berkeley. Asst. Prof.
Robert M. Somers, Ph.D., Yale. Asst. Prof.
John Michael Thorn, Ph.D., Wisconsin. Asst. Prof.
Richard H. K. Vieter, Ph.D., Pittsburgh. Asst. Prof.

The Department of History offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. Lecture courses, seminars, and directed research are available in the following fields: ancient, medieval, and modern Europe;

Russia; England and the British Empire; South Asia; Latin America; and all aspects of American history. While students are expected to get specialized training in the fields of their choice, they are also urged to develop a broad historical background. With the cooperation of other UMC departments, and other campuses of the University of Missouri, students may work out programs which provide for interdisciplinary specialization.

The UMC Ellis Library has substantial research holdings in all fields in which graduate training is offered, and there are specialized collections which are of the first importance. The Western Historical Manuscripts Collection is a unique depository of material for regional studies in political, social, and economic history, while the State Historical Society of Missouri has an outstanding library of primary and secondary works dealing with Missouri history. Ellis Library possesses an unusual collection of more than 5,000 pamphlets which are invaluable for seventeenth- and eighteenth-century British history; there are substantial holdings of eighteenth- and nineteenth-century British and continental journals, including the publications of all the major academies; and the Medical School Library has excellent published materials for the history of medicine. In addition, the program in recent United States history has available the resources of the Truman Library at Independence, Mo. Microfilm readers are available, one within the Department and others in Ellis Library.

The Department provides qualified students with the opportunity to gain teaching experience on the college level. Teaching assistants, earning current stipends of \$3,330, conduct 6 hours of discussion sections each week in American or European history; they may carry 12 academic credits each semester. Each appointment is subject to annual review and may be held for a total of three years.

A student holding a research assistantship, which is available on a part-time basis, is assigned to a senior faculty member to work on a specified project.

Research appointments available in the State Historical Society of Missouri and the Western Historical Manuscripts Collection carry stipends comparable to graduate assistantships, and employment at an hourly rate also is open to graduate students in history. For information concerning these opportunities write: Dr. Richard S. Brownlee, Secretary, State Historical Society, 3 Ellis Library, UMC, Columbia, Mo. 65201. A number of fellowships and research grants are available to qualified students.

The Graduate School offers a number of fellowships and scholarships. Students interested in such grants should apply directly to the Dean of the Graduate School, 205 Jesse Hall.

A number of appointments are available as graders for independent study courses in the UMC Extension Division and in undergraduate lecture courses in the Department of History. Compensation varies according to the time required.

Fellowships and assistantship application forms and further information concerning financial aid or degree programs may be obtained by writing the Director, History Graduate Studies, 143 Arts and Science Building.

Completed applications for financial aid must be filed not later than February 1. Announcements of awards are made on April 1.

MASTER'S DEGREE

An applicant for the M.A. must have a B.A. or a B.S. degree with a minimum of 18 upper-class hours of history and a GPA of 3.0 (on a 4.0 scale). Students with a B.S. in Education and a major in social studies must have a total of 21 undergraduate hours in history. Students who lack the necessary hours will take course work beyond the required 30 hours to remedy their deficiency. Remedial hours must be completed before the student is recognized as an M.A. candidate.

In addition to the general requirements of a completed application and a transcript required by the Admissions Office, the

Department requires each applicant to send directly to the Director of Graduate Studies, Department of History, scores on the GRE Aptitude Test, and a short essay (no more than 500 words) explaining the applicant's intended fields of study, professional and vocational goals, and other reasons for wishing to enter the graduate program. To strengthen their cases for admission, applicants may also wish to send directly to the Director of Graduate Studies such optional documentary material as letters of recommendation from faculty members familiar with their work; a sample of formal written work (term paper, seminar paper, or thesis); scores on the GRE Advanced Achievement Test in History, or scores on the Miller Analogies Test. The Department reserves the right to evaluate the work presented and to determine each student's needs.

Early in the first term in residence at UMC, the Director of Graduate Studies assigns each student an adviser, who assists in planning an M.A. degree program. Students must be in residence at UMC for a minimum of two semesters or three summer sessions. Not more than 6 semester hours of the required 30 hours of credit may be earned off campus by transfer, by correspondence and extension courses, or by non-resident research. The completed M.A. program must have at least 30 semester hours of graduate credit, including at least 20 hours in history and at least 15 hours in courses numbered 400 and above. Students may elect either the non-thesis program (which must include at least two research seminars), or the thesis program (which requires registration for 6 hours of thesis research in History 490 or in seminars, plus completion of an acceptable thesis); but students who elect the non-thesis M.A. are not allowed to continue for the Ph.D. at UMC unless they write a thesis and have it approved by an examining committee before applying for the doctoral program. This thesis requirement does not apply to doctoral applicants whose M.A. degree is from another institution. At the end of

either type of M.A. program, the candidate must pass an oral examination.

There is no foreign language requirement for the M.A. degree, but students who wish to go on for the Ph.D. are urged to pass their reading comprehension examination in at least one foreign language during their first year of graduate work. Teaching assistants are required to do so as a condition for reappointment for a second year.

DOCTORAL DEGREE

The admissions procedure for students who have already completed their M.A. degree before entering and who wish to become Ph.D. candidates are identical to the departmental requirement for additional materials as outlined in the preceding section, except that prospective Ph.D. candidates are strongly urged to submit as many of the optional documentary materials as they can, especially letters of recommendation sent by professors who are familiar with their academic work. The Department strongly advises students not to attempt the Ph.D. degree unless they received a grade of A in at least one-half of the courses on the Master's program.

Early in the first semester of post-M.A. enrollment, prospective doctoral candidates should arrange with the Director of Graduate Studies for a provisional advisory committee. This committee administers the oral qualifying examination during the first week of the student's second semester in residence. The examination focuses on the M.A. thesis and the thesis field, or (in cases where the student has no M.A. thesis) on a seminar paper or other research paper, plus the field in which that paper is written. Only after passing the qualifying examination will the student be admitted to candidacy for the Ph.D. degree in history. For a student whose M.A. program was done at UMC, the final oral examination for the M.A., based on the thesis and the thesis field, constitutes the qualifying examination; and the student proceeds beyond the

M.A. degree only upon the recommendation of the M.A. examining committee.

After completing the qualifying examination, students with their advisers make application for degree candidacy and request the appointment of an advisory committee. This committee, of which the adviser is chairman, certifies the passing of the qualifying examination and assists the candidate and adviser in defining the doctoral fields, in planning the program of study, and in determining how the language and residence requirements for the Ph.D. degree shall be met. After completion of course work, the student and adviser request appointment of the committee for the comprehensive examination. This examination, both written and oral, covers all fields offered for the Ph.D., including the dissertation field.

For a Ph.D. in U.S. History, a candidate must offer:

1. a general U.S. history field, broad in scope and emphasizing major trends;
2. a non-U.S. history field;
3. a special field, which may or may not be in history; and
4. a dissertation field.

A candidate may choose a dissertation field from the following: American Colonial and Revolutionary (to 1787), The National Period (1787-1877), Recent United States (1877-present), The South, The West, Diplomatic History, Social History, Economic History, Intellectual History, Constitutional History, Urban History, Afro-American History, and U. S. Environmental History.

For a Ph.D. in non-U.S. history, a candidate must offer four fields in history, one of which is the field of the dissertation, and one field outside history. In each of these fields the candidate is expected to have a general knowledge of the field as a whole. Choices are from the following 15 fields: Greece, Rome, Medieval, Renaissance and Reformation (1300-1600), Early Modern Europe (1555-1789), European Intellectual History, England and the British Empire (1485-1789) and England and the British Empire (1789-present), Modern Europe (1789-present), France (1789-pres-

ent), Germany (1789-present), Kievan Rus' and Muscovite Russia, Russia (Peter the Great to the present), India, History of Science, and Latin America. The candidate may choose one of the U.S. fields as one of four history fields, but not for the dissertation field.

Before being admitted to the comprehensive examination, a candidate must meet the requirements in two languages. The first language should be passed by examination in the first semester of residence, or formal course work must be started then to fulfill this requirement. The requirement for the second language may be satisfied in one of four ways: an ETS examination, 9 semester hours of college-level course work passed with a C or better, substitution of a Research Technique approved by the Advisory Committee, or demonstration of high proficiency in the first language as verified by the language department involved.

The doctoral dissertation is written under the direction of the candidate's adviser. The dissertation director may be a qualified member of the History faculty, either at UMC or at one of the other University of Missouri campuses. The final exam is oral and open to the public. It is both an examination on the field of and a defense of the dissertation.

Home Economics

Beatrice B. Litherland, Ph.D., Minnesota. Dean & Prof., College of Home Economics
Elinor R. Nugent, Ph.D., Louisiana State. Prof., Clothing & Textiles; Director of Graduate Studies

Child & Family Development

Virginia L. Fisher, Ph.D., Missouri-Columbia. Prof.
Marilyn C. Blossom, Ed.D., Missouri-Columbia. Assoc. Prof.
Clifton Anderson, Ph.D., Michigan. Asst. Prof.
Carolyn Farquhar, Ph.D., Michigan State. Asst. Prof.
Marion Typo, Ph.D., Missouri-Columbia. Asst. Prof.

Clothing & Textiles

Helen S. Allen, M.S., Iowa State. Prof.
Doris Saxon, M.S., Alabama. Prof.
Josephine M. Holik, M.A., Virginia Polytechnic Institute. Assoc. Prof.
Lois Korslund, Ph.D., Purdue. Assoc. Prof.
Jean B. Griffin, M.S., Missouri-Columbia. Asst. Prof.

Home Economics Communications

Orrine Z. Gregory, M.S., Missouri-Columbia. Assoc. Prof.

Family Economics & Management

Edward J. Metzger, Ed.D., Missouri-Columbia. Prof.

Marilyn Caselman, M.S., Ohio State. Assoc. Prof.

Sandra A. Helmick, Ph.D., Missouri-Columbia. Assoc. Prof.

Anna Cathryn Yost, M.S., Purdue. Assoc. Prof.

Melchior J. Zelenak, Ph.D., Iowa. Asst. Prof.

Home Economics Education

Betty Martin, Ph.D., Missouri-Columbia. Asst. Prof.

Joan Quilling, Ph.D., Michigan State. Asst. Prof.

Housing & Interior Design

Robert Kabak, M.F.A., Yale. Prof.

C. Bud Kaufmann, Ph.D., Florida State. Prof.

Kate Ellen Rogers, Ed.D., Teachers College, Columbia University. Prof.

Gary L. Hennigh, M.F.A., Colorado. Assoc. Prof.

Richard Helmick, M.F.A., Ohio State. Asst. Prof.

Human Nutrition, Foods & Food Systems Management

Margaret Flynn, Ph.D., Missouri-Columbia. Prof.

Elizabeth Hensley, M.S., Cornell. Prof.

Ruth Lutz, Ph.D., Cornell. Prof.

Aimee Moore, Ph.D., Michigan State. Prof.

Byrdine Tuthill, M.S., Wisconsin. Prof.

John Typpo, Ph.D., Minnesota. Prof.

Helen Anderson, Ph.D., Wisconsin. Assoc. Prof.

Richard Dowdy, Ph.D., North Carolina State. Assoc. Prof.

Ann Hertzler, Ph.D., Cornell. Assoc. Prof.

Frances McKelvy, M.S., Iowa. Assoc. Prof.

James Nordstrom, Ph.D., Minnesota. Assoc. Prof.

Robert O'Neal, Ph.D., Oklahoma State. Assoc. Prof.

Loretta Hoover, Ph.D., Missouri-Columbia. Asst. Prof.

Mary Bess Kohrs, Ph.D., Wisconsin. Asst. Prof.

The College of Home Economics offers graduate study in various disciplines within the College. The degrees offered are the Doctor of Philosophy, and the Master of Arts or Master of Science, depending on the nature of the program.

Because of the impact of rapidly changing living situations on individuals and families, program emphasis is placed upon interrelationships of human factors with physical aspects of food, clothing, and shelter within the environment.

Master's degree programs are planned individually to meet the needs and objectives of students. Subject areas which may serve, singly or in combination, as a focus for the Master's program include: child and family development, food, nutrition, food systems management, clothing, textiles, housing, interior design, family and consumer economics, and home eco-

nomics communication. Students with these master's degrees are much in demand for extension and other government service, or for teaching at secondary and college levels.

Master's degrees with emphases in the listed areas of Home Economics are also offered through Extension Education in the College of Agriculture and through Home Economics Education in the College of Education.

The Ph.D. program is designed to prepare students for research, college teaching, or other advanced professional careers requiring a high degree of understanding and competence.

The Ph.D. program in Home Economics relates environmental aspects of food, clothing, or shelter to human needs, or deals specifically with family development, economics, or management. These programs are planned individually on an interdepartmental basis.

Appropriate laboratory and work space is available for graduate study and research in Gwynn and Stanley halls and in the Home Management Center. Special facilities include animal and human areas in Gwynn Hall's newly renovated nutrition laboratories and in humidity- and temperature-controlled areas for textile research, and for research and observation in three Child Development laboratories. Costume and fabric collections are housed in Stanley Hall. Visual records of Missouri costume are also available for use by graduate students. The Medical Center, Experiment Station laboratories and whole-body counter, and research reactor facilities provide additional opportunities. Students in Food and Nutrition make considerable use of the Medical School Library; those planning historical studies use documents of the State Historical Society of Missouri; Ellis Library also provides excellent resources.

Research opportunities and facilities in the College are extended by cooperation with other schools and divisions on campus. The College of Education, through the Coordinator of Home Economics Education, provides opportunities for certification of specialization in addi-

tion to subject-matter degrees. The Director of the UMC Medical Center Department of Nutrition and Dietetics and other members of that staff are professional members of the College of Home Economics faculty. They act as advisers and provide research and teaching opportunities for graduate students with appropriate interests. The state staff in Home Economics Extension, also faculty members of the College, work closely with the teaching and research staff in providing graduate students with opportunities for research and experience in both rural and urban areas. Increasing concern with urban problems and with those of the underprivileged of the state make study and research in the various subject areas of Home Economics of vital importance. Also, the College participates in the Missouri Agricultural Experiment Station research program. Support from this source is supplemented by grants from other Federal agencies. Agricultural Experiment Station research projects and data banks from other research provide a basis for analyses for theses and dissertations. Excellent computer facilities and research consultation are available.

A number of teaching and research assistantships, as well as some opportunities for part-time work, are available to qualified students at both Master's and Ph.D. levels. Teaching assistantships provide supervised experience in college teaching activities. Applications should be submitted before April 1 of each year, although inquiries may be made at any time; information is also available on national fellowships. For application forms, write to the Dean of the College of Home Economics.

MASTER'S DEGREE

Requirements for entrance to the Master's degree programs are:

(1) a GPA of 3.0 (on a 4.0 system) for the last 60 hours from an accredited college. Applicants with slightly lower averages may ask to have their credentials reviewed for evidence of potential success. Consideration is given to evidence of aptitude, motivation, and performance in the student's major area, and the

Ohio Psychological Test scores; (2) acceptable performance on the GRE (Part I) is required.

Upon the student's acceptance into the program, the adviser or advisory committee determines what undergraduate courses are required to provide a sound basis for graduate study in the chosen field. The program of study includes both the courses in areas which have not previously been studied and those in which a student's knowledge is not up-to-date. The minimum course requirements are 30 hours of graduate course work, including at least 15 in courses numbered 400 or higher. Not more than 12 hours of the 30 may be in problems, readings, and research. Completion of the degree involves written and/or oral comprehensive examinations.

The student must successfully complete some kind of independent study. Students normally enroll for 6-8 hours in thesis Research 490, or for 4-8 hours in non-thesis Research 450. Non-thesis research may lead to a paper, a publication, or some other evidence of successful completion of the research, or to some other type of report; for instance, a student in interior design might do a restoration study on a historic Missouri home, with renderings of the restoration along with documentation constituting the report.

DOCTORAL DEGREE

Before applying for admission to candidacy, students must be accepted by the faculty in the field of their majors, and, by the quality of approximately 30 hours graduate-level course work, demonstrate that they are above-average students. A 3.0 or higher GPA is required in previous graduate work.

Acceptance to begin work on a Ph.D. program depends upon the qualifications of a student and the availability of faculty and facilities. Consideration is also given to grades in the major area of interest, maturity, experience, motivation, and other factors which indicate success in the program. Graduate aptitude test scores should indicate ability in the Ph.D. range and aptitude for the area being studied.

A written and/or oral qualifying examination, administered by the faculty of the student's subject area, must be completed satisfactorily before admission to candidacy. Students recently completing master's degrees may request that the master's examination be considered a qualifying examination. Students may request approval to pursue the Ph.D. without a master's degree. A student is formally accepted for a Ph.D. program at the time of admission to candidacy, which usually occurs in the first year after a master's program.

The student and adviser develop a preliminary program plan (taking into account specific background, strengths, weaknesses, and objectives) which serves as the basis of the final program to be approved by the Advisory Committee. This constitutes the course requirements for the degree. Courses must be completed with an average grade of B.

Comprehensive written and oral examinations covering the student's graduate work, a written dissertation based on original research, and an oral examination defending the dissertation must be completed.

Horticulture

Donald A. Hegwood, Ph.D., Mississippi State.
Chairman; Prof.

Raymond A. Schroeder, Ph.D., Missouri-Columbia.
Director of Graduate Studies; Prof.

Arthur E. Gaus, Ph.D., Missouri-Columbia. Prof.

Delbert D. Hemphill, Ph.D., Missouri-Columbia.
Prof.

Aubrey D. Hibbard, Ph.D., Missouri-Columbia. Prof.

Victor N. Lambeth, Ph.D., Missouri-Columbia. Prof.

Marlin N. Rogers, Ph.D., Cornell. Prof.

Ronald E. Taven, M.S., Minnesota. Prof.

John H. Dunn, Ph.D., Rutgers. Assoc. Prof.

Gary G. Long, Ph.D., Michigan. Assoc. Prof.

Ray R. Rothenberger, Ph.D., Missouri-Columbia.
Assoc. Prof.

Leon C. Snyder, Jr., M.L.A., Michigan. Assoc. Prof.

Keith R. Geller, Ph.D., Cornell. Asst. Prof.

David S. Koranski, Ph.D., Wisconsin. Asst. Prof.

The Department of Horticulture offers graduate work leading to the Master of Science and Doctor of Philosophy degrees. Opportunities for graduate study are available in areas of floriculture, fruits, ornamentals, turf, vegetables, and weed science, with emphasis on physiology and

plant breeding. The M.S. program offers advanced study in horticultural enterprises and agribusiness. The Ph.D. program prepares students for research, teaching, and advanced professional careers.

Well-equipped laboratories, plant growth chambers and environment-controlled greenhouses, and excellent outdoor laboratories and facilities are available to the student for biochemical, genetic, morphological, and physiological studies in horticultural science.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. Write the department chairman for additional information.

MASTER'S DEGREE

M.S. with Thesis. If a baccalaureate degree other than a B.S. degree in Agriculture is offered, the candidate must have completed satisfactory work in at least 30 semester hours in science subjects.

All students are required to take a qualifying examination to determine their proficiency in horticultural and science subjects and to guide the formulation of the study program. Additional university credits in these areas may be required if the examination indicates such need. Under the guidance of an adviser and the department chairman, a course of study is designed to fit each student's academic background, experience, and objectives. A student must complete a minimum of 30 semester hours of graduate work, including at least 15 hours numbered 400 or higher. There is usually no language requirement for the Master's degree.

A thesis is required of all candidates. A candidate must fulfill the approved course of study with a grade of B (3.0) or better, and pass a written and/or oral examination at completion of course work and dissertation.

M.S. without Thesis. A program leading to the M.S. degree without thesis, but having the same basic requirements as above, is also available to students who

would derive more benefit by taking additional course work than by completing a research project which normally culminates in the preparation of a thesis. This is primarily for students preparing for positions in horticultural extension, teaching in vocationally-oriented programs, or others who already have a B.S. degree, but find a postgraduate degree without thesis especially fitted to their needs. Up to 5 hours credit toward this degree could consist of Horticulture 450, Non-Thesis Research. Normally, this is considered a terminal program and *not* an intermediate step toward the research-oriented Ph.D. program.

DOCTORAL DEGREE

To be admitted to candidacy for a Ph.D. the student must:

1. demonstrate competency by a written and/or oral qualifying examination conducted by the Advisory Committee, composed of at least five members appointed by the Dean of the Graduate School; and
2. complete a program of study approved by the Advisory Committee.

The Advisory Committee determines the language requirement, if any, and approves the research problem for the dissertation.

Industrial Engineering

Jay Goldman, D.Sc., Washington University. Chairman; Prof., P.E.
William L. Fairman, Ph.D., Pittsburgh. Director of Graduate Studies; Assoc. Prof.
James M. Beauchamp, Jr., M.S., Lehigh. Prof., P.E.
Larry G. David, Ph.D., Purdue. Prof., P.E.
Robert M. Eastman, Ph.D., Pennsylvania State. Prof., P.E.
Melvin O. Braaten, Ph.D., North Carolina State. Assoc. Prof.
Owen W. Miller, D.Sc., Washington University. Assoc. Prof., P.E.
Glenn E. Staats, Ph.D., Texas. Assoc. Prof.
Ronald A. Enlow, Ph.D., Arizona State. Asst. Prof.
Michael S. Leonard, Ph.D., Florida. Asst. Prof.

The graduate program in Industrial Engineering provides a scholarly environment in which highly qualified, creative students may obtain the knowledge and develop the skills necessary to solve complex industrial, governmental, and societal systems design problems. Many of

these systems are required to operate within increasingly complex constraints, thus necessitating the use of sophisticated and creative designs. The industrial engineer responsible for such designs must be capable of applying a broad spectrum of scientific tools if the most effective systems are to be obtained. In Industrial Engineering the Master of Science program is designed to provide a basic understanding of these tools, as well as an application experience wherein these tools are utilized in the design process. The Doctor of Philosophy program is designed to provide the specialized knowledge and skills necessary to develop new tools or methods for solving complex systems design problems.

Admission to the Department's graduate programs is available to students with a baccalaureate degree from an accredited undergraduate curriculum in engineering, mathematics, statistics, or physical science, whose record indicates the ability to complete the program successfully. Several factors are considered in evaluating an applicant's capability, such as overall grade point average, grade trends, and major area grades. In addition, each applicant is required to take the General Aptitude portion of the Graduate Record Examination.

In support of the academic program, laboratory facilities in several major application areas are available both within the Department and in other departments with related interests. Neighboring industries; city, county, and state government agencies; the UMC Medical Center; the UMC Health Services Research Center; local hospitals; and nearby large metropolitan centers provide an unlimited reservoir for research and design opportunities.

One of the most important tools required by a strong industrial engineering research and design program is a modern computer facility. Terminal access to the UMC computing network's IBM 370/168, and a PDP 11/50 are available within the College of Engineering. In addition to Ellis Library facilities, an excellent collection of mathematical, statistical, and engineering

books and reference materials are housed in the Engineering Library.

Fellowships, scholarships, and teaching and research assistantships are available to qualified graduate students. These forms of financial assistance are supported by funds made available through the state of Missouri and federal and industrial graduate support programs, as well as research grants from various industrial and governmental agencies.

For additional information, applications for admission and financial aid, and other *Bulletins*, write the Director of Graduate Studies, Department of Industrial Engineering, UMC, Columbia, Mo. 65201, or call 314/882-2691.

MASTER'S DEGREE

There are two basic programs leading to the M.S. degree: (1) a 30-credit-hour research-oriented program requiring a thesis; (2) a 30-credit-hour design-oriented non-thesis program. There is no language requirement in either program.

To accommodate a wide variety of undergraduate backgrounds, prerequisites have been minimized to allow students to complete the entire program in a reasonable period of time.

In general, students are accepted for admission in the M.S. program if their undergraduate grade point average is at least 3.0 on a 4.0 scale, and if an acceptable score on the General Aptitude portion of the Graduate Record Examination has been recorded. Students who do not satisfy the above minimal requirements, but believe unusual circumstances qualify them to do graduate work in Industrial Engineering, may apply for admission. A letter explaining the nature of these circumstances should be submitted to the Director of Graduate Studies. The Departmental Graduate Faculty reviews such petitions on an individual basis.

DOUBLE M.S. DEGREE PROGRAM

The Department of Industrial Engineering, in cooperation with the Health Services Management program of the School of Medicine, offers a 60-credit-hour

double M.S. degree program to prepare its graduates for careers in the design and administration of health care delivery systems and organizations. The program was developed in recognition of the highly complex nature of health care organizations.

The program's basic objective is to fuse together competencies in health services management and in health systems design: the required courses in the Industrial Engineering program serve as the area of specialization in the Public Health program; and the required courses in the Public Health program are used as electives in the Industrial Engineering program. As a result, it is possible for the student to earn simultaneously an M.S. in Public Health and an M.A. in Industrial Engineering. Upon satisfactory completion of this program, the student is considered "a course graduate in hospital administration."

The specific requirements for the M.S. degree in Industrial Engineering are as described in the previous section.

DOCTORAL DEGREE

Ph.D. degree programs are individually tailored to satisfy students' objectives. However, the M.S. core courses also form a common core for all Ph.D. programs, which culminate in an original research dissertation. In general, a foreign language is not required.

Admission to the Ph.D. program is granted only to highly qualified students. While many earn an M.S. degree before pursuing a Ph.D. program, it is not prerequisite to admission.

The Department offers a Ph.D. program in Health Care Systems Design, financed by the National Center for Health Services Research and the Veterans Administration. Fellowships are available for qualified students. The basic philosophy or goals underlying the development of this training program are to provide students with the latest tools and techniques of systems analysis and design, an in-depth understanding of medical care and the organization of health care delivery systems, an extensive experience

in health care systems design, and research experience in the development of new tools or unique applications of existing technology to the design or analysis of health care systems. Traineeships are available for highly qualified applicants.

Journalism

Roy M. Fisher, B.S., Kansas State. Dean; Prof.
 Frank L. Dobyns, A.M., Missouri-Columbia. Chairman, Advertising; Prof.
 Keith P. Sanders, Ph.D., Iowa. Chairman, Editorial; Prof.
 W. David Dugan, Jr., M.A., St. Bonaventure. Chairman, Radio-Television; Prof.
 William H. Taft, Ph.D., Western Reserve. Director of Graduate Studies; Prof.
 G. Thomas Duffy, Prof.
 Clifton C. Edom, B.J., Missouri-Columbia. Prof. Emeritus
 Earl F. English, Ph.D., Iowa. Dean Emeritus; Prof. Emeritus
 Paul F. Fisher, Jr., Ph.D., Missouri-Columbia. Prof.
 Rod Gelatt, A.M., Iowa. Prof.
 Milton E. Gross, A.M., Missouri-Columbia. Assoc. Dean; Prof.
 Robert Haverfield, A.M., Missouri-Columbia. Prof.
 Edward C. Lambert, Ph.D., Missouri-Columbia. Prof.
 Edmund B. Lambeth, Ph.D., American University. Prof.
 Angus McDougall, M.A., Northwestern. Prof.
 John C. Merrill, Ph.D., Iowa. Prof.
 Thomas C. Morelock, A.M., Missouri-Columbia. Prof. Emeritus
 Ernest Cecil Morgan, Ph.D., Texas. Prof.
 J. Philip Norman, A.M., Missouri-Columbia. Prof.
 Eugene W. Sharp, A.M., Missouri-Columbia. Prof. Emeritus
 Dale R. Spencer, J.D., Missouri-Columbia. Prof.
 William Stephenson, Ph.D., Durham; Ph.D., London. Prof. Emeritus
 Spencer Allen, B.J., Missouri-Columbia. Assoc. Prof.
 William A. Bray, B.J., Missouri-Columbia. Assoc. Prof.
 Ruth B. Bratek, A.M., Missouri-Columbia. Assoc. Prof.
 Won Chang, Ph.D., Iowa. Assoc. Prof.
 Ruth C. D'Arcy, B.A., Wayne State. Assoc. Prof.
 Jane E. Clark, A.M., Missouri-Columbia. Assoc. Prof.
 Roger A. Gafke, A.M., Missouri-Columbia. Assoc. Prof.
 Dale L. Gaston, A.M., Oklahoma. Assoc. Prof.
 J. Robert Humphreys, A.M., Missouri-Columbia. Assoc. Prof.
 Robert P. Knight, Ph.D., Missouri-Columbia. Assoc. Prof.
 Harold Lister, A.M., Missouri-Columbia. Assoc. Prof.
 Daryl R. Moen, M.A., Minnesota. Assoc. Prof.
 Joye Patterson, Ph.D., Missouri-Columbia. Assoc. Prof.
 Donald P. Ranly, Ph.D., Missouri-Columbia. Assoc. Prof.
 Donald G. Romero, Ph.B., Brown. Assoc. Prof. Emeritus

Robert L. Terrell, M.A., California at Berkeley. Assoc. Prof.
 Brian S. Brooks, A.M., Missouri-Columbia. Asst. Prof.
 Phillips R. Brooks, A.M., Missouri-Columbia. Asst. Prof.
 Charles T. Ladwig, M.A., Emporia State. Asst. Prof.
 Manuel L. Lopez, B.A., Arizona. Asst. Prof.
 William McPhatter, A.M., Columbia. Asst. Prof.
 Dick Nelson, A.M., Missouri-Columbia. Asst. Prof.
 David M. Nichol, M.A., Michigan. Asst. Prof.
 Lester N. Pope, A.M., Hartford Seminary. Asst. Prof.
 John Rhein, B.S., Millikin. Asst. Prof.
 Linda Shipley, Ph.D., Pennsylvania. Asst. Prof.
 Arthur A. Terry, B.J., Missouri-Columbia. Asst. Prof.
 Donald S. Walli, A.M., South Carolina. Asst. Prof.

The School of Journalism offers graduate work leading to the Master of Arts and the Doctor of Philosophy degrees. Graduate students do not choose a major. Rather, they indicate a primary interest in journalism such as advertising, news-editorial, magazine, photo-journalism, international journalism, etc., and choose the program that best suits their backgrounds and career objectives.

The student can choose between two programs of study for the Master of Arts degree. The choice of program is dependent largely on the student's background, career objectives, and personal choice. Either program meets the needs of most students.

The choice of program should be made only after students have carefully assessed their professional objectives and have sought the advice of a potential faculty adviser. For some students, particularly those with an undergraduate degree in journalism, Plan A is the better approach. For others, particularly those who wish to develop a specialized competence (science writing, for example), Plan B is the better approach.

For either research or professional aims, the School of Journalism has special facilities. Among them are:

1. the building complex—three buildings equipped with computer typesetting, photography labs, an advertising research laboratory, the Graduate Studies Center, and full-leased wire services from the Associated Press, United Press International, and the New York Times Service;

2. *The Columbia Missourian*, a daily-Sunday teaching newspaper of general circulation, provides professional training under faculty supervision;

3. KOMU-TV, an affiliate of NBC, functions as a teaching television station, and radio station KBJA-FM provides training in radio news work;

4. three major libraries—Ellis Library with an excellent collection of newspapers and magazines; the journalism library with more than 15,000 volumes, plus hundreds of magazines and newspapers received regularly; and the State Historical Society of Missouri Library with its extensive file of Missouri newspapers dating from the first in 1808;

5. the Freedom of Information Center, which maintains a day-to-day study of the more notable actions by government, media, and society affecting the movement of information. The Center supports itself through sustaining memberships of newspapers and broadcasting stations, from annual subscriptions to its monthly report series and bi-monthly newsletter, and from sales of publications.

