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WASHINGTON

1995/1996

BULLETIN *of* WASHINGTON UNIVERSITY
SCHOOL *of* MEDICINE
ST. LOUIS, MISSOURI

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BULLETIN OF WASHINGTON UNIVERSITY

St. Louis, Missouri

***School of Medicine
1995/1996***

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CALENDAR 1995-96

1995

JUNE

- 5 **Monday** Academic year begins for the Third and Fourth Year Classes.
- 9 **Friday** Deadline for registration and initial payment of tuition for the Third and Fourth Year Classes.
- 14, 15 **Wednesday, Thursday** United States Medical Licensing Examination, Step 1.
- 27, 28 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 3.

JULY

- 4 **Tuesday** Independence Day observance.
- 14 **Friday** End of Clinical Clerkship Final Examinations.

AUGUST

- 9 **Wednesday** Orientation, matriculation, and initial payment of tuition for the First Year Class.
- 14 **Monday** Academic year begins for the First and Second Year Classes.
- 18 **Friday** Deadline for registration and initial payment of tuition for the Second Year Class.
- 25 **Friday** End of Clinical Clerkship Final Examinations.
- 30, 31 **Wednesday, Thursday** United States Medical Licensing Examination, Step 2.

SEPTEMBER

- 4 **Monday** Labor Day observance.
- 27, 28 **Wednesday, Thursday** United States Medical Licensing Examination, Step 1.

OCTOBER

- 6 **Friday** End of Clinical Clerkship Final Examinations.

NOVEMBER

- 3 **Friday** First trimester ends at 5:00 p.m. for the Second Year Class.
- 6 **Monday** Second trimester begins at 8:00 a.m. for the Second Year Class.
- 17 **Friday** Deadline for payment of the balance of tuition for the Third and Fourth Year Classes.
- End of Clinical Clerkship Final Examinations.
- 23 **Thursday** Thanksgiving Day observance.
- 24 **Friday** Holiday for First and Second Year Classes.

DECEMBER

- 5, 6 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 3.
- 16 **Saturday** Winter recess begins at 1:00 p.m. for all classes.
- First semester ends for the First Year Class.

1996

JANUARY

- 2 **Tuesday** Winter recess ends at 8:00 a.m. for all classes.
- Second semester begins at 8:00 a.m. for the First Year Class.
- 12 **Friday** End of Clinical Clerkship Final Examinations.
- Deadline for payment of the balance of tuition for the First and Second Year Classes.
- 15 **Monday** Observance of birthday of Martin Luther King, Jr.

FEBRUARY

- 9 **Friday** Second trimester ends at 5:00 p.m. for the Second Year Class.
- 12 **Monday** Third trimester begins at 8:00 a.m. for the Second Year Class.
- 23 **Friday** End of Clinical Clerkship Final Examinations.

MARCH

- 5, 6 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 2.
- 10 **Sunday** Spring recess begins for the First and Second Year Classes.
- 18 **Monday** Classes resume at 8:00 a.m. for the First and Second Year Classes.

APRIL

- 5 **Friday** End of Clinical Clerkship Final Examinations.
- Spring recess begins for the Third and Fourth Year Classes.
- 8 **Monday** Classes resume at 8:00 a.m. for the Third and Fourth Year Classes.

MAY

- 10 **Friday** Third trimester ends at 5:00 p.m. for the Second Year Class.
- 16 **Thursday** Academic year ends at 5:00 p.m. for graduating students.
- End of Clinical Clerkship Final Examinations.
- 17 **Friday** Commencement.
- Second Semester ends at 5:00 p.m. for the First Year Class.
- 18 **Saturday** Academic year ends at 5:00 p.m. for the Third Year Class.

JUNE

- 11, 12 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 1.

CLERKSHIP AND SIX-WEEK ELECTIVE PERIODS

<i>Period</i>	<i>Weeks</i>	<i>Begins</i>
I	1-6	June 5, 1995
II	7-12	July 17, 1995
III	13-18	August 28, 1995
IV	19-24	October 9, 1995
V	25-30	November 20, 1995
VI	31-36	January 16, 1996
VII	37-42	February 26, 1996
VIII	43-48	April 8, 1996

FOUR-WEEK ELECTIVE PERIODS

<i>Period</i>	<i>Weeks</i>	<i>Begins</i>
A	1-4	June 5, 1995
B	5-8	July 3, 1995
C	9-12	July 31, 1995
D	13-16	August 28, 1995
E	17-20	September 25, 1995
F	21-24	October 23, 1995
G	25-28	November 20, 1995
H	29-32	January 2, 1996
I	33-36	January 29, 1996
J	37-40	February 26, 1996
K	41-44	March 25, 1996
L	45-48	April 22, 1996

THE UNIVERSITY AND THE SCHOOL IN EDUCATION

MISSION STATEMENT FOR WASHINGTON UNIVERSITY

The mission of Washington University is the promotion of learning—learning by students and by faculty. Teaching, the transmission of knowledge, is central to our mission, as is research, the creation of new knowledge. Faculty composed of scholars, scientists, artists, and members of the learned professions serve society by teaching; by adding to the store of human art, understanding, and wisdom; and by providing direct services such as healthcare.

Our goals are:

- to foster excellence in our teaching, research, scholarship, and service;
- to prepare students with the attitudes, skills, and habits of lifelong learning and with leadership skills, enabling them to be useful members of a global society; and
- to be an exemplary institution in our home community, St. Louis, as well as in the nation and the world.

To this end we intend:

- to judge ourselves by the most demanding standards;
- to attract people of great ability from all types of backgrounds;
- to encourage faculty and students to be bold, independent, and creative thinkers; and
- to provide the infrastructure to support teaching, research, scholarship, and service for the present and for future generations.

VISION STATEMENT FOR WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

In its 104-year history, Washington University School of Medicine has had a major impact on health and science by educating superior physicians, researchers and other health professionals, expanding biomedical knowledge through fundamental and applied research, and providing superior healthcare delivery and effective community services. These are our goals for the future as they have been in the past.

It is important that we continue those traditions which have contributed to the greatness of the School of Medicine, while implementing new activities, approaches and programs based on careful planning.

The School will make difficult choices in light of limited resources, ensuring that programs selected for emphasis can mature to world leadership. Our success in all activities will depend on our friends and alumni, whose generous support represents an important investment in students and faculty. At the same time, we will recognize the importance of careful stewardship—of maintaining the public's trust in managing our resources.

We will select the best faculty and students; invest significantly in the careers of young investigators, teachers and clinicians; promote academic freedom, collaboration and collegiality; encourage cooperative relationships between basic and clinical sciences; enhance our community through service commitments; maintain a decentralized governance in which administration serves the faculty and students; and provide excellent facilities.

In medical education, we will promote the broad personal as well as the professional development of students and graduate physicians, heighten student knowledge of disease prevention and health promotion, and of ethical, cultural and financial issues related to healthcare delivery, enhance education in ambulatory/primary care, and incorporate informatics and computer literacy into the educational process at all levels. Our faculty and student body will be pluralistic, representative of all segments of society.

We will dedicate ourselves to innovation and discovery. Research successes will require not only the best faculty and facilities but also new organizational and financial approaches. Boundaries that now demarcate scientific disciplines will disappear: new scientific methodologies and training requirements mandate the creation of large, fluid and flexible multidisciplinary entities in which investigators, trainees and students with like interests and backgrounds collaborate with maximum efficacy and efficiency.

As a research and specialty intensive medical school, Washington University is a scarce national resource charged with the responsibility to develop, test and implement new approaches to healthcare delivery. It is our special task to pioneer and implement the new molecular, cellular and genetic medicine of the future.

We will pursue our clinical mission as part of a unique, academically based integrated health care system in partnership with our affiliated hospital system and representatives of our full-time and voluntary medical staff. This integrated system will provide highest quality, cost effective, user-friendly care at all levels from primary through quaternary, and will include inpatient, ambulant, home-based and extended care components.

Above all, Washington University School of Medicine must lead. We will strive to establish highest standards in all of our activities and continuously to do better.

THE STUDY OF MEDICINE AT WASHINGTON UNIVERSITY

HISTORY

The education of physicians at Washington University began in 1891. Under an ordinance enacted April 14, 1891, establishing a Medical Department of Washington University, the St. Louis Medical College (an independent medical college in St. Louis) was brought under the wing of the well-established University. The faculty of the college eagerly agreed to the union, stating "Most of the great medical schools of the world have always been integrant departments of universities, and the examples which America furnishes give added testimony to the fructifying influence of the contact of students and teachers of professional schools with the workers in universities." Eight years later, the Missouri Medical College (another independent college in the city) also joined Washington University, and thus the two most famous medical colleges in the city were merged with the University.

In 1909, Abraham Flexner began a survey of 155 medical schools in the United States and Canada for the Carnegie Foundation for the Advancement of Teaching. The survey created a national sensation. Some schools collapsed, others pooled their resources, while still others reorganized. The Medical School of Washington University did not escape criticism. In the report Flexner made to Dr. Pritchett, president of the Carnegie Foundation for the Advancement of Teaching and former professor of astronomy at Washington University, he said that one of two courses must be adopted: "The department must be either abolished or reorganized."

Dr. Pritchett mailed the report to Robert S. Brookings, a St. Louis merchant who was president of the Board of Directors of Washington University. Brookings was shocked and immediately went to New York to see Flexner, demanding proof that the conditions were as bad as described. Both returned to St. Louis and the two men went through the School. In less than two hours, Brookings was convinced that drastic action was necessary if the School was to be one of the foremost institutions of medical education and research. The meeting in 1909 of Brookings and Flexner was of unsurpassed significance in the history of the Washington University School of Medicine, for it led to the complete reorganization of the School and the establishment of the present Medical Center. Abraham Flexner inspired the dream of a model medical school. Robert Brookings accepted the challenge, and with the energy and vision which characterized all his enterprises, made the dream a reality.

No time was lost in making changes. The Bulletin of the Medical School for July 1910 made the following statement: "The Corporation of the University, becoming convinced that in no other direction could greater service be rendered than through a great, modern medical school, determined to reorganize the School and to place it in the front rank of American medical institutions. It has called to the heads of a number of leading departments the ablest men it could secure."

When Robert A. Barnes died in 1892, he left a will which directed the trustees of his estate to use \$840,000 for the erection and equipment of a hospital "for sick and injured persons, without distinction of creed, under the auspices of the Methodist Episcopal Church, South." Investigation by the trustees into the cost of building a modern hospital convinced them that the sum was not large enough to build an efficient, fireproof building, and they therefore invested the trust. By 1912 the value had increased to \$2 million, a sum which permitted the building of a hospital and left an endowment greater than the original fund.

At the same time the trustees were studying hospital construction, Robert Brookings was studying medical schools. It was apparent to everyone concerned that the two projects, the building of a medical school and the construction of a modern hospital, were so interrelated that the purpose of each would be more successfully fulfilled by an affiliation. A medical school would provide a highly trained staff and would assure the most modern methods and superior laboratory facilities for the hospital. A teaching hospital would give patients superior care and, at the same time, provide the essential clinical experience consistent with modern medical teaching methods.

In the spring of 1912 construction was begun on the medical school and hospital buildings which today form the nucleus of the present center. The laboratories were moved from their old quarters in downtown St. Louis into the new buildings on Euclid and Kingshighway during the summer of 1914, and late in the fall of the same year the activities of the Washington University Hospital were transferred to Barnes Hospital. Concomitantly, the St. Louis Children's Hospital, then located on Jefferson Avenue, became affiliated with the School of Medicine and moved to its new quarters in the Medical Center.

On April 28, 29, and 30, 1915, exercises were held to celebrate the completion of this group of buildings designed to promote the practice, the teaching, and the progress of medicine. The dedication ceremonies

marked what Dr. William H. Welch of The Johns Hopkins University called "one of the most significant events in the history of medical education in America." Robert S. Brookings, the one man most responsible for the reorganization, voiced the hope that "our efforts will contribute, in some measure, to raising the standard of medical education in the West, and that we will add, through research activities, our fair quota to the sum of the world's knowledge of medicine." These prophetic words have been realized.

In the ensuing years the Medical Center has continued to grow, and now its facilities are among the best in the world. With the increase in size of the physical plant there has come a substantial increase in the number of the faculty; the expansion has been made without compromise to the standards which marked the early development of the Medical Center. As a result, significant achievements in both research and clinical areas have been steadily recorded.

RESEARCH SUPPORT

Gifts and grants totaling \$192.1 million supported faculty research efforts at the Medical Center in 1994-95, including more than \$40.4 million from a total of 4,079 entities including foundations, agencies, alumni, friends and 53 corporate partners.

The School of Medicine received \$134.8 million from the National Institutes of Health in grants, making it the fourth largest recipient of NIH dollars among the 126 U.S. medical schools in fiscal year 1994.

That money came in 495 separate grants, 426 of which were designated as research grants. Funds supporting training came in 39 additional grants, and 24 grants were for fellowships. NIH research grants supported the investigations of at least 546 full-time faculty members.

Washington University faculty at Jewish Hospital received \$15.4 million directly in support of their research.

Johns Hopkins University	\$188,037,185
University of California-San Francisco	\$169,917,856
Yale University	\$146,591,027
Washington University	\$134,869,754
University of Washington	\$126,289,722

RESEARCH HIGHLIGHTS

A sampling of the many medical firsts that have taken place at the School of Medicine includes:

- First use of yeast artificial chromosomes to study hereditary diseases in humans.
- The first PET scanner, a device that images body function and has been used to map brain function.
- Among the first to give patients insulin for diabetes. Recent results show that cell transplants can eliminate the need for insulin injections.

- The now-common practice of taking aspirin to prevent heart attacks.
- Studies showing that a simple blood test can effectively diagnose prostate cancer in its early stages.
- A cure for hepatitis B.
- Endoscopic surgery techniques that remove diseased organs through tiny incisions, reducing patient pain levels, recovery time, scarring and medical bills.
- A surgical cure for the abnormal heart rhythm called atrial fibrillation.
- Proof that certain exercises and calcium supplements can rebuild brittle bones in some patients.
- Pioneering research into excitotoxic amino acids and brain injury.

Ongoing research includes:

- Investigations into nerve transplants, including the world's first nerve transplant using nerve tissue from a cadaver donor.
- Development of a new surgical procedure in which heavily damaged portions of emphysema patients' lungs are removed, dramatically improving lung function.
- The world's first islet cell processing laboratory to isolate and purify insulin-producing cells for transplantation in persons with insulin-dependent diabetes.
- Identification of 16 gene mutations that cause what is known as maturity-onset diabetes of the young, or MODY, responsible for about 5 percent of all non-insulin-dependent diabetes.
- Efforts to develop a synthetic blood substitute and a more complete understanding of hemoglobin, an oxygen-carrying molecule present in red blood cells.
- Investigations into the possibilities for preventing and reversing brain injury caused by the release of an excess of neurotransmitters, especially glutamate.
- Investigations by the school's AIDS Clinical Trials Unit (ACTU) to evaluate the effectiveness of drugs to treat AIDS and educate physicians in the region about how to care for AIDS patients.
- Identification of a natural target receptor for the bacterium *Helicobacter pylori*, a pathogen that causes gastritis and ulcers and may lead to stomach cancer.
- The George M. O'Brien Kidney and Urological Diseases Research Center's multidisciplinary studies that provide a better understanding of the cellular and molecular basis of kidney and urological diseases.
- Blood tests to quickly and safely determine whether heart attack patients will require invasive treatment to open blocked arteries.
- Research into a group of genetic diseases known as MEN type 2 syndromes which cause tumors in the endocrine glands.

• The Human Genome Project, part of one of the biggest scientific undertakings in history, that deciphers the genetic messages locked away in each of the body's cells.

FACULTY

The Washington University School of Medicine has one of the finest faculties of any medical school in the nation. Recognized for their distinguished achievements in original research, 10 current faculty members have been elected to the National Academy of Sciences. Fifteen Nobel laureates have been associated with the School of Medicine. During 1994-95, 71 members of the faculty held individual or career development awards: 38 from the National Institutes of Health, 15 from the American Heart Association, one from the American Lung Association, five from the American Cancer Society, one from the Child Neurology Society, four from the Pediatric Scientist Development Program, two from Research to Prevent Blindness, two from the National Alliance for Research on Schizophrenia and Depression, one from The Burroughs Wellcome fund, one from the Leukemia Society and one from the American Foundation for AIDS Research. The School of Medicine has 23 faculty members with Method to Extend Research in Time (MERIT) status, a special recognition given to only a few NIH grantees, which provides long-term, uninterrupted financial support to investigators who have demonstrated superior achievement during previous research projects.

In 1994-95, the School employed 1,189 full-time, salaried faculty members in its 17 preclinical and clinical departments. The clinical departments are further strengthened by 909 part-time faculty members, a group of physicians who practice their medical specialties in St. Louis and are members of one or more of the staffs of the four hospitals in the Washington University Medical Center.

STUDENTS

The School of Medicine attracts a student body of exceptional quality. The 1994 Entering Class of 123 students was selected from a pool of 6,639 applicants. The School is a national institution with 29 states and nine foreign countries represented in the current enrollment.

In 1995, the School conferred the M.D. degree upon 97 individuals. In addition, nine students received the M.A./M.D. degrees and 20 students graduated with the M.D. and the Ph.D. degrees. Graduating students who participated in the 1995 National Residency Matching Program matched in programs recognized for high quality and selectivity. Beginning on page 176, the graduates are listed by name, hometown, undergraduate and graduate schools attended and year of degree, type of postgraduate residency program, name of hospital, and the city in which it is located.

The student body of the School of Medicine numbers 572 medical students. Programs are also conducted for 559 students who are pursuing graduate degrees in health administration, occupational therapy or physical therapy. The Division of Biology and Biomedical Sciences has extensive graduate training programs for 448 students seeking the Doctor of Philosophy degree in areas of Bioorganic Chemistry, Developmental Biology, Evolutionary and Population Biology, Immunology, Molecular Biophysics, Molecular Cell Biology, Biochemistry, Molecular Genetics, Molecular Microbiology and Microbial Pathogenesis, Neurosciences, and Plant Biology.