In addition, the School works closely with international, national, and state media associations, and each spring it sponsors Journalism Week, which brings to the campus contemporary leaders in mass communications. There are also regular workshops for photojournalists, and college and high school publications advisers and staff members. For graduate students, a continuous year-round program is available through summer sessions and intersessions. For M.A. students under *Plan B* there are special programs as noted below.

Several fellowships and assistantships and other opportunities for financial aid are available. For details write to the Director of Graduate Studies.

MASTER'S DEGREE

To be admitted to the Graduate School, an applicant is required to have an undergraduate GPA of at least 3.0/4.0 or equivalent during the last two years of undergraduate work. Part I of the Graduate Record Examination is required. Transcripts are reviewed by the School of Journalism Graduate Studies Committee.

Under both *Plan A* and *Plan B* a student must complete successfully the following undergraduate courses or their equivalent as determined by the Admissions Subcommittee: History and Principles of Journalism, News, Advertising Principles and Practice, and Editing. Students who verify professional experience may be excused from certain of these requirements. All students must complete successfully at least one graduate-level course in reporting and one such course in editing. In addition, *Plan A* students must:

1. complete 36 semester hours of graduate work, at least half of it in courses numbered 400 or higher;

2. complete the following graduate courses: 422, Mass Media Seminar; 488, Research Methods in Journalism; and 490, Research, for a total not to exceed 8 hours. The product of the Research course should be a thesis showing capacity for investigation and independent thought.

In addition, *Plan B* students must:

1. complete 36 hours of graduate work, including at least 18 hours numbered 400 or higher;

2. complete the following graduate courses: 422, Mass Media Seminar; 487, Journalism as Communication, or 488, Research Methods in Journalism; and 499, Area Problem, for a total not to exceed 8 hours. The product of the Area Problem course should demonstrate a professional level of competency in a designated area of journalism.

3. The Area Problem may be completed in Columbia or in one of these off-campus programs:

- (a) M.A. candidates whose primary interest is in the reporting of public affairs may demonstrate professional competency in a program of depth reporting in Washington, D.C., under the supervision of a full-time faculty member of the School of Journalism. The program is directed from a facility in the National Press Club Building. Students who qualify for the reporting of public affairs programs in Washington need strong foundations in American and world history, in economics, and in political science. They report in depth on legislative, executive, and administrative aspects of the national government during their final semester.

- (b) Graduate students who wish to demonstrate professional competence in reporting may enroll in a program directed by a faculty member of the School of Journalism in London, England. In order to be considered for the London program, students need a strong background in economics because they will be reporting and interpreting



the activities of such organizations as the Common Market and NATO. In the semester preceding work in London, the student receives an intensive introduction to the European community in the course, Area Seminar, in the School of Journalism.

(c) Science, environmental, and medical reporting projects are currently available in New York. Special preparation prior to enrollment in these programs is advised.

(d) In Hong Kong, students participate in a reporting program set up as an exchange between the School of Journalism and the Mass Communication Center of the New Asia College, Chinese University. Publication emphasis is on the developing rapprochement between the U.S. and China, as well as between Japan and China.

(e) *Plan B* in Taipei is affiliated with the Department of Journalism, College of Chinese Culture, by means of a faculty-student exchange program limited to two Missouri students each year. Transportation and remuneration is offered for part-time teaching assistance in the college's journalism courses. Reporting emphasis is on developing Asian relationships with the United States. Publication outlets are the responsibility of the student.

Students interested in special coverage of state government and related agencies are supervised by a faculty member in Jefferson City, Mo.

Projects in advertising, broadcasting, public relations, readership investigations, media management, photojournalism, newspaper, and magazine origination have met all *Plan B* requirements.

Plan A and *Plan B* candidates must pass a written comprehensive examination. In addition, the *Plan A* candidate must pass an oral examination justifying the thesis as a work acceptable by the Graduate School. A *Plan B* candidate must pass an oral examination justifying the project

as a work acceptable by the Graduate School, and must provide the Graduate Studies Center with a detailed report of the project.

Each candidate is responsible for satisfying all residence and grade requirements, time limitations, and other matters specified in this bulletin and by the School of Journalism Graduate Studies Committee.

DOCTORAL DEGREE

The main objective of doctoral study in journalism is to develop facility in advanced research, and to integrate this skill and orientation with a depth of general scholarship in mass communications. Students must expand intellectual horizons, gain a theoretical framework for understanding communication, and refine the ability to communicate effectively.

The student must specialize or concentrate in three rather broad academic areas, two of them related to journalism (for example, International Journalism, and Mass Communications Research and Theory), and the other related to one academic field outside journalism (for example, sociology).

Ph.D. candidates must pursue post-baccalaureate study for a period of at least six semesters and submit an acceptable dissertation, pass all prescribed examinations, and satisfactorily meet all other requirements of the Graduate School.

During the first semester of graduate study beyond the Master's degree (or its equivalent), the doctoral student should consult with area specialists to discover research opportunities. Although no minimum number of credit hours is specified for the Ph.D. in journalism, from 50 to 65 beyond the Master's degree is common. The only journalism graduate courses required of all Ph.D. candidates are 422, Mass Media Seminar; 488, Research Methods in Journalism; and 489, Advanced Research Methods.

The student is admitted to candidacy for the Ph.D. in journalism after passing a qualifying examination, which should be

taken before pre-registration for the second semester or term on campus. The Ph.D. candidate must have a 3.0 grade point average and two years of professional experience.

The residence requirement is the equivalent of two years of graduate work beyond the Master's degree, exclusive of work taken to substitute for one foreign language.

To satisfy the language requirement, the candidate may take the regular examinations in two foreign languages; or a block of courses in a collateral field, such as statistics, in lieu of one language; or evidence fluency—in reading, speaking, and writing—in only one language.

Toward the end of the program, the student takes the comprehensive examination, administered by the Advisory Committee. Questions are given in two areas or "emphases" of journalism and in one area outside journalism which the student has chosen. This examination must be completed at least seven months before the final oral examination.

The dissertation is expected to be a contribution to knowledge in the general field of communication. It is read and appraised by at least three members of the Journalism faculty and by at least one member of the UMC faculty outside journalism, all of whom are on the student's committee. Following committee approval of the dissertation, the final oral examination, given primarily on the dissertation, is conducted.

Library Science and Information Science

Edward P. Miller, Ph.D., Oklahoma. Dean, School of Library & Informational Science; Assoc. Prof.; Director of Graduate Studies.

Bert R. Boyce, Ph.D., Case Western Reserve. Chairman, Information Science; Asst. Prof.

Francis J. Flood, A.M.L.S., Michigan. Chairman, Library Science; Assoc. Prof.

C. Edward Carroll, Ph.D., California. Prof.

Hellmut Lehmann-Haupt, Ph.D., University of Frankfurt. Prof. Emeritus

Ralph H. Parker, Ph.D., Texas. Prof.

Donald R. Shurtleff, Ph.D., Worcester Polytechnic Institute. Prof.

Roy W. Evans, Ph.D., Southern Illinois. Assoc. Prof.

Harold E. Holland, Ph.D., Columbia University. Asst. Prof.

Dean E. Schmidt, M.A., Minnesota. Asst. Prof.

The Department of Library Science offers graduate work and supervised experience leading to the degree of Master of Arts in Library Science.

Specialization is possible in academic, public, school, and special libraries; in information science, reference work, cataloging, and in work with children.

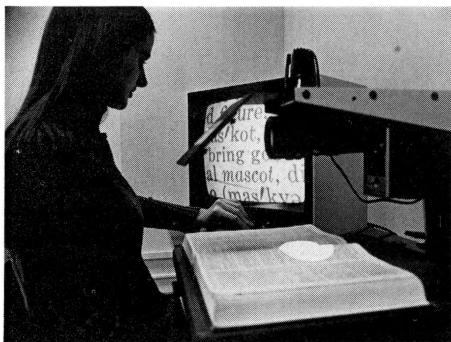
The UMC Ellis Library, with its extensive collections in many subject areas, offers support to the teaching and research program in library science and in informational science. The library's computerized record system is especially significant for teaching newer facets of librarianship. In addition, there are excellent libraries in the vicinity available for observation or for work experience.

A number of assistantships, limited to candidates for the M.A. in Library Science, are available for half-time employment in Ellis Library. There are several graduate teaching assistantships in the Department.

A degree equivalent to the Bachelor of Arts at UMC, including four basic courses (211, 221, 231, 241) in Library Science, is prerequisite to work for credit toward the Master's degree. If the degree does not include at least 9 hours of a modern foreign language and a major (24 semester hours) in a subject accepted without restrictions by the College of Arts and Science, these deficiencies must be made up without graduate credit.

Each applicant must demonstrate ability in computer programming, using one of the higher-level programming languages, preferably PL/I, through examination administered by the School of Library and Informational Science, or by completion of a college course in programming equivalent to Information Science 101.

Only students whose academic records indicate probability of successful completion of the Master's program are ac-



cepted for advisement. In general, a grade point average of 3.0 ($A=4.0$) on the last two years of undergraduate work, plus a satisfactory score on the Miller Analogies Tests, are required. Persons whose undergraduate grade point average is below 3.0 may be considered for admission, provided they have outstanding scores on aptitude tests. Under unusual circumstances, the Graduate Record Examination may be substituted for the Miller Analogies Test, but permission to make the substitution must be obtained from the Dean of the School of Library and Information Science.

To fulfill requirements for the degree, students must have a reading knowledge of one modern foreign language and fulfill other requirements as set out in their courses of study. The comprehensive examination may be either written or oral at the discretion of the departmental Committee on Examinations.

Three plans for the course of study are available:

Plan A is limited to students who have completed a Bachelor of Arts at the University of Missouri, with an area of concentration centered around library science. It includes 18 hours of library science as a major and 12 hours as a minor in another subject. There is no thesis, but a research course (450) is required.

Plan B is available to all other students. It includes, in addition to the four prerequisite courses in library science, at least 24 hours in library science and 6 hours in another subject, normally the undergraduate major. There is no thesis, but a research course (450) is required. Those students who have not had meaningful work experience in a library are required, in addition to the minimum program, to complete a course in library practice (380).

Plan C is designed for those interested in information science. It includes a major of 18 hours in library science and a minor of 12 hours in information science. There is no thesis, but a research course (450) is required. Those who have not had meaningful work experience in a library are required, in addition to the minimum program, to complete a course in library practice (380).

Management

Ronald Ebert, D.B.A., Indiana. Chairman; Assoc. Prof.

The Departments of Management, Finance, and Marketing in the School of Business jointly offer the Master of Business Administration and the Doctor of Philosophy in Business Administration interdisciplinary degrees. Program information and requirements are given under the area heading "Business Administration" in this catalog.

Marketing

Kenneth J. Roering, Ph.D., Iowa. Chairman; Assoc. Prof.

The Departments of Marketing, Finance, and Management in the School of Business jointly offer the Master of Business Administration and the Doctor of Philosophy in Business Administration interdisciplinary degrees. Program information and requirements are given under the area heading "Business Administration" in this catalog.

Mathematics

Clinton M. Petty, Ph.D., Southern California. Chairman; Prof.

Robert L. Wheeler, Ph.D., Wisconsin. Director of Graduate Studies; Assoc. Prof.

Leonard M. Blumenthal, Ph.D., Johns Hopkins. Distinguished Prof. Emeritus

Paul B. Burcham, Ph.D., Northwestern. Prof.

Melvin D. George, Ph.D., Princeton. Prof.

Marc Q. Jacobs, Ph.D., Oklahoma. Prof.

Walter Leighton, Ph.D., Harvard. Luther Marion Defoe Distinguished Prof. of Mathematics.

Ernest L. Roetman, Ph.D., Oregon State. Prof.

W. Roy Utz, Ph.D., Virginia. Prof.

Joseph L. Zemmer, Ph.D., Wisconsin. Prof.

Calvin D. Ahlbrandt, Ph.D., Oklahoma. Assoc. Prof.

Billy D. Arendt, Ph.D., Iowa. Assoc. Prof.

John K. Beem, Ph.D., Southern California. Assoc. Prof.

David H. Carlson, Ph.D., Case Western Reserve. Assoc. Prof.
 Robert P. Carmignani, Ph.D., Rice. Assoc. Prof.
 Richard M. Crownover, Ph.D., Louisiana State. Assoc. Prof.
 Nola A. Haynes, Ph.D., Missouri-Columbia. Assoc. Prof. Emeritus
 James A. Huckaba, Ph.D., Iowa. Assoc. Prof.
 Ping Fun Lam, Ph.D., Yale. Assoc. Prof.
 L. Jerome Lange, Ph.D., Colorado. Assoc. Chairman; Assoc. Prof.
 Dix H. Petty, Ph.D., Utah. Assoc. Prof.
 Keith R. Pierce, Ph.D., Wisconsin. Assoc. Prof.
 David J. Rodabaugh, Ph.D., Illinois Institute of Technology. Assoc. Prof.
 Keith W. Schrader, Ph.D., Nebraska. Assoc. Prof.
 F. Dennis Sentilles, Ph.D., Louisiana State. Assoc. Prof.
 Mary L. Cummings, M.A., Illinois. Asst. Prof. Emeritus
 Paul E. Ehrlich, Ph.D., SUNY at Stony Brook. Asst. Prof.
 James C. Kelly, Ph.D., Indiana. Asst. Prof.
 John H. Reeder, Ph.D., Northwestern. Asst. Prof.
 Richard C. Swanson, Ph.D., California-Santa Cruz. Asst. Prof.

The Department of Mathematics offers graduate work leading to the degrees Master of Arts, Master of Science for Teachers, Master of Science in Applied Mathematics, and Doctor of Philosophy.

Before being accepted as candidates for an advanced degree in Mathematics, applicants must first be admitted to the Graduate School. Their undergraduate mathematics courses and grades are then evaluated by the Department. While a bachelor's degree from an accredited institution is required, the undergraduate major need not be mathematics, as long as applicants have had sufficient mathematics training to prepare them for graduate work.

About 150 graduate students, of whom 15 are post-Master's, are currently in the department; many are supported by graduate teaching assistantships. Students considered eligible for fellowships may be asked to submit more detailed information about their qualifications.

MASTER OF ARTS

The requirements for the M.A. degree include the satisfactory completion of 30 hours of approved course work, of which at least 18 hours must be 400 level. The courses Theory of Functions of Real Variables I (Math 404), Complex

Analysis I (Math 413), Theory of Groups I (Math 432), and General Topology I (Math 468) are required for the degree. Students are expected to make up any deficiencies in their undergraduate training in advanced calculus and abstract algebra, and may list on their graduate program at most two of the courses Math 310, Math 311, Math 340, and Math 341. A written comprehensive examination is given in the final semester covering the material in the eight courses mentioned above. An additional oral examination may be required in some circumstances.

MASTER OF SCIENCE FOR TEACHERS

This degree is designed primarily for those whose major interest is in the teaching of mathematics at the secondary school level. It is designed to give a student a broad background in courses at the advanced-undergraduate—beginning-graduate level, but does not require the depth of study needed in the M.A. program. Courses in other fields, such as Statistics and Computer Science, may be included as part of the program. A candidate for the degree must have a certificate valid for teaching high school mathematics prior to completing the program for the degree. Requirements include 30 hours of course work, of which at least one course must be numbered above 400. At least two courses in each of the fields of algebra, analysis, and geometry (including topology) must be included in the program. Comprehensive written and oral examinations are given near the end of the program.

MASTER OF SCIENCE IN APPLIED MATHEMATICS

The program for this degree is designed to give students training in those areas of mathematics which are frequently used in applications. The requirements for the M.S. degree include the satisfactory completion of 30 hours of approved course work, of which at least 15 hours must be 400 level and 12 must be taken in the Department of Mathematics. The

courses Theory of Functions of Real Variables I (Math 404), Complex Analysis I (Math 413), and Partial Differential Equations (Math 408) are required for the degree. It is also expected that the student will have completed at least one course in each of the areas of linear algebra, numerical analysis, differential equations (beyond Math 304), and mathematical statistics or probability. At least 3 hours of graduate credit must be earned in approved courses outside the Department. Near the end of the final semester the student is required to pass a written examination on advanced calculus, real and complex analysis, linear algebra, and ordinary differential equations. An additional oral examination may be required in some circumstances.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy degree is a professional research degree designed to prepare students for various advanced professional careers, including college teaching and research.

Before formally becoming a candidate, a student must have training equivalent to that required for a master's degree and must pass a qualifying examination. Students with master's degrees from other institutions are often permitted to transfer this work as one-third of the Ph.D. residence requirement, and should expect to pass the qualifying examination shortly after beginning work here. In addition, the candidate must give evidence of reading proficiency in two foreign languages, complete a course of study approved by the advisory committee, and pass a comprehensive examination.

This Department has directed Ph.D. work for over 70 years. The active areas of research interest of the current members of the staff are: commutative rings, complex analysis, continued fractions, control theory, convexity, dynamical systems, differential equations (ordinary and partial), differential geometry, functional analysis, global analysis, group theory, integral equations, metric geometry, nonassociative algebras, numerical

analysis, operator theory, projective planes, semigroups, topology, and topological measure theory.

Mechanical and Aerospace Engineering

Paul W. Braisted, Ph.D., Stanford. Chairman; Prof.
 Carl M. Sneed, Ph.D., Michigan. Assoc. Chairman; Assoc. Prof.
 Roger C. Duffield, Ph.D., Kansas. Director of Graduate Studies; Prof.
 Alfred S. Gaskell, M.S., Iowa State. Prof. Emeritus
 David W. Hoepfner, Ph.D., Wisconsin. Prof.
 John C. Lysen, Ph.D., Iowa State. Prof.
 John B. Miles, Ph.D., Illinois. Prof.
 Gordon L. Moore, Ph.D., Florida. Prof.
 Jack W. Morgan, Ed.D., Missouri-Columbia. Asst. Dean, College of Engineering; Prof.
 Oran A. Pringle, Ph.D., Wisconsin. Prof.
 Richard C. Warder, Jr., Ph.D., Northwestern. Prof.
 Gaylord H. Bunch, M.S., Missouri-Columbia. Assoc. Prof.
 William L. Carson, Ph.D., Iowa. Assoc. Prof.
 Donald L. Creighton, Ph.D., Arizona. Assoc. Prof.
 Donald L. Gibson, Ph.D., Vanderbilt. Assoc. Prof.
 David A. Hansen, Ph.D., Iowa State. Assoc. Prof.
 Franklin D. Harris, Ph.D., Arkansas. Assoc. Prof.
 John Love, Jr., Ph.D., Oklahoma State. Assoc. Prof.
 Charles N. McKinnon, Jr., Ph.D., Missouri-Columbia. Assoc. Prof.
 George H. Stickney, Ph.D., Michigan. Assoc. Prof.
 David E. Wollersheim, Ph.D., Illinois. Assoc. Prof.
 Ross D. Young, M.S., Iowa State. Assoc. Prof.
 Darrol H. Timmons, Ph.D., Kansas State. Asst. Prof.
 Jeffrey W. Young, Ph.D., California-Davis. Asst. Prof.

The Department of Mechanical and Aerospace Engineering offers advanced study leading to the degrees of Master of Science and Doctor of Philosophy.

Graduate programs are planned to prepare students for advanced professional engineering careers. In recognition of the broad nature of the field of Mechanical and Aerospace Engineering, considerable latitude in programs is encouraged, so that students may prepare for employment in varied fields such as teaching, industry, and government.

Some areas of concentration a student may pursue are gas dynamics, heat transfer, direct energy conversion, structural integrity, engineering mechanics, mechanism synthesis, design, automatic controls, material science, bio-medical engineering, thermodynamics, and solar energy.

The Department has a number of special laboratory areas which are continually being expanded and improved. Included are laboratories for structural integrity, material science, heat transfer, fluid dynamics, interactive graphics, systems dynamics, X-ray diffractometry, and micro-wave plasma diagnostics.

In addition to the modern instrumentation and equipment normally found in well-equipped mechanical and aerospace engineering laboratories, the Department has such special items as a sub-sonic and super-sonic wind tunnel; a water table; an ultra-high vacuum system; three dynamic shake tables, including a 3,500 vector-pound electrodynamic shaker; a GE X-ray diffractometer; sample preparation facilities; a shock tube; a 32-kilogauss electromagnet; a Kerr cell optical shutter; and an optical spectrometer. Students have convenient access to a campus IBM 370/168 digital computer, a SEL 840A hybrid computer, and a series of analog computers operated by the College of Engineering. The proximity of the UMC School of Medicine offers opportunity for interdisciplinary projects in the rapidly developing field of bioengineering.

The Department currently has support for about two-thirds of its graduate students in the form of fellowships, and research and teaching assistantships. Consideration of applications for financial support starts on March 1 of each year. Application forms and further information about the Department can be obtained by writing the Director of Graduate Studies, Department of Mechanical and Aerospace Engineering.

MASTER'S DEGREE

The Master of Science degree in MAE is open to students with a B.S. degree in the same, or closely related, field.

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. Lower GPAs require special action and substantiation, such as three strong letters

of recommendation and a good score on the GRE or other recognized examination.

A program of study is developed by the student and adviser, subject to approval by the Departmental Graduate Committee and the Department Chairman.

The minimum degree requirement is 30 semester hours which must include a special problem or a thesis project. A special problem consists of 3 to 6 hours of MAE 400, with not more than 6 hours total of MAE 300 (Problems) and 400 for programs terminating in a report. Alternatively, programs directed toward a thesis shall include 6 to 9 hours of MAE 490. A thesis or a report must be read and approved by designated faculty members and placed on file in the departmental records. The successful completion of the M.S. final examination, administered by a faculty committee, finishes degree requirements.

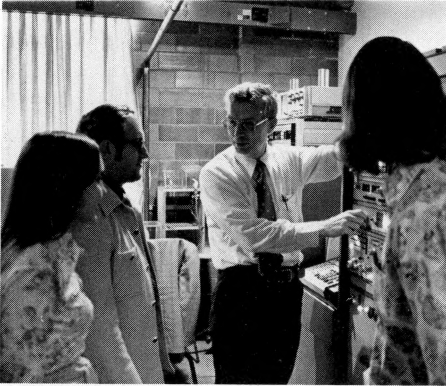
A maximum of 6 hours of graduate course work taken at other accredited institutions may be transferred. Courses in the 300 series, if not required for the undergraduate degree in Mechanical and Aerospace Engineering, may be used as part of the graduate program. Courses in the 200 series not in the MAE Department may also be part of the program. Each program must have at least 15 hours of 400-level credit.

DOCTORAL DEGREE

Ph.D. program applicants are closely and individually scrutinized. Minimum admission requirements include a strong record on the M.S. program and three letters of recommendation, one being from the applicant's M.S. adviser, if possible. Additionally, all applicants are strongly urged to take the GRE examination.

The usual purpose of a Ph.D. program is to prepare a person for a career in research or in teaching. The program is oriented toward research culminating in a dissertation suitable for publication.

In addition to course work in engineering, it is expected that a student's program will include additional mathematics and



basic science courses. Proficiency in reading one pertinent foreign language is currently required for the Ph.D. degree. German or French is customary; however, an appropriate substitution can be made for good cause. Alternatively, a special research technique or a collateral field can be substituted for the language.

A doctoral student must spend at least "one continuous year" beyond the master's degree level in full academic involvement on the Columbia campus. "One continuous year" is defined as either two 12-hour semesters or three 8-hour semesters successfully completed within 18 months. The three-year requirement may be met by completing the equivalent of six 12-hour semesters beyond the bachelor's degree.

The Ph.D. candidate works out a program of study and research under the immediate supervision of an adviser and in close cooperation with the Advisory Committee, which is appointed by the dean of the Graduate School upon the adviser's recommendation.

A qualifying examination, consisting of both written and oral questions, is given soon after the student begins doctoral study. It is administered by a five-man committee selected by the student's adviser. When previously arranged, the M.S. final examination can be administered so that it also serves as the Ph.D. qualifying examination. Successful completion of this examination is a prerequisite to formal acceptance into the Ph.D. program. A comprehensive examination is given after

all course work and language requirements have been satisfied. Upon completion of the program of study and research, a final examination is administered which is essentially a defense of the dissertation.

Microbiology

David J. Hentges, Ph.D., Loyola. Chairman; Prof. Thomas A. Brawner, Ph.D., Texas-Austin. Director of Graduate Studies; Asst. Prof.

James T. Barrett, Ph.D., Iowa. Prof.

Frank B. Engley, Jr., Ph.D., Pennsylvania. Prof.

Herbert S. Goldberg, Ph.D., Ohio State. Assoc. Dean, School of Medicine; Prof.

Joseph T. Parisi, Ph.D., Ohio State. Prof.

Reuel R. Hook, Jr., Ph.D., West Virginia. Microbiologist, Sinclair Comparative Medicine Research Farm; Assoc. Prof.

Hammond G. Riggs, Jr., Ph.D., Texas. Assoc. Prof.

Ronald F. Sprouse, Ph.D., Oklahoma. Assoc. Prof. (Microbiology & Pathology)

Michael Cooperstock, M.D., Michigan. Asst. Prof. (Child Health & Microbiology)

The Department of Microbiology offers graduate work leading to the degrees of Master of Science and Doctor of Philosophy. The M.S. degree, designed for students who have an undergraduate degree in biological or physical science, combines depth in microbiology with breadth in closely allied sciences. The Master's program requires about two years of advanced study culminating in a research thesis under the supervision of the student's adviser. The Ph.D. degree is offered to students who, after long study, have reached a high attainment in some special branch of learning and have given the clearest evidence of research potential, as approved by competent judges. The Ph.D. program normally requires three years beyond the Master's degree.

Graduate programs in microbiology are designed to prepare students for advanced professional careers in universities and colleges, research institutes, public health and hospital laboratories, industrial research, and production institutes. The educational philosophy of the department views microbiology as a rapidly changing field because of the advent of new techniques designed to obtain biological information at the subcellular or molecular level. Accordingly, graduate

programs in microbiology include course work in biochemistry, chemistry, genetics, and statistics.

Special facilities for microbiology study and research include: infrared, ultraviolet, and visible light spectrophotometry; ultraviolet, darkfield phase, and electron microscopy; high speed preparative and analytical ultracentrifugation, lyophilization equipment; column chromatography; paper, disc, starch and gel electrophoresis; special equipment for anaerobic studies; and facilities for germ-free animal experimentation.

The distinct areas of concentration a student may pursue are antibiotics, anti-sepsis disinfection and sterilization, immunology, microbial genetics, mycology, parasitology, pathogenicity, microbial physiology, and virology.

Many students admitted to the doctoral program are awarded teaching or research assistantships. Under the guidance of faculty members, teaching assistants are given practical experience in planning, organizing, teaching, laboratory preparation, and evaluating matter in microbiology. Research assistants work with faculty members to obtain practical experience in the planning of research proposals, the collection of research data, and the writing of research reports.

MASTER'S DEGREE

Entrance requirements for the M.S. program are a degree from an acceptable college of university, with courses in the following: biology (botany or zoology, plus at least one advanced course); chemistry (qualitative and organic); physics (one year); and mathematics (college algebra, analytical geometry, or trigonometry). The GRE is required.

The minimum course requirements for completing the degree are 30 hours of graduate study, 16 hours of which must be in courses numbered 400 or above. The 30 hours of graduate credit are composed of the following:

301, Medical Microbiology (8 hrs.)

401, Advanced Medical Microbiology (2 hrs.)

410, Seminar—continuous enrollment (to a maximum of 4 hours toward the required 30 hours)

490, Research; 400, Problems (7 hrs.)

Other departmental courses not listed above (9 hrs.)

It is strongly recommended that new students enroll in a biochemistry course during their first semester as a graduate student in the department.

In addition, a student must complete original research in preparation of a thesis, and pass an oral examination in both its defense and covering course work.

DOCTORAL DEGREE

To be accepted for candidacy into the Ph.D. program in Microbiology, all applicants must perform satisfactorily on a qualifying examination prepared and evaluated by all full-time faculty members in residence at the time of the examination. Part-time faculty members and joint appointees may contribute to the qualifying examination. The Ph.D. program normally requires three years beyond the Master's degree and consists of the following:

1. a course of study in which a minor field may be recommended;
2. either a demonstration of competence in a foreign language, or 3 hours of course work of an advanced nature in a discipline outside the usual study plan approved by the department;
3. practical experience in teaching;
4. successful completion of a comprehensive examination; and
5. a demonstration of research and writing ability by completing a scholarly dissertation on an approved research problem.

Under the guidance of an advisory committee, a course of study is individually designed to fit each student's academic background, experience, and objectives.

Minor fields may include biochemistry, chemistry, genetics, and statistics, or other areas. The minor field(s) provides breadth and balance in the program and enhances the student's research abilities. First and second minors may be so designated; a minor field comprises 15 semester hours of work carrying graduate credit in a single department.

A final examination covers chiefly the dissertation.

Music

Donald E. McGlothlin, Ph.D., Iowa. Chairman; Prof.
James M. Burk, D.M.Ed., Oklahoma. Director of Graduate Studies (Music); Assoc. Prof.
Charles L. Emmons, M.E., West Texas State. Prof.
Richard L. Hills, Ph.D., Iowa. Prof.
Thomas L. Mills, M.M., Illinois. Prof.
Andrew C. Minor, Ph.D., Michigan. Assoc. Dean, Graduate School; Prof.
Carleton B. Spotts, M.M., Manhattan School of Music. Prof.
John E. Cheetham, D.M.A., University of Washington. Assoc. Prof.
George B. DeFoe, M.A., Columbia Teachers College. Assoc. Prof.
Raymond C. Herbert, M.M., Eastman School of Music. Assoc. Prof.
Carolyn K. Kenneson, M.M., Texas. Assoc. Prof.
W. Thomas McKenney, Ph.D., Rochester. Assoc. Prof.
James A. Middleton, D.M.Ed., Oklahoma. Director of Graduate Studies (Music Education); Assoc. Prof.
Harry S. Morrison, Jr., M.F.A., Iowa. Assoc. Prof.
Charles Nick, Ph.D., Indiana. Assoc. Prof.
Perry G. Parrigin, M.M., Indiana. Assoc. Prof.
Alexander L. Pickard, Jr., D.M.A., Eastman School of Music. Assoc. Prof.
Ira C. Powell, D.M.Ed., Oklahoma. Assoc. Prof.
Virginia T. Pyle, D.M., Florida State. Assoc. Prof.
Santiago Rodriguez, M.M., Juilliard. Assoc. Prof.
Charles H. Sherman, Ph.D., Michigan. Assoc. Prof.
Edward R. Thaden, D.M., Florida State. Assoc. Prof.
Barbara A. Wood, M.A., Missouri-Columbia. Assoc. Prof.
Jane F. Franck, M.M., New Mexico. Visiting Asst. Prof.
Helen K. Harrison, M.A., Iowa. Asst. Prof.
Susan Hicks, M.M., Yale. Asst. Prof.
W. Peter Kurau, M.M., Connecticut. Asst. Prof.
Anne F. Manahan, M.S., Juilliard. Visiting Asst. Prof.
Betty J. Scott, Ph.D., Florida State. Asst. Prof.
Eva D. Szekely, M.S., Juilliard. Asst. Prof.
Thomas M. Wubbenhorst, Yale, Asst. Prof.