TEACHING FACILITIES

The Washington University Medical Center, spread over portions of six city blocks, is located along the eastern edge of Forest Park in St. Louis. The park is the site of the 1904 World's Fair, where the first hot dog, first hamburger, first ice cream cone and first iced tea were served. Along the western edge of the park is the Hilltop Campus of the University. A regularly scheduled shuttle bus, operated for the benefit of students, faculty and staff, brings the two campuses within 10 minutes of each other.

The Medical Center was incorporated in 1962. It now consists of the Washington University School of Medicine, Barnes Hospital, The Jewish Hospital of St. Louis, Barnes-Jewish-Christian Health System, St. Louis Children's Hospital, Barnard Hospital, and the Central Institute for the Deaf. Integral units of the Medical Center include the world famous Mallinckrodt Institute of Radiology and the Institute for Biomedical Computing.

Unprecedented growth has occurred in the last 10 years with construction of eight new buildings totalling 1,352,360 gross square feet. This expansion includes the Bernard Becker Medical Library, the Clinical Sciences Research Building (CSRB), the East Building, the 4480 Clayton Avenue Building, the new 1500-car Parking Garage, the Mallinckrodt Institute of Radiology Imaging Research Facility, the new CSRB North Tower Research Addition, and the new East McDonnell Sciences Building. The three-tower, 10-story CSRB alone added close to 400,000 gross square feet totally dedicated to research. The medical school library was completed in the fall of 1989. The completion of this \$14 million structure, consisting of 113,000 gross square feet, has enabled the expansion of its programs, as well as long-term growth of its collections. Even more importantly, it provided state-of-the-art information management. The 4480 Clayton Avenue Building houses Central Administration offices for the School of Medicine and the Department of Surgery. The new 494,500 gross square feet, 1500-car parking garage, built on the northeast corner of Taylor and Clayton Avenues, is a reinforced seven-story structure that provides much needed additional campus parking.

The new addition of 45,000 gross square feet and renovation of 22,000 gross square feet in the Mallinckrodt Institute of Radiology Imaging Research Facility, East Building, provides space for the creation of an Imaging Center that houses four major MRI (Magnetic Resonance Imaging) units. The new Imaging Center will initially focus on neuroimaging, but will also provide resources for the scientific evaluation of imaging technology in future years.

New buildings currently under construction are: (1) The new 223,260 gross square feet 10-story CSRB North Tower Research Addition which will consolidate all medical school specialized research into one structure. The top three floors of the addition will house wet lab research space. (2) The new 131,200 gross square feet seven-story East McDonnell Sciences Building which will be a maximum barrier research facility to accommodate higher brain function research and transgenic studies. (3) The new 45,160 gross feet Eric P. Newman Education Center will accommodate non-degree professional education for the WUMC. The new education center will provide auditoriums, classrooms, meeting space/lecture halls to support and enhance the new comprehensive education program when completed in the fall of 1995.

In addition, major renovation to existing buildings is continuing with emphasis on research facilities. Renovations totalling \$32 million recently have been completed or are currently underway. Such renovations include: the 31,000 gross square feet Health Key Medical Building at 4488 Forest Park, which was completed in 1993 and provides private practice space to accommodate mental health, physical therapy, lab, X-ray and administrative support on the lower level. Pediatrics and Allergy are located on the main level, with Internal Medicine and OB/GYN located on the upper level. The 91,000 gross square feet, five-story, former Dental School Building has been renovated to accommodate the Departments of Psychiatry, Neurology, Genetics, Pathology and Internal Medicine. This renovation includes: space on the ground, first and second floors for laboratories and department support; space on the fourth floor for Protein Chemistry Laboratory Research; and space on the third floor to accommodate human genome studies and research. Renovations were completed in January of 1995. The 46,400 gross square feet McMillan Building renovation project, currently in progress, includes five complete floors of general renovation for labs, offices, corridors and central mechanical and electrical system improvements. The renovation will provide new offices and research labs for Neurology, Neurosurgery, and Ophthalmology. Also included is a new eye clinic for Barnes Hospital. Renovations for the Eye Clinic, Neurosurgery and Neurology spaces were completed in 1994. All other renovations were completed in the spring of 1995. And, the 280,000 gross square feet 4444 Forest Park renovation project, in progress, includes various

office and research facility renovations. The building will house administrative offices of the various medical school departments, the Program in Physical Therapy, the Program in Occupational Therapy, and a major research facility for the Department of Genetics.

The School of Medicine is divided into two segments. The clinical departments are on the west side of the Medical Center, adjacent to hospital and patient areas, while the preclinical departments are to the east. Research and instructional activities occupy the greater portion of the facilities, with more than 1.6 million gross square feet devoted to these activities. In the aggregate, the School now occupies over 4 million gross square feet of space.

The focal point of the preclinical teaching activities is the McDonnell Medical Sciences Building, the center of activity for entering medical students. The McDonnell Building, with 300,000 square feet of first class research laboratories and classroom space, was made possible by James Smith McDonnell III, a generous benefactor of Washington University. Rising nine floors above ground, it contains administrative offices and two lecture halls on the first floor. Multidisciplinary teaching laboratories for first- and second-year students, and offices and research laboratories for the seven basic science departments are located on the upper floors. Modern centralized animal quarters are housed in the basement. In addition, two floors (15,467 gross square feet) of Olin Residence Hall have been converted into student carrels, classrooms and conference rooms.

The North and South Buildings, in which the work of several Nobel laureates are centered, have been extensively renovated. Along with the Cancer Research Building, they continue to provide space for laboratories, offices, and some departmental facilities. The East Building houses an MRI facility containing a 20 kilogauss magnet, computer installation and other components of the Mallinckrodt Institute of Radiology. The East Building also includes several administrative office suites.

The clinical departments of the School of Medicine, housed in nine buildings, are connected by a pedestrian bridge to the preclinical facilities. Washington University medical students receive intensive clinical training, and the School's clinical program is acknowledged as one of the best programs in the country.

Medical students work with patients in all areas of clinical care. This "hands-on" approach for clinical training, one-on-one with some of the top clinical faculty in the world, in a large, state-of-the-art medical center, makes the training at Washington University School of Medicine a vigorous and challenging experience.

Other facilities owned or operated by Washington University are:

McMillan Hospital houses offices and research laboratories for the Departments of Neurology and Neurological Surgery, Ophthalmology and Visual Sciences, and Otolaryngology.

The Edward Mallinckrodt Institute of Radiology-

An internationally recognized center of excellence in teaching, research, and clinical services in Radiology, the Institute is housed in a 13-story building with satellite units in the West Pavilion of Barnes Hospital, the East Building, and St. Louis Children's Hospital. MIR's facilities include two functioning cyclotrons and five magnetic resonance imaging scanners.

Renard Hospital-With consolidation of psychiatric patient-care services in the West Pavilion, this eight-story structure provides additional office and laboratory space for the Department of Psychiatry.

St. Louis Maternity Hospital houses offices and research laboratories for the Departments of Obstetrics and Gynecology, Ophthalmology and Visual Sciences, and Otolaryngology. A new Perinatal Center and laboratories for research in the physiology of reproduction are located in this building.

West Building contains offices and research laboratories for the Department of Pathology, as well as for the Department of Internal Medicine.

David P. Wohl, Jr., Memorial Hospital (10 floors), opened in 1953, provides offices and laboratories for the Departments of Medicine and Surgery. This building includes facilities for a Cancer Center on the third floor which is contiguous with companion facilities in the adjacent Barnard Hospital.

David P. Wohl, Jr., Memorial-Washington University Clinics are administered by Barnes Hospital and handle over 100,000 outpatient visits a year. Five floors of the building are devoted to the clinics and five floors to research facilities for several departments of the School of Medicine. This building is owned by the School of Medicine, with Barnes Hospital operating the recently expanded Emergency Room and the David P. Wohl, Jr. Memorial - Washington University Outpatient Clinics.

Institute for Biomedical Computing

The Institute for Biomedical Computing is an inter-school organization that spans the School of Medicine and the School of Engineering and Applied Science and has been in existence since 1966. The Institute consists of: the Biomedical Computer Laboratory, the Center for Molecular Design, and the Center for Computational Biology, all of which have close ties with both Schools. The mission of the Institute is to foster the development and application of advanced computing and engineering technologies to problems in biomedical science. In addition to its activities in collaborative research, the Institute serves as a focal point for interdisciplinary teaching and student research in biological and biomedical engineering and the Institute sponsors a variety of interdisciplinary and multidisciplinary seminars and discussion forums.

The Institute has its primary location on the campus of the School of Medicine, but it also occupies the Edward L. Bowles Laboratory on the Hilltop campus, where the School of Engineering is located. The Bowles Laboratory is adjacent to

Computer Science, Electrical Engineering, and other departments of the School of Engineering. This provides an Engineering School location for research and teaching activities. The Institute creates opportunities for collaborations between the two campuses and encourages involvement of students in activities spanning the medical and engineering sciences.

The Bernard Becker Medical Library

Founded in 1911, the Washington University medical school library is one of the oldest and most comprehensive in the United States. Today, the Bernard Becker Medical Library serves as an information center for the faculty, students, and staff of the Medical Center and, in addition, extends its services and resources to health professionals in the local, state, and national communities.

The facility, completed in 1989, integrates seven components: the Health Sciences Library, the Archives and Rare Books Collections, the Instructional Media Center, the Medical School Computing Facilities, the Medical School Network Coordinator's Office, the Library Software Group, and the Advanced Technology Group. The eight-level, 114,000 square-foot structure has a capacity for over 450,000 volumes and is one of the most technologically advanced health science libraries in America. The Library collection includes over 270,000 volumes and some 2,800 current subscriptions. Its Archives and Rare Book Division includes some 16,000 volumes and such outstanding collections as the Bernard Becker Collection in Ophthalmology, the Goldstein Collection in Speech and Hearing, and the Paracelsus Collection of the St. Louis Medical Society. The archives of the Medical Center contains the records and private papers of the School, memorabilia, and oral histories of individuals who have made important contributions to American medicine. Among the manuscript collections are papers of William Beaumont, Joseph Erlanger, E. V. Cowdry, Evarts Graham, and Carl Cori. Trained reference librarians are available six days per week and in the evenings five days per week. A large interlibrary loan program is also supported.

The Instructional Media Center houses over 2,500 audiovisual titles, a network of advanced personal computer workstations with network access to the Internet and other resources, and two large computer education classrooms equipped with heavily networked personal computers and large screen projectors. The Instructional Media Center is one of the organizations pioneering the use of high capacity networks and digital imaging technology in the medical curriculum. The Instructional Media Center also supports peripheral computer laboratories in other educational sites within the Medical Center. Facilities are integrated with other campus information sources through the campus-wide network and are available to medical students on a 24-hour basis.

The Medical School Computing and Networking Services provides the capability for electronic mail, Internet access, and a wide array of specialized software service for all faculty, students, and Medical Center collaborators. The facility consists of a broad complement of high performance mini-computers and file servers to accommodate the heterogeneous needs of academic medical centers. A Help Desk service is available to all students, faculty and staff during normal working hours. The division also ensures that present and future network-based information resources available through the library are disseminated effectively to all Medical Center collaborators. It is responsive to a comprehensive set of networking needs from the School of Medicine and, in collaboration with other staff in the School of Medicine Library, participates in a wide range of instructional programs available through the Library's Instructional Media Center.

The Library pioneered the development of the BACS database. This database includes the book journal holdings of over 34 libraries in the St. Louis medical area. The Library also supports CD Plus Medline and an on-line version of *Current Contents*. All databases are available via modem through the Medical Center's network.

The Library's Advanced Technology Group is a research and development group whose principal aim is to advance the notion of the electronic library. Principal research foci of the Advanced Technology Group includes electronic document systems, computer supported collaborative work systems, new approaches to the authoring and electronic publication of human genome maps, and better means to develop useful instructional media to support health sciences curricula.

The combined resources of the Bernard Becker Medical Library ensure that School of Medicine faculty and students have access to all state-of-the-art biomedical information technology and ensure that the School will retain its leadership position as information technology evolves over the coming decades.

For information on the Library's special services, the "Library Guide," the Library's newsletter "InfoMatters," or the Information Services Division may be consulted. Information Services may be reached at 362-7085 or reference@medicine.wustl.edu. Library hours are:

M-Th 8:00 a.m. - midnight	
Fri 8:00 a.m. - 10:00 p.m.	
Sat 8:30 a.m. - 6:00 p.m.	
Sun 1:00 p.m. - 10:00 p.m.	
Circulation	362-7080
Reference	362-7085
Interlibrary Loan	362-2780
Media/Computer	362-2793

Washington University Medical Center

Washington University's School of Medicine; Barnes, Jewish, Children's and Barnard hospitals and Central Institute for the Deaf compose Washington University Medical Center.

The Medical Center generates an annual financial impact of more than \$3 billion on the St. Louis area, including employment, taxes, purchasing, construction projects and the reverberation of that activity through the community. With more than 18,000 employees, the Medical Center has the largest private payroll in the City of St. Louis and the second largest in the metropolitan area.

Facilities

The 100-acre Medical Center, spread over portions of six city blocks, is located along the eastern edge of Forest Park in St. Louis. Along the western edge of the park is the 169-acre Hilltop Campus of the University.

A network of pedestrian bridges provides the ability to move freely among facilities, enhancing the interaction of all Medical Center institutions and benefiting research and patient care. Renovations to existing buildings continue, and more than \$100 million in construction projects now underway will add 420,000 square feet to School of Medicine facilities.

The School of Medicine is divided into two segments. Clinical departments are on the west side of the Medical Center, adjacent to hospital and patient areas. Preclinical departments are to the east. Research and instructional endeavors occupy the greater portion of the facilities, with more than 1.6 million gross square feet devoted to these activities. In the aggregate, the medical school occupies more than 4 million gross square feet of space.

Hospitals/Affiliates

Barnes Hospital, St. Louis Children's Hospital and The Jewish Hospital of St. Louis are all parts of BJC Health System and provide a link between the System and the School of Medicine. BJC Health System—with ties to 15 hospitals, five extended care facilities, an occupational/preventive medicine affiliate and the School of Medicine—is the largest full-service, fully integrated, academically linked health system in the country. By eliminating unnecessary duplication and by providing an integrated and geographically dispersed system of community hospitals and teaching hospitals, BJC Health System is able to provide widely available, high-quality patient care for the full range of medical needs. BJC Health System patients have access to the rapidly developing advancements in clinical medicine generated by the researchers on the faculty of Washington University School of Medicine.

Barnes Hospital, the largest hospital in the Medical Center, provides clinical experience for medical students and teaching facilities for all clinical

departments except Pediatrics. The medical staff is composed exclusively of members of the faculty of the School of Medicine.

Barnes is a member of *BJC Health System*, a regional healthcare system established to meet evolving healthcare needs, strengthen delivery and contain costs. Through Barnes, Jewish and Children's hospitals, the School of Medicine is affiliated with BJC, the largest academically based, integrated health system in the United States.

St. Louis Children's Hospital is one of the top five pediatric health centers in the country. Founded in 1879, Children's offers a complete range of subspecialty medical and surgical services to meet the health needs of newborns through adolescents. Children's is a part of the BJC Health System.

The Jewish Hospital of St. Louis is an acute-care teaching hospital, dedicated since 1902 to outstanding patient care and advanced medical research. The 1,100-member medical staff includes full-time academic faculty, private physicians and dentists. Jewish Hospital is a member of BJC.

Barnard Free Skin and Cancer Hospital houses the Washington University General Clinic Research Center (GCRC). Through a collaboration of Barnard and Barnes Hospital and Washington University, medically indigent patients with cancer or diseases of the skin receive free care from Barnes/Washington University physicians and GCRC nurses.

The following hospitals also are associated with the School of Medicine, and various members of their staffs hold University appointments:

- St. Louis Regional Medical Center: 304 beds
- Malcolm Bliss Mental Health Center: 96 beds
- Ellis Fischel Cancer Center: 60 beds
- John Cochran VA Medical Center: 621 beds
- Shriners Hospitals for Crippled Children: 80 beds

The Central Institute for the Deaf, an internationally known institution, operates laboratories for basic research into speech, language and hearing; maintains a school where deaf children are taught to talk; provides outpatient services in hearing and speech disorders for infants, children and adults and provides professional education.

CURRICULUM

The curriculum is the product of prolonged and continuing study, by both faculty and students, of the present and probable future course of medical science and medical practice, and of the ways in which medical education can be kept abreast of this course. It is planned to provide students who enter medical school with diverse backgrounds and interests and who will undertake a wide variety of careers with the basic knowledge and skills essential for their further professional development. Modern medical education can no longer hope to be comprehensive; it must be selective. Yet students must develop facility in the understanding and use of

several related technical languages: those of anatomy, chemistry, physiology, and clinical medicine. They must share responsibility for the care of the patient. They must also learn how these areas of endeavor are interrelated, how the organization and needs of society influence the methods of providing medical care, and how new knowledge is acquired and old knowledge re-evaluated.

The curriculum includes a core experience based upon a sequence of courses that will introduce students to the broad panorama of medicine. The principles, the methods of investigation, the problems, and the opportunities in each of the major disciplines of medical science and medical practice are presented in such a way as to help students select the career best suited to their abilities and goals.

In the final year of the medical school curriculum, the required elective program helps students to decide where major interests lie. It also enables them to benefit from the wide range of specialized knowledge and skills found in the faculty. As there is not enough time for all students to be introduced to each of today's areas of specialization, the elective program permits students to select, according to their desires, the areas they wish to explore or to study in depth.

Table of Credit Hours 1995-96

As reported to the Liaison Committee on Medical Education, representing the Council on Medical Education of the American Medical Association and the Executive Council of the Association of American Medical Colleges, credit hours for courses are expressed in terms of clock hours—the hours per year of contact between faculty and students. These clock hours are not to be interpreted as semester or quarter hours. Minor variations in the clock hours may occur as a result of schedule alterations made following the press date.

First-year courses are taught during the 38-week academic year.

Clock Hours	Courses
161	Gross Anatomy
46.5	General Biochemistry
33	Molecular Genetics
46.5	Cell Biology
39	Medical Humanities
57	Clinical Medicine I
86.5	Microscopic Anatomy
102	Physiology
38	Immunology
69	Microbiology
129	Neural Sciences
30	Electives*

837.5 Total clock hours for the year

*A student must successfully complete two electives. An elective is 15 clock hours in duration.

Second-year courses are taught during the 36-week academic year.

Clock Hours	Courses
170	Clinical Medicine**
134	Pathology
94	Pharmacology
245	Pathophysiology
643	Total clock hours for the year

**Includes introduction to Psychiatry, Ophthalmology, ENT, Human Sexuality, and Pediatrics.

Clinical Clerkship (Third) Year is a 48-week academic year.

Clock Hours	Courses	Weeks
453	Medicine Clerkship	12
154	Neurology/Neurosurgery Clerkship	4
231	Obstetrics/Gynecology Clerkship	6
38.5	Ophthalmology Clerkship	1
38.5	Otolaryngology Clerkship	1
231	Pediatrics Clerkship	6
231	Psychiatry Clerkships	6
453	Surgery Clerkship	12
18	Pathology & Laboratory Medicine Clerkship	
1,848	Total clock hours for the year	

Elective (Fourth) Year is a 48-week academic year.

To qualify for the Doctor of Medicine degree at Washington University School of Medicine, fourth-year students are required to participate in a minimum of 36 weeks of electives (full-time clinical or research courses). Two-thirds of the minimum required time for the Elective Year must be taken exclusively in residence in the Washington University School of Medicine elective course program. A complete listing of fourth-year elective offerings at Washington University School of Medicine is available through the Office of the Associate Dean for Curriculum. Students may participate in clinical electives of four and six weeks duration. If a student takes a research elective, that elective must be of at least six weeks' duration.

A maximum of 12 weeks' credit is allowed for full-time elective course work taken at other academic institutions. These may be clinical or research electives. Students desiring credit for work to be done at other institutions must petition the Associate Dean for Medical Education. Absolutely no credit will be granted for electives undertaken prior to approval from the appropriate administrative committees.

Credit may be given for elective work done at any point in the standard four-year Doctor of Medicine degree program so long as participation conforms to current elective guidelines and (a) the student is a duly registered, full-time student for a minimum of

three years and nine months, including scheduled vacation time, and tuition is paid for four complete academic years; or (b) if transferring into the Second Year Class, the student is a duly registered, full-time student for a minimum of two years and nine months and tuition is paid for three complete academic years; or (c) if transferring into the Third Year Class, the student is a duly registered, full-time student for a minimum of 22 months and tuition is paid for two complete academic years.

Students are encouraged to take lecture-seminar elective courses, but such offerings are optional. Total clock hours for the year 1,386 (36 weeks).

Remuneration for work done while participating in electives for credit is *prohibited*.

Humanities Program in Medicine

The Humanities Program in Medicine is a University-wide program dedicated to providing students with a broadened exposure to areas other than the biological sciences during their medical education. These areas include clinical ethics, jurisprudence, history, economics, literature, and health policy. The Program is directed from the dean's office at the medical school and utilizes faculty located at the Hilltop Campus, medical school, law school, as well as extramural faculty.

The mission of the Program is to generate an appreciation of the relationship of human experience, culture, institutions and values to medicine and thereby help to educate professionals who will apply that understanding to their activities as practicing physicians, biomedical researchers, and/or medical administrators. This Program is an enhancement of an already strong curriculum in order to prepare medical students to pursue their professional careers more effectively.

The current curriculum includes:

Physicians and Patients (Fall semester, First Year)

This is a required course given in the fall semester of the first year of medical school. The paradigm for this course is the basic science education in medical school which serves as the foundation for the continuing education in the clinical sciences. The "Medical Humanities" course serves to provide a broad overview of basic issues which will affect the clinical and academic practice of medicine in the future. The areas selected for study emphasize ethics, history of medicine, health care policy, and jurisprudence. Each of these areas is developed by a section leader of renown in the field who is responsible to the course master for developing curriculum, format and examination questions to evaluate achievement of learning objectives. *Dr. Lefrak and Staff*

Topics in Medicine (Spring semester, First Year)

This interdepartmental course is highly coordinated with "Medical Humanities." Students select topics of interest for in-depth study initiated by discussions in

a small group seminar format. Development of topics includes input from a broad range of disciplines, including sociology, philosophy, ethics, history, communications, economics, as well as the biological and medical sciences. It is offered as a menu of mini courses each limited to approximately 20 students. Each section consists of six two-hour sessions with a faculty member(s) devoted to an individual subject. Each student must select two courses from the menu.
Dr. Lefrak and staff

Clinical Ethics (Third Year)

Conferences are included throughout the third year clinical clerkships in internal medicine, neurology and neurosurgery, obstetrics and gynecology, pediatrics and psychiatry.

This novel approach to developing physician-scientists was begun by the Departments of Medicine at Washington University, Duke University, The Johns Hopkins University, and University of Pennsylvania. Students who participate in this unique program are awarded support for a five-year training program starting after the third year of medical school: one year of undergraduate research, two years of medical residency and two years of postdoctoral research. Student are allowed great latitude in shaping the research and clinical experiences within the Four Schools consortium. Financial support is also provided for the final year of medical school.

Course Evaluations

Systematic course evaluation is performed for each year of the curriculum by faculty peers, teaching faculty and students. This system permits problem identification, ensures timeliness of feedback, promotes discussion of new teaching methodologies, allows curriculum inventory, recommends changes in course offerings and provides better integration of the curriculum. These reviews are guided through a Committee on Evaluation of the Curriculum (CEC) for each of the preclinical years of instruction and another CEC to evaluate both clinical years (i.e., CEC I = first year, CEC II = second year, CEC III = years three and four).

The Office of the Associate Dean for Medical Education oversees the evaluation system, which is coordinated by Ms. Kelly Beine in the Curriculum Evaluation Office (362-3404). The collected data are forwarded to the Committee on Medical Education and the Academic Affairs Committee.

Adviser System

A new academic advising program was set in place in August 1994. Current student advising occurs within two broad programs:

1. **Clinical Advisers:** The first year students are assigned in small groups to a small group of faculty advisers, representing both basic science and clinical faculty. These groups meet on an informal basis, usually in the hospital setting. The students and faculty member explore mutually interesting topics which may include seeing patients, observing procedures, discussing health insurance or reading journal papers. The advisers serve as faculty contacts but do not have any formal academic advisory role.

2. **Career (Fourth Year) Advisers:** Each third year student selects a fourth year adviser from a list of potential faculty advisers. In most cases, the adviser is a faculty member in the field in which the student will be seeking a residency appointment. The career advisers have responsibility for reviewing the student's choice for fourth year elective and making appropriate recommendations for the structure and content of the elective year. In addition, fourth year advisers serve as valuable resources for information about residency programs.

In addition to the advising programs described, students seek informal advising from faculty with whom they have had contact, either through classroom work, research or clerkships. Students also have faculty and alumni contact through membership in the academic societies.

Each first year student is invited to join one of the three academic societies. Entering student society members are divided equally among the societies. Any student wishing to join an academic society after the first year will be placed in one by the Administrator of the Academic Society Program using size of the societies as a criterion. Incoming first year students and their faculty advisers share the same academic society.

Course Masters, 1995-96**First Year****Gross Anatomy**

Glenn Conroy, Ph.D. 362-3397

Biochemistry

David Silbert, M.D. 362-3336

Molecular Genetics

S. Bruce Dowton, M.D. (Syd.) 362-7800

Jeffrey Gordon, M.D. 362-7243

Ted Hansen, Ph.D. 362-2716

Cell Biology

Robert P. Mecham, Ph.D. 362-2211

Physicians & Patients

Stephen Lefrak, M.D. 454-7116

Clinical Medicine-I

Elliot Abbey, M.D. 362-2724

Electives

Carl Rovainen, Ph.D. 362-2299

Histology

David Menton, Ph.D. 362-3593

Immunology

Emil Unanue, M.D. 362-7440

Medical Microbiology

Julian Fleischman, Ph.D. 362-2528

Neural Science

David Van Essen, Ph.D. 362-7043

Physiology

Robert Wilkinson, Ph.D. 362-2300

Topics in Medicine

Stephen Lefrak, M.D. 454-7116

Second Year**Clinical Medicine-II**

Elliot Abbey, M.D. 362-2724

Ophthalmology

Morton Smith, M.D. 362-5722

ENT

Joel Goebel, M.D. 362-7532

Pediatrics

S. Bruce Dowton, M.D. (Syd.) 362-7800

Pathology

Samir El-Mofty, Ph.D. 362-2681

Pharmacology

Douglas Covey, Ph.D. 362-1726

Psychiatry

Michael Jarvis, M.D., Ph.D. 362-3072

Pathophysiology

S. Bruce Dowton, M.D. (Syd.) 362-7800

Infectious Diseases

Gerald Medoff, M.D. 362-1334

Lawrence Gelb, M.D. 362-7481

Cardiology

Julio Perez, M.D. 362-5363

Pulmonary

Michael Lippmann, M.D. 289-6306

Renal

Jay Seltzer, M.D. 454-7970

Metabolism-Endocrinology

William Clutter, M.D. 362-8065

Gastroenterology

Ellen Li, M.D., Ph.D. 362-1070

Nutrition

William Stenson, M.D. 362-8940

Hematology

Scot Hickman, M.D. 289-6536

Oncology**Diseases of the Nervous System**

Alan Pearlman, M.D. 362-6947

Developmental Medicine

Andrea Stephens, M.D. 879-6390

Rheumatology

Leslie Kabl, M.D. 362-7481

Third Year**Medicine Clerkship**

Alison Whelan, M.D. 362-8628

Surgery Clerkship

Dorothy Andriole, M.D. 362-7400

Obstetrics and Gynecology

Diane Merritt, M.D. 362-3143

Pediatrics Clerkship

John B. Watkins, M.D. 454-6299

Psychiatry Clerkship

Wayne Drevets, M.D. 362-2459

Neurology

Alan Pearlman, M.D. 362-3296

Otolaryngology Clerkship

Joel Goebel, M.D. 362-7552

Ophthalmology Clerkship

Carla Siegfried, M.D. 362-5722

Pathology and Laboratory Medicine Clerkship

Jeffrey E. Saffitz, M.D., Ph.D. 362-7728

DEGREE PROGRAMS

The Washington University School of Medicine offers four programs leading to the M.D. degree: a regular four-year program, a five-year program, the M.A./M.D. program, and a combined M.D./Ph.D. program.

Doctor of Medicine

By conferring the M.D. degree, the University certifies that the student is competent to undertake a career as a doctor of medicine. It certifies further that, in addition to medical knowledge and skills, the graduate possesses qualities of personality—compassion, emotional stability, and a responsible attitude—essential to an effective professional life.

A course of medical education for the M.D. degree ordinarily consists of a minimum of four years of study. Students recommended for the Doctor of Medicine degree must be of good moral character, they must have completed an entire academic course of instruction as matriculated medical students, they must have passed all required subjects or the equivalent and have received satisfactory grades in the work of the full academic course, and they must have discharged all current indebtedness to the University. Individuals applying for licensure must be at least 21 years of age.

At the end of the final academic year, students who have fulfilled these requirements will be eligible for the M.D. degree.

Five-Year Program

In addition to the regular four-year program leading to the M.D. degree and the M.A./M.D. degree program, students are permitted to spend one additional year in an academic program in a medical or medically related field. The program must be arranged with an academic adviser and is subject to the approval of the Committee on Medical Education.

Master of Arts and Doctor of Medicine

Medical students who are interested in an intensive research experience may apply for admission to the M.A. and M.D. degrees program after the first, second or third year of medical school. Students spend one year (12 months) working in the laboratory of the faculty member whom they have selected. Application to the program consists primarily of a student-prepared proposal for a significant and feasible project defined with the advice of the faculty mentor. The program requires submission and oral defense of a thesis in the form of a publication-quality manuscript at the end of the year of research. Students completing the program will be awarded a Master of Arts degree at the time that the M.D. degree is conferred. Students accepted into this program qualify for a stipend, health coverage, and tuition remission during the research year. Additional information can be obtained from the Office of the Medical Scientist Training Program.

Four Schools Program

A cooperative venture was begun several years ago by the Departments of Medicine of four leading research universities: Duke University, Johns Hopkins University, the University of Pennsylvania and Washington University to develop physician-scientists. Recently, the Program has been supported by the Lucille P. Markey Charitable Trust.

The Four Schools Program for training physician-scientists in internal medicine is based on several key elements: Each trainee will be awarded support for a five-year training program starting after the third year of medical school — one year of undergraduate research, two years of medical residency and two years of postdoctoral research. Financial support will be provided not only for the five years of research but also for the final year of medical school.

Essentially, at the end of the third year of medical school, the scholar will begin a special five-year program of research and clinical training that will begin before the final year of medical school and continue postdoctorally. The Program will provide for one year of biomedical research at one of the participating institutions while a medical student, a final year in medical school (according to the dictates of the individual schools), two years of medical residency and two years of research fellowship. After completion of the Program, the participant will have satisfied criteria for certification by the American Board of Internal Medicine and be prepared for the next step in assuming a full-time academic position as a medical scientist.

Announcements concerning the availability of the Four Schools Program will be made to medical students at each of the four participating schools early in the course of their third year of medical school. Those interested will apply to their school

coordinator as candidates for entrance into this Program. Two students will be selected from each of the four participating schools. The local coordinator (Dr. James B. Lefkowitz, 362-8621) will help the scholar in choosing an appropriate, established investigator for the scholarly year and will serve as preceptor for the scholars. Timetable for selection and assignment of students: Application deadline - end of January; selection of students - mid-February; students travel to other institutions to select research site - latter part of March; starting date - July 1.

Doctor of Medicine and Doctor of Philosophy

Washington University offers a combined M.D. and Ph.D. degrees program that utilizes the resources of the Division of Biology and Biomedical Sciences and the School of Medicine. This program, the Medical Scientist Training Program (MSTP), is designed for students interested in careers in academic medicine. Its purpose is to provide the basic research training needed for careers at major medical schools and research institutions. The Program was started in 1969, is one of the oldest and largest in the country, and is currently authorized to accept 22 students per year. The Program, which can be completed in six years, has been highly successful; more than 90 percent of those who have completed their residencies are actively involved in research programs at leading institutions.

All students in the Program receive financial support in the form of stipends (currently \$14,000 per year), health coverage, and tuition remission.

Only students who have spent an equivalent of at least one semester in a research laboratory should apply to the Medical Scientist Training Program. Applicants must meet the requirements for admission to both the School of Medicine and the Graduate School of Arts and Sciences, although the Graduate Record Examination is not required. In addition, students planning to concentrate in disciplines related to the chemical or physical sciences should have completed mathematics through calculus, physics and physical chemistry, and advanced organic chemistry. A course in differential equations also is recommended. For those students whose major interests are in the more biological aspects of medical science, the requirements for chemistry are less rigorous, but a strong background in mathematics and physics is important. Although most individuals enter the Program as first-year students, applications will be accepted from students in their first or second year at this medical school.

The Program consists of three parts: (1) Two years of the usual medical curriculum; (2) At least three years of original research toward a thesis to satisfy the requirements for the Ph.D. degree; (3) A final year which is the usual clinical year of the medical curriculum and is adjusted to each student's

career goals. Since the fourth year at Washington University School of Medicine is entirely elective, the medical scientist will have taken the equivalent of that year during the graduate portion of the Medical Scientist Training Program. Students normally take the first two years of the usual medical curriculum before entering the graduate portion of the Program, but it is possible to begin research following completion of the first year of the regular medical curriculum. Either sequence will satisfy requirements for both the M.D. and Ph.D. degrees. Degrees are awarded upon completion of the entire program.

While the Medical Scientist Training Program includes all medical courses required for the M.D. degree, it incorporates a high degree of flexibility for individuals through a wide range of electives and graduate courses as well as the large number of thesis programs available. Every effort is made to individualize each student's curriculum based on previous background and current interests. A student can be excused, by examination, from any of the regularly offered preclinical courses and may substitute either advanced course work or laboratory research in the time made available. In this way, students may have an opportunity to carry out supervised research during the first two years. The members of the Medical Scientist Training Program Committee are available to students to help them decide on an individual curriculum and appropriate laboratory rotations.

The performance of each student is reviewed annually and a high scholastic standing as well as a commitment to research is expected.

Funding support begins when the student begins the Program, either on July 1 or at the beginning of the medical school year. Students are encouraged to begin the Program in July. For these students, the first week is spent visiting faculty in various departments and choosing a laboratory in which to carry out a short research project before beginning medical school classes.

Students in the combined degree program will complete the usual medical school courses in the first two years. They are expected to do a summer research project between the first and second years of medical school. The laboratories selected for summer research need not be those chosen for the Ph.D. portion of the Program.

Students will spend the third, fourth and fifth years satisfying the following requirements of the Graduate School of Arts and Sciences for the Ph.D. degree:

- 1) Completion of graduate course work;
- 2) Successful performance in qualifying examinations;
- 3) Execution of original research suitable for a dissertation;
- 4) Defense of the thesis.

Students are also required to carry out a one-semester teaching assistantship during this period.

The Ph.D. degree may be obtained in any of the programs of the Division of Biology and Biomedical Sciences. Member departments of the Division include all clinical and preclinical departments of the medical school, as well as the Departments of Biology and Chemistry. These departments jointly provide training in the following interdisciplinary programs:

- Biochemistry
- Bioorganic Chemistry
- Developmental Biology
- Evolutionary and Population Biology
- Immunology
- Molecular Biophysics
- Molecular Cell Biology
- Molecular Genetics
- Molecular Microbiology and Microbial Pathogenesis
- Neurosciences

These programs draw together faculty from all of the departments listed and provide maximum flexibility for student training.

A series of monthly seminars is held for M.D./Ph.D. students that are conducted by medical scientists of the clinical departments. These seminars are aimed at stimulating student interest in clinical medicine and at increasing awareness of major research problems in clinical medicine.

M.D./Ph.D. students attend an annual weekend retreat during which students in the Ph.D. phase of training present their research.

To keep students in the Ph.D. phase of training up to date on their clinical skills, monthly opportunities are afforded for clinical interactions. These interactions include going on rounds, attending conferences, and working with the house staff. In addition, students are encouraged to establish individual clinical experience with members of the faculty.