The Department of Music offers graduate programs leading to the degrees Master of Music in Theory and in the applied areas; Master of Arts in Music History, Theory, Composition, or Education (with a major in Music Education); Master of Education with a major in Music Education. For Education information, see that department's listing in this catalog.

At UMC a student of music has an unusual opportunity to participate in varied performing organizations. A series of recitals are given by students, faculty, and visiting artists; several concerts are given during the year by the University Orchestra, Concert Band, Collegium

Musicum, and the Esterhazy Quartet. The music section of the Fine Arts Building contains a recital hall, classroom, and studio—all air-conditioned and suitably equipped.

The Art, Archaeology, and Music Library is one of eight subject-oriented divisions within Ellis Library. The fine arts holdings here number 25,000. The department maintains an electric keyboard laboratory for class piano, an electronic music studio, and has access to a Listening Laboratory for music history and theory courses.

For course requirements of the various sequences, write the Department for its bulletin. At the same time, the student may request information on assistantships and other financial aids.

ENTRANCE REQUIREMENTS

All graduate students intending to pursue a program which requires the study of theory courses must take the Graduate Entrance Examination in Theory. Students failing to meet the minimum standards in aural perception, or stylistic writing and analysis, are required to satisfactorily complete the respective review course (Music 107 and/or 108). The entrance examination is given at 8:00 a.m. on the first day of registration in August or June in Room 146, Fine Arts Building.

MASTER OF MUSIC DEGREE

The applied areas of performance are piano, organ, strings, voice, wind and percussion instruments. A candidate must have a B.M. in the same area or its equivalent. If a senior recital was not presented for the B.M., then such a program must be given by the student prior to the graduate recital. Other prerequisites for admission are the performance ability of graduate level as determined by an audition for a committee in the applied area, and a foreign language requirement of 13-20 hours, depending on the major.

To satisfy the requirements for the M.M. degree in one of the applied areas, a student must complete 32 hours of grad-

uate work, with a minimum of 16 hours at the 400 level; admission to 400-level courses is determined by audition. In all areas, 6 hours of music history and 6 of music theory at the 300 level are required. Graduate-level courses in the area, repertory and electives, complete the course requirements. The graduate recital has a faculty hearing in advance of the public performance. Piano majors present, in addition to the graduate recital, a memorized performance of a concerto with orchestra or second piano.

The prerequisites for the Master of Music degree in theory include:

- (1) admission to Graduate School;
- (2) bachelor's degree in music;
- (3) evidence of study and satisfactory completion of 18 hours in basic theory courses (including 2 hours of form and analysis), 4 hours of 16th- or 18th-century counterpoint, 4 hours of orchestration, and 2 hours theory elective;
- (4) 4 hours of music history; and
- (5) 16 hours or the equivalent of undergraduate applied music.

All candidates must file a formal application with the theory staff for admission to the program. Other requirements include a thesis, final oral examination, and a proficiency audition in sight singing and keyboard harmony.

The program of study consists of 22 hours of advanced courses in theory (including a thesis, 4 to 6 hours), 5 to 6 hours of music history, and 5 to 6 hours of applied music. A minimum of 33 hours must be completed by all students.

MASTER OF ARTS DEGREE

Prerequisites for the M.A. in music history are admission to the Graduate School; two years of piano; sufficient proficiency in technique and sight reading to be of use as a tool for investigation; 16 hours in harmony, ear-training, and sight singing; 4 hours in 16th-century counterpoint, 4 hours in form and analysis; and 8 hours of music history.

To complete requirements for the degree, the music history major may include 8 hours of upper-class work in applied music courses, numbered 300 or above, in partial satisfaction of the requirements for

the degree. Music history courses 321, 322, 323, or 324 may be included for graduate credit if not used to satisfy prerequisites for admission. In addition to the course requirements of 14-20 hours of music history and an outside course, a formal thesis on some phase of music history is required. This may count as graduate credit up to 8 hours in Music 490. In lieu of a formal thesis, a public recital may be substituted, subject to a pre-recital faculty hearing. In addition to the recital, each non-thesis major must elect Music 400 for 8 hours, which includes a survey of the literature in the applied field. As a part of this survey, the student must write three extended term papers.

The prerequisites for the M.A. in Theory are the same as those for the M.M. in Theory. The requirements for the program of study include:

- A. 18 to 22 hours of advanced courses in theory (including a thesis, 4 to 6 hours);
- B. 5 to 6 hours of music history;
- C. 5 to 6 hours in areas other than music; and
- D. 2 hours in an applied area (optional).

A minimum of 32 hours is essential for the above degree.

For information regarding the prerequisites and program of study for the M.A. degree in composition, write to the Department Chairman.

Nursing

Gladys A. Courtney, Ph.D., Illinois (Chicago). Dean, School of Nursing; Prof.

Frances Seither, Ph.D., Maryland. Director of Graduate Studies; Prof.

Betty Crim, M.Ed., Missouri-Columbia; Assoc. Prof. Elizabeth Geden, Ph.D., Missouri-Columbia. Asst. Prof.

Judith Sanders, M.S., Maryland. Asst. Prof.

The School of Nursing offers a graduate program leading to the Master of Science degree. The program provides specialized preparation in Community Mental Health Nursing, Family-Child Health Nursing, Medical-Surgical Nursing, and Mental Health Liaison Nursing; functional preparation in teaching, administration, or clinical research; a foundation for study on the doctoral level, and the opportunity to develop the qualities of scholarship neces-

sary to such study. The program is National League for Nursing accredited.

The graduate of the Master's program in nursing is expected to:

1. differentiate between various philosophies, models, theories, and conceptual frameworks according to purposes, function and methods of development;
2. design nursing systems based on a self-care deficit conceptual framework;
3. critically analyze research findings for applicability to assessment of client needs and implementation of nursing care;
4. demonstrate beginning competence as a nurse researcher through empirical investigation of a nursing problem using a scientific approach;
5. participate as a member of the health care team using skills as practitioner, educator, and collaborator;
6. assess individual needs, facilities, and resources related to health care delivery; and
7. exert leadership in activities relevant to nursing practice and health care delivery.

All students in the School of Nursing have access to the Medical Center library with its large collection of medical and nursing books, journals, tapes, etc. The School's location in the Medical Sciences Building of the UMC Medical Center provides convenience for the nursing students as they obtain learning experiences in the UMC Hospital, its outpatient department and rehabilitation unit; the Veterans Administration Hospital; and the Mid-Missouri Mental Health Center. In addition, opportunities are provided for students to gain learning experiences in other hospitals and health agencies in the city of Columbia and surrounding counties.

A limited number of traineeships, fellowships, scholarships, and assistantships are available to qualified graduate students. Additional information regarding financial assistance may be obtained from the Director of Graduate Studies, School of Nursing, UMC.

DEGREE REQUIREMENTS

A baccalaureate degree from a National League for Nursing accredited program or a degree judged to be its equivalent, with a grade point average of at least 3.0 ($A=4.0$), is prerequisite. Applicants who

have completed other curricula or who have deficiencies are considered individually and may be required to enroll in designated courses. The Graduate Record Examination, Part I, must be taken prior to admission. Results of this examination should be sent to the UMC School of Nursing. Acceptance for admission toward the Master's degree is based on prior academic record, scores on the GRE, and two letters of recommendation from persons who have knowledge of the candidate's work or study during the past three years.

To satisfy requirements for the M.S., a student must (1) complete an approved program with a cumulative GPA of 3.0 ($A=4.0$); (2) comply with residence, time limitations, and other matters as specified in this catalog.

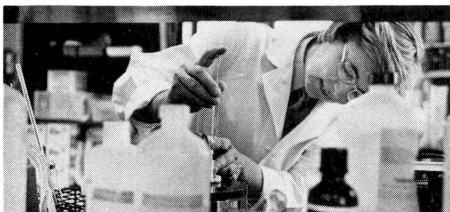
The approved program entails four semesters of course work. A thesis is optional. The program must be completed within a five-year period.

Pathology

- John F. Townsend, M.D., Missouri-Columbia. Interim Chairman; Prof.
Arlene P. Martin, Ph.D., Rochester. Director of Graduate Studies; Prof.
James Esterly, M.D., Chicago. Prof.
Howard C. Hopps, M.D., Ph.D., Chicago. Prof.
Donald A. B. Lindberg, M.D., College of Physicians & Surgeons. Prof.
Marie L. Vorbeck, Ph.D., Cornell. Prof.
Edward H. Adelstein, D.V.M., M.D., Missouri-Columbia. Sr. Prof.
Probodh K. Srivastava, Ph.D., Missouri-Columbia. Asst. Prof.

The Department of Pathology of the School of Medicine offers graduate work leading to the Master of Science degree. The Department cooperates with the Department of Plant Pathology of the College of Agriculture and with the Department of Veterinary Pathology of the College of Veterinary Medicine in offering a new area Ph.D. program in pathology, presented in the section on Area Programs in this catalog.

Research in pathology is readily accomplished through the availability of standard and special use equipment in the research laboratories. Faculty and staff members provide guidance, as well as



practical supervision in the conduct of clinical and experimental research. The M.S. degree is designed to prepare students for teaching in schools of medical technology, or supervisory roles in clinical laboratories. The degree is also considered preparatory to the Ph.D. degree which may lead to careers in teaching and research.

For information on and application forms for available assistantships, write to the Director of Graduate Studies, Pathology Department, UMC Medical Center.

DEGREE REQUIREMENTS

Admission to candidacy in the Master's program is limited to those who hold a baccalaureate degree in one of the biological sciences from an accredited college or university. GRE scores should be submitted on the general aptitude section of the examination.

Requirements for the degree include:

1. a minimum of 30 semester hours, with 15 or more hours at the 400 level;
2. maintenance of a B or better average in graduate course work;
3. a minimum of 5 hours of educational courses;
4. no more than 12 hours of research, problems, or special investigations culminating in a dissertation; and
5. satisfactory performance on a final examination in which a candidate is expected to demonstrate knowledge of clinical and research techniques, as well as defend the dissertation.

Faculty members advise students in the preparation of a program of study. Required courses are blended with those of special interest to the individual in order to complement the student's academic background and career objectives. In some cases, additional course work may be recommended to strengthen the candidate's knowledge of pathology.

Pharmacology

Murray Heimberg, M.D., Vanderbilt; Ph.D., Duke. Chairman; Prof.

Frederick Miller, Ph.D., Cincinnati. Director of Graduate Studies; Asst. Prof.

Leslie Eisenbrandt, Ph.D., Rutgers. Prof. Emeritus
Bertis A. Westfall, Ph.D., Missouri-Columbia. Prof. Emeritus

Robert L. Russell, Ph.D., Missouri-Columbia. Prof.

Walter D. Wosilait, Ph.D., Johns Hopkins. Prof.

Keith H. Byington, Ph.D., South Dakota. Assoc. Prof.

Leonard R. Forte, Ph.D., Vanderbilt. Assoc. Prof.

Carlos Soler-Argilaga, M.D., Barcelona (Spain). Visiting Assoc. Prof.

Ira Weinstein, Ph.D., George Washington. Assoc. Prof.

Henry G. Wilcox, Ph.D., Florida. Assoc. Prof.

David B. Bylund, Ph.D., California. Asst. Prof.

Edward H. Goh, Ph.D., Vanderbilt. Asst. Prof.

Robert A. Harris, Ph.D., North Carolina. Asst. Prof.

Friedhelm Schroeder, Ph.D., Michigan State. Asst. Prof.

Vincent St. Omer, Ph.D., University of Guelph (Canada). Asst. Prof.

Garf Thomas, M.S., Iowa. Asst. Prof.

The Department of Pharmacology offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy. The Department, however, does not encourage study toward the M.S. as a terminal degree. Since pharmacology is not taught in most undergraduate colleges due to the required background of mathematics, chemistry, physics, physiology, and biochemistry, the professional attainment and understanding at the master's degree level is usually insufficient for a career in pharmacology. The Master of Science program can be used as a step toward the Ph.D. program, although the M.S. is not required.

Graduate programs in pharmacology are designed to prepare students for academic teaching and research, research career positions in government, or industrial research in pharmacology. For their doctoral research, students may select from a variety of areas of active research in this department. These areas include absorption, biotransformation, distribution, and excretion of drugs; toxicology; actions of drugs on the autonomic nervous system; effects of drugs on microcirculation; mechanisms of action of anticoagulant drugs; metabolism of calcium-hormone receptor mecha-

nisms; renal pharmacology; psychopharmacology; behavioral pharmacology; mechanisms of narcotic addiction; developmental pharmacology; effects of drugs on functional and physiochemical properties of membranes of normal cells and cancer cells; mechanisms of oncogenesis; and endocrine and lipid pharmacology. The major emphasis of the Department is on biochemical aspects of pharmacology.

Cooperative programs with the College of Veterinary Medicine and the nearby Sinclair Research Farm provide research opportunities in a comparative pharmacology laboratory where effects of drugs on large domesticated animals such as horses, goats, sheep, and swine can be investigated. In addition, a large modern animal care center under the direction of a veterinarian is located within the Medical Center, where small laboratory animals are maintained for acute and chronic drug studies. Our location on a university campus in Columbia enables us to enrich our program through meaningful interaction with the Colleges of Arts and Science, Agriculture, Veterinary Medicine, and the School of Medicine. The cooperative research atmosphere on this campus is genuine, and staff and students are encouraged to work across departmental lines, which provides for a unique educational opportunity for training in many areas of pharmacology.

Within the limits of our resources, teaching and research assistantships are available to qualified graduate students who are candidates for the Ph.D. degree in Pharmacology. Students are usually admitted to the fall semester only. Applications should be submitted by March 1. Additional information can be obtained from the Director of Graduate Studies, Department of Pharmacology, M523 Medical Sciences, UMC, Columbia, Mo. 65201.

DEGREE PROGRAMS

Admission to the Ph.D. program is open to students who have a good background in biology and chemistry, with an understanding of mathematics and

physics. Deficiencies may be remedied during the first year of the graduate program. A bachelor's degree in either chemistry, biology, pharmacy, or related areas from an acceptable accredited college is recommended. To satisfy requirements for the M.S. degree, a student must complete the professional program of study with an average grade of *B* or better, and pass an oral comprehensive examination over an acceptable master's dissertation. Candidates must also comply with other regulations governing master's degrees. In the selection of students, preference is given to those who wish to enter the doctoral program. The doctoral program normally requires four years beyond the baccalaureate degree. A master's degree is not required. Entrance directly into the Ph.D. program is possible for students with a good educational background. If a master's degree is received, either at UMC or elsewhere, the program for the Ph.D. degree usually requires three years of additional work.

Selection of students is based on a combination of the following criteria: a 3.0 or higher overall grade point average (some exceptions) in undergraduate work ($A = 4.0$), with consideration given to a variety of other criteria serving as predictors of probable success in graduate study. All students are required to achieve a combined score of at least 1100 on the Graduate Record Examination. A potential candidate for the Ph.D. must pass a qualifying examination approved by the planning committee and given by the department. Upon acceptance, a student must complete the program of study, perform original research, and gain teaching experience. Although no foreign language or specific correlative skill is required, most students are encouraged to take one foreign language, and a research technique or collateral field designed to meet their needs. A candidate must pass a comprehensive examination over the field of pharmacology and an oral examination, complete an acceptable dissertation, and pass a final oral examination on the dissertation.

Philosophy

Joseph Bien, Ph.D., University of Paris. Chairman; Assoc. Prof.

John Kultgen, Ph.D., Chicago. Director of Graduate Studies; Prof.

Arthur Berndtson, Ph.D., Chicago. Prof.

William Bondeson, Ph.D., Chicago. Prof.

Donald Sievert, Ph.D., Iowa. Assoc. Prof.

Alexander von Schoenborn, Ph.D., Tulane. Assoc. Prof.

William Wilcox, Ph.D., Syracuse. Assoc. Prof.

Bina Gupta, Ph.D., Southern Illinois. Asst. Prof.

Peter Markie, Ph.D., Massachusetts. Asst. Prof.

The Department of Philosophy offers a program of graduate study leading to the M.A. and Ph.D. degrees in the major fields of philosophy. A standard selection of undergraduate and graduate courses is provided, with advanced courses in areas determined by faculty members' specialties and graduate students' interests.

The Department prepares creative philosophers and superior philosophy teachers by giving graduate students full responsibility for underclass sections of Logic, Ethics, and Introduction to Philosophy; faculty coordinators assist in the preparation of courses, and through class visits suggest improvements in teaching techniques. Teaching at least one of the under-class courses is a prerequisite for a Ph.D. The Department offers a graduate seminar in the teaching of philosophy, which the graduate student normally takes for at least one semester.

Original research by graduate students is encouraged. A regular schedule of prominent off-campus philosophers visit the Department yearly for talks and symposia.

Fellowships and teaching assistantships are available to qualified graduate students. Applications should be submitted by March 1 for the following fall. Applications for financial assistance and further information may be obtained from the Director of Graduate Studies.

M.A. IN PHILOSOPHY

Graduate work in philosophy requires the equivalent of the following six courses for the A.B. in the department: logic, ethics, ancient western philosophy, early modern philosophy, nineteenth-century

philosophy, and contemporary philosophy. Deficiencies may be made up after the student is enrolled at UMC, but only the last two may be taken for graduate credit after acceptance into the graduate program.

Additional admission requirements are a 3.0 grade point average ($A=4.0$) in all undergraduate work for the last four semesters, with a 3.25 average in all philosophy courses, and three letters of recommendation; the GRE Verbal and Quantitative Aptitude Tests are required; the Advanced Test in Philosophy is recommended. The Miller Analogies Test may be substituted for the Graduate Record Examination.

Applicants are judged not only on the basis of grades and test scores, but also on the general reputation of their undergraduate institution, recommendations, and other evidence of serious intent and intellectual ability. Any unusual circumstances regarding failure to meet the minimum requirements should be called to the attention of the Director of Graduate Studies.

M.A. degree requirements are: 30 semester hours of graduate work, of which 15 must be at the 400 level; a thesis, credited at 6 hours of 400-level work; and an oral examination on the thesis. There is no language requirement for the M.A. degree in Philosophy.

At least 80 per cent of the hours submitted for the Master's program must be completed with a grade of *A* or *B*, and at least 75 per cent of *all* graduate hours must be completed with a grade of *A* or *B*.

DOCTORAL DEGREE

For admission to the Ph.D. candidacy program, a student must have an M.A. in philosophy, or pass a qualifying examination. For students entering the graduate program for the first time, acceptable performance on the Miller Analogies or the Verbal and Quantitative Aptitude Tests of the GRE is required. The Advanced Test in Philosophy is recommended but not required.

Applicants from other universities are required to have three letters of recom-

mendation sent by those familiar with their prior work in philosophy, and are urged to submit other evidence of serious intent and intellectual ability.

Candidacy is established by a qualifying examination. Superior performance on the M.A. in the department may be accepted as the qualifying examination.

Requirements for the Ph.D. may be fulfilled by satisfying the following:

1. three years of residence beyond the A.B., including two 12-hour or three 9-hour semesters beyond the M.A.;

2. an M.A. from another university, which may be considered as equivalent to one year of residence;

3. a related field of study consisting of 12 to 18 hours of appropriate courses in other departments (a suitable undergraduate major may be accepted for the related field, without credit toward residence);

4. superior competence in one language, chosen from Greek, Latin, German, French, Spanish, or Italian; i.e., ability to read philosophical texts with facility;

5. a distribution requirement as follows: two courses in logic at levels determined by the Department; a seminar for each of the fields of theory of knowledge, philosophy of science, ethics, social and political philosophy, and aesthetics; two seminars in metaphysics representing district schools; and four specialized seminars, each dealing with one or two men or concepts. Certain historical seminars devoted to a systematic field, e.g., to metaphysics or theory of knowledge, may be substituted for one systematic seminar, but no course may be used for more than one requirement. In addition, the student must meet the required four basic historical survey courses for the A.B. and a course in Asian philosophy at the 300 or 400 level;

6. a comprehensive examination, following completion of residency, tests at an advanced level the student's ability to think philosophically in one field from each of the four areas of philosophy. The areas are Methodology (fields of logic, theory of knowledge, and philosophy of science); Metaphysics (taken as one field); Axiology (fields of ethics, social and political philosophy, and aesthetics); and History of Philosophy (fields of ancient and medieval, early modern, and recent philosophy). The exam has a two-hour part for each of the four fields. At a designated time, the student nominates (subject to Department approval) a concept for each of the systematic (non-historical) parts, and a major philosopher or school for the historical part. The examiners supply a repre-

sentative, concise reading list related to the chosen topics. The exam tests conceptual and scholarly competence within the scope of the list; and

7. a dissertation and a final oral examination on the dissertation.

Physics

Thomas Wolfram, Ph.D., California. Chairman; Prof.

Horace R. Danner, Ph.D., Pennsylvania State. Prof.

Newell S. Gingrich, Ph.D., Chicago. Prof. Emeritus.

Eugene B. Hensley, Ph.D., Missouri-Columbia. Prof.

Louis V. Holroyd, Ph.D., Notre Dame. Prof.

Paul W. Schmidt, Ph.D., Wisconsin. Prof.

Clifford W. Tompson, Ph.D., Missouri-Columbia.

Prof.

Samuel A. Werner, Ph.D., Michigan. Prof.

David L. Cowan, Ph.D., Wisconsin. Assoc. Prof.

W. Brian DeFacio, Ph.D., Texas A & M. Assoc.

Prof.

Terry W. Edwards, Ph.D., Wisconsin. Assoc. Prof.

Justin C. Huang, Ph.D., Michigan State. Assoc.

Prof.

Roland A. Hultsch, Ph.D., Iowa State. Assoc. Prof.

Robert R. Hurst, Ph.D., Pennsylvania State. Assoc.

Prof.

Keum H. Lee, Ph.D., Iowa State. Assoc. Prof.

Guy Schupp, Ph.D., Iowa State. Assoc. Prof.

Joseph E. Willett, Ph.D., Missouri-Columbia. Assoc.

Prof.

Henry W. White, Ph.D., California. Assoc. Prof.

H. R. Chandrasekhar, Ph.D., Purdue. Asst. Prof.

Haskell Taub, Ph.D., Cornell. Asst. Prof.

The Department of Physics offers graduate work leading to the degrees of Master of Science-Physical Science, Master of Science, and Doctor of Philosophy, with program emphasis both in traditional theoretical and experimental areas, including astronomy, and in a number of cross-linked multi-departmental areas such as biophysics, geophysics, environmental physics, chemical physics, mathematical physics, information sciences, computer science, and engineering. The interdisciplinary graduate programs are especially flexible in order to allow each student the maximum freedom in choosing a program. In addition, a number of traditional theoretical and experimental research specialties are available for students who desire a quality education in the more conventional areas of physics.

Active research programs in the department presently include:

Solid State and Structural Physics: experimental and theoretical studies include elastic and in-

elastic thermal neutron scattering of solids and liquids, small angle X-ray scattering, electronic structure of defects in ionic crystals, nuclear magnetic resonance, electron spin resonance, low-temperature specific heat measurements, electron inelastic tunneling in superconductors and studies of solid surfaces, chemisorption, and catalysis.

Nuclear Physics: experimental and theoretical studies include shakeoff in, β -decay and internal conversion processes, photofission and two-hole electronic states in heavy atoms and photonuclear reactions.

Other Areas in Theoretical Physics: include quantum field theories, statistical mechanics, high energy particle physics, plasma theory, and astrophysics (especially models of stars and general relativity).

Interdepartmental Projects: several research projects are currently underway or in various planning stages in collaboration with faculty members and/or students in the Departments of Biological Sciences, Biochemistry, Geology, Chemistry, Mathematics, Forestry, Food Sciences, and Engineering. Typifying these interdepartmental projects were studies recently undertaken, in collaboration with researchers in the School of Forestry, Fisheries & Wildlife, to determine the submicroscopic structure of Missouri oak charcoals. Also new methods for dating flintstones have been developed in collaboration with archeologists; new models for the breaking of biomolecular chains, such as proteins and enzymes, have been formulated with chemists and food scientists; and new techniques have been developed to use nuclear isotope methods for wildlife population studies. Extensive small angle X-ray scattering work has been carried out to determine the dimensions and structure of biological molecules, including proteins.

The Department is housed in a modern building with extensive research equipment available, including computer facilities and a variety of optical, X-ray, electron spin resonance and nuclear magnetic resonance spectrometers. Support facilities for student and faculty research include electronics, glass blowing and machine shops, and a cryogenics laboratory which provides liquid nitrogen and helium. At the University of Missouri Research Reactor, the Department of Physics operates double and triple axis thermal neutron diffractometers, a time of flight thermal neutron spectrometer, a Fourier chopper for thermal neutrons, as well as equipment for nuclear spectroscopy and

photonuclear reactions. The elaborate facilities of the University Computer Center, located on this campus, are accessible from the Physics Building via a PDP/11 remote terminal. The campus has an excellent physics library, and copies of most physics journals are available night and day in the physics building.

Financial support available for graduate students includes graduate assistantships, instructorships, O. M. Stewart Fellowships, and research assistantships. Additional information can be obtained by writing the Director of Graduate Studies, Department of Physics.

To be accepted, the applicant must have a bachelor's degree and must take the Graduate Record Examination. Students enter graduate work in physics from several types of backgrounds, e.g., (1) conventional undergraduate physics majors with extensive preparation in mathematics and physics; (2) science, engineering, or liberal arts students with strong science areas such as biology, geology, etc., and mathematics through calculus; and (3) students with undergraduate majors in science or mathematics education. Because of the wide range of student backgrounds, master's degree programs are quite flexible and are designed by the student with the advice and consent of a specifically selected faculty advisory committee.

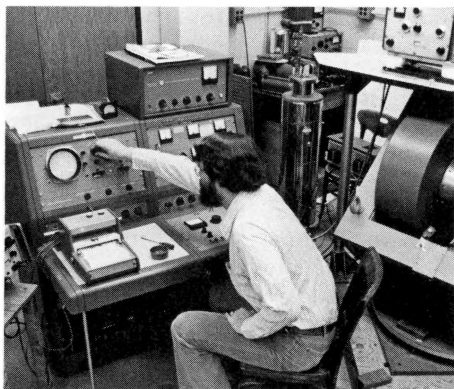
M.S.—PHYSICAL SCIENCE

The Master of Science—Physical Science degree is designed primarily for junior college teachers, and emphasizes broad training in physics, chemistry, and mathematics. For degree requirements, refer to the section on Regulations for Master's Degree Programs (see Contents for page number).

M.S. DEGREE

The Master of Science degree in Physics prepares students for careers as:

- (1) teachers of undergraduate physics, (2) scientists doing research and development work in government and industrial laboratories, and (3) members of interdisciplinary teams



on a broad spectrum of social problems ranging from environmental projects to housing, transportation, and health programs.

Since Physics is the most fundamental of the physical sciences, graduate-level studies in the field provide essential knowledge for application in many areas. Students with strong backgrounds in other areas ranging from biology to engineering are encouraged to consider a personalized M.S. program by which they add experimental or theoretical physics techniques to their own individual skills. Candidates for the M.S. degree are encouraged to include in their study programs advanced courses in other scientific disciplines. Depending on one's interest, courses in such related fields as astronomy, biology, chemistry, geology, computer science, mathematics, and engineering may be counted toward the M.S. degree. Those students primarily interested in the Ph.D. degree in traditional physics may be advised to concentrate more of their program in physics.

In general, all students must present 30 credit hours for the M.S. degree, including at least 15 hours drawn from courses numbered 400 or above. The program must include at least 15 hours of physics courses.

A thesis is not generally required for the M.S. degree, but some exposure to research is considered essential and 3-6 hours of research credits are normally required. These credits may be earned for work done in the Physics Department, or in a related area, at the discretion of the

student and advisory committee. Master's candidates must pass a qualifying examination over undergraduate physics and then an oral examination prior to their graduation.

All graduate students in physics are expected to take a full and active part in departmental activities. Participation in research programs, departmental lectures, and colloquia are considered a normal part of a graduate program.

DOCTORAL DEGREE

The Doctor of Philosophy degree is designed for the education of scientists capable of independently formulating and solving problems of fundamental importance.

The general requirements for admission to graduate study in the Department are listed under the M.S. requirements above. An "Application for Candidacy for the Doctor of Philosophy Degree" must be filed before continuing study beyond 30 semester hours of graduate credit. Students who enter with a master's degree from another institution must file the application during their first semester.

Before students are accepted as Ph.D. degree candidates, they must pass a qualifying examination based on advanced undergraduate physics.

The specific program of study for a Ph.D. in Physics, planned in consultation with the student's Advisory Committee, is selected to fit each student's academic background, experience, and objectives.

Before taking the final examination for the Ph.D. degree, a student must have completed with a satisfactory grade a minimum of 9 credit hours in a foreign language approved by the Advisory Committee. It is hoped that this requirement will have been met during the student's undergraduate period of study.

When all planned course work has been essentially completed, the candidate is required to pass a written and oral comprehensive examination. At the time of the examination the candidate must have completed (or be currently enrolled in) all of the courses on the Ph.D. program. In

special cases the examination may be taken with one course outstanding.

The candidate shall carry out original research and present an acceptable doctoral dissertation on a topic approved by the candidate's Advisory Committee and defend the dissertation in a final examination.

Physiology

James O. Davis, M.D., Ph.D., Missouri-Columbia. Chairman; Prof.
Douglas M. Griggs, M.D., Virginia. Director of Graduate Studies; Prof.
Dallas K. Meyer, Ph.D., Missouri-Columbia. Prof.
Xavier J. Musacchia, Ph.D., Fordham. Prof.
Wesley S. Platner, Ph.D., Missouri-Columbia. Prof.
Marvin L. Zatzman, Ph.D., Ohio State. Prof.
Patrick D. Harris, Ph.D., Northwestern. Assoc. Prof.
Allan W. Jones, Ph.D., Pennsylvania. Assoc. Prof.
J. Ricardo Martinez, M.D., Tulane. Assoc. Prof.
Donald H. York, Ph.D., Monash University (Australia). Assoc. Prof.
Ronald H. Freeman, Ph.D., Indiana. Asst. Prof.
J. Alan Johnson, Ph.D., Indiana. Asst. Prof.
Ferrill A. Purdy, A.M., Missouri-Columbia. Asst. Prof.
David L. Wiegman, Ph.D., Indiana. Asst. Prof.

The Department of Physiology provides interdisciplinary graduate programs leading to the degrees of Master of Arts and Doctor of Philosophy. These programs utilize the Departments of Anatomy, Biochemistry, Biological Sciences, Microbiology, and Psychology, and the Colleges of Agriculture, Veterinary Medicine, and Engineering for support in giving students in Physiology a breadth of knowledge.

The Master of Arts program is designed to give the students an in-depth exposure to mammalian physiology and cognate fields. It provides experience in experimental design of physiological research and in research itself. This degree may serve as an introduction to advanced biological studies for the student interested in moving from the physical sciences into biophysics or bioengineering. In exceptional cases an M.A. in Physiology may be obtained concurrently with work toward the M.D. degree. Students intending to make a career of physiological teaching and research may proceed with permission of the staff directly to a

Ph.D. program without taking a master's degree.