A special tutorial for M.D./Ph.D. students facilitates their transition into the sixth year of the program, which is the clinical year of the normal medical curriculum. The intensive clinical training provided in the final year is the last formal requirement for the M.D. degree. Both the Ph.D. and M.D. degrees will be granted at the conclusion of this clinical year.

Application Procedure

Students interested in applying to the Medical Scientist Training Program must apply to Washington University School of Medicine, which participates in the American Medical College Application Service (AMCAS). Those who have applied to the medical school and have not received information regarding this program may request an application or obtain additional information by writing to:

*Medical Scientist Training Program
Campus Box 8226
Washington University School of Medicine
660 South Euclid Avenue
St. Louis, Missouri 63110-1093
(800) 852-4625*

Doctor of Philosophy

The Division of Biology and Biomedical Sciences offers predoctoral programs in Biochemistry, Bioorganic Chemistry, Developmental Biology, Evolutionary and Population Biology, Immunology, Molecular Biophysics, Molecular Cell Biology, Molecular Genetics, Molecular Microbiology and Microbial Pathogenesis, Neurosciences, and Plant Biology. These educational activities are organized on an interdepartmental basis by the faculty of all clinical and preclinical departments of the School of Medicine, as well as the departments of Biology and Chemistry in the School of Arts and Sciences. All degrees are awarded through the Washington University Graduate School of Arts and Sciences. Additional information about the Divisional programs may be obtained by writing to:

*Graduate Studies Office
Campus Box 8226
Washington University School of Medicine
660 South Euclid Avenue
St. Louis, Missouri 63110-1093
(800) 852-9074*

APPLYING FOR ADMISSION

Washington University encourages and gives full consideration to all applicants for admission, financial aid, and employment. The University does not discriminate in access to, or treatment or employment in, its programs and activities on the basis of race, color, age, religion, sex, sexual orientation, national origin, veteran status, or disability. Present Department of Defense policy governing ROTC and AFROTC programs discriminates on the basis of sexual orientation; such discrimination is inconsistent with Washington University policy. Inquiries about compliance should be addressed to the University's Vice Chancellor for Human Resources, Washington University, Campus Box 1184, One Brookings Drive, St. Louis, MO 63130-4899, (314) 935-5949. Applicants who are qualified and who have special needs are considered individually in the selection process. The School of Medicine is committed to recruiting, enrolling, and educating an increased number of students from racial minority and educationally deprived groups.

Preparation for the Study of Medicine

Entrance requirements to the School of Medicine are:

1. Evidence of superior intellectual ability and scholastic achievement;

2. Completion of at least 90 semester hours of college courses in an approved college or university;
3. Completion of the Medical College Admission Test of the Association of American Medical Colleges;
4. Evidence of character, a caring and compassionate attitude, scientific and humanitarian interests, and motivation suitable for a career in medicine.

Chemistry, physics, and mathematics provide the tools for modern biology, for medicine, and for the biological basis of patient care. Thus, a firm grounding in these subjects is essential for the study of medical sciences. Entering students are expected to have had at least the equivalent of one-year courses at the undergraduate level in physics and biology; to have studied mathematics through integral calculus; and to have a background in chemistry, including organic chemistry. In selected instances, one or more of these prerequisites may be waived by the Committee on Admissions, but applicants are strongly advised to pursue their interests in these and in other areas of science.

A major goal of undergraduate college work should be development of the intellectual talents of the individual. This often involves the pursuit of some area of knowledge in-depth, whether in the humanities, social sciences, or natural sciences. At the same time, a diversity of background is encouraged in order to provide a necessary foundation for cultural development. Specific courses, other than the few in the natural sciences, are not prerequisites because a great variety of courses may prepare students for the many roles they may play in their medical careers.

Application Procedure

The Washington University School of Medicine participates in the American Medical College Application Service (AMCAS) of the Association of American Medical Colleges. AMCAS provides a centralized system for applying to any participating medical school with only one application and one set of official transcripts of academic work.

The AMCAS Application for Admission, common to all participating medical schools, is distributed by the AMCAS and pre-professional advisers. Applicants are urged to file their applications as early as possible.

Applicants to the 1996 First Year Class must submit their AMCAS application so that it is postmarked no later than November 15, 1995. On receipt of the application from AMCAS, the Office of Admissions promptly forwards to applicants the additional materials that must be submitted to complete the application process. At this stage, a

nonrefundable Application Service Fee of \$50 is charged by the University. Once complete, the applicant's admission credentials are reviewed and independently evaluated by members of the Committee on Admissions. The Committee would like to interview every applicant, however, since this would involve several thousand applicants, it is physically impossible to accomplish. Therefore, selected applicants are invited for a personal interview, as well as a tour of the School of Medicine and the Washington University Medical Center. This visit provides an opportunity for the applicant to meet and talk with students and faculty members.

If an applicant is planning an interview trip which will include the St. Louis area, it is appropriate to write the Interview-Appointments Secretary, Committee on Admissions, Box 8107, Washington University School of Medicine, 660 South Euclid Avenue, St. Louis, Missouri 63110-1093, to inquire if an interview has been authorized. Communication by facsimile and e-mail is encouraged. The fax number for the Committee on Admissions is (314) 362-4658. The e-mail address is wumscoa@molly.wustl.edu. The inquiry should be made at least three weeks in advance of the anticipated travel. The Office of Admissions is open weekdays from 8:30 a.m. to 5:00 p.m. Central Time.

Admission decisions are made by the Committee on Admissions. Washington University School of Medicine operates on a rolling admissions schedule beginning October 15, and applicants are notified as soon as a final admission decision has been made on their application. By April 15, 1996, every applicant should have a final decision: accepted, waiting list, or not accepted.

Upon notification of acceptance for admission to the School, the applicant is required to file a Statement of Intent. Three options are presented: (1) accept the offer of admission and submit the \$100 acceptance deposit; (2) accept the offer of admission, submit the \$100 deposit, and request financial aid materials; and (3) decline the offer of admission. The \$100 acceptance deposit reserves a place in the class and is applied to the tuition charge at the time of matriculation. If an accepted applicant withdraws from the class with written notification to the Admissions Office prior to May 15, 1996, the deposit is refunded.

Full Tuition Scholarships

In 1978, the School of Medicine established a scholarship program which based selection on merit rather than financial need. As one of the first merit scholarship programs for medical students, the Distinguished Student Scholarship Program has recognized and rewarded academic excellence and personal achievement for 17 years. To recognize outstanding alumni of Washington University, the Medical Center Alumni Association created in 1989 the Distinguished Alumni Scholarship Program.

Both the Distinguished Alumni Scholarships and the Distinguished Student Scholarships are subject to annual renewal. Recipients of these scholarships are expected to maintain academic excellence. If a scholarship is not renewed, the student may file for financial aid from the School. For scholarship recipients who document financial need above the full-tuition scholarship, additional funds are available to provide support up to the total cost of education. Scholarship recipients may not concurrently participate in the School's Medical Scientist Training Program, Mr. and Mrs. Spencer T. Olin Fellowships for Women, or the Armed Forces Health Professions Scholarship Program.

Distinguished Student Scholarships

Five full-tuition scholarships are awarded annually to members of the entering First Year Class. In early fall 1995, selected applicants for admission to the School's 1996 First Year Class will be invited to file applications for scholarship consideration. Final selection of Scholarship recipients will be made by a committee of the faculty and will be based on demonstrated superior intellectual achievement as well as an assessment of the applicant's character, attitude, motivation and maturity. The announcement of the 1996-97 scholarship recipients will be made on May 6, 1996.

Distinguished Alumni Scholarships

Four full-tuition Scholarships are awarded annually to members of the entering First Year Class. The application procedure and selection process are the same as for the Distinguished Student Scholarships. Since 1989, Distinguished Alumni Scholarships have been named in honor of Leonard Berg, M.D.; Eugene M. Bricker, M.D.; Justin J. Cordonnier, M.D.; Robert C. Drews, M.D.; I.J. Flance, M.D.; David Goldring, M.D.; Paul O. Hagemann, M.D.; Alexis F. Hartmann, M.D.; John C. Herweg, M.D.; John M. Kissane, M.D.; Ira J. Kodner, M.D.; Nicholas T. Kouchoukos, M.D.; Virgil Loeb, Jr., M.D.; Gerald Medoff, M.D.; J. Neal Middelkamp, M.D.; Carl V. Moore, M.D.; Charles W. Parker, M.D.; Edward H. Reinhard, M.D.; Fred C. Reynolds, M.D.; George Sato, M.D.; Hyman R. Senturia, M.D.; Penelope G. Shackelford, M.D.; Jessie L. Ternberg, Ph.D.; and Mildred Trotter, Ph.D.

The 1995-96 Distinguished Alumni Scholarships honor Allan E. Kolker, M.D.; Barbara S. Monsees, M.D.; Robert C. Packman, M.D.; and Gordon W. Philpott, M.D.

A Three-Year M.D. Program for Students with Ph.D. Degrees (MSTPCC)

To assist matriculating WUSM students who enter with Ph.D. science degrees, the School established in 1973 a three-year program. Once admitted to the regular, four-year program, these students may apply to the Medical Science Training Placement Curricu-

lum Committee (MSTPCC) for approval to complete medical school in three years by receiving credit for their Ph.D. work in lieu of the elective fourth year of the standard M.D. program. Additional information about the MSTPCC Program may be obtained by writing to: Leslie E. Kahl, M.D., MSTPCC Campus Box 8077, Washington University School of Medicine, 660 S. Euclid Ave. St. Louis, MO 63110-1093, or by calling (314) 362-6844.

Third Year Class Transfer Program

Each year the Washington University School of Medicine accepts a limited number of transfer students into its Third Year Class. Transfer applications are accepted from well-qualified students who are enrolled in good standing and eligible to continue in their U.S. medical schools, who have a cogent reason for requesting transfer, and who have the full approval of the dean of their current school.

Transfer application forms for our 1996 Third Year Class are available on August 1, 1995. Application deadline is March 30, 1996. Those applicants selected for interview will be invited to visit the Medical Center. All applicants will be notified of the decision of the Committee on Admissions by April 15, 1996.

Inquiries should be directed to:

*Third Year Class Transfer Program
Washington University School of Medicine
660 South Euclid Avenue—Campus Box 8077
St. Louis, Missouri 63110-1093*

FINANCIAL INFORMATION

Cost of Education

For the First-Year Class matriculant, tuition and housing rates for the 1995-96 academic year are listed below. Students who enter in 1995 will benefit from a tuition stabilization plan, which provides that their annual tuition of \$25,170 will be constant over four years. The items listed below provide an estimate of the expenses for a single student in the 38-week First Year Class. The total of these figures suggests a basic minimum budget of approximately \$33,139. Allowances for entertainment, travel, clothing and other miscellaneous items must be added to this estimate.

Tuition (includes Student Health Service and Microscope Lending Plan)	\$25,170
Books, supplies, and instruments	1,220
Housing (single room, Olin Residence Hall)	2,956
Board (Medical Center cafeterias)	3,793

Student Health Service

The Student Health Service provides comprehensive healthcare, including hospitalization, for all students in the School of Medicine. Health insurance coverage for dependents of students can be arranged for an

additional charge.

Long-term group disability insurance is provided for medical students. Coverage may be converted to an individual portable policy prior to graduation.

Microscope Lending Plan

Microscopes which meet the technical requirements set by the faculty are provided at no additional charge to each student in the First and Second Year Classes. The Plan saves students the high cost of microscope purchase and makes available to them a superior quality instrument.

Registration, Payment of Financial Obligations, and Refunds

All tuition and fee payments are due and payable on the dates specified in the published calendars of the programs in the School of Medicine. Failure of a student to register on or before the date specified in the published calendar will result in a late registration fee of \$50, to be added to the amount due. Any tuition and fee payments due from the student and not paid at the time of registration or on the specified due date accrue interest at the lesser of: (a) the rate of one percent above the prime interest rate in effect on the first business day of the month in which that payment is due, or (b) the maximum lawful interest rate then in effect. Any amounts not paid when due plus accrued interest thereon must be paid in full within three months of the original due date. If a student fails to settle such unpaid amounts within three months of the original due date, the School of Medicine will not release the student's academic record or progress reports pending settlement of the unpaid account. A student who has not satisfied all past due financial obligations to the University one month before the end of the academic year will not be allowed to progress to the next academic year or be issued a diploma.

A student who withdraws from the School will receive a pro rata refund of tuition and appropriate fees. The refund will be based on the ratio of the class days enrolled (from the first day of classes to the termination date) to the total number of class days in the term for which tuition and fees were paid. It is understood that the date on which a student formally notifies the Registrar's Office in writing of the decision to withdraw from the School of Medicine shall be regarded as the termination date, with no retroactive clause to be accepted. A prospective date will be accepted, however. If tuition and fees were paid entirely or in part by financial aid from the School, the refund will be applied first to the total repayment of the accounts from which financial aid was drawn, with any remaining refund balance given to the student. Financial aid received in excess of the costs of tuition and fees must be refunded by the student to the School on the same pro rata basis as calculated for the tuition refund outlined above.

Examples of the application of the refund policy may be requested from the Registrar's Office.

Financial Assistance

The ability to finance a medical education at Washington University does not influence the student selection process. As all students accepted for admission have proven scholastic ability, financial assistance is awarded solely on the basis of documented financial need which cannot be met by student and family resources. Students who consider themselves financially independent of their parents must arrange for loans to replace the amount of support parents are analyzed to have the potential to contribute. The School of Medicine's Office of Financial Aid (Box 8059) will assist students in making these arrangements.

The School of Medicine participates in the Financial Aid PROFILE Service offered by the College Scholarship Service (CSS). At the time accepted students indicate they will matriculate in the School, they may request financial aid application materials. A PROFILE Registration Form and other financial aid application documents will be sent to the student beginning January 1, 1996. There are three steps in the PROFILE process:

Step 1: The applicant registers for the PROFILE service by completing the one-page PROFILE Registration and mailing it to CSS. CSS will produce a customized PROFILE Application packet, based on the applicant's Registration information, and mail it to the applicant.

Step 2: The applicant and the applicant's parents complete the PROFILE Application and mail it to CSS for processing and reporting to Washington University School of Medicine and any other medical schools the applicant listed on the Registration Form.

Step 3: CSS sends the applicant an Acknowledgement after it has completed processing of the PROFILE Application.

When the PROFILE Application is received at the School of Medicine, the financial aid office prepares the Application and other financial aid documents for evaluation by the six-member Committee on Student Financial Aid. Award decisions are made normally within two weeks from the date all financial aid documents are received by the financial aid office.

The PROFILE Application and other financial aid application materials solicit information about the applicant and parents, including a detailed description of resources and liabilities. If an applicant's parents are separated or divorced, the financial information is required from both biological parents (excluding income and assets of their spouse, if remarried). If the applicant is married, similar information is required of the spouse. The School expects the applicant to complete and submit the PROFILE Application and other financial aid documents within two weeks from the date the applicant receives them.

Official copies of both biological parents' and the applicant's U.S. Individual Income Tax Returns complete the data required for financial aid consideration. While "Permanent Residents" of the United States are eligible for most Federal financial aid programs, need-based financial aid from Washington is only awarded if the applicant and both biological parents can provide official, audited documents with the same detailed information as provided on a U.S. income tax return. All information is held in strict confidence.

Financial aid awards are credited toward payment of tuition and fees. Proceeds from loans may be disbursed directly to the borrower. The loan portion of an award will be funded through the resources of the School of Medicine or through the Federal Stafford Loan program. All loans awarded by the Committee are free of interest while a student is enrolled in the School. Financial aid awards are made for a given academic year. Students may reapply for financial assistance in succeeding years if they remain in good academic and personal standing, and if there is continued financial need. Awards made to a student may vary from year to year, depending upon the student's needs and upon the availability of funds to the Committee. Students are responsible for filing applications for renewal of awards in the spring of each year.

The Committee holds that students receiving assistance have an obligation to notify the Committee in writing if their financial situation changes, for example, through employment or receipt of a scholarship not anticipated at the time the application was submitted.

First- and second-year students are urged not to accept employment during the academic year. A number of fourth-year students find employment in hospitals within the Medical Center. The Personnel Office provides assistance to students' spouses seeking employment.

Policy For International Students

The admission decision at Washington University School of Medicine is based on academic and personal merit and not on the ability of the student to pay the costs of education. However, individuals who are not citizens of the United States of America or who do not hold U.S. Permanent Resident Visa status are not eligible for financial aid due, in part, to regulations covering most programs used by the School to fund financial assistance. Therefore, in order for the School to complete the required documents which are necessary for issuance of a Visa, the student must document, by a date and in a manner designated by the School, that the necessary amount of funds, as established by the School, is available to pay the costs of education (tuition and living expenses) for the anticipated period of enrollment, normally four years. Documentation of the required amount of financial resources may be by a letter of credit or by deposit of funds in an escrow account with a bank designated by the School.

Standards for Satisfactory Academic Progress for Financial Aid Eligibility

Federal law and regulations require that all students receiving financial assistance from Federal Title IV funds maintain satisfactory academic progress. The policy presents the standards adopted by the Washington University School of Medicine and applies to all students.

Academic requirements for the M.D. degree include the satisfactory completion of the curriculum designated by the faculty. The progress of each student working toward an M.D. degree is monitored carefully by the Committee on Academic Evaluation of Students (CAES). Refer to the section, "Assessing Academic Achievement."

A student failing to meet the standards of progress as determined by the Committee on Academic Evaluation of Students shall be placed on financial aid probation. While on probation the student may receive financial assistance for one trimester, semester or equivalent time period. At the conclusion of this period, the student must have achieved compliance with each standard. A student who does not achieve compliance with each standard by the conclusion of the probationary period is suspended from financial aid eligibility. The Office of Student Financial Aid must notify a student of implementation of probationary status and/or suspension.

A student shall be reinstated for financial aid eligibility at such time as that student has completed satisfactorily sufficient course work to meet the standards of progress. A student on financial aid probation or suspension may appeal that status by indicating in writing to the Director of Student Financial Aid the existence of mitigating circumstances which should result in reinstatement of financial aid eligibility. Each appeal will be considered on its merit by the Committee on Student Financial Aid.

The Director of Student Financial Aid shall have primary responsibility for enforcement of this policy. The Director shall provide in writing to each student at the time of initial enrollment a copy of this policy. The Director shall ascertain at the time of each disbursement of funds and prior to certification of a financial aid application that the student is in compliance with the policy.