The Ph.D. program is designed to prepare the candidate for a career in research or teaching or both. The culmination of this program is the completion of a meritorious and original research project, writing a dissertation on the research, and the defense of this dissertation before a graduate committee. It is strongly recommended that the candidate's academic education be furthered with one or more years of postdoctoral training. Postdoctoral fellows also contribute to the education of degree candidates. All Ph.D. candidates, regardless of their source of support, are required to participate in the laboratory or lecture room instruction of Elements of Physiology 201 or Medical Physiology 250 at some time during the graduate program.

Emphasis is on mammalian physiology, and while advanced study in this field is directed to the discovery and understanding of basic physiological mechanisms in higher organisms, its application to medicine, veterinary medicine, agriculture, and related studies is obvious.

Departmental areas of specialization within the field of mammalian physiology are in neurophysiology and renal, cardiovascular, endocrine, comparative, and environmental physiology. This is reflected by the research interests of the department—cardiovascular, renal, and environmental physiology. More specifically, research problems under active investigation are: the renin-angiotensin mechanisms, control of coronary circulation, cardiac metabolic rhythm, control of microcirculation, control of sodium excretion by the proximal tubule, ion transport in smooth muscle, lipid metabolism, physiological functions in the hypothermic and the hibernating animal, and synaptic transmission.

Departmental members maintain research laboratories on the fourth floor of the Medical Sciences Building and in the Dalton Research Center. These laboratories, the best equipped physiological laboratories in the state, have a wide range of

sophisticated physiological instrumentation for the gathering of quantitative physiological data at both the chemical and physical levels. The laboratories are equipped for physiological research on large and small mammals. Equipment includes Sanborn, Grass, and Electronics electronic recording equipment, Packard Scintillation Counters, atomic absorption spectrometer, autoanalyzers, gas chromatographs, analog computers, recording spectrophotometers, environmental chambers, and other equipment for accurate analysis of chemical and physical properties of living organisms. Also available on the UMC campus are the general service facilities such as animal care facilities, the nuclear reactor, and the computer center.

The medical library's extensive scientific collection, available to students and staff, is supplemented by a small but conveniently located departmental library.

Financial support for qualified graduate students is available from a number of sources. Students themselves may apply for an NIH, or Dalton Research Center (UMC) fellowship. The department also has a cardiovascular training grant which supports two graduate students and four postdoctoral fellows. There are six graduate teaching assistantships. In addition, a number of students are supported from staff research grants. Information on entrance to the graduate program in Physiology and the sources of financial support may be obtained from the department chairman.

MASTER'S DEGREE

Selection of students is based on a combination of the following criteria:

1. undergraduate work is evaluated in detail, as well as from the standpoint of an overall grade point average requirement of 3.0 or higher ($A=4.0$);

2. each applicant must complete the department's application blank and submit three letters of recommendation from senior professors;

3. each applicant must have taken the Graduate Record Examination within the past four years, and the transcript of test scores must be



sent from the Educational Testing Service directly to the Department. Specifically, the applicant must score in the upper fiftieth percentile on Part I (general aptitude test), and must take the advanced test in one or more of the following subjects: biology, chemistry, engineering, mathematics, physics, or psychology;

4. the following courses are required prior to entrance into the graduate program, although a superior student lacking some of these courses may take them while pursuing the master's degree: Biology—a college major or minor in zoology or related fields; Chemistry—inorganic, qualitative, quantitative and physical chemistry, and organic chemistry through aromatic compounds; Physics—one year of college physics; and Mathematics—college mathematics through calculus.

There is no language requirement for the master's degree. The minimum course requirements are 30 hours of graduate credit, of which 15 or more must be in 400-level courses and not more than 12 may be in research.

The typical candidate for the M.A. in physiology must take Physiology 305 (10 hours), biochemistry (5 hours), biophysics (3 hours), and other courses that the adviser designates as necessary to give breadth to the program or to remedy omissions in the undergraduate curriculum. The program, of necessity, frequently exceeds the minimum 30 hours, and a *B* or better average must be maintained. The candidate must submit a thesis and defend it in an oral examination.

DOCTORAL DEGREE

The entrance requirements are the same as items 1, 2, and 3 in the M.A. program. In addition, the applicant is required to pass written and oral qualifying examinations administered by members

of the physiology faculty during the first year of the Ph.D. program.

Three years of residence are required; this is equivalent to about 88 semester hours of credit.

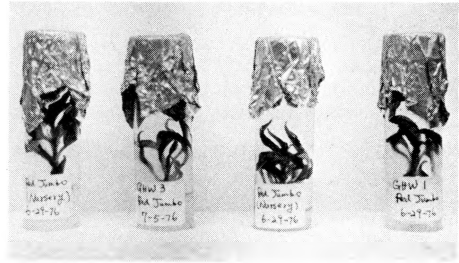
The candidate must also fulfill the following degree requirements: complete the program of study approved by the candidate's planning committee; demonstrate by examination a reading knowledge of two foreign languages, or of one foreign language and complete a collateral field; pass a comprehensive examination in mammalian physiology and such related fields as deemed essential by the examining committee; and complete a meritorious, original piece of research for the dissertation.

Plant Pathology

Robert N. Goodman, Ph.D., Missouri-Columbia. Chairman; Prof.
 Thomas D. Wyllie, Ph.D., Minnesota. Director of Graduate Studies; Prof.
 Oscar H. Calvert, Ph.D., Wisconsin. Prof.
 Victor H. Dropkin, Ph.D., Chicago. Prof.
 William Q. Loegering, Ph.D., Minnesota. Prof.
 Daniel F. Millikan, Ph.D., Missouri-Columbia. Prof.
 Einar W. Palm, Ph.D., North Dakota State. Prof.
 Jack R. Wallin, Ph.D., Iowa State. Prof.
 Charles H. Baldwin, Jr., Ph.D., Oregon State. Assoc. Prof.
 Merton F. Brown, Jr., Ph.D., Iowa. Assoc. Prof.
 Anton Novacky, Ph.D., Czechoslovak Academy of Sciences. Assoc. Prof.
 Om P. Sehgal, Ph.D., Wisconsin. Assoc. Prof.
 Arthur L. Karr, Jr., Ph.D., Colorado. Asst. Prof.
 Paul W. Steiner, Ph.D., Cornell. Asst. Prof.

The Department of Plant Pathology, College of Agriculture, offers graduate work leading to the Master of Science degree. The Department also cooperates with the Department of Pathology of the School of Medicine and the Department of Veterinary Pathology, College of Veterinary Medicine, in offering an area Ph.D. program in pathology. Information on that program is presented in the section on Area Programs in this catalog.

The following areas of concentration in plant pathology are offered: ultrastructure research bearing on host-plant pathogen interactions, phytobacteriology, intermediary metabolism of plant pathogenic fungi, ecology of soil-borne plant patho-



genic fungi, plant pathogenic viruses, fruit pathology, and clinical plant pathology.

Stipends are derived from the Agricultural Experiment Station, NIH, NSF, and NDEA funds. For information and application forms, write the Director of Graduate Studies, Department of Plant Pathology.

Plant Pathology also cooperates with the Departments of Agronomy, Entomology, and Horticulture in offering a curriculum in Plant Pest Management. This curriculum is designed to prepare professionals for fields related to protection of the plant and its environment.

MASTER'S DEGREE

For admission to the M.S. program, an applicant should have a B.S. degree with at least a 3.0 grade point average ($A=4.0$) and at least 15 hours of biological sciences in undergraduate work.

There is no language requirement. A cumulative grade point average of 3.0 or better is required, with no more than two grades of C or lower allowed during the study period for the M.S. degree.

Political Science

Wayne L. Francis, Ph.D., Indiana. Chairman; Prof.
 Herbert K. Tillema, Ph.D., Harvard. Director of Graduate Studies; Assoc. Prof.
 Soon Sung Cho, Ph.D., Michigan. Prof.
 Stanley T. Gabis, Ph.D., Chicago. Prof.
 Arthur L. Kalleberg, Ph.D., Minnesota. Prof.
 Robert F. Karsch, Ph.D., Missouri-Columbia. Prof.
 Frederick C. Spiegel, Ph.D., Illinois. Prof.
 Richard A. Watson, Ph.D., Michigan. Prof.
 Lloyd M. Wells, Ph.D., Princeton. Prof.
 David M. Wood, Ph.D., Illinois. Prof.
 Stanley B. Botner, Ph.D., Missouri-Columbia. Assoc. Prof.
 Barry Bozeman, Ph.D., Ohio State. Assoc. Prof.
 Gregory Casey, Ph.D., Georgetown. Assoc. Prof.
 Richard R. Dohm, Ph.D., Minnesota. Assoc. Prof.

David A. Leuthold, Ph.D., California-Berkeley. Assoc. Prof.
Patrick N. Peritore, Ph.D., California-Santa Barbara. Assoc. Prof.
Robin Remington, Ph.D., Indiana. Assoc. Prof.
Marvin Rogers, Ph.D., California-Berkeley. Assoc. Prof.
Paul Wallace, Ph.D., California-Berkeley. Assoc. Prof.
Dean L. Yarwood, Ph.D., Illinois. Assoc. Prof.
Michael Fitzgerald, Ph.D., Oklahoma. Asst. Prof.
John R. Freeman, Ph.D., Minnesota. Asst. Prof.

The Department of Political Science offers graduate work leading to the degrees of Master of Arts and Doctor of Philosophy.

It is the objective of the Department to train people to qualify as experts by acquiring knowledge of government and to encourage them to acquire a background in other disciplines broad enough to enable them to correlate their specialized knowledge with all aspects of modern life. The M.A. degree is intended to prepare the student for teaching at the junior college level, or as a stepping stone toward candidacy for the Ph.D. degree. The Doctor of Philosophy degree program is designed to prepare the student for a career in research and college teaching.

Through the Department's membership in the Inter-University Consortium of Political Research, political science graduate students are eligible for summer training in quantitative analysis and research design at the University of Michigan. Courses in public opinion, policy analysis, and decision-making provide students with experience in research design, data analysis, and computer applications.

The Department plays an important role in the South Asia Language and Area Center, an NDEA-supported studies program. In addition to political science, courses are also available in Asian civilization, history, sociology, geography, philosophy, and South Asian languages.

A fair amount of specialization is possible also in such areas as East Asia, the Soviet Union, and Western Europe, by combining political science courses with courses in history, economics, and philosophy, to mention only a few.

The UMC Ellis Library is well stocked with books, periodicals, and government

documents pertaining to the study of political science and related social science fields. In recent years special efforts have been made to increase material on South Asia, the Soviet Union, and East Asia. For those interested in the government and politics of Missouri, the library of the State Historical Society offers additional materials, including a large collection of state newspapers. The state capital, Jefferson City, is only 30 miles from Columbia; therefore, students interested in state government can easily keep in close contact with state governmental agencies and may have access to materials from such agencies.

Students may apply for departmental fellowships and teaching and research assistantships, as well as University and South Asia fellowships and scholarships. Applicants for financial assistance must submit GRE scores to the Department. About 25 departmental assistantships offer stipends ranging between \$3,500 and \$4,000 per year. Other research assistantships are paid on an hourly basis. University fellowships and scholarships generally involve part-time teaching or research assistantships, with stipends beginning at \$2,700, to which summer grants may be added. For application blanks for research and teaching assistantships and fellowships, and for additional information on the department's graduate program, write the Director of Graduate Studies, Department of Political Science.

DEGREE REQUIREMENTS

For admission to graduate study in political science an applicant should preferably have had an undergraduate major in political science, or at least 6 hours of upper-level course work in political science. Such work is not included in any graduate degree program. A major in another area may be acceptable, but each case is judged on its own merits. An applicant must have an overall undergraduate GPA of at least 3.0, as well as a 3.0 in political science courses ($A=4.0$). Applicants should take the GRE aptitude

test and have the results reported to the department's Director of Graduate Studies at the time of applying for admission. Those finding it impossible to comply with this requirement must take the GRE as soon after applying as possible, but no later than during the first semester in residence at UMC.

The Master of Arts degree may be earned by completing either a thesis or non-thesis program. The thesis program requires 24 hours of course work (at least 8 in 400-level courses) and an acceptable thesis. The non-thesis program requires 30 hours, at least 15 of which are to be distributed among 400-level courses. A student wishing to advance from the non-thesis master's program to the Ph.D. program must take 24 hours of course work and write a master's paper (for which 6 hours credit is given). Students who do not continue for the Ph.D. enroll in 30 hours of course work. Both the thesis and non-thesis program culminate with a comprehensive oral examination. There are no specific course requirements for the M.A., but each candidate must take an upperlevel course in each of the six fields of political science: comparative government, international affairs, political theory, politics and legislation, public administration, and public law. An M.A. candidate must maintain a *B* or better average; the candidacy will be terminated for more than 6 hours of *C* in political science courses.

Acceptance to Ph.D. candidacy is determined by a committee's consideration of the applicant's performance on the GRE, academic record, written and oral special qualifying examinations, and letters of recommendation. Although permitted flexibility in planning, students must offer Ph.D. programs that include at least 48 hours of graduate work. At the option of the student's Advisory Committee, not more than 24 hours of the M.A. program may be included in the Ph.D. program. Such a program shall include at least 36 hours distributed among four of the six fields of political science, plus at least 12 hours in an outside field or combination of fields. In addition to completing the

necessary course work, the candidate must demonstrate the capacity to use a research tool associated with another academic discipline (e.g., a foreign language or statistics), must pass a written and oral comprehensive exam, and must submit and defend a dissertation.

Poultry Husbandry

J. E. Savage, Ph.D., Missouri-Columbia. Chairman; Director of Graduate Studies; Prof.
Harold V. Biellier, Ph.D., Missouri-Columbia. Prof.
Walter D. Russell, M.S. Missouri-Columbia. Prof.
Alfred B. Stephenson, Ph.D., Iowa State. Prof.
Glenn S. Geiger, M.S., Missouri-Columbia. Assoc. Prof.
J. M. Vandepopuliere, Ph.D., Florida. Assoc. Prof.

The Department of Poultry Husbandry provides graduate study leading to the degrees of Master of Science and Doctor of Philosophy.

Graduate programs are designed to prepare students for advanced professional careers in industry, research, and college teaching. Poultry science is a broad and rapidly changing field demanding a wide variety of training. Accordingly, graduate programs include course work in biochemistry, economics, genetics, management, marketing, microbiology, nutrition, physiology, statistics, and zoology.

The Department cooperates closely with scientists in government, industry, and at other state institutions, with national and local firms, and with the professional associations for these groups.

The following facilities are available for use in graduate research programs: a controlled environmental physiology laboratory, nutrition laboratory, experimental avian research units, three research farms, and a departmental library containing scientific journals, periodicals, and other references in poultry science.

Practical experience in teaching and research is provided. Fellowships, scholarships, and research assistantships are available to qualified graduate students. Applications should be submitted by March 1 each year. Additional information can be obtained from the Chairman, Department of Poultry Husbandry.

MASTER'S DEGREE

The Master of Science degree is a professional program designed by the student and adviser to provide basic concepts, techniques, and organization within the following subject areas: genetics, management, nutrition, and physiology.

To be accepted as a candidate in the master's program, a student must meet the requirements of the Graduate School and have a B.S. in Agriculture, or, if another baccalaureate degree is offered, the candidate's undergraduate work must include a total of 30 credit hours in science. Deficiencies in this or in essential technical agricultural subjects may be corrected by additional course work.

To satisfy requirements for the master's degree, a student must have completed substantially all course requirements for the undergraduate degree in Poultry Husbandry and meet the requirements of the Graduate School, with 15 of the required minimum of 30 hours in 400-level courses. There is no language requirement. A thesis is required at the discretion of the adviser.

DOCTORAL DEGREE

The Department of Poultry Husbandry accepts candidates for the Ph.D. degree on the basis of (1) performance on the GRE test; (2) consideration of scholastic performance, experience, maturity, and other factors affecting probable success in the program; and (3) results of a written and/or oral qualifying examination. Students who receive their master's degree at UMC may have the master's degree examination accepted as the qualifying examination.

The program requires two or more years beyond the master's degree and consists of an individually planned program of study; practical experience in teaching and research; examination over accumulated knowledge in a major field; completion of departmental language requirements—proficiency in two foreign languages, or in one foreign language and one research technique (a collateral

field acceptable to the Advisory Committee may substitute for the research technique); and demonstration of research and writing ability by completing a doctoral dissertation on an approved research topic.

Examples of acceptable research techniques are: statistics, computer programming, instrumental analysis, radiochemistry, and histology.

Psychology

- Sam C. Brown, Ph.D., Virginia. Chairman; Prof.
William T. McReynolds, Ph.D., Texas. Director of Graduate Studies; Assoc. Prof.
Robert Boice, Ph.D., Michigan State. Director of Graduate Admissions; Prof.
Wayne P. Anderson, Ph.D., Missouri-Columbia. Prof.
Bruce Biddle, Ph.D., Michigan. Prof.
Thomas O. Blank, Ph.D., Columbia. Visiting Asst. Prof.
June E. Chance, Ph.D., Ohio State. Prof.
Robert S. Daniel, Ph.D., Indiana. Prof.
Robert Dolliver, Ph.D., Ohio State. Prof.
Russell Geen, Ph.D., Wisconsin. Prof.
Alvin G. Goldstein, Ph.D., Clark University. Prof.
William R. Galeota, Ph.D., New York. Prof.
Donald H. Kausler, Ph.D., Washington (St. Louis). Prof.
Charles J. Krauskopf. Ph.D., Ohio State. Prof.
William H. Lichte, Ph.D., Iowa. Prof. Emeritus.
Melvin H. Marx, Ph.D., Washington (St. Louis). Research Prof.
David G. McDonald, Ph.D., Washington (St. Louis). Prof.
Fred McKinney, Ph.D., Chicago. Prof.
John H. Mueller, Ph.D., St. Louis University. Prof.
Mark H. Thelen, Ph.D., Michigan State. Prof.
Joseph Thorpe, Ph.D., Texas. Prof.
Douglas G. Anger, Ph.D., Harvard. Assoc. Prof.
James H. Banning, Ph.D., Colorado. Assoc. Prof.
G. Derwood Carnes, Ph.D., Missouri-Columbia. Assoc. Prof.
John G. Jones, Ph.D., Wisconsin. Assoc. Prof.
Marjorie Marlin, Ph.D., Illinois. Assoc. Prof.
Algimantas M. Shimkunas, Ph.D., St. Louis University. Assoc. Prof.
David T. Vernon, Ph.D., Chicago. Assoc. Prof.
William F. Waters, Ph.D., California. Assoc. Prof.
Dennis Wright, Ph.D., California. Assoc. Prof.
Robert M. Arkin, Ph.D., Southern California. Asst. Prof.
Harris M. Cooper, Ph.D., Connecticut. Asst. Prof.
Lois A. Huebner, Ph.D., Colorado. Asst. Prof.
Richard E. Petty, Ph.D., Ohio State. Asst. Prof.
Jane L. Rankin, Ph.D., Colorado. Visiting Asst. Prof.
Timothy A. Salthouse, Ph.D., Michigan. Asst. Prof.
Lawrence J. Siegel, Ph.D., Case Western Reserve. Asst. Prof.
Esther Thelen, Ph.D., Missouri-Columbia. Asst. Prof.

The Department of Psychology offers a broad choice of advanced degree programs. The Master of Science degree is offered in the field of college teaching in psychology, or, in conjunction with the Department of Counseling and Personnel Services, in the field of counseling techniques. The Master of Arts and Doctor of Philosophy degrees are offered in general-experimental psychology, clinical psychology, counseling psychology, and social psychology.

Financial aids are available through departmental research and teaching assistantships, and from Graduate School fellowships. Federal agency funds such as U.S. Public Health Service Traineeships in social psychology and clinical psychology, and Veterans Administration stipends in clinical psychology and counseling psychology are available to qualified graduate students.

A strong foundation in experimental methodology is considered to be of fundamental importance to all graduate training. The program is designed to give the student a thorough background in statistics, scientific methodology, and content courses. Graduate students are active in research, and training follows the philosophy of learning by doing. A number of faculty research programs are supported by grants which also provide stipends and training opportunities for students. Departmental colloquia are scheduled to expose students to outside expertise, and students and faculty frequently meet informally to discuss research.

The Ph.D. program in Experimental Psychology includes around 30 semester hours in research. The primary specific objective of the experimental program is to give the student a thorough substantive and methodological foundation in experimental psychology. The Ph.D. program emphasizes student research projects and collaboration in faculty research in the areas of learning, gerontology, perception, physiological psychology, motivation, and the like. In the Psychology Animal Research Building, the department maintains a variety of equip-

ment for the study of animal learning, motivation, comparative behavior, and physiological correlates of behavior. A fully-equipped laboratory for the study of the electroencephalogram and muscle action potentials is in use in McAlester Hall, and a similarly-equipped mobile unit is used for more extensive studies at schools and institutions in the surrounding area. A PDP-11 computer laboratory is available in the department for use by faculty and graduate students. Also in McAlester Hall are laboratories equipped for studies in human learning and memory, visual and auditory perception, and experimental-social psychology.

The Clinical Psychology program, which is approved by the American Psychological Association, is coordinated by a director and a committee made up of staff members specializing in this area. The philosophy of training is to achieve a balance between scientific and service activities. The program prepares students for teaching, research, and service in universities, clinics, hospitals, and similar agencies. In addition to the research emphasis and training in basic areas of psychology (which characterize all of the programs in the department), clinical students obtain training in behavior theory and dynamics and in techniques of assessment and behavior change. Supervised experience is provided through practicum courses in the department's Psychological Clinic and, by arrangement through the department, paid clerkships and internships in campus and other cooperating institutions such as Fulton State Hospital, Mid-Missouri Mental Health Center, and the Veterans Administration Hospital.

The program in Counseling Psychology is patterned after the American Psychological Association's recommendations and is offered in conjunction with the Department of Counseling and Personnel Services. It is designed to train psychologists for work in universities, the Veterans Administration, and public or private agencies. Program emphasis is on research and a strong basic foundation in

general behavior theory, followed by intensive training in supervised practicums and internships. Facilities for the latter part of the program are provided by local agencies (e.g., the UMC Counseling Services), state and federal agencies, and the Veteran's Administration.

The program in Social Psychology is jointly presented with the Department of Sociology. Like the other Ph.D. programs of the psychology department, it has a strong research emphasis. The goal is to provide thorough preparation for careers in research, teaching, and the service functions of social psychology. Some of the specialized course work may begin in the first year, with concentrated seminars and other courses coming in the second and third years. Emphasis is given to personality theory, behavior dynamics, role theory, small group theory, environmental psychology, and other aspects of this rapidly developing area of social psychology. In addition to the general research training in the department, there are opportunities for research experience in the Center for Research in Social Behavior.

These programs and others are more fully described in brochures available from the department chairman.

DEGREE REQUIREMENTS

Applicants for advanced degrees in psychology must complete application forms obtainable from the Department. There are no rigid requirements, but most students accepted have an undergraduate major in psychology or its equivalent. Acceptance is based on training, quality of work, recommendations, GRE and Miller Analogies Test scores, and other information. For additional information on admission requirements, interested persons are encouraged to consult the book, *Graduate Study in Psychology*, published annually by the American Psychological Association, and available in most libraries. Missouri follows national deadlines in accepting and acting on applica-

Graduate students not accepted by the department may not take psychology courses at the 400 level without consent of the instructor.

Degree requirements for the M.A. consist of 30 hours of course work, including 6-8 hours of research credit for an experimental thesis in publishable form. An oral examination on the thesis is required.

M.S. degree requirements are 40 hours, including 3-6 hours in Psychology 400 or 450 (non-thesis research) and a practicum. Also required is a special investigation (experimental or scholarly) submitted in written form to the student's committee, which subsequently conducts an oral examination on the report.

The Ph.D. qualifying examination requirement is satisfied by successful completion of the department's core curriculum. In addition, a master's degree with an empirical thesis is required for admission to doctoral study. Those entering the department with a master's degree obtained without an empirical thesis may meet the latter requirement by conducting an investigation under the supervision of their adviser.

General requirements for the Ph.D. include 15 hours of core curriculum courses, three courses in statistics, 2 hours of staff proseminar, a selection of courses both within and without the main area of concentration, and research. Practicum and certain other courses are required for the counseling and clinical programs.

Other requirements are: one year of full-time, paid professional experience (or equivalent); a major review paper; a dissertation; and comprehensive and final oral examinations.

Recreation and Park Administration

Glenn A. Gillespie, Ph.D., Missouri-Columbia. Asst. Dean, College of Public & Community Services; Chairman; Prof.

Hardeep S. Bhullar, Ph.D., Georgia. Director of Graduate Studies; Assoc. Prof.

Keith B. Roys, Ph.D., Illinois. Prof.

Arlin F. Epperson, Re.D., Indiana. Assoc. Prof.

Ethel O. Scott, Ph.D., Minnesota. Assoc. Prof.

Ronald J. Havard, Ed.D., Indiana. Asst. Prof.

Glenn D. Weaver, M.S., Missouri-Columbia. Asst. Prof.

The Department of Recreation and Park Administration offers graduate work leading to a Master of Science degree.

The special areas of concentration include public recreation, therapeutic recreation, and outdoor recreation.

Students in the area of therapeutic recreation can gain practical experience in the UMC Department of Physical Medicine and Rehabilitation. They have access to therapy facilities of the UMC Medical Center and, under supervised conditions, work with patients there. Local park and recreation officials cooperate with students in the areas of public and outdoor recreation.

Most graduates of the program enter careers in public park and recreation departments, in the National Park Services, various therapeutic settings, and youth-serving agencies. Assistantships are available, but presently on a limited basis.

MASTER'S DEGREE

To be admitted to the master's program, a student should have a baccalaureate degree with a major in Recreation and Park Administration (or the equivalent), or make up deficiencies, and a solid undergraduate foundation in the humanities, the social and behavioral sciences, and courses in health and physical education.

For advisement purposes, an applicant should take the Strong Vocational Interest Blank, Miller Analogies Test, Ohio State Psychological Test, and the Cooperative English Test.

There is no language requirement. The following are the requirements of the program: 14 hours in Recreation and Park Administration Theory, 6 hours professional field experience or optional field, 6 hours of electives, 6 hours of thesis or optional field. If the student does not write a thesis, it takes a minimum of 6 credit hours in a related area and 1 credit hour of Recreation 400 in which an approved research project is required. Each graduate student is assigned to a com-

mittee of three members. They evaluate any completed research and administer a final oral examination.

A student receiving a grade of C or below in more than one Recreation course is subject to dismissal from the program.

Regional and Community Affairs

John A. Croll, M.S., Missouri-Columbia. Chairman; Assoc. Prof.

C. David Anderson, Ph.D., Missouri-Columbia. Director of Graduate Studies; Prof.

Lee J. Cary, Ph.D., Syracuse. Prof.

Hugh Denney, M.A., Missouri-Columbia. Prof.

Bryan Phifer, Ph.D., Chicago. Prof.

Boyd Faulkner, M.S., Nebraska. Assoc. Prof.

Robert E. Knittel, Ph.D., Southern Illinois-Carbondale. Assoc. Prof.

Alvin Lackey, Ph.D., Cornell. Assoc. Prof.

E. Frederick List, M.A. Ed., Washington (St. Louis). Assoc. Prof.

George F. Nickolaus, J.D., Missouri-Columbia. Dean, College of Public & Community Services; Assoc. Prof.

William E. Robertson, Ph.D., Wisconsin. Assoc. Prof.

Ellen Biddle, Ph.D., Missouri-Columbia. Asst. Prof.

John Collins, Ph.D., Northwestern. Asst. Prof.

James B. Cook, Ph.D., Walden University. Asst. Prof.

Donald W. Littrell, M.S., Missouri-Columbia. Asst. Prof.

Thomas J. Nicastro, Ph.D., Missouri-Columbia. Asst. Prof.

Jack D. Timmons, Ph.D., Nebraska Asst. Director, UM Community Public Sector; Asst. Prof.

The Department of Regional and Community Affairs offers a program of graduate work leading to a Master of Science in Community Development—one of only three such programs offered in the United States. The University of Missouri-Columbia's program prepares students for beginning professional practice. Specific courses and field experience help prepare students for urban careers, rural and regional positions, and international work. Within the elective component of the master's program, students may take a course concentration in planning, public administration, gerontology, youth work, or international development.

In addition, the department offers (1) a one-year Diploma Program for international students and (2) a state-wide community development program as part of

the University Extension Service. The department maintains a departmental community development reference library.

An applicant with an undergraduate GPA of at least 3.0/4.0 or the equivalent during the last two years of undergraduate work may be admitted to the Graduate School on a basis of this record alone. However, to be accepted for advisement for the master's degree in Regional and Community Affairs, a student should preferably have completed a minimum of 20 hours in social sciences and at least one course in statistics. An overall GPA of at least 2.5 is also required.

A total of 48 credit hours is required for a Master of Science in Community Development. The core curriculum consists of 30 credit hours in the Department of Regional and Community Affairs. This is made up of designated courses, including 9 hours of field experience required of all students. The remaining 18 hours consist of elective courses selected by the student and adviser. Electives may be selected from non-core courses in the Department of Regional and Community Affairs and appropriate courses offered by other departments.

Either a thesis (RCA 490) or a research project (RCA 450) is required. Before the master's degree is granted, the student must pass both a written and oral comprehensive examination.

Romance Languages

Howard T. Mancing, Ph.D., Florida. Chairman; Assoc. Prof. (Spanish)
Benjamin L. Honeycutt, Ph.D., Ohio State. Assoc. Chairman; Assoc. Prof. (French)
Albert Brent, Ph.D., Princeton. Director of Graduate Studies; Prof. (Spanish)
M. Bonner Mitchell, Ph.D., Ohio. Prof. (French & Italian)
Margaret S. Peden, Ph.D., Missouri-Columbia. Prof. (Spanish)
William H. Shoemaker, Ph.D., Princeton. Visiting Prof. (Spanish)
Kernan B. Whitworth, Jr., Ph.D., Princeton. Prof. (French)
Vern G. Williamsen, Ph.D., Missouri-Columbia. Prof. (Spanish)
Ebion De Lima, Ph.D., Catholic University of Sao Paulo. Assoc. Prof. (Portuguese)
Daniel E. Gulstad, Ph.D., Illinois. Assoc. Prof. (Spanish & Linguistics)

Harold G. Jones III, Ph.D., Princeton. Assoc. Prof. (Spanish)
Edward J. Mullen, Ph.D., Northwestern. Assoc. Prof. (Spanish)
Daniel C. Scroggins, Ph.D., Michigan. Assoc. Prof. (Spanish)
O. Allen Thiher, Ph.D., Wisconsin-Madison. Assoc. Prof. (French)
Wallace H. Craft, Ph.D., Indiana. Asst. Prof. (Italian)
Anthony C. DeBellis, M.A., Ohio State. Asst. Prof. (Italian)
Richard K. Dixon, Ph.D., Colorado. Asst. Prof. (French)
John M. Howie, Ph.D., Indiana. Asst. Prof. (French & Linguistics)
Donna Kuizenga, Ph.D., City University of New York. Asst. Prof. (French)
Margaret P. Sommers, Ph.D., Stanford. Asst. Prof. (French)
James K. Wallace, Ph.D., Vanderbilt. Asst. Prof. (French)

The Department of Romance Languages offers programs of study leading to the degree of Master of Arts in French or Spanish, and Doctor of Philosophy in Romance Languages, with primary specializations in French literature, Peninsular Spanish literature, or Spanish American literature. A person interested in working for any one of these degrees should first write to the Director of Graduate Studies, Romance Languages, requesting an application form. When submitted, the application should be accompanied by a transcript of all undergraduate and graduate work completed, and GRE scores on both the aptitude and the advanced French or Spanish examinations. If accepted by the department, the student is then notified to apply for admission to the Graduate School through the Office of Admissions, 130 Jesse Hall.

Part-time teaching assistantships are available to departmental graduate students. A student interested in being considered for one of these appointments should so indicate in the initial letter to the Director of Graduate Studies and on the application form.

Candidates for an advanced degree (except native speakers of French or Spanish) are given a language proficiency examination at the time of entrance to determine their ability to speak, understand, read, and write their languages of specialization.

tion. Students deficient in the ability to speak and understand are required to register for 209, Advanced Conversation; if deficient in writing ability, they must register for 206, Advanced Composition.

MASTER'S DEGREE (French or Spanish)

The student may take work wholly in French or wholly in Spanish, or may elect a minor in one of the following fields of study: for a major in French—Spanish, Italian, Portuguese, German, Russian, Latin, English, art history, philosophy, European history, linguistics, education; for a major in Spanish—French, Italian, Portuguese, German, Russian, Latin, English, linguistics, European history, Latin American history, art history, philosophy, education. Other minor fields may be selected subject to departmental approval.

A total of 30 hours selected from courses receiving graduate credit must be completed. In a major-minor combination, a minimum of 20 hours must be in the major subject, and a minimum of 10 hours in the minor field. At least 15 hours must be in courses numbered 400 or above. No more than 12 hours credit is allowed for research, problems, and special readings (courses 490, 400, and 350). A course in the history of the language (French 311 or Spanish 361) must be included in the study program. Students with fewer than five courses (normally 15 hours) at the undergraduate level in literature in their major fields must make up these deficiencies.

The writing of a thesis is optional; however, students who contemplate working for the doctorate are encouraged to write one. The thesis counts for 6 hours toward the 30-hour requirement.

Candidates for the degree of Master of Arts are required to pass a 6-hour written examination based on the M.A. reading list. Copies of the list are available in the Departmental Office, 27 Arts & Science Building. This examination is given in October and in March. Two failures on the final examination eliminates the can-

didate from consideration for the M.A. degree. If an official minor is offered, the candidate is examined in it, as well as in the major field.

DOCTORAL DEGREE (Romance Languages)

The Department offers primary specialization for the doctorate in the following major fields: French language and literature, Spanish language and literature, and Spanish American literature. Secondary fields from which the candidate's work is selected are as follows:

1. with a major in French language and literature—any other foreign language and literature acceptable to the department, *or* general linguistics;
2. with a major in Spanish language and literature—Spanish American literature *and* any other foreign language and literature acceptable to the department, *or* Spanish-American literature *and* general linguistics;
3. with a major in Spanish American literature: Spanish literature *and* any other foreign language and literature acceptable to the department, *or* Spanish literature *and* general linguistics.

Secondary fields involving course work in other departments are also available in Medieval Studies or Renaissance Studies.

All prospective Ph.D. candidates are required to take the qualifying examination to determine their fitness for doctoral study. However, doctoral students who hold the M.A. from this department may be excused from the qualifying examination if their performance on the M.A. final examination is judged by the examining committee to be outstanding.

The qualifying examination is given in November to doctoral students *with* the M.A. who enter the department in September; in March for those who enter in February; in October for those who enter in June. For doctoral students *without* an M.A., the examination is given in February to those entering the department in August; in October to those entering in February; in November to those entering in June.

The examination is oral, normally not exceeding one hour in length, and is de-

signed to reveal a student's (1) knowledge of the major field; (2) acquaintance with related fields; (3) oral proficiency in the major language; and (4) general acumen. If the Committee is satisfied with the performance on the examination, they will consider the student's program of study. If the performance is judged unsatisfactory, the student may repeat the examination at the end of the academic year. The second examination may be, in part, written. Failure on a second examination terminates doctoral study in this department. However, in the case of a student with only a bachelor's degree, failure does not prevent candidacy for a master's degree.

Before being admitted to the comprehensive examination, a candidate must satisfactorily show ability to read two foreign languages *other than* the major language. The Advisory Committee determines which two languages are required. Of the two, normally one of them is the language of the secondary field—French, Italian, Portuguese, or Spanish; the other language may be another one of the four, or German or Russian.

A student beginning doctoral work must satisfy the departmental Latin requirement as a prerequisite to enrolling in French 411 (Old French) or Spanish 460 (Old Spanish). The Latin requirement must be fulfilled by the end of the first year of graduate study. A candidate for the doctorate in French is required to have some formal training in Old French; a candidate for the doctorate in Spanish must have some formal training in Old Spanish. This requirement must be fulfilled by the end of the second year.

A student teaching 5-7 hours as an assistant in the department may take 12-14 hours of course work and count one semester of residence requirement for the year's work; for 8-11 hours teaching, 9-11 hours course work and $\frac{3}{4}$ semester; for 12-15 hours teaching, 6-8 hours course work and $\frac{1}{2}$ semester.

The comprehensive examination is composed of two sections: one written, the other oral. The written examination consists of four 3-hour examinations, at

least one of which must be written in the language of specialization. Should these written examinations be judged of sufficiently high quality in content, organization, and language, the candidate is admitted to the oral section, at least part of which is conducted in the candidate's language of specialization.

The final examination is oral and open to the public, and is largely, but not exclusively, a defense of the dissertation.

GENERAL LINGUISTICS AS A SECONDARY FIELD

A student with no previous training in general linguistics is expected to complete at least 15 hours of work in the field. Additional work in fields other than those mentioned above (e.g., History, Philosophy, etc.) may be recommended if the candidate's advisory committee feels such courses are essential to round out the student's preparation.

Before the end of the second year in residence, the candidate is expected to demonstrate proficiency (speaking, reading, writing) in French *and* Spanish. In addition, the candidate must have a good reading knowledge of Latin and of at least one of the following: German, Italian, Portuguese, Russian, or some other language (which need not be of Indo-European origin) acceptable to the Advisory Committee and the Graduate School. The two languages used to meet the departmental language reading requirement may be among those used to fulfill this proficiency requirement.

Social Work

Richard E. Boettcher, Ph.D., Minnesota. Director, School of Social Work; Director of Graduate Studies; Prof.

Thompson R. Fulton, A.M. in S.S.A., Chicago. Prof. Emeritus

Barry L. Levin, Ph.D., Columbia. Prof.

Roland G. Meinert, Ph.D., St. Louis. Prof.

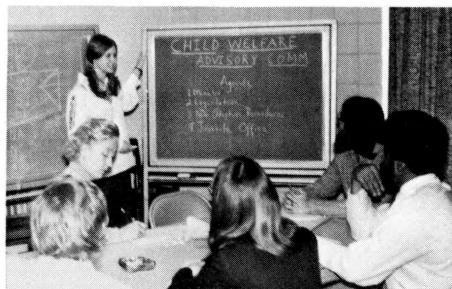
John J. O. Moore, Ed.D., Columbia. Prof. Emeritus
Clara Louise Myers, D.S.W., Washington (St. Louis). Prof.

Arthur W. Nebel, M.A., Missouri-Columbia. Prof. Emeritus

J. F. X. Paiva, Ph.D., Brandeis. Prof.

Elizabeth A. Dubansky, M.S.W., Washington (St. Louis). Assoc. Prof.

O. Duane Kroeker, M.S.W., Pennsylvania. Assoc. Prof.
 Marilyn E. Maddux, M.S.W., Washington (St. Louis). Coordinator for Field Instruction; Assoc. Prof.
 Charles F. Mitchell, A.M. in S.S.W., Chicago. Assoc. Prof.
 Dwight W. Rieman, M.S. in S.A., Case Western Reserve. Assoc. Prof.
 Virginia Southwood, M.S.S.W., Missouri-Columbia. Assoc. Prof.
 Judith P. Burke, Ph.D., Bryn Mawr. Asst. Prof.
 Brian F. Carr, M.S., SUNY-Buffalo. Asst. Prof.
 Vincent Faherty, D.S.W., Utah. Asst. Prof.
 Paul M. Mengel, M.S.W., Kansas. Asst. Prof.
 Joanne Mermelstein, M.S.S.W., Missouri-Columbia. Asst. Prof.
 Clotilde M. Moller, A.M. in S.S.W., Chicago. Asst. Prof. Emeritus
 Araminta Smith, M.S.W., Washington (St. Louis). Asst. Prof.
 Anne B. Summers, M.S.W., Washington (St. Louis). Asst. Prof.
 Paul A. Sundet, M.S.S.W., Missouri-Columbia. Asst. Prof.
 DeVere R. Whitesell, M.S.W., Washington (St. Louis). Asst. Prof.



in social work practice. During the first semester, major attention is given to the acquisition and development of basic assessment and interactional skills, as well as strategies of intervention. The second semester focuses on enlarging basic social work skills, with major attention given to helping the student integrate learning into an identifiable understanding of the professional role of social work in the direct delivery of human welfare services. This includes an awareness of the major advantages and constraints associated with the use of interdisciplinary and collaborative efforts undertaken with other helping persons, professionals or nonprofessionals, and a beginning understanding of the institutional and organizational constraints imposed on all professional endeavors. All students take the same courses during the first year, including a practicum of two full days per week.

The second graduate year prepares the student for beginning leadership in a chosen area of concentration, emphasizing either direct or instrumental service functions. The generic base is strengthened, and skills needed in the retrieval and production of knowledge are developed. About one-third of the course work is elective, and most of the second semester is devoted to a concentration practicum, generally outside the immediate Columbia area.

The School may have some federally-sponsored traineeships available, subject to review by the Department of Health, Education and Welfare and yearly congressional appropriations. Various social agencies, including the State Division of Family Services, UMC Medical Center,

MASTER'S DEGREE

The Master of Social Work degree program is designed to prepare the student for beginning competence in professional leadership for social work practice. Preparation for professional leadership is conceived as encompassing two major components: (1) a deepened understanding and ability to apply behavioral skills of the generic core of social work practice; and (2) an individualized configuration of specific roles and contexts enabling the student to possess specialized ability in an area of social work practice. The range of such specialization is broad, with emphasis on administration, supervision, program planning and implementation, and staff development, in a variety of practice areas such as health, housing, welfare, education, aging, corrections, etc.

The graduate program curriculum is organized to utilize the varied scientific and interdisciplinary sources of knowledge required for social work practice. At the same time, collaborative partnership which University-based professional education in social work has historically shared with contemporary practice in the field is preserved.

Emphasis is on developing beginning competence for professional leadership

and State Division of Mental Health offer stipends and educational leave. Work-study programs are administered directly by the various social agencies.

Sociology and Rural Sociology

C. Edwin Vaughan, Ph.D., Minnesota. Chairman; Assoc. Prof.

J. Kenneth Benson, Ph.D., Texas. Prof.

Bruce J. Biddle, Ph.D., Michigan. Prof.

Rex R. Campbell, Ph.D., Missouri-Columbia. Prof.

Donald O. Cowgill, Ph.D., Pennsylvania. Prof.

Ralph E. Dakin, Ph.D., Colorado. Prof.

John F. Galliher, Ph.D., Indiana. Prof.

Noel P. Gist, Ph.D., Northwestern. Prof. Emeritus

Robert W. Habenstein, Ph.D., Chicago. Prof.

Peter M. Hall, Ph.D., Minnesota. Prof.

Daryl J. Hobbs, Ph.D., Iowa State. Prof.

Edward W. Hassinger, Ph.D., Minnesota. Prof.

Herbert F. Lionberger, Ph.D., Missouri-Columbia. Prof.

James L. McCartney, Ph.D., Minnesota. Prof.

Robert L. McNamara, Ph.D., Ohio State. Prof.

Hans O. Mauksch, Ph.D., Chicago. Prof.

C. Terence Pihlblad, Ph.D., Missouri-Columbia. Prof. Emeritus

Ted R. Vaughan, Ph.D., Texas. Prof.

Donald Granberg, Ph.D., Pennsylvania State. Assoc. Prof.

Joel Hartman, Ph.D., Pennsylvania State. Assoc. Prof.

William Heffernan, Ph.D., Wisconsin. Assoc. Prof.

Richard Hessler, Ph.D., Pittsburgh. Assoc. Prof.

John S. Holik, Ph.D., Missouri-Columbia. Assoc. Prof.

Michael F. Nolan, Ph.D., Pennsylvania. Assoc. Prof.

James R. Pinkerton, Ph.D., Wisconsin. Assoc. Prof.

Andrew Twaddle, Ph.D., Brown. Assoc. Prof.

Barbara J. Bank, Ph.D., Iowa. Asst. Prof.

Jere L. Gilles, Ph.D., Cornell. Asst. Prof.

John R. Hall, Ph.D., Washington-Seattle. Asst. Prof.

J. Craig Jenkins, Ph.D., SUNY-Stony Brook. Asst. Prof.

George P. Primov, Ph.D., Washington-Seattle. Asst. Prof.

Loretta J. Williams, Ph.D., SUNY-Buffalo. Asst. Prof.

The Departments of Sociology and Rural Sociology, which function on the graduate level as a single department, offer two graduate degrees—an M.A. and a Ph.D. in Sociology. Major areas of specialization at the master's or doctoral level are in comparative family studies, criminology and deviant behavior, demography, medical sociology, methodology, rural sociology, social change, social organization, social psychology, social theory, and urban sociology.

The department is organizationally affiliated with the Center for Research in

Social Behavior and the School of Medicine. In addition, the *Sociological Quarterly* and the *Review of Social Theory* are published on campus. The department maintains a library of major sociological journals; others are housed in the Ellis Library.

Sources of support for students include fellowships, teaching assistantships, and research assistantships.

MASTER'S DEGREE

To be admitted to the master's program, the department requires at least 12 hours of sociology at the undergraduate level, with a grade average of *B* or better. The candidate must submit, with the application, scores from the GRE or the Miller Analogies Test.

The master's degree may be taken on a thesis or a non-thesis plan. The thesis is considered a requirement for continuing work toward the Ph.D. degree. Under the thesis plan the M.A. candidate must take 30 hours of graduate credit, including at least 15 hours in courses at the 400 level, and no more than 12 hours of independent study and research. The non-thesis plan requires a total of 40 credit hours with the same stipulations. Under both plans, the student and the Advisory Committee develop a plan of study appropriate to professional interests. There is no language requirement.

DOCTORAL DEGREE

While there is no set requirement beyond that established by the Graduate School, the typical Ph.D. program in Sociology includes from 40-45 hours of course work beyond the M.A., plus an additional 12 hours of thesis research credit.

Qualifying examinations covering three major areas of sociology are administered early in the second semester of the student's work toward the Ph.D. After passing the qualifying examinations and meeting the supplementary skills requirement, but before completing 72 hours of graduate credit, the student is expected to take the comprehensive examination

which consists of a general examination over sociological issues, and an examination over the student's special field of interest.

Speech and Dramatic Art

James W. Gibson, Ph.D., Ohio State. Chairman; Prof.

Larry D. Clark, Ph.D., Illinois. Prof.

Clifton Cornwell, Ph.D., Missouri-Columbia. Prof.

Barton L. Griffith, Ph.D., Michigan. Prof.

Carla Marston, Ph.D., Indiana. Prof.

Charlotte G. Wells, Ph.D., Wisconsin. Director, Area of Speech Pathology-Audiology; Prof.

James D. Amerman, Ph.D., Illinois. Assoc. Prof.

Stephen M. Archer, Ph.D., Illinois. Assoc. Prof.

Donald G. Williamson, Ph.D., Michigan State. Assoc. Prof.

G. Joseph Wolfe, Ph.D., Iowa. Assoc. Prof.

H. Michael Banks, Ph.D., Northwestern. Asst. Prof.

Weldon Durham, Ph.D., Iowa. Asst. Prof.

Robert B. Glenn, Ph.D., Colorado. Asst. Prof.

David Jorns, Ph.D., UCLA. Asst. Prof.

Sandra Nickel, Ph.D., Iowa. Asst. Prof.

Sue David Pendell, Ph.D., Utah. Asst. Prof.

William C. Powers, Ph.D., Oklahoma. Asst. Prof.

Edward S. Small, Ph.D., Iowa. Asst. Prof.

Mary-Jeanette Smythe, Ph.D., Florida State. Asst. Prof.

Henry Tharp, M.A., Illinois. Asst. Prof.

The Department of Speech and Dramatic Art offers graduate study toward M.A. and Ph.D. degrees in each of four areas: speech communication, theatre, speech pathology-audiology, and radio-television-film. All of the programs are interdisciplinary in that they include work in

other departments with related or complementary interests. Master's degree programs prepare students for a variety of careers, depending on the area studied. Doctoral programs are designed for highly superior students interested in college or university teaching and research.

The Area of Speech Communication offers opportunities for study and research in the historical, critical, and experimental aspects of speech. Courses from such fields as history, political science, sociology, and psychology contribute to an interdisciplinary approach.

The Area of Theatre stresses broad understanding of principles, theories, and esthetic foundations of theatre along with opportunities for application of talent and knowledge in a wide variety of theatrical productions and in research.

The Area of Speech Pathology-Audiology offers specialized training for those who wish to qualify as professional workers to provide diagnostic and remedial services for individuals with disorders of communication, or who wish to teach at the college or university level. Abundant research materials are available in the Speech and Hearing Clinic and in the other centers with which the Area is affiliated. The master's program in speech pathology is accredited by the American Board of Examiners in Speech Pathology-Audiology.

The Area of Radio-Television-Film provides some technical training in the master's degree program, but emphasizes research on problems of commercial, educational, and instructional broadcasting as they relate to the needs of a changing society. Doctoral programs are individually planned to broaden knowledge in radio-television-film and related fields.

Research materials include the UMC Ellis Library and its special collections on British and American public address; the UMC Medical Library with its special collection on cleft palate and its large number of medical texts and journals; the Western Historical Manuscripts Collection's materials on the Missouri River and Great Plains regions; the State Historical Society; and the Harry S. Truman Memorial Library in Independence.

A university theatre, a studio theatre, a speech and hearing clinic, a speech communication laboratory, and a radio-television-film studio serve as facilities for research and practice. In addition, stu-



dents have the following opportunities within their areas:

Speech Pathology-Audiology: practicum and research through cooperative efforts with the UMC Medical Center (particularly Rusk Rehabilitation Center), Mid-Missouri Mental Health Center, Woodhaven Learning Center, and nearby school systems; participation in the local chapter of the National Student Speech and Hearing Association.

Theatre: participation in the University Theatre, Summer Repertory Theatre, and Studio Theatre productions.

Radio-Television-Film: involvement in various broadcasting and film activities.

Public Address: membership in Delta Sigma Rho and Tau Kappa Alpha, honorary speech fraternities.

FINANCIAL AIDS

Graduate students are eligible to apply for Gregory Fellowships and Work-Study Grants, forms for which may be obtained from the Department. Other financial aids include:

Graduate Teaching Assistantships: master's degree required; usually first-year appointment for half-time teaching to permit 12-hour enrollment in graduate studies.

Graduate Research Assistantships: bachelor's degree required; 40 to 60 hours of work per month during the nine-month academic year.

Traineeships: available through federal grants to qualified master's and doctoral degree candidates in speech pathology-audiology; tax-exempt stipends ranging from \$2,000 to \$2,400 for the academic year; fees paid from grant funds, or by inclusion of cost of fees in stipends; no service required.

Loans: available to students in speech pathology-audiology from the Joann Goodman Gum Memorial Loan Fund; information available from the area director.

MASTER'S DEGREE

An applicant must usually present (1) an undergraduate GPA of at least 3.0/4.0 or the equivalent for the last two years of undergraduate work; (2) Graduate Record Examination Aptitude Test scores; and (3) letters of recommendation when requested by the specific Area. Students with lower GPAs may apply for admission on probation.

The Master of Arts degree may be completed under either *Plan A*—requiring a

thesis approved by an advisory committee, or *Plan B*—a non-thesis option. Both plans require a minimum of 30 hours of graduate credit, including at least 15 hours of course work numbered 400 or above. There is no language requirement.

For the assignment of advisers, students should see the director of the area in which they plan to study.

DOCTORAL DEGREE

To be accepted for advisement a student must usually present (1) a minimum 3.0 GPA for courses taken for the master's degree; (2) Graduate Record Examination Aptitude Test scores; and (3) three letters of recommendation.

A student desiring acceptance as a candidate must (1) demonstrate adequate speech; (2) take qualifying examinations during the first semester of registration if the master's degree was not completed on this campus; and (3) obtain the consent of a member of the department's teaching faculty to serve as an adviser.

Degree requirements include the successful completion of: (1) a course of study designed in consultation with advisory committee; (2) additional course work and/or foreign language examinations to satisfy one of the four options in the department's foreign language-related field requirement:

Option I: Demonstrate evidence of ability to translate into English *two* foreign languages by passing the ETS examination if the languages are French, German, Spanish or Russian, or by receiving certification of competence from a qualified examiner if other languages are presented.

Option II: Demonstrate a high order of competence in *one* foreign language by an additional examination conducted by the language department concerned.

Option III: Demonstrate evidence of ability to translate into English *one* foreign language either by examination or course work (as outlined above) and complete with grades of *B* or better, at the post-master's level, 9 semester hours in courses numbered 200 or above that represent a coherent unit of study, either relating to the field of major interest or providing a research tool applicable to that field from one or

more departments outside the Department of Speech and Dramatic Art.

Option IV: Complete with grades of B or better, at the post-master's level, *two blocks* of course work of 9 semester hours each (in courses numbered 200 or above), each block being from *one or more* departments outside the Department of Speech and Dramatic Art and each representing a coherent unit of study. At least one block of course work must relate to the field of major interest; the other *may* provide a research tool that is applicable to that field.

(3) written and oral comprehensive examinations; (4) an approved research project culminating in a dissertation; (5) an oral examination defending the dissertation.

Statistics

Asit P. Basu, Ph.D., Minnesota. Chairman; Prof.
Frederick Williams, Ph.D., Northwestern. Assoc. Chairman; Prof.
Shrinivas K. Katti, Ph.D., Iowa State. Director of Graduate Studies; Prof.
Gary F. Krause, Ph.D., Virginia Polytechnic Institute. Prof.
William A. Thompson, Jr., Ph.D., North Carolina. Prof.
Richard L. Dykstra, Ph.D., Iowa. Assoc. Prof.
Wallace E. Franck, Ph.D., New Mexico. Assoc. Prof.
John E. Hewett, Ph.D., Iowa. Assoc. Prof.
James E. Holstein, Ph.D., Iowa. Assoc. Prof.
Melvin R. Moeschberger, Ph.D., North Carolina State. Assoc. Prof.
Robert Tsutakawa, Ph.D., Chicago. Assoc. Prof.
Richard W. Madsen, Ph.D., Iowa State. Asst. Prof.
Douglas R. Miller, Ph.D., Cornell. Asst. Prof.
Philip F. Rust, Ph.D., California-Berkeley. Asst. Prof.

The Department of Statistics offers the Master of Arts and the Ph.D. degrees emphasizing either probability or statistics or a combination of both. The department maintains contact with people interested in statistics throughout the University through regular Statistics Colloquia which provide opportunities for faculty and graduate students to present the results of their research.

Special facilities in the department include an open Statistics Laboratory with 33 desk calculators, including an electronic desk calculator which can be programmed. In addition, programmed learning courses in mathematics and statistics are available. During Laboratory hours, an assistant on duty provides instruction in the use of the equipment. In addition, the department has avail-

able for students 3 typewriter communications terminals capable of handling all languages including APL. There are also 12 typewriter communications terminals for student use in a nearby laboratory.

The Mathematical Sciences Building houses the Departments of Mathematics, Statistics, and Computer Science, and the University Computer Network, which has an IBM 370, Model 168-158 Computer and related auxiliary equipment. A large library of programs and subroutines is available. The Mathematics Library has an outstanding collection of books and journals pertaining to mathematics, statistics, and computer science.

Fellowships and teaching and research assistantships are available to qualified graduate students. For further information, write the Director of Graduate Studies, Department of Statistics.

Admission is open to any student who holds a baccalaureate degree from an accredited college, and whose record indicates the likelihood of successfully completing a graduate program in statistics. This usually implies an undergraduate major in statistics or mathematics, or equivalent training such as a degree program in economics or in one of the sciences. Consideration is given also to rank in graduating class, trends in grade record, maturity, and experience, as well as other criteria bearing on qualifications. Ordinarily students should have close to a 3.0 average (on a 4.0 scale) in mathematics and statistics courses in order to enter the master's degree program, and close to a 3.5 average in mathematics and statistics in order to become Ph.D. candidates.

The Department of Statistics recommends the Graduate Record Examination verbal and quantitative aptitude tests, and the GRE advanced mathematics test.

Prior to entering the graduate program, a student should have a background which includes matrix theory, calculus and advanced calculus, and some general courses in statistics. Any deficiencies must be made up. Required courses at the 300 level not taken as an undergraduate

may be taken for graduate credit as part of the graduate program.

MASTER'S DEGREE

Neither a thesis nor a language is required. The specific requirements are:

1. 30 hours of course work numbered 300 or higher, of which at least 15 hours must be taken from listings of the Department of Statistics;
2. 15 hours of course work numbered 400 or higher, of which at least 9 hours must be taken from listings of the Department of Statistics;
3. Mathematics—the following courses are required if equivalent courses were not taken as an undergraduate: (a) 302—Advanced Calculus with Applications or 310—Advanced Calculus I or the equivalent. If 302 is taken, 303—Vector Calculus is recommended. If 310 is taken, 311—Advanced Calculus II is recommended; (b) 331—Matrix Theory or the equivalent;
4. Statistics: (a) 403—Statistical Inference II; (b) at least one year of Linear Statistics; (c) the following courses are required if equivalent courses were not taken as an undergraduate: 401—Probability Theory, or 325—Introduction to Probability Theory; 326—Statistical Inference I; and
5. An M.A. comprehensive examination, usually taken during the last semester of the program of studies.

Except for the above restrictions, there is considerable flexibility. At least one course in computer science and additional courses in areas of applications such as industrial engineering, economics, biological sciences, and atmospheric science are highly recommended. Participation in organized consulting is strongly recommended. Each student's program must be approved by the Department of Statistics.

The accumulation of 9 credit hours with a grade of C or lower on a program for the degree ordinarily terminates a student's candidacy. If a graduate student receives 6 hours of C in courses offered by the Department of Statistics during the first two semesters of the degree program, then candidacy for the M.A. degree is terminated unless specific action to the contrary is taken by the department. For each credit hour with a grade of C or lower, except for 3 credit hours, received in courses offered by the Department of Statistics at the 300 level and

above, the student must receive a credit hour with a grade of A in courses offered by the department at the 300 level and above.

DOCTORAL DEGREE

Each student must pass a qualifying examination to be admitted to candidacy. Requirements for the Ph.D. in Statistics are determined by the student's Advisory Committee and the Director of Graduate Studies. A dissertation is required, and the student must take comprehensive examinations and a final examination.

Veterinary Anatomy-Physiology

- Gary A. Van Gelder, D.V.M., Ph.D., Iowa State. Chairman; Prof.
- Vincent V. St. Omer, D.V.M., Ph.D., University of Guelph. Director of Graduate Studies; Assoc. Prof.
- James E. Breazile, D.V.M., Missouri-Columbia; Ph.D., Minnesota. Prof.
- Esther M. Brown, Ph.D., Michigan State. Prof.
- Homer E. Dale, D.V.M., Iowa State; Ph.D., Missouri-Columbia. Prof.
- Charles W. Foley, Ph.D., Missouri-Columbia. Prof.
- Robert C. McClure, D.V.M., Iowa State; Ph.D., Cornell. Prof.
- Hermann Meyer, D.V.M., Dr.med.vet., University of Zurich, Switzerland; Ph.D., Cornell. Prof.
- Gary D. Osweiler, D.V.M., Ph.D., Iowa State. Assoc. Prof.
- Myron E. Tumbleson, Ph.D., Minnesota. Assoc. Prof.
- Robert W. Zumwalt, Ph.D., Missouri-Columbia. Asst. Prof.
- Richard E. Doyle, D.V.M., Missouri-Columbia; M.S., Florida. Asst. Prof.

The Department of Veterinary Anatomy-Physiology provides graduate study leading to the degree Master of Science in three disciplines: Veterinary Anatomy, Veterinary Pharmacology, and Veterinary Physiology. A Master of Science in Nutrition is offered in the Nutrition Area Program. Graduate study leading to the Doctor of Philosophy degree is offered in the department under the auspices of Area Programs in Physiology or Nutrition, and through a cooperative arrangement with the Departments of Anatomy and Pharmacology of the School of Medicine. In all cases, the program of study is individually arranged; prospective students are encouraged to correspond directly with the Director of Graduate

Studies about the available opportunities.

The following serve as minimal standards for admission to the program:

1. a GPA of 3.0 ($A=4$) in the undergraduate program, or rank in the upper 33 per cent of the graduating class;

2. a minimum of 10 hours in biology with at least one course in zoology, a minimum of 10 hours in chemistry, a minimum of 5 semester hours in college physics, and a minimum of 5 semester hours in college mathematics which must include college algebra.

Admission is based in part upon evaluation of the applicant through correspondence and personal interview to ascertain the motivation and purpose of pursuing the graduate degree. Letters of reference for evaluation of previous attitude and motivation (in either work environment or courses of study) should be submitted, as well as a transcript of previous courses of study.

Facilities for research are available in the Veterinary Anatomy-Physiology Department, and at the Veterinary Research Farm and the Sinclair Comparative Medicine Farm.

VETERINARY ANATOMY

The courses of study in Veterinary Anatomy include gross, microscopic, and ultrastructural levels, comparative neuroanatomy and neurology, embryology and developmental anatomy, and anatomy of laboratory animals.

The department has an electron microscope and accessory-supporting laboratory equipment, electrophysiological monitoring and recording equipment, experimental surgery equipment, and a giant microtome. Also an advantage is the availability of supporting disciplines on campus such as human anatomy, zoology, psychology, and laboratory animal science in the School of Medicine, and the Colleges of Engineering, Agriculture, and Arts and Science.

The requirements for a degree in the M.S. program depend upon whether the M.S. is a terminal degree or a step toward earning a Ph.D. degree on this campus. All candidates are expected to demonstrate proficiency in neuroanatomy, and

microscopic, developmental, and gross anatomy. Continuation for the Ph.D. degree requires a statistics experience.

The student chooses an adviser, and with an advisory committee plans the course of study consisting of a minimum of 30 hours beyond the baccalaureate degree. A thesis based on original experimental laboratory investigation and a final examination are also required.

Work for the Ph.D. degree can be accomplished through cooperation with the Department of Anatomy, School of Medicine. The requirements for this program are described under Doctoral Degree for the Department of Anatomy.