Scholarship Funds

Helen M. Aff-Drum Scholarship Fund. Established in 1988 to provide scholarship support to financially deserving medical students.

African-American Medical Alumni Scholarship. A two-year full tuition scholarship supported by African-American alumni and friends of the Medical School will be awarded to a student in the first year class for academic excellence, personal achievement and service to the African-American community.

American Medical Association - Education and Research Foundation Medical Student Assistance Fund. Begun in 1983, donors' gifts supplement the

Foundation's gift to support excellence and contribute to the Distinguished Student Scholarships and Distinguished Alumni Scholarships Program.

Dr. William Monroe Baker Fund. Established in 1988 under the will of Miss Lola Braxton in memory of Dr. Baker to provide scholarship assistance to worthy students who would be otherwise unable to obtain a medical education.

The Barnes Hospital Society Scholarships. Established in 1989 by the attending staff physicians of Barnes Hospital, one scholarship is awarded to a first-year student based on financial need, four book scholarships are awarded to first-year students based on financial need, and an additional four book scholarships are awarded to second-year students who demonstrated distinguished academic achievement in the first-year curriculum.

The Dr. Joseph A. and Helene H. Bauer Scholarship Fund. Created in 1987 by Dr. and Mrs. Joseph A. Bauer to provide scholarship support to academically well-qualified and financially deserving medical students.

Albert G. Blanke, Jr. Endowed Scholarship Fund. Established by a generous gift in 1982, the fund provides scholarship assistance for deserving students in the School of Medicine.

Isabel Valle Brookings Scholarship Fund. Established in 1957 by Isabel Valle Brookings (Mrs. Robert S.) for scholarships and loans in the School of Medicine.

Ruth Elizabeth Calkins Scholarship Fund. Established by Dr. Delevan Calkins in honor of his granddaughter.

Gilbert L. Chamberlain, M.D., Scholarship Fund. Created in 1971 by Dr. Gilbert L. Chamberlain to be used to aid worthy students in acquiring their medical education.

Dr. Pierre I. Chaneysson Scholarship Fund. Created in memory of Dr. Chaneysson by his daughter, Carol M. Chaneysson, to provide scholarship assistance to worthy students.

Cecil M. Charles—Nu Sigma Nu Medical Student Scholarship Fund. Established by the Nu Sigma Nu Medical Fraternity in memory of Dr. Charles.

Class of 1964 Scholarship Fund. Established in 1993 by the Alumni from the class of 1964 to support scholarships.

Class of 1969 Scholarship Fund. Established in 1994 by members of the Class of 1969 in honor of their 25th reunion to support scholarships.

Grace Strong Coburn Scholarship Fund. Created in 1962 through the bequest of Mrs. Grace Strong Coburn for scholarships in the School of Medicine.

T. Griswold Comstock Scholarships. Established under the will of Marilla E. Comstock for students who would otherwise be unable to obtain a medical education.

Arpad Csapo, M.D., Memorial Scholarship Fund. Established in 1982 by Elise Csapo in memory of her husband, and by his friends and colleagues to

provide assistance for students who have shown promise in fields relating to reproductive medicine.

Paul and Ruth DeBruine Scholarship. Established in 1994 by Dr. and Mrs. Paul DeBruine in honor of his 35th medical school reunion to provide scholarship support to academically well-qualified and financially deserving medical students.

Distinguished African-American Students Scholarships. Four-year full tuition scholarships are awarded to two students in each First Year Class for academic excellence and personal achievement.

Dr. Charles Drabkin Scholarship Fund. Created in 1964 to provide financial assistance to medical students.

Robert B. Fickel, D.D.S. Scholarship Fund. Received in 1990 and given in memory of Dr. Fickel's uncle, W. H. Fickel, M.D. ('12). Awards are made to students after their first year of study.

Carl Fisch Scholarship Fund. Created in memory of Dr. Fisch by his daughter, Marguerite F. Blackmer. Provides support to students who demonstrate financial need.

Flance Medical Scientist Traineeship. Established in honor of faculty member and alumnus, I. Jerome Flance, M.D. '35, by the Harry Edison Foundation for support of a student in the Medical Scientist Training Program. The trainee supported during the 1991-92 academic year is Matthew Schreiber.

Charles H. Geppert Scholarship Fund. Established by Mrs. Mary Geppert in memory of her husband, M.D. '57.

George F. Gill Scholarship Fund. Instituted in memory of a former clinical professor of pediatrics.

Paul H. and Lila L. Guttman Student Aid Fund. Established in 1976 to provide financial assistance to qualified medical students.

Harvielle-Bailey Scholarship. Established in 1970 under the will of Miss Isabel Bailey Harvielle as a memorial to Dr. Charles Poplin Harvielle and Dr. Steele Bailey, Jr., alumni of the School.

Dr. Grace Huse Memorial Fund. Provides scholarship awards for deserving Washington University medical students.

Jackson Johnson Scholarship Fund. Provided through a bequest in 1930 from Jackson Johnson.

Dr. Lorraine A. Johnsrud Scholarship Fund. Established in 1983 as a memorial to Lorraine from her classmates, friends, and family to assist deserving medical students in the funding of their medical expenses.

Henry J. Kaiser Family Foundation—Medical Century Club Scholarship Fund. Following the Foundation's generous gift in 1980 for medical student scholarships, the Medical Century Club accepted the challenge to raise new scholarship funds to match an additional gift from the Foundation.

George D. Kettelkamp Scholarship Fund. Established in 1969 by Mrs. Kettelkamp in memory of her husband, an alumnus of the School of Medicine.

M. Kenton King, M.D. Scholarship Fund. Created by the Executive Faculty to honor Dr. King at the time of his retirement in 1989 as Dean of the School of Medicine after having served in that position for 25 years.

Albert F. Koetter, M.D., Scholarship Fund. Established in 1978 by Mrs. Stella Koetter Darrow in memory of her father, an alumnus and former faculty member of the School of Medicine. At least one full-tuition scholarship is awarded annually on the basis of academic achievement and financial need.

Anne L. Lebmman Scholarship Fund. Established in 1983 to grant continued scholarship support to medical students.

Life and Health Insurance Medical Research Scholarship Fund. Established for the training of promising scholars intent upon a career in research and academic medicine. Trainees funded during 1991-92 academic year are: Jonathan Glickman; Theodore Ross; Sally York; and, John Zempel.

Life Insurance Medical Scholarship Fund. Created in 1972 from residual funds in the Life Insurance Medical Research Fund, scholarship support is now awarded to students in the M.D. degree program.

Maude L. Lindsey Memorial Scholarships. Created in 1976 to assist students in the School of Medicine.

John R. Lionberger, Jr., Medical Scholarship Endowment Fund. Created in 1982 by Dr. John R. Lionberger to be used to aid worthy students in acquiring their medical education.

Eliza McMillan Scholarship Fund. Provides assistance to young women in any of several schools of the University to secure an education.

Alma Mavis Scholarship Fund. Created in 1988 under the will of Alma Mavis to assist students intending to practice family (general) medicine.

Medical Center Alumni Scholarship Fund. Awarded on the basis of academic achievement and financial need.

Roy B. and Viola Miller Memorial Fund. Created in 1963 through the bequest of Roy B. Miller to provide scholarships for medical students and for post graduate students engaged in study and research in the medical sciences.

The Warren S. and Dorothy J. Miller Scholarship Fund. Established in 1982 through the bequest of Dorothy J. Miller to provide scholarships for any students engaged in studies leading to the degree of Doctor of Medicine and especially for those students with an aptitude and desire for the general practice in internal medicine.

Joseph J. and Ernesta G. Mira Scholarship Fund. Established in 1988 by Dr. and Mrs. Mira to provide assistance to students from the Alton, Illinois area, including the counties of Madison, Jersey, Calhoun, Greene and Macoupin.

The Monsanto Scholars Program. Established in 1990 with generous support from the Monsanto Fund, The Monsanto-Washington University Minority Medical Scientist Scholarship Program provides a

monthly stipend and full tuition support for outstanding minority students who are committed to becoming academic physicians. Participants pursue both the M.D. and Ph.D. degrees in the six-year Medical Scientist Training Program (M.S.T.P.).

Carl V. Moore, M.D. Scholarship Fund. Earning both the A.B. and M.D. degrees at Washington University, Dr. Moore was internationally recognized for his medical research, teaching of medical students and residents, and patient care. As an administrator, he served the School as Dean for a period, was the first Vice Chancellor for Medical Affairs, and was the Busch Professor and Head of the Department of Medicine for 17 years.

The Scholarship was created in 1992 by Mrs. Dorothy Moore in memory of her husband. It provides generous financial support each year to a student who documents financial need and superior academic achievement.

Dr. Helen E. Nash Scholarship for African-American Medical Students. \$5,000 awarded for the first year of medical studies to an individual of demonstrated academic excellence, personal achievement and commitment to serve the African-American community. The scholarship honors Dr. Helen E. Nash, a Clinical Professor of Pediatrics, and a distinguished citizen of St. Louis.

Mr. and Mrs. Spencer T. Olin Fellowships for Women. Provides for annual financial support to women in any of several disciplines. Application deadline is February 1. The 1992 Fellows are: Rosalia Fonseca and Jennifer Payne.

Spencer T. and Ann W. Olin Medical Fellowships. Created in an effort to help fill the continuing shortage of physicians who pursue careers in biomedical research, the awards are primarily for students in the Medical Scientist Training Program. Trainees funded during 1992-93 are: James Amatruda, John Butman, Alan Cantor, Robin Hanson, David Simon and David Rudnick.

William B. Parker Scholarship Fund. Established in 1976 by the School of Medicine in honor of William B. Parker's 51 years of service to the School.

Phi Beta Pi—Charles Ruggieri Scholarship Fund. Established in 1985 by the Washington University Alumni of the Phi Beta Pi medical fraternity to honor Charles Ruggieri and to assist deserving medical students enrolled in the Washington University School of Medicine with the funding of their undergraduate medical education.

The George M. (M.D. '32) and George K. (M.D. '64) Powell Medical Student Scholarship Fund. Established in 1984 by Mrs. George M. Powell in grateful appreciation for the medical education provided to her husband and son by the Washington University School of Medicine, which so positively affected the lives of the Powell families.

Henry and Louise Reller Scholarship. To be given to medical students in the name of the parents of Louise Reller.

Lyman K. Richardson, M.D. Scholarship Fund. Established in 1993 by Mrs. Ellen Richardson to provide scholarship support to medical students.

Samuel Jennings Roberts Scholarship Fund. Created to provide scholarships for any students engaged in study leading to the degree of Doctor of Medicine.

Robert Allen Roblee Scholarship Fund. Established in 1948 through the gift of Mrs. Joseph H. Roblee for students in the School of Medicine.

Thomas W. and Elizabeth J. Rucker Scholarship Fund. Created in 1956 under the will of Eugenia I. Rucker, in memory of her mother and father.

J. Max Rukes Scholarship Fund. Established in 1987, the fund provides scholarship support to deserving medical school students who are doing research in endocrinology or the chemistry of metabolism.

Joseph H. Scharf Scholarship Fund. Provided in 1949 through the bequest of Dr. Joseph H. Scharf.

William H. and Ella M. Schewe Fund. Established to provide financial assistance to worthy students in the medical school.

School of Medicine Scholarship Fund. Created in 1970 to provide financial assistance for medical students.

Edna Schrick, M.D. Scholarship Fund. Established in 1992 by Dr. Schrick to provide scholarship support to female medical students.

Dr. John B. Shapleigh Scholarship Fund. Established in 1926 with the bequest of Dr. John B. Shapleigh and supplemented by contributions from Mrs. Shapleigh and Miss Margaret Shapleigh.

Alexander Balridge Shaw Scholarship Fund. Created in 1958 through the bequest of Roy A. Shaw in memory of his father, Dr. Alexander Balridge Shaw.

Dr. Edward Hiroshi Shigeoka Scholarship Fund. Created in 1988 by Dorothy F. Shigeoka in memory of her husband, Dr. Edward Hiroshi Shigeoka, to help disadvantaged and deserving students pursue their careers in medicine.

Ernie Simms Scholarship Fund. Founded in 1984 by friends, colleagues, and former students of Professor Simms in recognition of his contributions to scholarly research and teaching in the Department of Microbiology and Immunology.

Beulah B. Strickling Scholarship Fund. Established in 1960 with a bequest from Mrs. Beulah B. Strickling.

Marleah Hammond Strominger Scholarship. Established in 1971 by the family and friends of Marleah Hammond Strominger. The recipient shall be a motivated student with need for financial assistance and shall come from a disadvantaged background.

Mary and Ernst Stuehrk Scholarship Fund. Established in 1987, to assist medical students with documented financial need.

Edwin H. and Virginia M. Terrill Scholarship Fund. Established in 1964 with the bequest of Dr. Edwin H. Terrill, an alumnus. It was Dr. Terrill's

hope that scholarship recipients would repay into the Fund the amount of the award.

Mildred Trotter Scholarship Fund. For students with documented financial need, the fund was established in 1979 by Dr. and Mrs. Paul Guttman, and supplemented by former students of Dr. Trotter, as a tribute to her many years of teaching in the Department of Anatomy.

Hiromu Tsuchiya Scholarship Fund. Created to provide scholarships in the School of Medicine.

Tubolske-Jonas-Tubolske Medical Scholarship Fund. Established in 1974 by Rose T. Jonas in memory of her father, husband, and brother. The recipient shall be a senior student preparing to enter the field of surgery, obstetrics and gynecology, or internal medicine.

Dr. Cornelia M. Van Prooyen Scholarship Fund. Established in 1987, the fund provides scholarship support and other financial assistance to female medical students.

John Alfred Veazey Scholarship Fund. Established in 1992 with a bequest from Mrs. Dorothy Veazey Parker.

Dr. Howard Phillip Venable Scholarship for African-American Medical Students. \$5,000 awarded for the first year of medical studies to an individual of demonstrated academic excellence, personal achievement and commitment to serve the African-American community. Dr. Venable, Clinical Associate Professor of Ophthalmology (Emeritus), has served as a member of the School's Committee on Admissions, Committee on Student Financial Aid, and currently on the Minority Medical Student Scholarship Committee.

Louis H. Waltke and Marie Waltke Memorial Fund for Medical Education. Created in 1984 to provide scholarships and fellowships at the School of Medicine.

Dr. George S. Wilson Scholarship Fund. Established in 1988 with the bequest of Dr. George S. Wilson to provide scholarship support to medical students.

George and Irene Wolf Medical Scholarship Fund. Established by the donors to benefit students in the School of Medicine. The Fund began supporting students during the 1990-91 academic year.

George Zografakis Memorial Scholarship Fund. Created by the family and friends of Dr. Zografakis, a distinguished faculty member in the Department of Surgery.

Loan Funds

Auer-Rosenfeld Memorial Loan Fund. Established by Mrs. Elizabeth Auer to be used for educational loans to students.

Dr. John C. Boetto Loan Fund. Established in 1993 by a bequest from Mrs. Josephine D. Boetto as a memorial to her son to provide loans for deserving medical students.

Jess K. Goldberg Memorial Loan Fund by Ophelia H. Kooden and Violet G. Sachs. Created in 1970 to

provide loans for medical students in memory of the donors' brother who passed away while attending medical school.

Health Professions Student Loan Fund. Established by federal legislation for medical students with a demonstrated financial need. Loans are available for long terms at favorable rates.

William Randolph Hearst Medical Scholars Loan Fund. In 1989, the Hearst Foundation provided first funding for a new and innovative loan program which provides interest-free loans to students in their last year of study.

Ursula Hecker Loan Fund. Established in 1967 by a bequest from Ursula Lee Hecker for the use and benefit of worthy, deserving, and needy medical students.

Horncrest Foundation - School of Medicine Loan Fund. In 1982, the Trustees of the Horncrest Foundation approved a proposal on behalf of the School of Medicine to match up to a generous annual cap for five years loan funds solicited by the School. The campaign was extremely successful and now provides loan funds to students with documented financial need.

W. K. Kellogg Foundation Loan Fund. Provides financial assistance to medical students in need of such aid.

Gustel and Edith H. Kiewitt Scholarship Loan Fund. Provides loan funds for medical students.

Medical Scholars Loan Program. Established in 1985 by members of the William Greenleaf Eliot Society, this fund provides an interest-free source of long-term student loans. Annual contributions from alumni and friends support this perpetual and growing resource upon which current and future medical students will draw.

George W. Merck Memorial Loan Fund. Established in 1959 by The Merck Company Foundation, the original purpose of the loan was modified in 1983 to provide loans to graduating students which would help bridge the transition from student to resident physician.

Mound City Medical Forum Minority Student Emergency Loan Fund. Established in 1988 by the Mound City Medical Forum, a professional organization of black physicians in St. Louis and a component society of the National Medical Association, the fund provides short-term, no interest loans for minority students.

Perkins Student Loan. A federal program (formerly National Direct Student Loan) to provide loans to students with financial need. Permits repayment over an extended period at a favorable interest rate.

Dr. William C. and Elva Pratt Loan Fund. Established in 1982 for medical students with demonstrated financial need.

G. H. Reinhardt Memorial Scholarship Loan Fund. Established in 1947 through the bequest of G. H. Reinhardt.

Aline Rixman Loan Fund. Created in 1940 by William Rixman in memory of his wife, the fund is

used to alleviate unexpected financial emergencies of medical students.

Caroline O. Schlesinger Loan Fund. Established in 1969 to provide financial support for medical students.

School of Medicine Student Loan Fund. Established to make loans to students with documented financial needs.

Washington University Medical Center Alumni Association Loan Fund. Provides emergency loans to medical students.

The Alan A. and Edith L. Wolff Loan Fund. Established in 1993 by Mrs. Edith L. Wolff to provide loans to students with demonstrated financial need who are in their final year of study for the Doctor of Medicine degree.