BIOCHEMISTRY AND NUTRITION

The precise course of study is determined by the interests and needs of the student, but in all cases the minimal requirements for the M.S. degree are:

Physiological chemistry (Biochemistry 270, 272, 274, or 304 and 305, or equivalent—6 hours); organic qualitative chemistry (Chemistry 325 or equivalent, 3 hours); Statistics (6 hours); Research (5-8 hours to culminate in a thesis); and electives in courses numbered 400 or above (8-11 hours, with a minimum of 5 hours in biochemistry or physiology).

Research activities are chosen from such areas as interactions between biochemical nutrition and disease, effects of stress on metabolism, and other problems related to nutritional biochemistry.

Work for the Ph.D. degree in biochemistry and nutrition can be accomplished in the department under the authority of the Area Program in Nutrition.

VETERINARY PHARMACOLOGY

In this section, graduate students gain a basis for the understanding of the fundamental principles of pharmacology. Although planning a program is the responsibility of the student and adviser, the following courses (or their transferable equivalent) are required for the M.S. degree:

Statistics 207 (3 hours); Pharmacology 320 (8 hours); Veterinary Anatomy-Physiology 326 or 427 (2-3 hours) or 328, Adaptation to Xenobiotics (3 hours); Physiological Chemistry

(Biochemistry 270, 272 and 274, or 304 and 305, or equivalent of these courses—6 hours); Math 205 (3 hours); Pharmacology 400-level courses in the area of the student's research interest (3-5 hours); Pharmacology 410—Seminar (2 hours); and Veterinary Anatomy-Physiology 490—Research (8-10 hours).

Neuropharmacology is emphasized. Students may choose to work on any of several different research projects, with instrumentation and laboratory space for investigations provided in the department. A thesis resulting from an original experimental laboratory investigation is required.

The Ph.D. degree in Pharmacology is granted in cooperation with the Department of Pharmacology in the School of Medicine; candidates should consult individually about the opportunities and requirements for such a program.

VETERINARY PHYSIOLOGY

Graduate students in this section survey knowledge of normal functions in domestic animals and become familiar with research in the field.

The specific program of study for the M.S. degree depends on the background and interests of the student; before enrolling for any course work, students should discuss this matter with their major professors. All programs must include the following:

Physiology (15 hours); physiological chemistry (Biochemistry 270, 272, 274, or 304 and 305 or equivalent courses—6 hours); Statistics (3 hours); and Math 205—Selected Topics in Analysis (3 hours).

The intent of these requirements is not to provide highly specialized training in one particular aspect, but to insure significant and broad exposure to the field of physiology.

The thesis is based on experimental physiological investigations conducted during the degree program. Because both the number and research interests of departmental faculty do change, prospective students are advised to explore in depth any proposed programs.

Work for the Ph.D. degree in Veterinary Physiology can be accomplished in

the department under the auspices of the Area Program in Physiology.

Veterinary Medicine and Surgery

Charles E. Martin, D.V.M., Missouri-Columbia; M.S., Purdue. Diplomate, A.C.T.; Chairman; Prof.

Harold E. Garner, D.V.M., Kansas State; Ph.D., Baylor College of Medicine. Director of Graduate Studies; Assoc. Investigator, Dalton Research Center; Prof.

Clarence J. Bierschwal, D.V.M., Iowa State; M.S., Missouri-Columbia. Extension Veterinarian; Diplomate, A.C.T.; Prof.

Roger E. Brown, D.V.M., Michigan State; Ph.D., Purdue. Prof.

Arthur A. Case, M.S., D.V.M., Kansas State. Extension Veterinarian; Prof.

James R. Coffman, D.V.M., M.S., Kansas State. Diplomate, A.C.V.I.M.; Prof.

E. Allen Corley, D.V.M., Georgia; Ph.D., Colorado State. Diplomate, A.C.V.R.; Assoc. Dean; Prof.

Allen W. Hahn, D.V.M., Missouri-Columbia; Ph.D., Drexel Institute of Technology. Investigator, Dalton Research Center; Prof.

Joseph T. McGinity, D.V.M., Kansas State; M.S., Missouri-Columbia. Prof.

Kenneth H. Niemeyer, D.V.M., M.S., Missouri-Columbia. Asst. Dean; Prof.

M. Joseph Bojrab, D.V.M., Purdue; M.S., Oklahoma State; Ph.D., University of Bristol. Diplomate, A.C.V.S.; Assoc. Prof.

Louis A. Corwin, Jr., D.V.M., Ph.D., Colorado State. Diplomate, A.C.V.R.; Asst. Prof., Dept. of Radiology; Assoc. Prof.

Arthur W. Dobson, D.V.M., Iowa State; M.S., Missouri-Columbia. Assoc. Prof.

Gary A. Eckhoff, D.V.M., Iowa State; M.S., Minnesota. Assoc. Prof.

Harlan E. Jensen, D.V.M., Iowa State; Ph.D., Missouri-Columbia. Diplomate, A.C.V.O.; Assoc. Prof., Dept. of Ophthalmology; Assoc. Prof.

Jerry H. Johnson, D.V.M., Georgia; M.S., Iowa State. Diplomate, A.C.V.S.; Assoc. Prof.

James S. Larsen, D.V.M., Illinois; M.S., Michigan State. Adjunct Assoc. Prof.

Robert B. Miller, D.V.M., Kansas State; M.S., Ph.D., Missouri-Columbia. Assoc. Prof.

John D. Rhoades, D.V.M., Missouri-Columbia; Ph.D., Minnesota. Urban Extension Veterinarian; Assoc. Prof.

Steven G. Stoll, D.V.M., Illinois. Diplomate, A.C.V.S.; Assoc. Prof.

James G. Thorne, D.V.M., Missouri-Columbia. Assoc. Prof.

Cynthia M. Trim, B.V.Sc., M.R.C.V.S., D.V.A., Royal College of Veterinary Surgeons. Assoc. Prof.

Louis G. Tritschler, D.V.M., M.S., Missouri-Columbia. Assoc. Prof.

James F. Amend, D.V.M., Washington State; Ph.D., Baylor College of Medicine. Asst. Prof.

Robert J. Bahr, D.V.M., Oklahoma State. Diplomate, A.C.V.R.; Asst. Prof.



Claudia L. Barton, D.V.M., Missouri-Columbia. Asst. Prof.
Joseph M. Carrillo, D.V.M., Illinois. Asst. Prof.
R. G. Elmore, D.V.M., Illinois. Asst. Prof.
Brent D. Jones, D.V.M., Colorado State. Asst. Prof.
John M. MacDonald, D.V.M., Cornell. Asst. Prof.
Stephen T. Simpson, D.V.M., Auburn; M.S., Purdue. Asst. Prof.
Robert S. Youngquist, D.V.M., Iowa State. Diplomate, A.C.T.; Asst. Prof.

The Department of Veterinary Medicine and Surgery offers graduate work leading to the Master of Science degree and supervision for post-doctoral study and research. The Department joins with relevant departments in staffing and presenting the Area Program in Laboratory Animal Medicine which also offers the Master of Science degree.

The departmental graduate program provides advanced training in food, equine and small animal medicine and surgery, anesthesiology, comparative cardiology, ophthalmology, theriogenology, radiology and radiation biology, and laboratory animal medicine.

The complete medical records maintained on all animals entering the clinic provide a source for comparisons with current clinical materials. Graduate students have immediate access to the clinic patients, medical records, and facilities of the Veterinary Medical Teaching Hospital

to aid them in clinical research. The College of Veterinary Medicine Research Farm is used for laboratories and animal holding. In addition, the College has its own library.

For information and application forms regarding financial assistance, teaching and research assistantships and fellowships, write to the Chairman, Department of Veterinary Medicine and Surgery.

DEGREE REQUIREMENTS

The D.V.M. degree or its equivalent, as approved by the department, is a prerequisite for advanced study. Performance in the professional curriculum greatly influences selection of applicants for graduate study. In addition, the applicant must have ranked at least in the upper half of the graduating class and must take the GRE.

The professional curriculum completed by the applicant is compared with that offered at UMC. Applicants are asked to strengthen any deficiencies, especially prerequisites to the chosen area of concentration.

The planning of the program of study is the responsibility of the student with the aid of the chosen adviser. Because of the wide range of areas of concentration within the department and the advantages of interchanges offered among them, an advisory committee should be selected within the first semester of study and a definite program accepted. Members of this committee (three or more) may later be recommended for appointment to the examining committee. The four- or five-member advisory group should consist of the major adviser and other members of the department, plus a member from another department within the division, and a member from outside the College.

The final examination committee should be of the same make-up as the Advisory Committee.

A thesis which reports the results of original research and is suitable for publication is generally required of all candidates.

Veterinary Microbiology

Raymond W. Loan, Ph.D., Purdue. D.V.M., Washington State. Chairman; Prof.
Hans K. Addinger, Ph.D., Cornell. Dr.med.vet., University of Munich. Director of Graduate Studies; Assoc. Prof.
Donald C. Blenden, M.S., D.V.M., Missouri-Columbia. Prof.
Olen R. Brown, Ph.D., Oklahoma. Prof.
Emmett L. McCune, Ph.D., Minnesota; D.V.M., Missouri-Columbia. Prof.
Leslie C. Murphy, D.V.M., Washington State. Assoc. Dean for Research; Prof.
Bruce D. Rosenquist, Ph.D., Missouri-Columbia; D.V.M., Iowa State. Prof.
John N. Berg, Ph.D., Missouri-Columbia; D.V.M., Iowa State. Assoc. Prof.
Gerald M. Buening, Ph.D., D.V.M., Purdue. Assoc. Prof.
Robert M. Corwin, Ph.D., Georgia; D.V.M., Michigan State. Assoc. Prof.
Lloyd A. Selby, D.P.H., Tulane; D.V.M., Colorado State. Assoc. Prof.
Robert F. Solorzano, Ph.D., Pennsylvania State. Assoc. Prof.
William F. Fales, Ph.D., Idaho. Asst. Prof.
David G. Thawley, Ph.D., University of Guelph; B.V.Sc., Massey University. Asst. Prof.

The Department offers advanced study leading to the Master of Science in Veterinary Microbiology. The Doctor of Philosophy is offered as part of the Area Program in Microbiology. The Master of Science in Public Health (M.S.P.H.) is offered through a joint program with the Department of Family and Community Medicine.

The M.S. and Ph.D. programs are designed to prepare students for teaching, research and diagnostic service in veterinary microbiology, infectious diseases, and the biomedical areas. The M.S.P.H. program prepares students for teaching, research and administrative positions in Veterinary Community Health and Epidemiology.

As a specialized segment of microbiology, veterinary microbiology involves studies of the host-parasite relationship. Infectious disease, host resistance, immunology, and preventive medicine are emphasized. Graduate programs include courses in biochemistry, genetics, immunology, pathology, physiology, radiobiology, statistics, and ultrastructural morphology, as well as bacteriology, mycology, parasitology, and virology. Specific areas of concentration are bacteri-

ology, epidemiology, helminthology, immunology, mycology, parasitology (general), veterinary community health, and virology.

Research and teaching laboratories and other departmental facilities are located in Connaway Hall. Facilities for animal care are located in Connaway Hall and at the Veterinary Medicine Research Farm on Brown Station Road, four miles north of the campus. Additional animal facilities are available at other locations.

A limited number of stipends are available from research grants. Other sources of support include National Institutes of Health postdoctoral and special fellowships, other fellowships and assistantships funded by the federal or state government and stipends from commercial companies. Students also provide their own support from private, commercial, and governmental sources.

MASTER'S DEGREE

The following are requirements for admission:

1. a professional degree or a baccalaureate degree in a biological or physical science;
2. rank in the upper one-half of the graduating class;
3. a minimum GPA of 3.0 ($A=4.0$). Students with a GPA of 2.5-3.0 may be admitted based upon superior test scores, work experience, and outstanding recommendations;
4. the approval of the Adviser, the Department Chairman, and the Director of Graduate Studies; and
5. a combined score on the aptitude section of the GRE of at least 1,000. This test is required by the Graduate School.

In exceptional cases, students who do not meet the established requirements may be accepted for a one-semester probationary period during which they must attain a minimum of a *B* average to continue graduate study.

Under the guidance of an adviser, a program of study is designed to fit the student's academic background, experience, and objectives. The course of study must include a minimum of 9 credit hours outside the department, including one course in biochemistry or biostatistics (300 or 400 level). This latter requirement may be waived for students who present evi-



dence of satisfactory completion of equivalent courses from another institution.

Upon satisfactory completion of the course work and thesis, the Graduate School appoints a final examination committee composed of at least one member from the department, one member from the Area of Microbiology, and one member from outside the department.

Veterinary Pathology

Willard H. Eyestone, D.V.M., Ph.D., Wisconsin. Chairman; Prof.

Donald A. Schmidt, D.V.M., Ph.D., Michigan State. Director of Graduate Studies; Prof.

Loren D. Kintner, D.V.M., M.S., Missouri-Columbia. Prof.

Charles C. Middleton, D.V.M., M.S., Michigan State. Prof.

Lawrence G. Morehouse, D.V.M., Ph.D., Purdue. Director, Veterinary Medical Diagnostic Laboratory; Prof.

Stuart L. Nelson, D.V.M., Ph.D., Purdue. Prof.

LeRoy D. Olson, D.V.M., Ph.D., Purdue. Prof.

Joseph E. Wagner, D.V.M., Ph.D., Illinois. Prof.

Kenneth D. Weide, D.V.M., Ph.D., Michigan State. Dean, College of Veterinary Medicine; Prof.

John J. Andrews, M.S., Iowa State. Assoc. Prof.

Harry H. Berrier, D.V.M., M.S., Missouri-Columbia. Assoc. Prof.

Robert A. Green, D.V.M., Ph.D., California. Assoc. Prof.

Bonnard L. Moseley, D.V.M., M.S., Missouri-Columbia. Assoc. Prof.

Darrell A. Kinden, B.A., Ph.D., Missouri-Columbia. Asst. Prof.

Larry P. Thornburg, D.V.M., Ph.D., North Carolina. Asst. Prof.

The Department of Veterinary Pathology offers graduate work leading to the Master of Science in Veterinary Pathol-

ogy and also cooperates with the Department of Pathology of the School of Medicine and the Department of Plant Pathology of the College of Agriculture in offering a Ph.D. program in Pathology.

The laboratories and equipment described in the Pathology Area program are generally available for M.S. candidates. The Area's fields of study are applicable to the departmental program.

Write the departmental Director of Graduate Studies for details and application forms for assistantships and fellowships.

MASTER'S DEGREE

For admission to the Master of Science program in Veterinary Pathology, the applicant should have completed the D.V.M. or an acceptable baccalaureate degree. The latter would include subject courses in anatomy, microbiology, physiology, biochemistry, and pathology, or their equivalents. Students not in the upper one-third of their graduating classes may be admitted on probationary status for one semester. Part I (general aptitude) of the GRE must be taken before entering Graduate School or during the first semester.

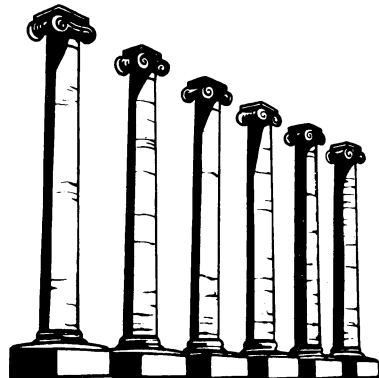
An advisory committee of three faculty members is established during the first semester to assist in formulating a plan of study and advising the student on thesis research.

There is no language requirement. However, a student must complete a minimum of 30 graduate credit hours, with 15 or more hours in 400-level courses and 16 hours in pathology courses other than 490. A minor, if chosen, must be approved by the professor of the minor subject and is included in the final examination.

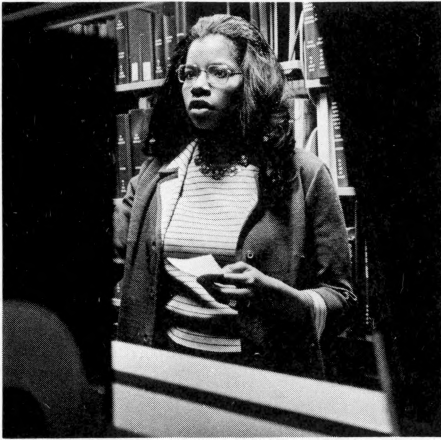
An acceptable thesis and a final examination, chiefly in defense of the thesis, are required of all M.S. degree candidates. It is possible for a student to transfer to the Ph.D. program without completing the M.S. degree requirements. Regulations governing this are available from the Director of Graduate Studies.

Area Programs

- Ancient Studies
- Black Studies
- Business Administration
- Computer Science
- Environmental Sciences
- Genetics
- Laboratory Animal Medicine
- Linguistics
- Medieval and Renaissance Studies
- Microbiology
- Nuclear Engineering
- Nutrition
- Pathology
- Physiology
- Public Administration
- Regional Science
- South Asia Language and Area Studies



Area Programs



Ancient Studies Area

H. David Soren, Ph.D., Harvard. Chairman; Assoc. Prof. of Art History & Archaeology
 William B. Bondeson, Ph.D., Chicago. Prof. of Philosophy
 Claudia Kren, Ph.D., Wisconsin. Prof. of History
 Eugene N. Lane, Ph.D., Yale. Prof. of Classical Studies
 Fordyce Mitchel, Ph.D., Yale. Prof. of History
 Meyer Reinhold, Ph.D., Columbia. Prof. of Classical Studies
 Robert J. Rowland, Jr., Ph.D., Pennsylvania. Prof. of History
 Ralph M. Rowlett, Ph.D., Harvard. Prof. of Anthropology
 Charles F. Saylor, Ph.D., California-Berkeley. Prof. of Classical Studies
 John C. Thibault, Ph.D., Illinois. Prof. of Classical Studies
 Homer L. Thomas, Ph.D., University of Edinburgh. Prof. of Art History & Archaeology
 Saul S. Weinberg, Ph.D., Johns Hopkins. Prof. of Art History & Archaeology
 William R. Biers, Ph.D., Pennsylvania. Assoc. Prof. of Art History & Archaeology
 Theodore A. Tarkow, Ph.D., Michigan. Assoc. Prof. of Classical Studies
 Victor Estevez, Ph.D., Wisconsin. Asst. Prof. of Classical Studies
 Murari L. Nagar, D.L.S., Columbia. Instructor in Sanskrit

The Ancient Studies Area is an interdisciplinary program in Anthropology, Art History and Archaeology, Classical Studies, History, and Philosophy, offering a minor for both the M.A. and Ph.D. degrees. Students who pursue graduate degrees in one of the participating departments are eligible to work for the minor in Ancient Studies. To participate in the program, they must make formal application to the Chairman.

If accepted, they must satisfy the following requirements:

1. For a master's degree with a minor in Ancient Studies, students must take at least 10, but no more than 12 hours of approved course work in at least two of the related departments other than the major department.
2. For a Ph.D. degree with a minor in Ancient Studies, students must take at least 24 hours of approved course work in all three of the related departments other than the major department. Further, as part of these 24 hours, they must take at least one course at the 400 level in each of two separate related departments.

Black Studies Area

Arvarh E. Strickland, Ph.D., Illinois. Coordinator; Prof. of History.

An individual program of specialization in Black Studies may be arranged within the framework of a conventional graduate degree in any one of several fields. The options within a regular degree program are employed to include maximum exposure to courses emphasizing the Afro-American background and experience. Courses outside the major department, but in related fields, are incorporated into the student's study plan.

Students interested in pursuing a Black Studies specialty within their chosen fields should consult a departmental adviser designated to assist in this matter. In the absence of other information, students should contact the Coordinator of Black Studies through the Graduate School.

Business Administration

S. Watson Dunn, Ph.D., Illinois. Dean, College of Business & Public Administration; Prof. of Marketing
 Robert V. Penfield, Ph.D., Cornell. Director of Graduate Studies; Assoc. Prof. of Management
 Carl E. Block, Ph.D., Iowa. Prof. of Marketing
 Robert G. Cook, D.B.A., Indiana. Prof. of Management
 Lewis E. Davids, Ph.D., New York. Chairman, Dept. of Finance; Robert E. Lee Hill Prof. of Bank Management
 Nylen W. Edwards, D.B.A., Indiana. Prof. of Marketing
 Norman D. French, Ph.D., Illinois. Prof. of Business Administration/Marketing; Whiteman AFB Graduate Program in Business

Donald S. Holm, Jr., D.B.A., Indiana. UM Treasurer & Asst. Vice Pres.; Prof. of Management

Raymond W. Lansford, Ed.D., New York. Director of Educational Services & Extension; Prof. of Finance

Robert C. Manhart, Ph.D., Ohio State. Prof. Emeritus of Management

John J. Pascucci, Ph.D., Stanford. Prof. of Finance

Robert J. Paul, Ph.D., Arkansas. Prof. of Management

Robert D. Schooler, Ph.D., Texas. Prof. of Marketing

Donald L. Shawver, Ph.D., Illinois. Prof. of Marketing

Francis L. Stubbs, Ph.D., Wisconsin. Prof. of Finance

Don R. Webb, Ph.D., Illinois. Prof. of Marketing

Samuel G. Wennberg, Ph.D., Northwestern. Prof. Emeritus of Marketing

David A. West, Ph.D., Arkansas. Prof. of Finance

Everett E. Adam, Jr., D.B.A., Indiana. Assoc. Prof. of Management

Robert E. Bray, A.M., Missouri-Columbia. Assoc. Prof. of Finance

Earl A. Cecil, Ph.D., Indiana. Asst. Dean for Academic Affairs; Assoc. Prof. of Management

Ronald J. Ebert, D.B.A., Indiana. Chairman/Assoc. Prof. of Management

Harvey W. Greene, M.A., Missouri-Columbia. Assoc. Prof. of Business Administration; Whiteman AFB Graduate Program in Business

Robert A. Hershberger, Ph.D., Georgia. Assoc. Prof. of Finance

Earl F. Lundgren, Ph.D., Wisconsin. Assoc. Prof. of Management

T. Charles McKinney, Ph.D., Wisconsin. Assoc. Prof. of Management/Family & Community Medicine

William E. McTeer, Ph.D., Missouri-Columbia. Assoc. Prof. of Business Administration/Accountancy; Whiteman AFB Graduate Program in Business

Robert J. Monroe, D.B.A. Indiana. Director, School of Business; Assoc. Prof. of Finance

James Patterson, D.B.A., Indiana. Assoc. Prof. of Management

Kenneth J. Roering, Ph.D., Iowa. Chairman/Assoc. Prof. of Marketing

Melville Peterson, Ph.D., Illinois. Assoc. Prof. of Finance

William B. Wagner, Ph.D., Ohio State. Assoc. Prof. of Marketing

Roger P. Bey, Ph.D., Pennsylvania State. Asst. Prof. of Finance

Jehoshua Elishberg, D.B.A., Indiana. Asst. Prof. of Marketing

Myron L. Erickson, J.D., Wisconsin. Asst. Prof. of Management

Adam K. Gehr, Jr., Ph.D., Ohio State. Asst. Prof. of Finance

Weldon E. Harris, Ph.D., Missouri-Columbia. Asst. Prof. of Business Administration; Resident Director, Whiteman AFB Graduate Program in Business

Neil B. Marks, Ph.D., Ohio State. Asst. Prof. of Management

Rodney C. Sherman, Ph.D., Georgia State. Asst. Prof. of Business Administration; Whiteman AFB Graduate Program in Business

LeRoy F. Simmons, Ph.D., Tennessee. Asst. Prof. of Business Administration; Whiteman AFB Graduate Program in Business

E. Allen Slusher, Ph.D., Iowa. Asst. Prof. of Management

The Master of Business Administration and the Doctor of Philosophy in Business Administration are interdisciplinary degrees offered by the School of Business of the College of Business and Public Administration through the Departments of Finance, Management, and Marketing. A master's candidate may select advanced course work from the offerings of these departments, while a Ph.D. candidate selects one of the departments as the area in which to concentrate course work and write a dissertation.

The School of Business faculty is housed in Middlebush Hall, a modern air-conditioned building. Students have terminal access to the University Computer Network's IBM system 370/168-158 computer, and full access to the resources of the Public Affairs Information Service of the College and to Ellis Library.

The M.B.A. Degree

The M.B.A. degree is designed for superior graduate students whose primary interest is preparation for managerial careers in business. At the same time, it provides a strong educational background for persons who plan to continue their academic training in preparation for teaching and research in business administration. Although major emphasis is placed on the essential unity and interrelations of all business operations, the program provides for a concentration in one area of work.

The program is open to students who hold a baccalaureate degree in any discipline from an accredited school. Normally, an accumulated undergraduate overall grade point average of 2.8 (A=4.0) or a grade point average of 3.0 in the last 60 hours, and a score of 475 on the Graduate Management Admissions Test (GMAT) [formerly the Admission Test for Graduate Study in Business (ATGSB)] are considered the minimum levels of performance necessary for admission. In exceptional cases work experience, mo-

tivation, and maturity are taken into consideration. A foreign student whose native language is not English is required to present a minimum score of 575 on the Test of English as a Foreign Language (TOEFL). Both the GMAT and TOEFL are administered by the Educational Testing Service.

Total graduate course work necessary to qualify for the M.B.A. degree may vary from 30 to 55 semester hours, depending upon the nature and quality of a student's undergraduate preparation. The first year of the program consists of a series of graduate core courses, which draw upon subject matter normally covered in undergraduate courses in business and related disciplines. However, the scope and method of coverage is more demanding and is directed toward the maturity of the graduate student. A core course may be waived for a student whose undergraduate record indicates that courses covering substantially the same materials have been completed.

First-year courses total 28 hours of work in the following subjects: calculus, organization theory and behavior, accounting, FORTRAN computer programming, statistics, information systems, micro-macro economics, operations management, finance, and marketing.

The second year of the program requires at least 27 hours (30 hours if all core courses are waived), consisting of 24 at the 400-level and including specific courses in managerial decision science, business and society, and business policy. Each student must complete an area of concentration in one of the following:

Business logistics, controllership, economics, financial management, general, health services management,* investment management, international business, marketing, operations management, personnel management and industrial relations, quantitative methods, and risk and insurance.

**The Health Services Management Concentration is offered in cooperation with the School of Medicine. Students electing this concentration must meet the admission requirements of both programs before selecting this concentration. For application materials and additional information, write Admissions Director, Graduate Studies, in Health Services Management, 403 Noyes Bldg., UMC, Columbia, Mo. 65201.*

In selecting second-year courses, a student should observe the following restrictions:

1. the program must include at least 3 hours of 400-level work in each of two of the following disciplines: finance, management, marketing;
2. a program may not include more than 15 hours of course work offered by one department;
3. a program may include 3 hours of 300-level required first-year course work which carries a Business Administration designation, and is taken in an area other than those from which 400-level courses are completed in satisfaction of (1) above;
4. not more than 6 hours of advanced work may be transferred toward the second year requirements from another university, and that university must be accredited at the master's level by the American Assembly of Collegiate Schools of Business.

The M.B.A. does not require a thesis or a language; however, a number of second-year courses emphasize research projects and analytical reports.

In cooperation with the Graduate School and the Air Force Institute of Technology, the School of Business conducts at Whiteman Air Force Base a Minuteman Educational Program leading to the Master of Business Administration degree. This program is subject to the same requirements as previously described.

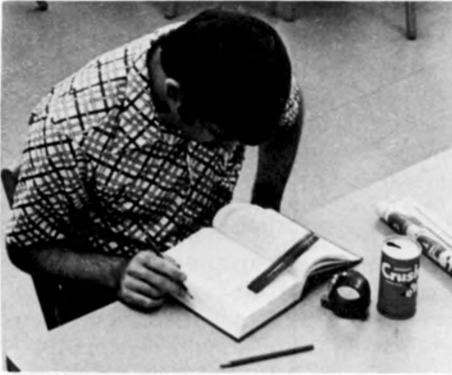
Limited financial assistance through research and teaching assistantships is available. These assistantships are usually quarter-time appointments involving approximately 10 hours of work per week at a rate of \$1,750 annually.

Applications and additional information about the program may be obtained by writing the Director of Graduate Studies in Business.

DOCTORAL DEGREE

The Doctor of Philosophy in Business Administration is designed to provide:

1. a broad understanding of the major areas of business; the role of the business manager as analyst, planner, and decision maker; and the mutual dependence between the firm and its environment;
2. intensive preparation for teaching in a specialized area at the college or university



level with emphasis upon the dynamics of the discipline; and

3. competence for original and meaningful research, and awareness of the importance of self-development and scholarly growth.

The Ph.D. program is open to students who have exhibited outstanding performance in previous academic work, have superior test scores from the GMAT, and display the maturity and potential required for making scholarly contributions to their field of interest. To apply for permission to begin course work leading to the Ph.D. degree, applicants must submit the following: transcripts from all colleges and universities attended; a score from the Graduate Management Admissions Test; a score from the Test of English as a Foreign Language (TOEFL) if a foreign student; three letters of recommendation from persons who can attest to the student's abilities; and a statement by the applicant indicating the intended major area of study, career objectives, and any other information deemed pertinent for consideration by the Admissions Committee. Formal admission to the Ph.D. Program in Business Administration requires satisfactory performance on a doctoral qualifying examination taken during the student's first semester of study.

During the first semester of course work, students must arrange with a member of the doctoral faculty from their major area of study to serve as chairman of an advisory committee. This committee, appointed after student/faculty consultation, consists of five members,

with a minimum of two members from the student's major area of study and a minimum of one member from each of the student's supporting areas of study. The advisory committee conducts the qualifying examination and works with the student to design a program of study. All programs of study must include:*

1. any first-year and required second-year M.B.A. courses, or equivalents, that have not been completed prior to admission to the Ph.D. program;
2. a concentration of 15 hours of 400-level courses in the area of finance, management, or marketing;
3. two supporting areas of at least 9 hours each, one of which must be taken outside the School of Business; and
4. a 21-hour collateral emphasizing the analytical tools for Business Administration; proficiency in a foreign language does not fulfill the collateral requirements. Courses in the collateral are in addition to those listed in 1, 2, and 3 above, and must include the following:

Business Administration 481, Research Design & Methodology.

Economics 451, Advanced Price Theory AND Economics 453, Advanced Income Analysis OR Business Administration 471, Behavioral Science in Business I AND Business Administration 472, Behavioral Science in Business II.

A quantitative sequence. The student may choose either (a) OR (b) OR (c).

- (a) Statistics 307, Nonparametric Statistical Methods; Statistics 385, Regression & Correlation Analysis; Statistics 395, Analysis of Variance; Finance/Management/Marketing 418, Business & Economic Research OR a graduate operations research course beyond Business Administration 420, Managerial Decision Science.
- (b) Statistics 307, Nonparametric Statistical Methods; Psychology 420, Advanced Psychological Statistics II; Psychology 421, Advanced Techniques in Psychological Statistics; Finance/Management/Marketing 418, Business & Economic Research OR a graduate operations research course beyond Business Administration 420, Managerial Decision Science.
- (c) A 12-hour mathematical statistics/quantitative sequence approved by the Director of Graduate Studies in Business.

*The requirements listed in 1-4 above are independent from each other; courses taken to satisfy one requirement may not be used in satisfaction of any other requirement. However, previous graduate work taken prior to admission to the Ph.D. program may be used in satisfaction of these requirements if it is deemed appropriate by the Advisory Committee.