ASSESSING ACADEMIC ACHIEVEMENT

Committee on Academic Evaluation of Students

Responsibility of the Committee

Overall evaluation of academic performance by students at the Washington University School of Medicine will be made by the Committee on Academic Evaluation of Students (CAES). The deliberations of the CAES are generally positive in approach and are committed to the ultimate aim of assisting students to successfully complete the courses of study required by the School. The principle that careful selection of students will minimize attrition from the School is strongly endorsed by the CAES. The CAES has several important roles, including:

1. approving promotion of students to a subsequent year of study;
2. recommending to the Executive Faculty those students who have successfully completed all the prescribed requirements of the School and are qualified to receive the Doctor of Medicine degree;
3. requiring entry of a student into an individualized program of study;
4. deciding upon matters of academic disciplinary action.

It is also the ultimate responsibility of the CAES to decide whether each student meets the academic and ethical standards necessary to enter the profession of medicine. The rules governing operation of the CAES apply to students in the following categories:

1. students who are engaged in the preclinical and clinical education requirements for the M.D. degree.
2. students in a five year M.A./M.D. degree program taking the pre-clinical or clinical portion of their M.D. education.

3. students in the Medical Scientist Training Program (MSTP) taking the pre-clinical and clinical portion of their M.D. education.

4. those selected students with a prior medically relevant Ph.D. who have been approved by the Medical Science Training Placement Curriculum Committee (MSTPCC) and are enrolled in the M.D. portion of their education.

Membership of CAES

(A) Appointed & ex officio membership—There will be 12 voting faculty members of the CAES, and membership will be appointed for a four-year term by the Dean of the School of Medicine following nomination of suitable individuals by the department heads. Initial appointments will be staggered for periods of one, two, three, or four year terms. A faculty member may be reappointed to serve on CAES. Membership will be equally divided between clinical and pre-clinical departments. In addition, CAES membership will include, in ex officio capacity, the Registrar (non-voting) and the Associate Dean of Students (non-voting). The Associate Deans of Medical Education, Admissions, Minority Affairs and the Director of the Student Health Service may attend CAES meetings as non-voting observers.

(B) Guests—A course master, who is not a member of the CAES, but who has submitted a Fail/Incomplete grade for a student, which is to be discussed at a meeting of the CAES, will be present at the meeting to provide information concerning the student's performance. Alternatively a course master will send a designated representative. In the event that a course master or designated representative is not present, final action for that student will be deferred until adequate information concerning the student's performance is available.

Chair of CAES

A faculty member will be appointed by the Dean from within the CAES committee to serve as Chairperson. The term of the chair will be four years.

Meeting Frequency

CAES meetings must occur in a timely manner after final examinations or re-examinations (i.e. as soon as practical after grades are submitted to the Registrar). Generally grades will be submitted to the Registrar within 15 days of the completion of an examination or within four days of a re-examination. A meeting of the Committee may also be convened at any time such that timely review of student performance and action thereupon is provided.

Quorum for CAES Meetings

Seven voting members must be present to consider items of academic disciplinary action (i.e. recommendation for dismissal from enrollment or entry into Individual Study Program).

The Evaluation and Grading System

General

(A) For students of exceptional merit, a Letter of Commendation may be sent to the student with a copy to the Registrar for the student's permanent file.

(B) Students are required to take all examinations at the specified time. A student may be excused from this rule for extenuating circumstances at the discretion of the course master. Such occasions will be promptly reported to the Registrar.

In the event of inability to attend a scheduled examination due to illness, unless extenuating circumstances exist, the student is required to inform the coursemaster prior to the examination and to be evaluated by the Student Health Service. In the event the student cannot reach the relevant coursemaster, the student should contact the Associate Dean for Student Affairs.

(C) In order to continue their studies at the Washington University School of Medicine, students must demonstrate sound judgment, responsibility, a sensitivity and compassion for individual needs, an ability to synthesize and apply knowledge and the capability of becoming a safe and effective physician. Breaches of these principles will be referred to the CAES for review.

(D) At the annual CAES meeting, the Committee will vote to recommend promotion of students who have successfully completed all the requirements of the current academic year to the studies of the subsequent year.

(E) At the conclusion of each academic year students receive a grade report which indicates the grade achieved in each course. When all the official grades have been received, the official transcript, in addition to listing courses and grades achieved, lists the grade distribution in each course (with the exception of elective courses).

(F) Prior to graduation, students are required to complete and pass all course work. Occasionally students are permitted to complete equivalent course work at other institutions with the permission of the responsible department and written notification to the Registrar.

(G) It is the responsibility of students who feel that personal concerns, health problems, or any other factors may be adversely affecting their academic performance to bring such matters to the attention of the Director of the University Health Service or the Associate Dean of Student Affairs.

Grading System in the First Year

For purposes of the official grade records of the School of Medicine, courses in the first year curriculum are evaluated on a Pass (P) / Fail (F) basis. Incomplete (I) indicates that, because of a delay excused by the course master, the student has not completed the requirements to pass a course.

Grading System in the Second and Subsequent Years

For purposes of the official grade records of the School of Medicine, the following grades are used for subsequent years:

- H = Honors, reflecting a truly outstanding performance
- HP = High Pass, awarded for excellent/very good work
- P = Pass, indicating satisfactory performance
- F = Fail
- I = Incomplete, as for first year

Actions for Academic Review

General

(A) "Actions for Academic Review" refer to procedures used at the School in the event that a student fails a course or fails to complete a course in the requisite time.

(B) In the event of failure at any initial examination offered at the School, the student will be informed in writing of the options, depending upon the year of study (as detailed below), to remediate such failure.

(C) If the Registrar has recorded a Fail or Incomplete grade in two or more courses in a single year or cumulatively three courses between years, the student's academic performance will be referred to CAES for review and determination of a course of action. Actions for Academic Review shall be referred to CAES for consideration by a student's course master(s) or the Registrar's office.

(D) When the performance of a student is referred to CAES for potential Academic Review, the following rules will apply.

1. No student may take more than three years to complete the course work required for the first two years. The end of such a "three year" period, is

defined as 36 months from the date of matriculation to the School. Time periods included in a "Leave of Absence" are not counted in these 36 months.

2. In the absence of extenuating circumstances, no student may take more than two academic years to complete the course work required in the first year curriculum.

3. CAES shall notify the student in writing of the course(s) for which Academic Review is proposed and the date and time at which the CAES will address the matter. The Registrar or the course master(s), or their designated representatives, shall present the matter to the CAES in a closed and confidential CAES meeting.

4. The student shall be permitted, upon written request, in advance of the CAES meeting, to appear on his or her own behalf. At the student's written request, he or she may be accompanied by a member of the faculty or staff of the School of Medicine for guidance and support. Alternatively, again following written request, the student may be accompanied by a fellow student enrolled in the School of Medicine. A record of the CAES meeting shall be preserved for purposes of review by the School of Medicine's Appeals Committee, as necessary. The CAES's decision shall be by majority vote and shall be communicated, in writing, to the student and the Registrar's office.

5. For students referred for course failure, CAES meetings will have, in addition to the grade report forms for the course for which the student is referred to CAES, a complete record of the student's academic performance and the student file.

6. The maximum number of attempts to pass any individual course during enrollment in the School, including time in an ISP, will be three.

7. Throughout the enrollment of a student it is within the jurisdiction of CAES to terminate the enrollment of a student who has demonstrated serious academic failure or breaches listed under The Evaluating and Grading System C. Such a course of action for serious academic failure will generally apply to a student for whom the Registrar has recorded Fail/Incomplete grades in three or more subjects.

8. Decisions of the CAES regarding a necessary course of action will be communicated to the student by the Associate Dean for Student Affairs, and written records of such communications shall be maintained by the Registrar in the student's file.

First Year

(A) If a student has received a Fail/Incomplete grade in a single first year course, the Registrar will advise, in writing, the student of the options for remediation as follows:

1. Take a re-examination in the course at a time prescribed by the course master before August of the following academic year, OR

2. Enroll in and successfully complete, at the level designated by the course master, a summer course at a different institution, such course being completed and passed by the beginning of classes for the second academic year.

3. A student who fails the re-examination or fails to complete and pass an approved summer course will be referred for CAES to review and propose a recommended course of action. The CAES may require such a student to enter an ISP. Alternatively, the CAES may permit a re-examination. If the re-examination is failed enrollment will be terminated.

(B) A student for whom the Registrar has recorded a Fail/Incomplete grade in two or more courses during the first year will be referred to CAES for determination of a course of action.

(C) For students referred to CAES, under First Year Section B above, the Committee may decide to permit the student to take re-examinations, if a re-examination has not already been taken, in the courses for which Failed/Incomplete grades have been recorded. Such re-examinations will generally occur during the last week of the interacademic year break. If such a re-examination is failed the student may be required to enter an ISP or be dismissed from enrollment in the School. If Fail/Incomplete grades have been recorded for more than two courses or a single re-examination the CAES may require that a student enter an Individual Study Program or that enrollment in the School be terminated. If a student has failed three attempts to pass a course, enrollment will be terminated.

Second Year

(A) Regarding courses of the Second Year, the Registrar will advise, in writing, students in the following categories of the requirement that they take a re-examination, according to the schedule listed under B, immediately below:

1. a student for whom a Fail or Incomplete grade has been recorded in a single complete course in Pathology, Pharmacology, Clinical Medicine or Introduction to Psychiatry, OR

2. a student for whom a Fail or Incomplete grade has been recorded in one or two section(s) of the Pathophysiology course.

(B) Re-examinations in complete courses in Pathology, Pharmacology, Introduction to Psychiatry, or Clinical Medicine will generally be offered during the last week of the inter-academic year break, prior to

entry into the Third year. Re-examinations for students who have failed one or two Pathophysiology sections will be generally offered on the following schedule:

Failure in	Re-examination Schedule
Trimester I	During the first week after return from the Winter holiday break
Trimester II	During the first week after the Spring break
Trimester III	During the last week of the inter-academic year break

Students who fail a re-examination of a single course will be referred to the CAES to determine a course of action. The CAES may decide that the student must enter an ISP. Alternatively, a re-examination may be offered. If the re-examination is failed, enrollment will be terminated.

(C) Students in the second year for whom the Registrar has recorded Fail/Incomplete grades under the following categories will be referred to CAES for review and resolution of a recommended course of action:

1. two or more complete courses (Pathology, Pharmacology, Clinical Medicine, Introduction to Psychiatry) OR
2. three or more sections of Pathophysiology OR
3. one complete course and two sections of Pathophysiology.
4. a student for whom the Registrar has recorded a Fail/Incomplete grade in any re-examination.

(D) At review by CAES for students referred to above Section C, the Committee may decide to permit the student to take re-examinations, if a re-examination has not already been taken, in the courses for which Failed/Incomplete grades have been recorded. Such re-examinations will generally occur during the last week of the interacademic year break. The CAES may allow the student to defer beginning the clinical rotations so that re-examinations may be taken up to 12 weeks after the beginning of the usual cycle of clinical clerkships. Such extra time, used for study and preparation, will ordinarily mean that the student will not have the usual 'unscheduled time' in the elective year. In the event that a Fail/Incomplete grade is recorded at a re-examination, CAES may require that a student enter an Individualized Study Program or that enrollment in the School of Medicine be terminated. In the event that CAES decides not simply to permit re-examination, the CAES may require that the student enter an Individualized Study Program as detailed below, or that enrollment in the School be terminated.

(E) No student will be permitted to begin clinical rotations of the third year until all first and second year courses have been successfully completed.

Third and Subsequent Years

(A) Regarding performances beyond the second year, the Registrar will promptly advise, in writing, a student for whom a single Fail/Incomplete grade has been entered, regarding the requirements stipulated by the relevant course master to remediate the grade entered. Options will generally include a re-examination or repeating the course. If a Fail/Incomplete grade has been entered following the prescribed remediation the student will be referred to the CAES to determine a course of action. When such a student is referred to the CAES, the CAES may permit a re-examination or re-taking the course. If the course is failed a third time, enrollment in the School of Medicine will be terminated.

(B) A student beyond the second year for whom the Registrar has recorded two or more failing grades in the Clinical rotations or electives will be referred to CAES for review and proposal of a course of action.

(C) For students referred to CAES, the Committee may endorse or amend the recommendations of course masters from whom Fail/Incomplete grades have been entered for students beyond the second year curriculum regarding a necessary course of action to remediate the grades entered. In the event that a student fails such a course of remediation, as defined by the course master and approved by the CAES, CAES may require that the rotation be repeated or that enrollment of a student in the School be terminated. Students will generally be permitted three attempts to achieve a passing grade in any clerkship course. If three failing grades have been submitted for a course, enrollment will be terminated.

Individual Study Program

The educational program is designed to assist the specialized needs of all medical students in an individualized and personalized manner. Tutorial assistance is available to any student at any time as detailed below. Occasionally students who have difficulty in handling the normal academic course load will be required to enter an Individualized Study Program (ISP), requiring five years to complete rather than four years. The following rules govern students engaged in an ISP:

(A) Recommendation requiring entry into an ISP is made by the CAES after careful consideration of the student's academic performance at intervals throughout the curriculum.

(B) The intent of an ISP is to optimize the prospect that the student will successfully complete the curriculum.

(C) The specific program of any ISP (i.e. the content and sequences of courses) will be determined by the student and the Associate Dean for Student Affairs with input from relevant course masters and the CAES. The specific recommendations of the CAES will generally be adopted. The CAES may delineate for the student required to enter an ISP the consequences of a Fail/Incomplete grade recorded in any course once the student has entered the ISP. The plan for execution of an ISP, once established, will be recorded in the student's file in the Registrar's office and a copy provided to the student.

(D) Unless extenuating circumstances exist, ISP students are required to take the examinations for a particular course in their usual temporal relationship to the course work. Requests for consideration of unusual circumstances should be recorded in the student's file in the Registrar's office.

(E) In the event that a Fail or Incomplete grade is recorded for a student after entry into an ISP (including in a complete course or a section of Pathophysiology), a re-examination schedule will be determined by CAES. If a Fail/Incomplete grade is recorded for the re-examination of a single course for which two previous final examinations have been failed, enrollment in the School of Medicine will be terminated. If a Fail or Incomplete is recorded for the re-examination of a single course which the student has not previously failed, the student may be permitted to repeat the course.

(F) At the completion of the time for their ISP, ISP students who have not successfully completed and received a grade of Pass or above in the usual courses of the first and second year curricula by the start of the second six week period in the year of the clinical clerkship will be dismissed from enrollment in the School.

Tutorial Assistance Program

Students experiencing difficulty in any course may request tutorial assistance. Such requests should initially be directed toward the course masters and thereafter to the Associate Dean for Student Affairs. Students who are repeating courses will be offered the opportunity for tutorial assistance. CAES may also require that a student seek tutorial assistance.

Leave of Absence

A student may request a leave of absence for academic or personal reasons by submitting a statement in writing to the Office of Student Affairs. Such a statement should include indication of the beginning and anticipated ending dates and a brief

statement of the reason (academic or personal). Requests for leave of absence must be approved by the Associate Dean for Student Affairs.

Leaves of absence shall be granted for no more than one year, but in unusual cases may be renewed by CAES for a second year after discussion with the Associate Dean for Student Affairs. Students requiring a personal leave of absence for medical reasons must submit a supporting letter from the Director of the Student Health Service. In extreme cases where a student may pose a danger to others, an involuntary leave of absence may be imposed. Return of students from involuntary leave of absence requires clearance of both the Director of the Student Health Service and the Associate Dean for Student Affairs.

Students receiving financial aid should be advised that at the end of six or more months of leave of absence, the grace period for loan repayment will have been exhausted. In such cases there will be an obligation for the student to start payments. According to the Federal rules under which loans are made, the use of a grace period during a leave of absence will generally mean that the schedule for loan repayment may be changed. Students who are receiving financial assistance should consult with the Financial Aid Office to determine the implications of a Leave of Absence for their financial aid.

Policy on Student Status and Benefits During Research Years or LOA

M.D./Ph.D.

Student status is maintained while in the research phase of the M.D./Ph.D. program. Students are registered in the graduate school during the research years. Both student health and disability coverage are provided by the Division of Biology and Biomedical Sciences.

M.D./M.A.

Student status is maintained while in the research phase of the M.D./M.A. program. Students are registered in the graduate school during the research year. Both student health and disability coverage are provided by the Division of Biology and Biomedical Sciences.

Five Year M.D. Program

Research Year Here: Student status is maintained throughout the approved research year. Students are registered in the School of Medicine. Both disability and student health coverage are required and are payable by the student. Outside funding often covers such fees. (The student health coverage requirement will be waived if the student is eligible for employee health coverage as an employee of Washington University during the approved research year and if proof of health insurance is provided.)

Research Year Away: Student status is maintained throughout the approved research year. Students are registered in the School of Medicine. Both disability and student health coverage are optional with proof of like coverage. The cost of either elected coverage is payable by the student. Outside funding often allows these costs.

Leave of Absence

Leave of Absence Year Here: Student status is *not* maintained during the leave of absence though benefits of student health coverage and disability insurance are optional throughout an approved leave. Costs are payable by the M.D. program students. M.D./M.A. and M.D./Ph.D. students may request support for these costs from the Division of Biology and Biomedical Sciences if funds are available. The Office of Financial Aid should be consulted for information regarding loan repayment and grace periods when on a leave of absence.

Leave of Absence Year Away: Same as Leave of Absence Year Here.

Liability Insurance

Washington University provides general liability insurance for all students while they are engaged in approved academic programs. In addition, Washington University voluntarily provides a defense and indemnification benefit for matriculated students who are candidates for the M.D. degree at the Medical School (WUMS).

The benefit is provided to WUMS students for defense and indemnification of claims arising out of activities which are part of academic programs and only while a student is acting in his or her capacity as a medical student enrolled in the undergraduate medical program at the Medical School. This policy is subject to terms, conditions, limitations, and exclusions, and each request for defense/indemnification will be decided on a case-by-case basis at the sole discretion of the University.

Defense/indemnification will not be provided for any criminal act or any act committed while in violation of any law or ordinance or University program guideline, or where the injury or damage resulted from intentional wrongdoing, gross negligence or recklessness, or in the event that the action or proceeding is brought by or on behalf of Washington University. This indemnification does not cover any liability which is insured elsewhere, but it may be in excess of any amount payable under any other such insurance.

Any incident, either actual or alleged, which you have knowledge of must be reported immediately to the Risk Management Office of the Medical School, 362-6956.

If you have any questions about Washington University's professional liability program, please feel free to call the Risk Management Office.