Oral and written comprehensive examinations covering the major area and the supporting areas are administered after the candidate has completed all course work of the official study program. A doctoral dissertation, for which a student earns a minimum of 12 hours and a maximum of 24 hours credit, is required of each candidate. A final oral examination is held at the completion of the dissertation, and is concerned primarily with the research accomplished by the student while writing a dissertation.

If more than four years elapse between the time the student satisfies the comprehensive examination committee requirements and completion of the dissertation, both written and oral comprehensive examinations must be retaken.

In order to be eligible to receive a Ph.D. degree offered by the UMC faculty, students are required to have the equivalent of three complete years of graduate work beyond the bachelor's degree. This must include at least two 12-hour or three 8-hour semesters of graduate-level work completed within an 18-month period on the UMC campus. A minimum of three years is normally required to complete the Ph.D. in Business Administration.

Limited financial assistance through research and teaching assistantships is available. These assistantships are usually half-time appointments involving approximately 20 hours of work per week, and range from \$4,000 to \$5,000 annually.

Applications and additional information about the Ph.D. program may be obtained by writing the Director of Graduate Studies, School of Business, Middlebush Hall, UMC, Columbia, Mo. 65201.

Computer Science

Paul Blackwell, Ph.D., Syracuse, Chairman; Director of Graduate Studies; Assoc. Prof.

Donald R. Shurtleff, Ph.D., Worcester Polytechnic Institute. Prof.

Gordon K. Springer, Ph.D., Pennsylvania State. Asst. Director for Systems, Computer Network; Assoc. Prof.

Fred N. Springsteel, Ph.D., Washington-Seattle. Assoc. Prof.

David T. Chen, Ph.D., New York-Buffalo. Asst. Prof.

Peter A. Ng, Ph.D., Texas-Austin. Asst. Prof.

The Computer Science Department offers a program leading to a degree of Master of Science in Computer Science. Entrance requirements include proficiency in two programming languages and a background in mathematics with at least two courses beyond calculus.

Requirements for graduation include satisfactory completion of 30 credit hours of course work covering programming languages and language processors, operating systems and systems programming, data structures and programming techniques, the theory of computation, and the design and construction of computers. The program of study, emphasizing the interrelations of the practical and the theoretical aspects of computer science, culminates in a master's project which is carried out under the supervision of a faculty adviser.

Environmental Sciences Area

Howard C. Hopps, M.D., Ph.D., Chicago. Curators Prof. of Pathology

The UMC Graduate School provides a multidisciplinary program for students interested in environmental studies within the social, biological, medical, engineering, and physical sciences.

Students are admitted to the Environmental Sciences Area only through existing departments. Initial inquiries should be made to the department of major interest. All students who have been admitted as graduate students to a department in the science area are eligible for the Environmental Sciences Graduate Area Program. A special Environmental Program application should be completed and submitted shortly after admission to the chosen department. As a minimum, this must be done in time sufficient for consideration by the committee before the last semester's work is arranged.

A participating student must satisfy the degree requirements of the chosen department in addition to those that may be

imposed by the Environmental Sciences Committee.

The Ph.D. candidate must normally complete at least 15 hours from acceptable courses at the 200 level or above in other departments, as determined by the student's regularly appointed advisory and examining committees. Master's candidates must normally complete at least 9 hours selected from acceptable courses at the 200 level or above in other departments, as determined by the student's regularly appointed advisory and examining committees.

The master's or Ph.D. advisory and examining committees must be composed of two members outside the department who are members of the Environmental Sciences graduate faculty, including a member of the Environmental Sciences Graduate Area Program Committee.

Genetics Area

Gary Y. Kikudome, Ph.D., Illinois. Chairman; Director of Graduate Studies; Assoc. Prof.

Allan B. Burdick, Ph.D., California. Prof.

Edward H. Coe, Jr., Ph.D., Illinois. Prof.

Abraham Eisenstark, Ph.D., Illinois. Prof.

Charles S. Gowans, Ph.D., Stanford. Prof.

Gordon Kimber, Ph.D., University of Manchester. Prof.

William Z. Loegering, Ph.D., Minnesota. Prof.

Henry A. McQuade, Ph.D., Washington (St. Louis). Prof.

Myron G. Neuffer, Ph.D., Missouri-Columbia. Prof.

Gyorgy P. Redei, C.S., Hungarian Academy of Sciences. Prof.

Ernest R. Sears, Ph.D., Harvard. Prof.

Armon F. Yanders, Ph.D., Nebraska. Prof.

Marcus S. Zuber, Ph.D., Iowa State. Prof.

Linda F. Chapman, Ph.D., California-Los Angeles. Assoc. Prof.

Gregory G. Doyle, Ph.D., Illinois. Assoc. Prof.

Russell L. Larson, Ph.D., Illinois. Assoc. Prof.

C. Donald Miles, Ph.D., Indiana. Assoc. Prof.

Om P. Sehgal, Ph.D., Wisconsin. Assoc. Prof.

Richard J. Wang, Ph.D., Colorado. Assoc. Prof.

Paul F. Agris, Ph.D., Massachusetts Institute of Technology. Asst. Prof.

Jack B. Beckett, Ph.D., Wisconsin. Asst. Prof.

John D. David, Ph.D., Vanderbilt. Asst. Prof.

Donald L. Riddle, Ph.D., California. Asst. Prof.

Louis A. Sherman, Ph.D., Chicago. Asst. Prof.

Lottie M. Sears, Ph.D., California. Asst. Prof.

The Area of Genetics offers programs leading to the degrees of Master of Science and Doctor of Philosophy. They are designed to provide broad, individualized

training to prepare graduates for teaching and research careers in genetics.

Applicants with a *B* average or equivalent in the most recent two years of course work, particularly in the sciences, are considered. Application should be made to the Director of Graduate Studies. A complete application consists of: official transcripts, letters of recommendation, scores on the Graduate Record Examinations (Aptitude and Biology), and the form entitled "Application for fellowship. . . ."

Applicants are expected to have a broad background in biology, an introductory course in genetics equivalent to UMC's, and one or more courses in each of the following: organic chemistry, biochemistry, mathematics (preferably through calculus), physics, and statistics. Deficiencies in these subjects are to be remedied promptly after admission.

In addition to the requirements of the Graduate School, the minimum requirements for the degrees are:

Master of Science: Biol. Sci. 202 & 241 (no-credit status); advanced courses in genetics; biochemistry; two seminars; thesis (or, on approval, credits in Biol. Sci. 400, Problems, may be substituted). These requirements and other courses are determined with the student's adviser.

Doctor of Philosophy: Biol. Sci. 202 and 241 (no-credit status); advanced courses in genetics; biochemistry; advanced courses in physiology and metabolism; three seminars; some form of teaching experience in classroom and laboratory teaching in biology which prepares the student to enter a teaching career. Other advanced



courses and language requirements are prescribed by the student's Advisory Committee.

Laboratory Animal Medicine Area Program

Charles C. Middleton, D.V.M., Missouri-Columbia. Chairman; Assoc. Prof. of Veterinary Pathology/Family & Community Medicine
Richard E. Doyle, D.V.M., Missouri-Columbia. Director of Graduate Studies; Asst. Prof. of Veterinary Anatomy-Physiology
Joseph E. Wagner, Ph.D., Illinois. D.V.M., Iowa State. Prof. of Veterinary Pathology

The Graduate Area Program in Laboratory Animal Medicine provides training leading toward a Master of Science degree in Laboratory Animal Medicine—a specialty of Veterinary Medicine concerned with experimental animals and their use in biological research.

The graduate program is designed to provide training in such depth and breadth that graduates can assume positions of senior responsibility in these career areas: professional care and management of research animal colonies; administration and teaching; or basic research in identifying and defining animal models that can be used to study human health problems.

Principally, the resources of the Medical Center, College of Veterinary Medicine, and Sinclair Research Farm are utilized in this program; however, other resources such as the Dalton Research Center may be used.

In addition to UMC's Ellis Library, the libraries of the Medical and Veterinary schools provide an outstanding selection of reference texts and periodicals. The Department of Laboratory Animal Medicine in the Medical Center has a highly specialized library particularly pertinent to laboratory animal medicine.

A training grant now being used to support this program includes a limited number of trainee stipends awarded by the Laboratory Animal Medicine Area Executive Committee on a best-qualified basis. In addition, the National Institutes of Health provides individual postdoc-

toral fellowships to qualified individuals seeking training in the field of Laboratory Animal Medicine.

PROGRAM REQUIREMENTS

The Laboratory Animal Medicine Area Executive Committee selects graduate students for acceptance into the area program. All trainees must have a degree of Doctor of Veterinary Medicine or its equivalent.

The training program includes specified and elective course work, residency training, and research. An acceptable master's thesis based upon original research is required. In most cases it is anticipated that three years will be needed to complete this program; however, a shorter period may be approved by the committee in instances where a trainee has had special experience or demonstrates exceptional progress.

Required formal courses include 19 semester hours of specified Laboratory Animal Medicine courses, and a course in statistics relative to biology. Additional elective courses may be required depending upon the area chosen for thesis research.

The residency of this program consists of approximately 20 hours per week of applicatory training in an assigned area. During the first year of training, each postdoctoral fellow rotates at four-month intervals through the following three areas utilized for residency training: the Department of Laboratory Animal Medicine, Sinclair Research Farm, and the Research Animal Diagnostic and Investigative Laboratory.

Linguistics Area Program

Donald M. Lance, Ph.D., Texas. Chairman; Assoc. Prof. of English
John M. Howie, Ph.D., Indiana. Director of Graduate Studies; Asst. Prof. of French/Linguistics
Thelma Trombly, Ph.D., Missouri-Columbia. Prof. Emeritus of Speech
James D. Amerman, Ph.D., Illinois. Assoc. Prof.
Daniel E. Gulstad, Ph.D., Illinois. Assoc. Prof. of Spanish/Linguistics
Benjamin L. Honeycutt, Ph.D., Ohio State. Assoc. Prof. of French
Eugene N. Lane, Ph.D., Yale, Assoc. Prof. of Classical Studies

Linnea D. Lilja, Ph.D., Minnesota. Assoc. Prof. of Curriculum & Instruction
 Marjorie Marlin, Ph.D., Illinois. Assoc. Prof. of Psychology
 Ruth H. Firestone, Ph.D., Colorado. Asst. Prof. of German
 Louanna Furbee-Losee, Ph.D., Chicago. Asst. Prof. of Anthropology
 Daniel L. Greenblatt, Ph.D., Michigan. Asst. Prof. of English
 Mark Kiken, Ph.D., Brown. Asst. Prof. of Russian
 Dena Lieberman, Ph.D., Wisconsin. Asst. Prof. of Anthropology

The Linguistics Area program, offering interdisciplinary work leading to a Master of Arts in Linguistics, is jointly staffed by faculty from various departments of the University. Supporting course work may include foreign languages and literature, psychology, philosophy, English, education, speech, anthropology, or South Asian studies.

A Kay sonograph is available to perform spectrographic analyses of speech.

Financial aid, when available, is arranged through the participating departments. For further information, write the Director of Graduate Studies, Linguistics Area Program, 27 Arts and Science Building.

THE MASTER'S PROGRAM

To be accepted as an M.A. candidate, a student must have taken an introductory course in general linguistics. Admission to the program is contingent upon recommendation of the linguistics faculty. An adviser with appropriate academic interests is selected from the linguistics staff to aid the candidate in planning a program. All candidates must complete with grades of *B* or better a core program of five courses: linguistic analysis, phonology, advanced phonology, syntax, and advanced syntax.

Foreign languages are not required, but are normally included in a linguistics program; these needs are determined on an individual basis.

A candidate has an option of two programs of study: 24 hours of course work plus a 6-credit-hour thesis, or 30 credit hours of course work. In either, a student must take 15 hours of 400-level

course work and not more than 12 hours in readings and research. Either plan culminates in a two-part final: a five-hour written portion to be followed within a week by an hour-long oral portion. The candidate on the thesis program must also pass an examination, either written or oral, covering the research and related topics.

Medieval and Renaissance Area Studies

Donald K. Anderson, Jr., Ph.D. Duke. Prof. of English
 Lloyd E. Berry, Ph.D., Cambridge. Prof. of English
 William B. Bondeson, Ph.D., Chicago. Prof. of Philosophy
 Milton McC. Gatch, Ph.D., Yale. Prof. of English
 James V. Holleran, Ph.D., Louisiana State. Prof. of English
 William M. Jones, Ph.D., Northwestern. Prof. of English
 Claudia Kren, Ph.D., Wisconsin. Prof. of History
 Hellmut Lehmann-Haupt, Ph.D., University of Frankfurt. Prof. of Library Science
 Andrew C. Minor, Ph.D., Michigan. Prof. of Music History
 Bonner Mitchell, Ph.D., Ohio State. Prof. of French & Italian
 Charles F. Mullett, Ph.D., Columbia. Prof. Emeritus of History
 Charles G. Nauert, Jr., Ph.D., Illinois. Prof. of History
 George B. Pace, Ph.D., Virginia. Prof. of English
 Meyer Reinhold, Ph.D., Columbia. Prof. of Classical Studies
 John R. Roberts, Ph.D., Illinois. Prof. of English
 Robert J. Rowland, Ph.D., Pennsylvania. Prof. of History
 Robert Ruigh, Ph.D., Harvard. Prof. of History
 John C. Thibault, Ph.D., Illinois. Prof. of Classical Studies
 Homer L. Thomas, Ph.D., University of Edinburgh. Prof. of Art History & Archaeology
 Vern G. Williamsen, Ph.D., Missouri-Columbia. Prof. of Spanish
 Edzard Baumann, Ph.D., University of Vienna. Assoc. Prof. of Art History
 Robert M. Bender, Ph.D., Michigan. Assoc. Prof. of English
 Thomas D. Cooke, Ph.D., Pittsburgh. Assoc. Prof. of English
 Ebion De Lima, Ph.D., Pontifical University of Sao Paulo. Assoc. Prof. of Portuguese
 Daniel E. Gulstad, Ph.D., Illinois. Assoc. Prof. of Spanish
 C. Haskell Hinnant, Ph.D., Columbia. Assoc. Prof. of English
 Ben L. Honeycutt, Ph.D., Ohio State. Assoc. Prof. of French
 Harold G. Jones III, Ph.D., Princeton. Assoc. Prof. of Spanish
 Howard T. Mancing, Ph.D., Florida. Assoc. Prof. of Spanish

Osmund Overby, Ph.D., Yale. Assoc. Prof. of Art History
 Margaret P. Sommers, Ph.D., Stanford. Assoc. Prof. of French
 Russell Zguta, Ph.D., Pennsylvania State. Assoc. Prof. of History
 Anthony De Bellis, M.A., Ohio State. Asst. Prof. of Italian
 Ruth H. Firestone, Ph.D., Colorado. Asst. Prof. of German
 Norma J. Fisk, Ph.D., Texas. Asst. Prof. of English
 Norman Land, Ph.D., Virginia. Asst. Prof. of Art History

The staff of the Medieval and Renaissance Studies program is composed of appropriate faculty members from the Departments of Art History, Classical Studies, English, Germanic and Slavic Studies, History, Music, Philosophy, and Romance Languages. A doctoral candidate in one of these departments offering a Ph.D. may elect a minor concentration in interdisciplinary Medieval or Renaissance Studies by taking a number of appropriate courses outside the department, as well as all appropriate ones within it. Thus, one earns, for example, a Ph.D. in Art History and Medieval Studies, or a Ph.D. in History and Renaissance Studies. Under certain circumstances, a minor in Medieval or Renaissance Studies may also be arranged for M.A. programs.

Ellis Library has large collections in the Medieval and Renaissance fields, and course offerings in the two fields are extensive.

Information on fellowships may be obtained by writing to the Director of Graduate Studies in the department of major interest.

DEGREE REQUIREMENTS

Since the area program itself offers only minor concentrations and does not give degrees, a student must first be accepted for graduate work by the major department. Then, in consultation with the major adviser, who must be a specialist in the Medieval or Renaissance period, an interdisciplinary curriculum for a minor in Medieval or Renaissance concentration is prepared and submitted to the Area Committee for approval. Since the area program places considerable em-

phasis on the study of foreign languages, all doctoral candidates must have at least two, and sometimes more are required.

Microbiology Area Program

Charles S. Gowans, Ph.D., Stanford. Prof. of Biological Sciences; Director, 1977-78
 James T. Barrett, Ph.D., Iowa. Prof. of Microbiology
 Abraham Eisenstark, Ph.D., Illinois-Urbana. Prof. of Biological Sciences
 Marion L. Fields, Ph.D., Purdue. Prof. of Food Science & Nutrition
 Arthur P. Harrison, Jr., Ph.D., Maryland. Prof. of Biological Sciences
 David J. Hentges, Ph.D., Loyola (Chicago). Prof. of Microbiology
 Raymond W. Loan, D.V.M., Washington State. Ph.D., Purdue. Prof. of Veterinary Microbiology
 Robert T. Marshall, Ph.D., Missouri-Columbia. Prof. of Food Science & Nutrition
 LeRoy D. Olson, D.V.M., Minnesota; Ph.D., Purdue. Prof. of Veterinary Pathology
 Joseph T. Parisi, Ph.D., Ohio State. Prof. of Microbiology
 Bruce D. Rosenquist, D.V.M., Iowa State; Ph.D., Missouri-Columbia. Prof. of Veterinary Microbiology
 Hans K. Addlinger, Dr.med.vet., University of Munich; Ph.D., Cornell. Assoc. Prof. of Veterinary Microbiology
 Olen R. Brown, Ph.D., Oklahoma. Assoc. Prof. of Veterinary Microbiology
 Gerald M. Buening, D.V.M., Ph.D., Purdue. Assoc. Prof. of Veterinary Microbiology
 Linda F. Chapman, Ph.D., California at Los Angeles. Assoc. Prof. of Biological Sciences
 Edward J. Hsu,* Ph.D., California. Assoc. Prof. of Microbiology
 John W. Lawson,* Ph.D., North Carolina. Assoc. Prof. of Microbiology
 Hammond G. Riggs, Ph.D., Texas. Assoc. Prof. of Microbiology
 Marvin Rogolsky,* Ph.D., Syracuse. Assoc. Prof. of Microbiology
 Lloyd A. Selby, D.V.M., Colorado State; Dr.P.H., Tulane. Assoc. Prof. of Veterinary Microbiology
 Robert F. Solorzano, Ph.D., Pennsylvania State. Assoc. Prof. of Veterinary Microbiology
 Ronald F. Sprouse, Ph.D., Oklahoma. Assoc. Prof. of Microbiology
 Richard J. Wang, Ph.D., Colorado. Assoc. Prof. of Biological Sciences
 Phillip D. Harriman,* Ph.D., California-Berkeley. Asst. Prof. of Microbiology
 Louis A. Sherman, Ph.D., Chicago. Asst. Prof. of Biological Sciences

Leading to the Doctor of Philosophy degree, the Area Program in Microbiology is jointly staffed by faculty in these

*Members of Area from the University of Missouri-Kansas City.

departments: Food Science and Nutrition from the College of Agriculture; Microbiology from the School of Medicine; the Division of Biological Sciences from the College of Arts and Science; Veterinary Pathology and Veterinary Microbiology from the College of Veterinary Medicine; and Biology from the College of Arts and Sciences (UMKC).

With the broad scope of the program and its cross-departmental organization, the Area keeps abreast of technical changes and advanced research techniques developed for obtaining biological information at the subcellular or molecular level.

Special facilities for study and research include: infrared, ultraviolet, and visible light spectrophotometers; ultraviolet, darkfield, phase, and electron microscopes; high speed preparative and analytical ultracentrifuges; lyophilization equipment; column chromatography; and paper, disc, starch, and gel electrophoresis.

The distinct areas of concentration which a student may pursue are: antibiotics; antiseptics, disinfection and sterilization; ecology; immunology; microbial genetics; mycology; parasitology; microbial physiology; virology; infectious disease; aspects of microbial pathology; and food microbiology.

The Microbiology Area Program is designed to prepare students for advanced professional careers in universities and colleges, research institutes, public health and hospital laboratories, and industrial research.

Many students admitted to the area program are awarded teaching or research assistantships administered through the participating departments. Under the guidance of faculty members, teaching assistants are given practical experience in planning, organizing, teaching, laboratory preparation, and evaluating subject matter in microbiology. Research assistants work with faculty members to obtain practical experience in the planning of research proposals, the collection of research data, and the writing of research reports.

Write the area program director for further information.

THE PH.D. PROGRAM

To be accepted for advisement in the area program, a student should have completed the following courses: mathematics through college algebra, 10 hours of chemistry including organic, 10 hours of biology, and 5 hours of physics.

The master's degree or a professional college degree (MD. or D.V.M.) may be accepted as meeting requirements for admission in lieu of the minimal grade point average stipulated under Regulations for Admission, providing the applicant attained a minimal grade point average of 3.0/4.0 in graduate courses. Prospective graduate students must submit Graduate Record Examination aptitude test scores to be considered for admission to the Area.

To be considered for candidacy, an applicant must show satisfactory performance on a qualifying examination administered by the Advisory Committee. The UMC master's examination may be accepted in lieu of the Ph.D. qualifying examination.

This program normally requires three years beyond the master's degree and consists of:

- (1) a course of study, (2) practical experience in teaching and research, (3) a comprehensive examination, and (4) demonstration of research and writing ability by completing a doctoral dissertation on an approved research problem.

The majority of the student's advisory and examining committees shall be from the Area faculty. Under the guidance of an advisory committee, a course of study is individually designed to fit each student's academic background, experience, and objectives. Courses normally suggested for completion include one course each in calculus, physical chemistry, and statistics; one general and two advanced courses in biochemistry; and 18-20 hours in 300- and 400-level courses in microbiology. Courses may be chosen from one or more departments, as determined by the advisory committee, but shall consti-

tute a definite plan of training for research or scholarly investigation in some particular aspect of microbiology.

The final examination covers chiefly the dissertation.

Nuclear Engineering

Walter Meyer, Ph.D., Oregon State. Chairman, Prof. Stanley R. Bull, Ph.D., Stanford. Director of Graduate Studies; Assoc. Prof.

Robert N. Brugger, Ph.D., Rice. Director, Research Reactor; Prof.

Robert L. Carter, Ph.D., Duke. Prof. (Electrical Engineering)

Ardath H. Emmons, Ph.D., Michigan. Vice-President for Research; Prof. (Radiological Sciences)

David W. Hoepfner, Ph.D., Wisconsin. Prof. (Bioengineering/Mechanical Engineering)

William R. Kimel, Ph.D., Wisconsin. Dean, College of Engineering; Prof.

Sudarshan K. Loyalka, Ph.D., Stanford. Assoc. Prof.

James A. Seydel, Ph.D., Michigan. Assoc. Prof.

Darrol H. Timmons, Ph.D., Kansas State. Assoc. Prof.

James R. Vogt, Ph.D., Kentucky. Assoc. Director, Environmental Trace Substances Research Center; Assoc. Prof.

Don M. Alger, Ph.D., Missouri-Columbia. Assoc. Dir., Research Reactor; Asst. Prof.

Clifford W. Richter, Ph.D., Oklahoma. Chief, Medical Physics, Ellis Fischel Cancer Hospital; Visiting Asst. Prof.

Phillip K. Lee, Ph.D., Purdue. Director, Health Physics Services; Asst. Prof. (Radiological Sciences)

William H. Miller, Ph.D., Missouri-Columbia. Asst. Prof.

The Area Program in Nuclear Engineering offers graduate work and supervised research experience leading to the degrees of Master of Science and Doctor of Philosophy.

A student may pursue specific areas of concentration in the various research programs of the faculty. These include nuclear materials management, nuclear applications in biomedicine, fast reactor analysis, nuclear energy conversion, reactor designs, microstructure aspects of fracture and fatigue, non-destructive inspection, radiation protection and dosimetry, radiative heat transfer, neutron spectrometry, medical radiological physics, neutron and gamma ray transport, and neutron activation analysis.

Area research is facilitated by several special research facilities and laboratories. The University of Missouri Research Re-

actor (MURR), a ten-million watt facility, has the highest steady state neutron flux of any U. S. university reactor.

The volume in the center of the reactor fuel annulus is a "flux trap" which is accessible from the pool surface for insertion and removal of experiments. The reactor also services three six-inch I.D. beam tubes, three four-inch I.D. beam tubes, four pneumatic tube irradiation positions, eight reflector region irradiation positions, and a neutron radiography facility. Surrounding the reactor is a 26,000 square foot laboratory facility for nuclear research.

A linear electron accelerator with a 40 mev research beam is available for research through the Department of Medical Physics at Ellis Fischel Cancer Hospital. The neutron generator accelerates deuterons to 150 kev energy to produce 14 mev neutrons via the T (d,n) reactions. It may be operated in either pulsed or continuous mode; for the latter the maximum neutron production is 10^{11} neutrons per second.

Other facilities include:

Subcritical Training Reactor: natural uranium metal fuel and H₂O moderator; neutrons supplied by a 5 curie Pu-Be source.

⁶⁰Co Irradiator: The irradiator contains approximately 5,000 curies of ⁶⁰Co and is installed in a pool at the MURR facility.

Nuclear Instrumentation: Multichannel analyzers—1024 and 400 channel units, semiconductor detectors; scintillation counters; GM counters; gas flow proportional counters; liquid scintillation counters; neutron counters; BF₃, ³He, ⁶LiI (Eu); microdosimeters.

Digital Computers: terminal access to IBM 370/168, PDP8s and PDP11/05 data acquisition and control computers.

Analog Computers: two EAI TR-48's, Cross-correlation computer.

Ellis Library has over 1,800,000 volumes, and the Engineering Library, over 30,000 volumes.

Financial assistance includes federal, industrial, and UMC fellowships; teaching and UMC research assistantships; and sponsored research assistantships. The distribution of these funds is coordinated through the Nuclear Engineering Program administration, except research assistantship funds associated with sponsored research projects which

are distributed by the individual professors in charge of the grant. Students on probation and foreign students with no prior educational record in the U. S. are not eligible for financial assistance during the first semester of their programs. Those who perform satisfactorily during their first semester are eligible for consideration for financial assistance for their second semester.

DEGREE REQUIREMENTS

To be accepted for advisement in the nuclear engineering graduate program, a student must have a baccalaureate degree in engineering or a physical science from an accredited college or university, and must have earned an undergraduate grade point average of at least 3.0/4.0 in the last two years. Students not meeting these requirements may be admitted for graduate study on a probationary basis by recommendation of the nuclear engineering staff.

The Master of Science degree requires a minimum of 30 credit hours of graduate-level courses, to be approved by the adviser as well as the Nuclear Engineering faculty. A thesis is typically used to fulfill 6 of the 30 credit hours of study (NE 490). Students with an interest in electrical power generation may pursue a non-thesis option in Nuclear Power Systems (a joint EE/NE program).

Graduate course work taken at other accredited institutions may be transferred up to a maximum of 8 hours. Nuclear engineering courses in the 300 series, if not required for the undergraduate degree, may be used as part of the graduate program. Courses in the 200 series, but not in nuclear engineering, may also be part of the program. An average grade of 3.0 or better is required for the M.S. degree.

Applicants wishing to enter the Doctor of Philosophy program are individually evaluated. The minimum admission requirements include (1) a strong record in the M.S. program, and (2) three letters of recommendation, one from the applicant's M.S. adviser. The reading ability

requirement in one foreign language may be satisfied by exhibiting competence in a collateral field which usually means electing three courses (one must be 400 level) in a field outside the dissertation area.

The minimum requirement of three years work beyond the bachelor's degree must include two semesters in residence, with a graduate registration of at least 12 credit hours per semester or three semesters in residence with a graduate registration of at least 9 credit hours per semester.

The three-year requirement may be met by completing a minimum of four semesters of equivalent full-time work beyond the master's degree, with an average grade of 3.0/4.0 or better.

The Ph.D. candidate selects a program of study and research under the immediate supervision of an adviser and in close cooperation with an advisory committee.

A Ph.D. qualifying examination, given soon after the student begins doctoral study, consists of both written and oral questions. Successful completion is a prerequisite to formal acceptance into the Ph.D. program. The program is oriented toward research culminating in a dissertation suitable for publication. A comprehensive examination is given after all course work and foreign language requirements have been satisfied. Upon completion of the program of study and research, a final examination, which is essentially a defense of the dissertation, is administered.

Nutrition Area Program

- Margaret A. Flynn, Ph.D., Missouri-Columbia. Chairman; Director of Graduate Studies; Prof. of Human Nutrition/Family & Community Medicine
Thomas D. Luckey, Ph.D., Wisconsin. Prof. of Biochemistry
Ruth N. Lutz, Ph.D., Cornell. Prof. of Human Nutrition, Foods & Food Systems Management
Fredric A. Martz, Ph.D., Purdue. Prof. of Dairy Husbandry
Boyd L. O'Dell, Ph.D., Missouri-Columbia. Prof. of Biochemistry
William H. Pfander, Ph.D., Illinois. Prof. of Animal Husbandry
James E. Savage, Ph.D., Missouri-Columbia. Prof. of Poultry Husbandry

Robert L. Wixom, Ph.D., Illinois. Prof. of Biochemistry
 J. Malcolm Asplund, Ph.D., Wisconsin. Assoc. Prof. of Animal Husbandry
 Richard Dowdy, Ph.D., North Carolina State-Raleigh. Assoc. Prof. of Human Nutrition, Foods & Food Systems Management
 Myron E. Tumbleson, Ph.D., Minnesota. Assoc. Prof. of Veterinary Anatomy-Physiology

The Area Program in Nutrition, an interdisciplinary program leading to a Master of Science or a Ph.D. in Nutrition, is designed to provide a foundation in the many scientific aspects of nutrition. This is accomplished by a core of courses on which a student builds a graduate program. Specialized research is conducted on the Columbia campus in several departments: Biochemistry, Animal Husbandry, Dairy Husbandry, and Poultry Husbandry from the College of Agriculture; Human Nutrition, Foods and Food Systems Management from the College of Home Economics; Veterinary Anatomy-Physiology from the College of Veterinary Medicine. Thus, a basic foundation is insured, yet the student is able to specialize in one area of nutrition.

Students may concentrate in one of these areas of experimental nutrition: human, swine, poultry, ruminant, and laboratory animals. Additionally, a student may concentrate on studies involving a specific nutrient in several species of animals.

Chemical laboratories and animal facilities enable students to conduct both basic and applied nutrition research. Analytical laboratories facilitate research, and radioactive and stable isotopes can be used through the facilities in several laboratories, as well as through the whole body radiation detector facility. The Animal Science building provides modern research facilities for both chemical and animal research.

All of the major journals in the field of nutrition are in the libraries on the campus.

The U.S. Department of Agriculture, Public Health Service, and Energy Research and Development Administration, as well as state and private sources, provide research support. Fellowships

and assistantships are available through the various departments represented in the Area. Apply to the Director of Graduate Studies of the Area of nutrition, or to the department in which one plans to do nutrition research.

Pathology Area Program

Willard H. Eyestone, Ph.D., Wisconsin. Chairman; Prof. of Veterinary Pathology
 Robert N. Goodman, Ph.D., Missouri-Columbia. Chairman; Prof. Plant Pathology
 John F. Townsend, M.D., Missouri-Columbia. Interim Chairman; Prof. of Pathology
 Thomas D. Wyllie, Ph.D., Minnesota. Director of Graduate Studies; Prof. of Plant Pathology
 Oscar H. Calvert, Ph.D., Wisconsin. Prof. of Plant Pathology
 Victor H. Dropkin, Ph.D., Chicago. Prof. of Plant Pathology
 James A. Esterly, M.D., Chicago School of Medicine. Prof. of Pathology
 Howard C. Hopps, M.D., Oklahoma; Ph.D., Chicago. Prof. of Pathology
 Loren D. Kintner, M.S., Missouri-Columbia. Prof. of Veterinary Pathology
 Donald A.B. Lindberg, M.D., College of Physicians and Surgeons. Prof. of Pathology
 William Q. Loegering, Ph.D., Minnesota. Prof. of Plant Pathology
 Arlene P. Martin, Ph.D., Rochester. Prof. of Pathology/Biochemistry
 Charles C. Middleton, M.S. Michigan State. Prof. of Veterinary Pathology
 Daniel F. Millikan, Ph.D., Missouri-Columbia. Prof. of Plant Pathology
 Lawrence G. Morehouse, Ph.D., Purdue. Prof. of Veterinary Pathology
 Stuart L. Nelson, Ph.D., Purdue. Prof. of Veterinary Pathology
 Leroy D. Olson, Ph.D., Purdue. Prof. of Veterinary Pathology
 Einar W. Palm, Ph.D., North Dakota State. Prof. of Plant Pathology
 Donald A. Schmidt, Ph.D., Michigan State. Prof. of Veterinary Medicine
 Marie L. Vorbeck, Ph.D., Cornell. Prof. of Pathology/Biochemistry
 Joseph E. Wagner, Ph.D., Illinois. Prof. of Veterinary Pathology
 Jack R. Wallin, Ph.D., Iowa State. Prof. of Plant Pathology
 Edward H. Adelstein, M.D., Missouri-Columbia. Assoc. Prof. of Pathology
 John J. Andrews, M.S., Michigan State. Assoc. Prof. of Veterinary Pathology
 Charles H. Baldwin, Jr., Ph.D., Oregon State. Assoc. Prof. of Plant Pathology
 Harry H. Berrier, M.S. Missouri-Columbia. Assoc. Prof. of Veterinary Pathology
 Merton F. Brown, Jr., Ph.D., Iowa. Assoc. Prof. of Plant Pathology
 Robert A. Green, Ph.D., California-Davis. Assoc. Prof. of Veterinary Pathology
 Anton Novacky, Ph.D., Czechoslovak Academy of Sciences. Assoc. Prof. of Plant Pathology

Om P. Sehgal, Ph.D., Wisconsin. Assoc. Prof. of Plant Pathology
Prabodh K. Srivastava, Ph.D., Missouri-Columbia. Assoc. Prof. of Pathology
Arthur L. Karr, Jr., Ph.D., Colorado. Asst. Prof. of Plant Pathology.
Darrell A. Kinden, Ph.D., Missouri-Columbia. Asst. Prof. of Veterinary Pathology
Paul W. Steiner, Ph.D., Cornell. Asst. Prof. of Plant Pathology
Larry P. Thornburg, Ph.D., North Carolina-Chapel Hill. Asst. Prof. of Veterinary Medicine

The Ph.D. Area Program in Pathology is jointly staffed and presented by the following departments: Pathology, School of Medicine; Veterinary Pathology, College of Veterinary Medicine; and Plant Pathology, College of Agriculture.

The program is designed to provide students with the opportunity to examine and use research concepts and methods indigenous or specific to each of the three areas of pathology. In its approach to comparative pathology, it allows the opportunity to obtain training in breadth or in depth in studies of disease mechanisms or processes in various host species.

Joint seminars and committee appointments, and cooperative efforts in course offerings create an atmosphere for meaningful interdisciplinary dialogue and research cooperation among graduate students and faculty of the existing pathology departments. This is further implemented through an advisory committee composed of one member from each pathology department.

Ph.D. candidates may choose their plans of research to take advantage of the interests and specialties of the various Ph.D. advisers. Among these research areas are ultrastructure research, membrane transport systems, immunopathology, phytobacteriology, enzymology, electron transport systems in tissue, oncology, host cell-pathogen relationships, and pathogenesis of avian and mammalian disease (companion animal, food-producing animal, and spontaneous disease of laboratory animals).

In addition to standard equipment suitable for research in each pathology area, special items in the various departments include: six electron microscopes,

six walk-in plant growth chambers capable of environmental control within close tolerances, chromatographic equipment (gas-liquid, column, paper, and thin-layer), spectrophotometers, low-high speed and ultra-centrifuge electrophoresis apparatuses, mass spectrometer, Warburg respirometers, liquid scintillation and thin window radioisotope counters, ultra-microtomes, radiometer blood gas analyzer.

Facilities also include necropsy and clinical pathology laboratories for supportive course work (Medical and Veterinary Pathology), research laboratories in medical, plant, and veterinary medical pathology, and two research farms.

Various stipends are available, including teaching assistantships and post-doctoral fellowships. Write to the chairman of the specific pathology department for application forms.

DEGREE REQUIREMENTS

To be considered for admission to the Ph.D. area program in Pathology, an applicant should hold the M.S. degree in plant pathology or a closely related field of biological science, or be a graduate with a degree of M.D., D.V.M., or D.D.S.

An applicant should take Part I (general aptitude) of the GRE before entering Graduate School, or during the first semester of graduate study; furthermore, students must pass a qualifying examination for admission to candidacy.

A student's course of study includes a "core curriculum" which must be met some time before graduation. These subjects are not requirements for admission. If adequate evidence is established for prior work in these areas, or their equivalents, they need not be repeated. The student is referred to chairmen of specific departments for additional information on course requirements. The core curriculum is as follows: a three-hour introductory course in comparative pathology, as well as comparative pathology seminars meeting regularly for each semester the student is enrolled; a basic course in microbiology and an advanced

course in virology, bacteriology, mycology, or immunology, depending on the interests of the student; an introductory course and two advanced courses in biochemistry, or one advanced course in biochemistry and a semester of physical chemistry; one basic and one advanced course in genetics; Mathematics 80 or an acceptable equivalent; an introductory course in statistics; one course in scientific instrumentation.

Abilities developed in the preparation of the required dissertation should include:

- (1) logical thought regarding technical aspects of pathology and areas to which it relates,
- (2) planning and conducting of independent objective research investigations, and
- (3) the ability to communicate scientific results in writing.

The dissertation, presented in the format set by Graduate School regulations, must be prepared in form for publication in an edited journal in the field.

Physiology Area Program

Wesley S. Platner, Ph.D., Missouri-Columbia. Executive Secretary; Director of Graduate Studies; Prof. of Physiology
 Ralph R. Anderson, Ph.D., Missouri-Columbia. Prof. of Dairy Husbandry
 Harold V. Biellier, Ph.D., Missouri-Columbia. Prof. of Poultry Husbandry
 James E. Breazile, D.V.M., Missouri-Columbia; Ph.D., Minnesota. Prof. of Veterinary Anatomy-Physiology
 Homer E. Dale, Ph.D., Missouri-Columbia. Prof. of Veterinary Anatomy-Physiology
 James O. Davis, Ph.D., Missouri-Columbia; M.D., Washington University. Chairman/Prof. of Physiology
 Billy N. Day, Ph.D., Iowa State. Prof. of Animal Husbandry
 Charles W. Foley, Ph.D., Missouri-Columbia. Prof. of Veterinary Anatomy-Physiology
 H. E. Garner, Ph.D., Baylor College of Medicine. Prof. of Veterinary Medicine & Surgery
 Douglas M. Griggs, M.D., Virginia. Prof. of Physiology
 Allen W. Hahn, Ph.D., Drexel Institute. Prof. of Veterinary Medicine & Surgery; Investigator, Dalton Research Center
 Patrick D. Harris, Ph.D., Northwestern. Assoc. Prof. of Physiology; Investigator, Dalton Research Center
 Harold D. Johnson, Ph.D., Missouri-Columbia, Chairman/Prof. of Dairy Husbandry

J. Alan Johnson, Ph.D., Indiana. Asst. Prof. of Physiology; Research Physiologist, Veterans Administration Hospital
 Allan W. Jones, M.D., Ph.D., Pennsylvania. Assoc. Prof. of Physiology
 Benjamin R. Londeree, Ed.D., Toledo. Assoc. Prof. of Health & Physical Education.
 Jose R. Martinez, M.D., Tulane. Assoc. Prof. of Child Health/Physiology
 Dennis T. Mayer, Ph.D., Missouri-Columbia. Prof. Emeritus of Agricultural Chemistry
 Charles P. Merilan, Ph.D., Missouri-Columbia. Prof. of Dairy Husbandry; Assoc. Investigator, Dalton Research Center
 Dallas K. Meyer, Ph.D., Missouri-Columbia. Prof. of Physiology
 Merle E. Muhrer, Ph.D., Missouri-Columbia. Prof. of Biochemistry
 X. J. Musacchia, Ph.D., Fordham. Prof. of Physiology; Director, Dalton Research Center
 Donald H. York, Ph.D., Monash University, Australia. Assoc. Prof. of Physiology
 Marvin L. Zatzman, Ph.D., Ohio State. Prof. of Physiology

The Area of Physiology offers graduate study leading to the degrees of Master of Science and Doctor of Philosophy in Physiology. Graduate programs in the Area of Physiology are designed to provide in-depth training to meet the needs of the individual student. The Area affords a unique opportunity to explore the frontiers of knowledge at the interface between one or more specialized fields in physiology.

The faculty of this Area includes members from the following departments: Biochemistry from the College of Agriculture/School of Medicine; Animal Husbandry from the College of Agriculture; Biological Sciences from the College of Arts and Science; Physiology from the School of Medicine; and Veterinary Anatomy-Physiology and Veterinary Medicine and Surgery from the College of Veterinary Medicine. These programs are described elsewhere in this catalog.

Specialties and interests include: avian physiology, bioengineering, bioenergetics, biological instrumentation, biological rhythms, blood coagulation, calorimetry, cardiovascular physiology, control systems, comparative vertebrate physiology, depressed metabolism, endocrinology, environmental physiology,

ecology, electrolyte metabolism, fat metabolism, hypothermia-hibernation, milk secretion, micro-circulation, neurophysiology, exercise, respiration, reproductive physiology, renal physiology, and water and electrolyte metabolism.

Specialized major facilities include the Nuclear Reactor, Low Level Radiation Laboratory, Sinclair Comparative Medical Research Farm, Dalton Research Center, the Climatic Laboratory, and the Thermo-electric Partitional Calorimeter. Also, extensive basic research instrumentation and facilities are available in the member departments.

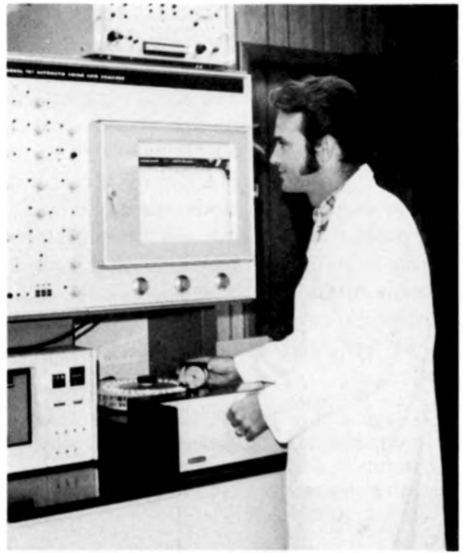
DEGREE REQUIREMENTS

The Physiology Area admits students who have met the admission standards of the UMC Graduate School and have completed satisfactorily five semester hours of mathematics, 10 semester hours of chemistry, 10 semester hours of biology, and 5 semester hours of physics. An equivalent number of quarter hours will be accepted. The student is expected to have earned a 3.0 grade point average (4.0=A) or equivalent during the last two years of undergraduate work; however, a non-terminal master's degree may be substituted.

A student desiring to enter the Area submits to the Secretary of the Physiology Area a complete official transcript and scores on the Graduate Record Examination. Three former undergraduate or graduate professors should send letters of recommendation and/or completed "Student Rating Forms" to the Secretary of the Area, who supplies the rating forms.

The Secretary of the Area appoints an *ad hoc* committee of three Area members to evaluate each applicant's credentials. The Secretary, an *ex officio* member of all admissions committees, notifies an applicant and the Graduate Dean of the action taken by a committee.

Because of different interests and variable backgrounds, graduate programs are individually arranged. More specific requirements for both course work and re-



search are determined by the major professor, an Area staff member. For many students the M.S. is not a terminal degree, but rather an integral part of a Ph.D. program. The doctoral program is emphasized within the Area since it is oriented specifically toward preparation for basic research and for college and university teaching.

Ph.D. candidates must take a written and oral qualifying examination to evaluate their training and needs in the following subjects: mammalian physiology; statistics and/or mathematics; biochemistry or physical chemistry. The examination is administered by an appointed advisory committee having a majority of its five members from the Physiology Area. This advisory committee determines the required course work and stipulates the language requirements (a reading knowledge of two foreign languages or equivalent is required). The committee evaluates the proposed research and may suggest appropriate modification.

Additional information in the various facets of the Area of Physiology may be obtained from the Executive Secretary, Area of Physiology, Graduate School, 205 Jesse Hall, Columbia, Mo. 65201.

Public Administration Area

Robert F. Karsch, Ph.D., Missouri-Columbia. Director, Institute of Public Administration; Prof. of Public Administration/Political Science

Stanely B. Botner, Ph.D., Missouri-Columbia. Director of Graduate Studies; Assoc. Prof. of Public Administration/Political Science

Rondal G. Downing, Ph.D., Illinois at Urbana-Champaign. Prof. of Public Administration/Political Science

Robert W. Paterson, Ph.D., Virginia. Prof. of Public Administration/Economics

Barry Bozeman, Ph.D., Ohio State. Asst. Prof. of Public Administration/Political Science

John N. Collins, Ph.D., Northwestern. Asst. Prof. of Public Administration/Regional & Community Affairs

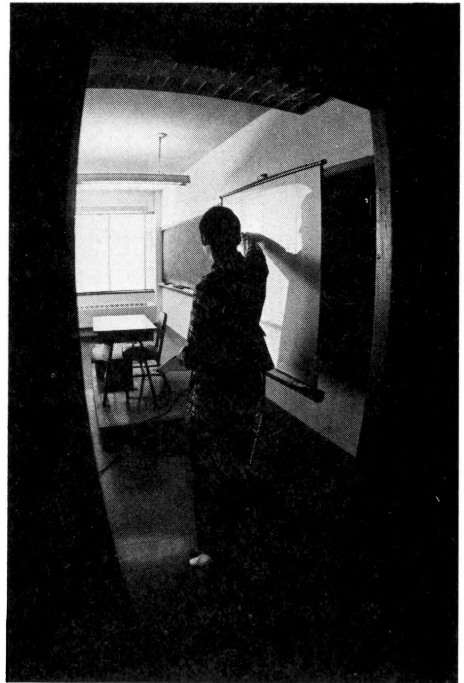
The Institute of Public Administration of the College of Business and Public Administration offers the Master of Science in Public Administration degree as full academic preparation for administrative careers in local, state, and national governments, and other public agencies. The two-year professional program is open to students holding baccalaureate degrees from accredited institutions and meeting admission standards of the Graduate School.

The first year emphasizes applications of behavioral, social, and decision sciences to problems that confront administrators in the public sector. The second year concentrates on the institutional, political and behavioral aspects of public decision making and on systematic approaches to policy analysis and governmental problem solving. Students are trained in administrative skills through a thorough, substantive treatment of major areas of public policy at all levels of government.

Consisting of 48 hours of graduate work, the M.S.P.A. Program includes a Public Administration core (21 hours); area of specialization (12 hours); electives (9 hours); and internship (6 hours). After admission to the M.S.P.A. program, students who have deficiencies in their undergraduate work may be required to take courses for no credit toward the degree.

A summer internship between the first and second years of study provides the student with work/training experience in the administration of a major policy or program. Internships may be arranged with local, state, or federal governmental agencies and with other non-profit organizations of a public nature.

For further information write to the Director of Graduate Studies, Institute of Public Administration, College of Business & Public Administration, 315 Middlebush Hall, UMC, Columbia, Mo. 65201.





Regional Science Area

Curtis H. Braschler, Ph.D., Purdue, Chairman;
Professor of Agricultural Economics

The option of a minor in regional science is offered to master's and Ph.D. degree candidates in the Departments of Anthropology, Agricultural Economics, Economics, Geography, Political Science, Sociology, and Regional and Community Affairs. Candidates take 12 hours of electives chosen from a list approved by the Regional Science committee and from at least three departments *other than* the major department.

Students interested in pursuing a regional science specialty within their chosen fields should consult a departmental adviser designated to assist them. In the absence of other information, contact the Chairman, Regional Science Committee, 318 Mumford Hall, UMC, Columbia, Mo. 65201.

South Asia Language and Area Studies

Paul Wallace, Ph.D., California-Berkeley. Director;
Assoc. Prof. of Political Science
Melvin G. Blase, Ph.D., Iowa State. Prof. of
Agricultural Economics
Robert Bussabarger, M.A., Michigan State. Prof.
of Art
Douglas Ensminger, Ph.D., Cornell. Prof. of Rural
Sociology
Noel P. Gist, Ph.D., Northwestern. Prof. Emeritus
of Sociology
J. F. X. Paiva, Ph.D., Brandeis. Prof. of Social Work
Arthur Robins, Ph.D., Minnesota. Prof. of Psychiatry
Peter Gardner, Ph.D., Pennsylvania. Assoc. Prof.
of Anthropology

Larry A. Kantner, Ed.D., Pennsylvania State. Assoc.
Prof. of Art/Education
William A. Noble, Ph.D., Louisiana State. Assoc.
Prof. of Geography
Bina Gupta, Ph.D., Southern Illinois. Asst. Prof.
of Philosophy/South Asian Languages
Murari L. Nagar, D.L.S., Columbia. South Asian
Librarian
Sarla D. Nagar, M.A., Agra University. Asst.
Curator, South Asian Art

The South Asia Languages and Area Center provides a central focus for a student who wishes to pursue specialization in South Asian studies at the M.A. or Ph.D. level. Graduate degrees are pursued through the departments which relate to the Center. In addition to the graduate degree, a certificate of specialization is awarded in conjunction with degrees in specific disciplines.

The participating departments are Agriculture, Anthropology, Education, Geography, History, Philosophy, Political Science, Sociology, and Social Work. The additional field of study is South Asian languages and literature, directly administered by the Center. The South Asian language offered is Hindi.

The South Asia Program at UMC was formally designated a Language and Area Center under the National Defense and Education Act in 1965. In addition, the University is a member of the American Institute of Indian Studies, a consortium and funding agency for the leading South Asia Centers in this country.

National Defense Foreign Language Graduate Fellowships (NDEA Title 6) are available. Individual departments also offer financial assistance, and applicants should contact them directly.

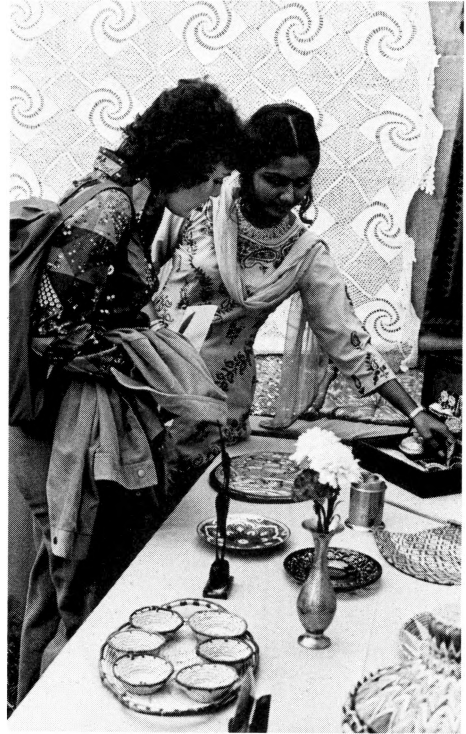
A significant South Asian collection in Ellis Library is growing systematically under the supervision of a permanent full-time South Asian librarian. The library is a recipient of books published in South Asia under the P.L. 480 program. Particularly notable is the broad selection of books and microfilm on the Punjab area of South Asia. A collection of South Asian works of art is located in the University Museum.

DEGREE REQUIREMENTS

Students must fulfill the degree requirements of the department through which they pursue their graduate degrees, and are expected to prepare themselves in language and area subjects, in addition to departmental requirements. Remaining requirements are established so as to provide maximum flexibility to the student's goals and prior training. The object is to provide both depth and breadth, South Asia expertise in a discipline, and a meaningful exposure to the area on an interdisciplinary basis. Advisers may also require additional courses to supplement the candidate's undergraduate preparation in Asian studies.

Minimum South Asian courses for the M.A. degree are two years of a South Asian language and one minor field in South Asia (minimum 6 credits).

Ph.D. candidates must complete at least three years of a South Asian language, a minor field (minimum of 6 credits), and 6 elective credits in courses to be chosen from outside the major and minor fields.



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UNIVERSITY OF MISSOURI-COLUMBIA

APPLICATION FOR ADMISSION

UNDERGRADUATE AND GRADUATE

RETURN TO:

Director of Admissions
130 Jesse Hall
University of Missouri-Columbia
Columbia, Missouri 65201

17. Name and location of ALL colleges attended, Dates of attendance, Degrees earned or expected prior to enrollment at UMC. (If none, enter "none") If currently enrolled, indicate in date space. List schools beginning with most recent. (Failure to indicate colleges or universities in which you have been enrolled will void your admission.)

NAME OF COLLEGE	LOCATION (CITY & STATE)	DATES OF ATTENDANCE	DEGREES EARNED	DEGREE DATES
Card 1 13-16				
Card 2 13-16				
Card 3 13-16				
Card 4 13-16				
Card 5 13-16				

18. Sex * M F

19. Date of Birth

160	29 - 34	Month	Day	Year
160	35			

20. Previous to enrollment, will you have satisfied the 1 year residence requirement in Missouri?

R Yes N No (See item 5 of instructions)

21. Place of Birth

160	60	61	62	63	Country
45-64	City	State	64	65	160

23. Ethnic Origin *

American Indian/Alaskan Native

Asian or Pacific Islander

Black-Non Hispanic

Hispanic

White-Non Hispanic

Non-Resident Alien

25. Citizen of the U.S.? Yes No

If no, what country? Parent, Spouse, or Guardian/Other (Check one)

160	14 - 48	Last	First	Middle
73	163			

27. Did Parent or Guardian attend UMC one semester or more?

Yes No

28. (Graduate Applicants Only) Have you taken the required Graduate level examinations? Yes No

If yes, have these scores been submitted to the UMC Graduate Office?

Yes No

29. Check to receive scholarship, financial payment and program information on

Army ROTC Navy ROTC Air Force ROTC

30. Legal Signature (In Ink)

31. Date

100 I.D. No. | 1-3 4 - 12 13 - 16 17 18 - 21 22

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100 I.D. No. | 1-3 4 - 12 13 - 16 17 18 - 21 22

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100 I.D. No. | 1-3 4 - 12 13 - 16 17 18 - 21 22

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58 Use only for Colleges Not in CEEB 71 Code Directory.

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100 I.D. No. | 1-3 4 - 12 13 - 16 17 18 - 21 22

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160 I.D. No. | 1-3 4 - 12 13 - 16 17 18 - 21 22

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1 79

OAR/A1 - 7/77 *This information is optional and requested for purposes of reporting to Federal Compliance Agencies only and will not be used in determining admissions status.

Complete All Items and Return This Form To:

Director of Admissions, 130 Jesse Hall, University of Missouri-Columbia, Missouri 65201

APPLICATION FOR ADMISSION-UNIVE

Please Print (In Ink) or Type and DO NOT Write in Shaded Areas.
See Additional Instructions on Reverse Side.

1. Name 020 22-56 22 Last 4 6 7 12 Social Security Number	2. Social Security Number 020 13-21 020 22-68	3. I would like information on campus services for the physically handicapped* Yes <input type="checkbox"/> No <input type="checkbox"/>	4. Veteran of the U.S. Armed Forces? Yes <input type="checkbox"/> No <input type="checkbox"/>	5. Permanent Address and Telephone Number (This address will be used for all University correspondence prior to your first registration) 150 I.D. No. M J 1-3 4 - 12 13 - 15 21 Number and Street or RFD No. 40 41 Apt. No. or Box No. 60 61 1-3 4 - 12 13 - 16 21 State City Telephone No.	6. Address of <input type="checkbox"/> Parent, <input type="checkbox"/> Spouse, or <input type="checkbox"/> Guardian/Other (Check one) (if different from item 5) 150 I.D. No. J 1-3 4 - 12 13 21 Number & Street or RFD No. 40 41 Apt. No. or Box No. 60 61 1-3 4 - 12 13 21 State City Zip 47 Country 60-62 63	7. Previously been enrolled at UMC? Yes <input type="checkbox"/> No <input type="checkbox"/> Correspondence <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Extension <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, when? _____ If yes, when? _____	8. Ever enrolled in Correspondence (Indep. Study) or Extension Courses at UMC? Correspondence <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Extension <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> If yes, when? _____ If yes, when? _____	9. School or College entering (check one) 14 <input type="checkbox"/> Education; 17 <input type="checkbox"/> Engineering; 21 <input type="checkbox"/> Forestry, Fisheries, Wildlife; 60 <input type="checkbox"/> Graduate; 24 <input type="checkbox"/> Home Economics; 27 <input type="checkbox"/> Journalism; 31 <input type="checkbox"/> Law; 37 <input type="checkbox"/> Medicine; 47 <input type="checkbox"/> Nursing; 54 <input type="checkbox"/> Public & Comm. Services; 57 <input type="checkbox"/> Vet. Medicine; 01 <input type="checkbox"/> Agriculture; 07 <input type="checkbox"/> Arts & Science; 04 <input type="checkbox"/> Bus. & Pub. Admin.;	10. Immediate degree sought at UMC? Academic major _____ 060 (18 - 21) _____ Bach. _____ Mstrs. _____ Spec. _____ Doct. _____ Prof. _____ None _____ Undergraduate <input type="checkbox"/> Graduate <input type="checkbox"/>	11. Applying as (check one) Undergraduate <input type="checkbox"/> Graduate <input type="checkbox"/>	12. Term of expected entrance (check one) fall <input type="checkbox"/> winter <input type="checkbox"/> summer <input type="checkbox"/> Year: _____ Month _____ Year _____	13. (Undergraduate Applicants Only) If you have taken the G.E.D. High School Equivalency Test, indicate date UMC? _____ Month _____ Year _____	14. (Undergraduate Applicants Only) Leaving High School early to attend UMC? Yes <input type="checkbox"/> No <input type="checkbox"/>	15. High School attended 110 13-18 Name City State Month Year	16. Date of H.S. Graduation _____ / _____ / _____
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UNIVERSITY OF MISSOURI-COLUMBIA

APPLICATION FOR ADMISSION

Instructions . . .

1. APPLICATIONS for admission and complete transcripts for ALL schools and colleges of the University of Missouri-Columbia should be sent to the Director of Admissions, 130 Jesse Hall, Columbia, Missouri 65201 and should be on file not later than May 1 (Freshmen) and July 1 (Transfer and Graduate Students) for Fall Semester; December 1 for Winter Semester; and May 1 for Summer Session. (Supplemental applications are required for admission to the School of Nursing, the College of Veterinary Medicine, the School of Medicine and the School of Law.)
2. FRESHMEN applicants must submit an official high school transcript (with class rank) and required test scores.
3. UNDERGRADUATE TRANSFER applicants must submit official transcripts from each college attended. (Transfers entering Arts & Science or Journalism must also submit a high school transcript.)
4. GRADUATE applicants must submit an official transcript showing baccalaureate degree and transcript(s) showing any additional graduate work. Additional information concerning graduate study may be obtained from the Graduate School, 205 Jesse Hall.
5. OUT-OF-STATE APPLICANTS: It is the duty of each applicant to apply and register under the proper residence and to pay the proper tuition fees. A pamphlet giving detailed information on tuition and residence rules may be obtained from the Admissions Office, 130 Jesse Hall or the Cashier's Office, 123 Jesse Hall.
6. FINANCIAL AID: An application for admission to UMC *does not* serve as an application for financial aid. UMC accepts *either* the Financial Aid Form (FAF) of the College Scholarship Service *or* the Family Financial Statement (FFS) of American College Testing. Both forms are available in school counseling offices. They are released at the beginning of a new calendar year and should be filed by April 30. Late applications will be considered according to the date received and the availability of funds. Questions should be directed to the Office of Student Financial Aids, 11 Jesse Hall.
7. HOUSING: An application for admission to UMC *does not* serve as an application for housing. Single student housing applications/brochures are printed and mailed in February to all who have requested them. Married student housing applications/brochures are available throughout the year. If you are applying for admission before February 1 for the fall semester (October 1 for the winter semester, April 1 for the summer session) and want an application for University-owned housing, check item 22. If you are applying for admission after the aforementioned date, do not check item 22 but write directly to the Housing Office, 123 Jesse Hall. (Please do not duplicate requests.)

Additional Information . . .

No transcript can be accepted directly from the student; admission status cannot be determined until complete credentials are on file in the Admissions office. Failure to complete this form fully or giving of misinformation concerning previous enrollment in other colleges or universities will void your admission. All transcripts become the property of UMC.

Because of limited enrollment and/or higher minimum standards, general acceptance as a student at the University of Missouri-Columbia does not guarantee acceptance to specialized or professional programs.

Some information requested is required by Title VI of the Civil Rights Act of 1964, Title IX of the Higher Education Amendments of 1972 and section 504 of the Rehabilitation Act of 1973 and is for the purpose of reporting to Federal Compliance Agencies concerning equal education opportunity, in order to keep the records required by the Federal Government, and to assure that there will not be discrimination on the basis of race, color, religion, handicap, national origin or sex.

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The University of Missouri is one university with four campuses—Columbia, Kansas City, Rolla, and St. Louis. Established in 1839 at Columbia (oldest and largest of the four campuses), the University is recognized as the first state university west of the Mississippi River. Designated a land-grant university in 1870, it has extended its educational benefits to all sections of Missouri in addition to its traditionally assigned tasks of teaching and research within the campus settings. The University is governed by a Board of Curators. The President of the University and his staff coordinate programs of all four campuses. The Chancellors are the chief academic and administrative officers for their respective campuses.

All statements in this publication are announcements of present policies only and are subject to change at any time without prior notice. They are not to be regarded as offers to contract.

The University of Missouri is an Equal Opportunity/Affirmative Action institution and is nondiscriminatory relative to race, religion, color, national origin, sex, age, and qualified handicapped.



UNIVERSITY OF MISSOURI-COLUMBIA
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Scanner model	fi-7460
Scanning system software	ScandAll Pro v. 2.1.5 Premium
Optical resolution	600 dpi
Color settings	24 bit color covers; 8 bit gray for the rest
File types	tiff
Notes	

Derivatives - Access copy

Compression	Tiff: LZW compression
Editing software	Adobe Photoshop
Resolution	600 dpi
Color	color covers; grayscale for the rest
File types	pdf created from tiffs
Notes	Images cropped, straightened, brightened.