Procedures Concerning Breaches of Professional Integrity

Matters involving possible breaches of professional integrity shall be brought to the attention of the Associate Dean for Student Affairs. Behavior inappropriate to the medical profession shall mean breaches of personal confidence and trust including cheating or unauthorized use of materials during examinations; abuse, misrepresentations or other seriously improper conduct in relation to patients or colleagues; and other misconduct, misrepresentation or failure in personal actions or in meeting obligations, so as to raise serious unresolved doubts about the integrity of the student to enter the practice of medicine. Allegations of breach of research integrity policy are the primary responsibility of the Research Integrity Committee of the School of Medicine. Complaints regarding students enrolled for the MD degree will be directed promptly to that committee. The Research Integrity Committee will promptly investigate the charges and report its conclusions and recommendations to the Dean who will convene a Disciplinary Committee (as detailed in the procedures detailed below-sections E. to M.), which will have final disciplinary responsibility.

In such matters, the following rules apply:

(A) The individual(s) raising the questions of possible misconduct shall present them in writing to the Associate Dean for Student Affairs and shall be reminded of their confidentiality.

(B) The Associate Dean for Student Affairs shall convene a meeting between the Associate Dean for Student Affairs, the Associate Dean for Admissions, or the Associate Dean for Medical Education to review the complaint and decide whether further action is necessary.

(C) If further inquiry is deemed necessary, the Associate Dean for Student Affairs and one of the Associate Dean's listed under (B) will discuss the complaint with the student.

(D) If the Associate Dean for Student Affairs considers the matter sufficiently serious, a recommendation will be made to the Dean to convene a Disciplinary Committee.

(E) Appointment to a Disciplinary Committee will be made by the Dean and will include four faculty members and one academic representative from the Office of Student Affairs. Appointees will decline if assurances of their impartiality in the matter are not evident. Members of the Committee will elect a chairperson who will be responsible for applying correct procedure to the hearing. The Registrar will attend the meeting to record the minutes. A simple

majority will prevail (three out of five votes), except when the motion is for dismissal from enrollment in the school, where four out of five votes will be required.

(F) If the Disciplinary Committee is convened, the Associate Dean for Student Affairs will forward all information concerning the matter to the Committee.

(G) The Disciplinary Committee shall, whenever possible, convene within one to two weeks after the initial meeting between the student and the Associate Dean for Student Affairs.

(H) Prior to the meeting of the Disciplinary Committee, the Associate Dean for Student Affairs will inform the student in writing regarding the time, date and place of the meeting, that the proceedings are completely confidential, and that the student may bring a faculty member, staff member or fellow student of the School of Medicine for guidance and support. A copy of the complaint will be provided to the student.

(I) The following guidelines will be applied to the conduct of a Disciplinary Committee and these will be made available to members of the committee at the opening of the meeting. The aim of the Committee is to provide fair and prompt review of the inquiry. The Committee is not positioned in an adversarial role against the student but simply to review the evidence as presented and determine its decision regarding disciplinary action. The Committee has neither the advantages nor limitations inherent in a court of law. Innocence of the student being questioned will be presumed. No facts or conclusions will be assumed. The decision as to whether the student perpetrated the alleged act will be made solely on the basis of evidence and testimony presented at the meeting. During the hearing the student will have access to all the evidence presented. The record of such proceedings will be held confidentially with access restricted to Committee members, the student involved, and members of the Administration involved in the proceedings.

(J) All who appear before the Committee are assured that their appearance occurs without fear of repercussions from their testimony.

(K) After the meeting and decision of the Disciplinary Committee, the Associate Dean for Student Affairs will inform the student verbally and in writing of the result within three working days.

(L) The student will have access to the written record of the meeting's proceedings.

(M) Unless it is determined by the Associate Dean for Student Affairs that extraordinary circumstances exist (e.g. physical threat to others), the student will be permitted to continue in the usual academic activities during the Disciplinary proceedings.

Appeals Process

The School of Medicine has the right and responsibility to assure that each student, during the time of enrollment, demonstrates levels of academic achievement and ethical stature appropriate to the practice of medicine. The School must also ensure provision of fairness in discharging those rights and responsibilities.

An Appeals Committee, composed of faculty members appointed by the Dean of the School of Medicine, shall be created to review decisions under either Academic Review or Procedures Concerning Breaches of Professional Integrity. A quorum of this committee shall consist of five members.

Within 20 days of the date on which either an Academic Disciplinary Action decision is rendered by CAES or a Breach of Professional Integrity decision is rendered by the Disciplinary Committee, the student may request, in writing to the Registrar, that the School of Medicine's Appeals Committee review the record of such CAES or Disciplinary Committee decision or that the Appeals Committee request that the CAES or Disciplinary Committee consider additional information which was not previously presented to such committee.

The Appeals Committee shall review the record of the CAES or Disciplinary Committee's decision solely to determine whether the pertinent CAES rules or Breach of Professional Integrity procedures were followed and whether all relevant information was considered by the CAES or Disciplinary Committee. If the appeal is based on a contention that all relevant information was not presented to CAES or the Disciplinary Committee, the appeal must provide the Appeals Committee with adequate reason why the student did not present this information at the CAES or Disciplinary Committee meeting in question. On all appeals the Appeals Committee may either remand the matter to the CAES or Disciplinary Committee for reconsideration with its explanation for the remand, or deny the appeal. However, the Appeals Committee shall not substitute its opinions of the merit of matter and appeal for those of CAES or the Disciplinary Committee. The Appeals Committee shall provide its decision in writing to the Dean, the student, the CAES or Disciplinary Committee, and the Registrar. The Appeals Committee shall determine whether the student may continue his or her curriculum pending its review of a CAES or Disciplinary Committee decision.

Within 20 days of the date of an Appeals Committee's decision or referral back to CAES or Disciplinary Committee, the student may request, in writing, that the Dean of the School of Medicine review the decision of the Appeals Committee. The decision of the Dean shall be final.

United States Medical Licensing Exam (USMLE)

The USMLE has replaced the National Board of Medical Examiners (NBME) exam and the Federation Licensing Exam (FLEX). The USMLE is designed to "assess the examinees' understanding of and ability to apply concepts and principles that are important in health and disease." The USMLE represents a single uniform examination for medical licensure in the United States, and as such, is a minimum requirement for obtaining a medical license.

The USMLE consists of three separate examinations: STEP 1, generally taken in June or September following the second year curriculum, tests knowledge in the basic sciences; STEP 2, generally taken in March or September prior to graduation, tests proficiency in clinical sciences; STEP 3 is taken during internship.

Further information can be obtained from the Bulletin of Information published by the National Board of Medical Examiners, and is available, along with application forms, from the Registrar's Office, Room 100, McDonnell Sciences Building.

ST. LOUIS

St. Louis is one of the most livable areas in the United States, with a cost of living that ranks consistently lower than many other comparable cities. For recreation, the lively arts, and great everyday living, St. Louis is a city of opportunity and variety.

The Gateway Arch—St. Louis' preeminent symbol—represents the joining of old and new on the historic Mississippi riverfront. Rising in front of a dramatic skyline, the Arch symbolizes St. Louis' role as the Gateway to the West. Today, as in the past, St. Louis is a prominent cultural and commercial city, linking the north and south, east and west, through its traditions and its view of the future. The Arch itself, designed by Eero Saarinen, is a remarkable sculptural achievement and an incredible engineering feat, worthy of its dramatic setting. It frames the commercial center of downtown and the Old Courthouse where in 1847 Dred Scott argued his right to be a free man.

Ambitious renovation and architectural experimentation characterize busy downtown St. Louis. The Old Post Office and the massive Romanesque Union Station have been revitalized. Union Station now houses a hotel and expansive shopping mall, inviting convention visitors and tourists to explore commerce St. Louis-style. New corporate headquarters buildings downtown display the variety of modern architecture

evident in major metropolitan centers around the nation. Members of the Washington University School of Architecture consult with local firms in the creation of new structures and the refurbishing of the old. A new housing area in the fashionable Central West End, home to the Washington University Medical Center, is the design of a School of Architecture professor.

Though the St. Louis area has nearly 2.5 million residents, living here is simple and affordable. You are never farther than a 20-minute drive from any place you want to go in the metropolitan area, especially from Washington University's central location in suburban St. Louis. A convenient, modern highway system and a simple city plan allow easy access to all parts of the city and its many activities. A new light rail line—MetroLink—runs from Lambert Airport through Laclede's Landing in the downtown area and on to Illinois. A stop at the Medical Center makes this mode of transportation especially convenient for medical school faculty, students and staff.

A keynote to St. Louis is variety. Any taste in housing, cuisine, lifestyle, and leisure activities can be found in the greater St. Louis area, but St. Louis is less expensive than comparable cities. Attractive, affordable residential communities abound here, many of them within a two-mile radius of Washington University. The Central West End, University City, and Clayton—all of which border Washington University—provide attractive housing and recreational opportunities. To the north, small shops, galleries, and ethnic restaurants dot the main street of University City. Adjacent to the Washington University Medical Center and close to the Hilltop Campus is the Central West End—fashionable, trendy, and restored to its late-19th century grandeur. To the south are the elegant homes and multi-family dwellings of Clayton. Those who come to St. Louis to be associated with the University find apartments that range in price from \$350-\$800 per month, and purchase properties ranging from \$80,000 and up, all in the immediate area. For those who desire a more suburban lifestyle, west St. Louis County is a growing and beautiful area.

Cultural Opportunities

Once settled, new St. Louisans discover the rich recreational and cultural life here. You see the effects of the St. Louis renaissance in its theaters, galleries, and festivals. The St. Louis Symphony, among the finest in the nation, performs at historic Powell Hall. Symphony members bring their skills to the community through teaching and chamber concerts as well. Several hold appointments in the Washington University music department, which also has close ties with the St. Louis Conservatory and Schools for the Arts (CASA), an institution offering high-level, intense training in music and the arts. In the downtown area, the rich St. Louis traditions in jazz, blues, and ragtime music are continued in a number of lounges and clubs.

Broadway comes to St. Louis at the Fox Theatre, a \$2 million renovation of a 1929 example of exotic cinema temple art. Galleries sprinkled throughout the area bring the most current in visual arts to St. Louis, while antique shops remind us of the past. St. Louisans tend to be avid moviegoers. Supplementing the standard movie fare available throughout the metropolitan area are two theaters close to campus, the Hi-Pointe and the Tivoli, both offering excellent foreign films.

When the St. Louis city art museum was built for the 1904 World's Fair, much of the Washington University collection was housed in it. Standing on a hill in Forest Park, the museum was called the jewel of the Fair. By 1929, it exhibited the entire University art collection and provided space for fine arts students and faculty shows.

Though in 1960 Washington University built its own museum—the Gallery of Art housed in Steinberg Hall—and moved its collection there, ties with the St. Louis Art Museum remain very close. Students in art and in business intern at the Art Museum working in arts management and gallery organization. St. Louis also features one of the world's few sculpture gardens, Laumeier International Sculpture Park. The park has 60 large-scale sculptures representing artists of international renown. St. Louis has two major historical museums as well: the Missouri Historical Society in Forest Park and the Museum of Westward Expansion under the Gateway Arch.

Recreation

For recreation, St. Louisans may use any of 93 parks that dot the metropolitan area. In Forest Park, which lies between the two Washington University campuses, are the Art Museum, The Muny (an outdoor theater), the famed St. Louis Zoo, municipal golf courses, tennis and handball courts, a skating rink, and acres of paths, picnic areas, gardens, and wooded groves. Tower Grove Park is in south St. Louis, and adjoining it is the Missouri Botanical Garden, world famous for its research, collections, and facilities. The Garden's professional staff hold positions on the Washington University faculty and make the extensive research facilities available to students.

Celebrating its 20th year in 1995, the Opera Theatre of St. Louis has been enormously successful, nationally and internationally, bringing English-language versions of the classics and presentation of contemporary operas to the stage. The Repertory Theatre of St. Louis has an extensive annual season, which includes experimental works and traditional dramas. The Theatre Project Company, City Players of St. Louis, and the Black Repertory Theatre enrich the dramatic offerings available in the immediate area. Right on campus, Edison Theatre offers the very highest quality in national and international programs in theater, dance, and music each season.

Farther afield, St. Louis residents find outdoor adventure in the countryside beyond the city. In the Ozark Mountains, on the rivers of Missouri, on the lakes of neighboring Illinois, variety abounds. Camping, hiking, floating, rock climbing, and caving are among the many possibilities within a few hours' drive of St. Louis. For sailors, there is Carlyle Lake in Illinois. And for those with rod and reel, the Missouri streams are made-to-order.

The Washington University Athletic Complex provides outstanding resources to athletes at every level of ability. Open to all members of the University community, it includes an eight-lane, 25-meter stretch pool, two complete gymnasiums, weight rooms, racquetball courts, a complete outdoor tennis complex, and a track complex. Built on the site of the 1904 Olympic games, this state-of-the-art facility offers recreational opportunities year-round for students, faculty, and staff.

For the spectator, St. Louis is a splendid sports town. For over a century, it has hosted one of the oldest traditions in baseball—the St. Louis Cardinals. Dizzy Dean and the Gas House Gang, Lou Brock, Ozzie Smith, and Stan Musial are all part of Cardinal history.

The ice hockey book in St. Louis began when the Blues moved here in 1967. They have a winning history and play 40 games per year in their brand new home, the Kiel Center, a state-of-the-art indoor sports arena and entertainment facility. The Kiel Center hosts a number of other sports teams as well, including the Ambush, an indoor soccer squad; the Vipers, St. Louis' in-line skate hockey team, and the St. Louis Stampede, the local arena football team. St. Louis will welcome the NFL Rams to town in the fall of 1995, bringing professional football back to the city. The Rams will finish the 1995-96 season in the newly built domed stadium in downtown St. Louis.

Employment

St. Louis is a great place to work—job opportunities are varied and abundant, many companies are distinguished for their excellent working conditions, and commuting is easier than in many large cities.

Since the 1960s, the St. Louis area has enjoyed the presence of corporate headquarters and offices. Fifteen of the Forbes 500 companies have headquarters in the St. Louis area; approximately 300 Fortune 500 firms have an office, and 10 of the Fortune 500 are headquartered here. In addition, major insurance, retail, transportation, and banking organizations are in St. Louis. Among the top firms in town are Anheuser-Busch, The Brown Group, McDonnell Douglas, Monsanto, Pet, and Ralston Purina—all founded in St. Louis. Because of the corporate headquarters in St. Louis, many support services have grown around them—law, accounting, data processing, advertising, public relations, and design firms, as well as photographic and audio visual studios.

One of the largest employers is the Washington University Medical Center—composed of the School of Medicine and several teaching hospitals. Illustrative of the productive ties between university and community, the Monsanto Company supports molecular biology research at the School of Medicine and has contracted with Washington University for biomedical research.

The John M. Olin School of Business at Washington University enjoys a special relationship with the business community. As a laboratory for student study, internship opportunities, practicums through the Management Center, and permanent employment of business graduates, St. Louis plays an integral role in the education of undergraduate and graduate business students. Faculty and student consultants work with corporations to explore new opportunities for growth and development of their firms. The local business and professional communities have also been very supportive of a new graduate internship program making part-time jobs available to advanced graduate students in the humanities and social sciences divisions of the Graduate School of Arts and Sciences.

Similarly, the School of Law has close ties with the St. Louis legal community and, through its clinical program, offers internships in private and local government offices and in state and federal courts. In addition, the law school is fortunate in the active and interested role of the local bar associations in the development of the school's special programs.

The George Warren Brown School of Social Work is also linked in many ways to the St. Louis social work community. Students find practicum assignments throughout the area, and both students and faculty do research and consult with local agencies.

A strong partnership exists between technologically based businesses and industries in St. Louis and the School of Engineering and Applied Science. Engineering faculty members regularly undertake collaborative research and consulting projects with firms such as McDonnell Douglas, Monsanto, and Emerson. The cooperative education program gives undergraduate engineering students an opportunity to apply what they learn in the classroom in alternating periods of employment, both in St. Louis and nationwide. Through the engineering school's continuing education division that reaches out to St. Louis' technical community, area residents can pursue an engineering education outside of regular working hours. A new program, offered in conjunction with the University of Missouri-St. Louis, is designed specifically for nontraditional engineering students from St. Louis.

In addition to their ties to local business, both the Hilltop Campus and the School of Medicine at Washington University are dedicated to the support of K-12 education. Students from the medical school participate in a variety of outreach programs, including STATS, Students Teaching AIDS to Stu-

dents, designed to teach awareness and responsible behavior to junior high school students; the Young Scientist Program, an interactive learning experience that brings high school students to the Medical Center, and health and preventive programs on drug and sex education.

In short, Washington University enjoys a special relationship with St. Louis.

STUDENT LIFE

Fourth Year Class Officers

President

Scott Gilbert

CME Representative

Alison Wakoff

Social Chairman

Andrea Blum

Third Year Class Officers

President

Todd Vedder

CME Representative

Anjala Vaishampayan

Social Chairmen

Christine Ferrone

Clint Merrick

Lisa Oldham

Second Year Class Officers

President

Amy Sullivan

CME Representative

Joseph Erinjeri

Social Chairman

Dawn Eback

Constitution and Bylaws of the Washington University School of Medicine Medical Student Government

Article I:

Name, Purpose, and Membership

- A. The name of this organization shall be the Medical Student Government of The Washington University School of Medicine.

- B. The purpose of the Medical Student Government shall be the advancement of student interests and welfare to achieve excellence in academic pursuits and professional interactions.
- C. The Medical Student Government shall represent all students pursuing a medical degree who are in good standing with the University.

Article II:

Class Officers

- A. Offices: Each Class shall elect the following officers: President, Representative to the Committee on Medical Education (CME Rep), Representative to the Organization of Student Representatives (OSR Rep) of the Association of American Medical Colleges (AAMC), and a Social Chair/Committee.
- B. Duties: Each class officer shall have specific responsibilities:
 1. President: Each class shall elect one President. This person shall serve as the official spokesperson for the class in dealings with the Student Government and with the University. The President shall disseminate information regarding medical student affairs and activities. The President shall have oversight and approve of all moneys spent by the Social Chair/Committee. The President shall perform any and all duties that are unique to the class represented.
 2. CME Rep: The CME Rep shall represent the class at all meetings of the CME and Curriculum Evaluation Committee and serve as a liaison between students and faculty on curricular matters. The CME Rep shall poll the class as needed regarding course evaluations, and selection of recipients for the various Faculty Awards presented each year.
 3. OSR Rep: The OSR Rep shall keep class members up to date with news from the OSR and from the AAMC. The OSR Rep shall represent the University at regional and national meetings of the OSR under an agreement with the University.
 4. Social Chair/Committee: The Social Chair/Committee shall organize social functions for class members and interact with other Social Chairs/Committees to organize social functions with other classes and within the University community. The Social Chair/Committee shall consult and obtain approval from the class President for all moneys spent on such functions.
- C. Elections: An Election Official designated by the Student Government shall be responsible for the organization and execution of all elections held for offices specified under this Constitution. Elections shall be held for each of the class officer positions according to the following format:

1. Nominations: Nominations for each office shall be held at least one week prior to the election. Nominations shall be submitted in writing to the Election Official. Any student within the class may nominate him/herself or another class member who agrees to run.
 2. Elections and Terms: All terms shall begin upon election. Regular elections shall be held according to the following schedule:
 - a. First Year: Elections shall be held within two weeks after the completion of the sixth week of first semester classes. Each position carries a term of one academic year.
 - b. Second Year: Elections shall be held within eight weeks prior to the completion of the first academic year. Each position carries a term of one academic year.
 - c. Third and Fourth Year: Elections shall be held within eight weeks prior to the completion of the second academic year. Each position carries a term of two academic years.
 3. Balloting: To be elected a candidate must receive a simple majority of a quorum of one-half of the class members. Write-in candidates shall be allowed on all ballots. Proxy ballots shall be allowed only if they are given in writing to the Election Official. Ballot counting shall be the responsibility of the Election Official with a witness agreeable to all candidates.
 4. Runoff Procedures: If no candidate receives a simple majority for a particular position, a runoff between the top two candidates shall be held within three days of the initial election.
 5. Vacant Offices: If any office is vacated before its set term, an election for that office shall be held within three weeks of the vacancy. All students of a given group shall be eligible to run for the vacated office. If a current class officer runs for the vacated post, that officer must vacate the post he/she occupies.
 - D. M.D./Ph.D. Research Students: There shall be a Representative of the M.D./Ph.D. Students who are outside the core medical curriculum. This Representative shall have the same duties and responsibilities as a Class President and CME Rep and shall be elected by the M.D./Ph.D. Students who are in the Ph.D. phase of their training. The election shall be held within eight weeks of the finish of the University's academic calendar under the conditions of Article II, Section C. The term shall be one year.
- Representative to the Organization of Student Representatives of the Association of American Medical Colleges. In addition, the Student Government may offer a non-voting position to a duly elected representative of any student group which is recognized nationally, regionally, or within the Medical School so long as such a group is open to all medical students without discrimination and that such a group is not in conflict with the goals of the Student Government.
- B. Purpose and Responsibilities: The Student Government shall carry out the business of the Student Government pursuant to the goals stated in Article I. The purpose of the Student government shall be to represent and promote the interests and concerns of the medical student body through activities including but not limited to:
1. Forming and representing official student body opinions for interaction with the University, its Administration, and other groups associated with medical education.
 2. Serving as a forum for interaction between student groups.
 3. Serving as a forum for student-initiated curricular review and reform in the pursuit of academic excellence.
 4. Promoting interaction among the Medical School students, faculty and administration, and with the wider University community.
 5. Establishing a funding mechanism and budget with the associated collection and disbursements of funds for activities pursuant to goals stated in Article I.
 6. Organizing elections for class officers and any other official representative of the student body at large.
 7. Exercising any such additional authority as may be granted to it by the Medical School or by other organizations, so long as such authority is consistent with the purposes stated in Article I.
 8. Posting minutes of all meetings for public reference. Minutes shall be approved by a simple majority within one week of a given meeting.
 9. Formulating all rules and bylaws necessary for the Student Government to carry out the responsibilities and powers granted through this constitution. Such rules and bylaws shall require a simple majority of a quorum of two-thirds of the voting Student Government members.
 10. Each member of the Student Government shall take on a Student Government approved project or program to the completed during the term of his/her office.
 11. Upon completion of the academic year, each member of the Student Government shall prepare a typed summary brief of the activities undertaken during their term. The brief shall

Article III:

The Medical Student Government

- A. Membership: The Student Government shall consist of the President and the Representative to the Committee on Medical Education from each of the four classes, the Representative of M.D./Ph.D. Students, and the University's Official

include detailed descriptions of all activities for permanent record. Descriptions shall be as specific as possible and include names, dates, prices, telephone numbers, and other pertinent information as appropriate.

12. The Student Government shall meet regularly and at intervals of no more than six weeks.
13. The CME Reps shall keep the Student Government informed of all activities associated with their posts in the form of a written brief to be presented at the Student Government meeting immediately following a given meeting of the CME. The responsibility for the brief can be distributed among the CME Reps at their discretion.
14. Representatives from the various student groups sitting on the Student Government shall keep the Student Government informed of all activities associated with their posts in the form of a written brief to be presented at the Student government meeting as appropriate for their group's activities.

C. Student Government Offices: There shall be a Student Government Chair and Vice-Chair elected from the voting members of the Student Government. Election shall require a simple majority of the voting Student Government. The election shall be held within six weeks prior to the completion of the academic year. The terms of these offices shall be one academic year.

1. Student Government Chair: The Student Government Chair shall preside at all meetings of the Student Government and have specific responsibilities:
 - a. The Chair shall serve as official representative and spokesperson for the Student Government to the University, its Administration, and to other groups associated with medical education.
 - b. The Chair shall be responsible to ensure the duties of the Student Government are carried out efficiently and in a timely manner.
 - c. The Chair shall report the names of the Class Officers to the Dean, and post such a list for public reference.
 - d. The Chair shall be responsible for overseeing and maintaining records and to set the agenda for such meetings in written form for distribution to Student Government members prior to each meeting.
 - e. The Chair shall be responsible for overseeing and maintaining records of all financial transactions of the Student Government. The Chair shall regularly update the Student Government on its financial standing, and must make all financial records available to any medical student, member of the Administration, or to any official of the University. All transactions shall require the signatures of the Chair and the Vice-Chair.

f. The Chair shall be empowered to call for and appoint standing and ad-hoc committees to evaluate and make recommendations about specific areas of concern to the Student Government, the Medical School and its students.

g. The Chair shall be empowered to designate another Student Government member to take on one or more of his/her duties.

Article IV:

Ratification

A. This Constitution shall be ratified by a two-thirds majority of a quorum of one-half of the student body pursuing a medical degree. A ratification vote shall be held within two weeks of distribution of this Constitution. The President of each class, and the Representative of the MD/Ph.D. students outside of the core medical curriculum shall be responsible for the balloting within the group represented by their post. Having fulfilled the criteria under Article VII for Ratification, this Constitution shall take effect on June 1, 1993.

Housing

Those who come to St. Louis to be associated with Washington University School of Medicine find apartments which range in price from \$400-\$650 per month, all in the immediate area. The Apartment and Housing Referral Services, located in Millbrook Square on the Hilltop Campus, maintains listings of housing appropriate for married and single students. For information, contact Apartment and Referral Services, 6926 Millbrook Blvd., Box 1059, St. Louis, Missouri 63130 (Telephone: (314) 935-5092).

The Spencer T. Olin Residence Hall (Telephone: (314) 362-3230), located at 4550 Scott Avenue in the Medical Center, has accommodations for approximately 200 single men and women. Shared cooking facilities are available. The building was made possible by generous gifts from Spencer T. Olin, alumni and friends of the School of Medicine. Olin Hall is planned for the convenience of students in the medical or paramedical sciences. Every effort is made to provide an atmosphere that not only aids them in meeting their study obligations, but also recognizes their privileges as graduate students.

The rates for rooms during 1995-96 are:

School Year: Late August-May (Nine Months)

Two-room suite	\$3,307
Single room	\$2,490
Double room	\$1,680
Large single	\$2,985

Summer 1995 for Three Months

Two-room suite	\$988
Single room	\$722
Double room	\$495
Large single	\$890

Summer 1995: Weekly Rates for Student Visitor

Two-room suite	\$92
Single room	\$83
Double room	\$74

Daily Rates for Visitors

Two-room suite (furnished)	\$40
Single room	\$31
Single room (prospective student)	\$28

Parking

Parking is available on surface lots and garages owned and operated by the School of Medicine. The surface lots are located near Olin Hall and various other sites within the Medical Center. Although space is limited with regard to surface parking, parking is generally available in the new 1500 space employee/student garage located at the corner of Clayton and Taylor.

Check Cashing

Personal checks may be cashed at the Cashier's Office (Room 107, first floor McDonnell Sciences Building). Hours 9:00 a.m. to 4:00 p.m., Monday through Friday. Limit for personal checks is \$100 per check or a total of \$100 per day. Your Washington University identification card must be presented when checks are cashed. A charge of 25 cents per check is made for this service.

Bulletin Boards

Bulletin boards are located on the wall outside the Admissions Office, on the first floor of the McDonnell Sciences Building, on the second floor of McDonnell and on the first floor of the Olin Residence Hall. Please check these frequently.

Lockers

Student lockers with combination padlocks are located on the second floor, McDonnell Sciences Building. Locker assignments are made by the Registrar's Office for a \$5 fee.

Mail

First class student mail sent to the School of Medicine may be picked up in the mailroom, first floor, McDonnell Building, just north of the elevators. This will most probably serve as a temporary mailing address and be used only until you are settled in St. Louis. It is important that your mail sent to the School of Medicine have information that you are a medical student when this arrangement is to be used:

Jane Doe Medical Student

Washington University School of Medicine

660 S. Euclid Ave. St. Louis, MO 63110

Please call for this mail between the hours of 10:00 a.m. and 4:00 p.m.

Student Health Service

The Student Health Service is located on the third floor of the Old Children's Hospital Annex, room 390. Office hours are 8 a.m. to 4 p.m., Monday through Friday. Telephone numbers:

Information/Appointments	362-3523
Nursing Staff	362-3524
Billing	362-2346

Entering students are required to have a medical examination prior to matriculation, and to show proof of immunity to measles (rubeola), rubella and mumps. Subsequent medical care is provided as long as enrollment is maintained in the School of Medicine.

Physicians at the Student Health Service provide preventive healthcare and care for urgent illness. Emergency care is available at Barnes and Jewish hospitals emergency departments.

Essential costs of hospitalization are covered up to a maximum of \$1 million for any one injury or illness. The student or his/her family is responsible for meeting the costs of hospital care in excess of those paid by the Health Service.

There are no benefits for outpatient care away from the medical center. The responsibility of the Student Health Service for hospitalization and emergency care will end 30 days after an individual ceases to be an officially enrolled student.

Students may purchase coverage for dependents. Details of this plan are available at the Student Health Service.

Counseling Services

Students within the Medical Center may have concerns over poor concentration, ineffective study habits, anxiety over their performance, low self-esteem, getting along with others, grief or depression. The psychiatry and clinical psychology staff members are available to help students cope with these concerns. Initial evaluations are made at the Medical Campus Health Service. Subsequent care may be at the medical campus, a designated physician's office, or at the Hilltop Health Service in Umrath Hall on the Main Campus. Call 362-3523 for more information. All records are confidential and may not be seen by anyone without the student's written consent.

Disability Insurance

All students are covered by group disability insurance. A student who is completely disabled for six consecutive months is eligible to receive \$500 per month benefit. Coverage increases to \$1,300 per month in the third year. Individual disability policies are issued to fourth year students, increasing the monthly benefit to \$2,000. Individual policies are

portable, guaranteed issue, and can be increased after graduation up to a maximum \$4,700 per month benefit. Call 726-2220 for more information.

Life Insurance

All students are covered by \$10,000 life insurance benefit. Call 362-2346 for more information.

Washington University Medical Campus Policy on HIV and HBV Infection

In 1992, the Executive Faculty of the Medical School formally adopted a medical campus policy on Human Immunodeficiency Virus (HIV) and Hepatitis B virus (HBV) infections. The purpose of the policy is to provide guidelines to prevent or reduce the transmission of these infectious agents between patients and healthcare workers.

The policy deals with (1) the University's responsibilities to infected patients (including obligation to treat, confidentiality, and appropriate serologic testing) (2) appropriate health and safety precautions and procedures for faculty, students and staff (including compliance with CDC guidelines, blood and body fluid precautions and handling of needles or sharp instruments and (3) the University's responsibilities to faculty, staff or students who are infected with HIV or HBV infection (including admission to medical school, participation in clinical rotations, serologic testing confidentiality, and medical treatment).

The policy makes a distinction between class I activities (those involving no risk of transmission from infected healthcare workers to patients, such as routine physical examinations, dressing changes, intravenous line placement) and class II activities (those that involve the potential for transmission of HIV or HBV from infected healthcare workers to patients, such as invasive surgical procedures in which trauma to a healthcare worker is possible).

This policy is comprehensive, and a complete copy is available to any interested student through the Office for Student Affairs.

Dress Code

While the Washington University School of Medicine does not have a written dress code, it is expected that all students will dress in attire that is appropriate for a professional.

Appropriate attire in the clinical setting is especially important, not only because the student will be part of the team representing the medical profession to patients, but also because the student will be representing the School of Medicine.

Appropriate attire for male students on the clinical services includes man-tailored shirt and tie, trousers or slacks and closed toe shoes. Appropriate attire for female students includes a dress, a blouse, tailored shirt or sweater, and slacks or skirt. Both men and women should wear a short white jacket with the appropriate hospital identification card clearly visible.

Medical School Jazz Ensemble

The "Hot Docs," now in its 14th year of existence, is a fully instrumented big band jazz ensemble. The 20-member group, composed predominantly of Washington University medical students, residents, and attending physicians, rehearses weekly and performs at concerts and dances throughout the year. The band's large repertoire spans several musical generations, with the music of Miller, Dorsey, Basie, and Gillespie as well as present day jazz and pop composers represented.

The "Hot Docs" provide one of several ways students can continue to pursue longtime special interests in addition to their medical education.

Organized Medicine

Students at Washington University School of Medicine are active participants in medical student organizations on the local, state and national levels. The American Medical Student Association (AMSA), the Student National Medical Association (SNMA), the American Medical Women's Association (AMWA), the Medical Student Section of the American Medical Association (AMA), the Missouri State Medical Association (MSMA), and the Organization of Student Representatives (OSR) in the Association of American Medical Colleges (AAMC), provide forums for addressing the educational, social and political concerns of medical students. The School of Medicine supports student participation in these national organizations and provides on an annual basis funds for travel and other expenses.

AMSA

On the local level, AMSA is the major student organization at the School of Medicine. The chapter's annual activities include a speaker series and several community service projects. In recent years, the service projects have included an ongoing blood pressure screening program done in conjunction with the American Heart Association.

Community Service Experience

Participation in a host of community service projects nurtures the students' altruistic nature and provides an alternative educational experience. University-sponsored, student-run community-based service activities include the Perinatal Project which provides information concerning well-baby care and prenatal care to women from lower socioeconomic groups, and the Drug Education Project which educates inner city youngsters concerning the effects of drug and alcohol abuse. One of the newer programs is the Reproductive Health Project which provides sex education to middle school students. The Students Teaching Aids to Students (STATS) Program allows trained medical students to provide sixth and seventh graders with information about AIDS. The combined efforts of medical students, faculty, middle school teachers, parents, and speakers with AIDS have made

STATS a very successful program. The Commotion project serves as a clearinghouse for students to participate in a series of St. Louis city's outreach programs. Through this project, students have worked in a soup kitchen and shelters for the homeless, supervised a women's center and organized a holiday gift drive for homeless families.

AMA-MSS

Washington University has an active chapter of the American Medical Association Medical Student Section. WUMS students are involved at the local, state and national levels and represent Washington University in policy development. In addition, student members of the AMA are active in a "dinner with a doctor" program, and community oriented activities such as Organ Donor Awareness.

SNMA

The Student National Medical Association (SNMA) is the oldest and largest medical student organization focused around the needs and concerns of black, Latino and Native American medical students. This organization is concerned with providing services to medically underserved communities, promoting minority student recruitment and retention to schools which train health personnel and assisting in ways to provide quality education to minorities and women. Washington University has an active SNMA chapter and funds are available for representation at regional and national meetings as well as for community service activities.

AMWA

The American Medical Women's Association is a national organization designed to address issues of concern to women in medicine. Washington University has an active student group and funding is available for student representation at regional and national meetings.

Academic Societies

To foster communication between students and faculty, three academic societies—The Joseph Erlanger and Evarts Graham Society, The Carl and Gerty Cori Society, and the Oliver Lowry and Carl Moore Society—meet independently throughout the academic year to enjoy a social hour, dinner, and conversation stimulated by an after-dinner speaker. The Societies promote a collegial environment for the medical school's diverse faculty and student body.

Program for Women in Science and Medicine

The Program for Women in Science and Medicine is designed to foster interaction among women at all levels at the medical school. The program sponsors a variety of informal discussions, receptions, and dinners with informative speakers throughout the academic year.

Washington University Medical Center Housestaff Auxiliary (WUMCHA)

WUMCHA is an organization comprised of female residents and female spouses of those affiliated with Washington University Medical Center, including Jewish, Children's and Barnes hospitals, the Medical School and Mallinckrodt Institute of Radiology. The purpose of the organization is to provide friendship and social support among the members. In addition to sponsoring numerous recreational and educational activities, WUMCHA publishes a "Guide to St. Louis" as well as a directory of members. Annual dues are \$15.00 and information about membership and applications can be obtained by writing to WUMCHA, c/o Annette Yundt, Treasurer, 7484 Wise Avenue, St. Louis, MO 63117.

Intramural Program

Students enrolled in the Washington University School of Medicine enjoy an active and diverse Intramural (IM) Program. The IM Program offers students the opportunity to participate in a wide range of sports. Utilizing the state-of-the-art facilities in the University's Athletic Complex, medical students pursue personal athletic interests and enjoy interaction with students enrolled in both undergraduate and graduate degree programs. The IM Program provides an excellent opportunity to socialize with colleagues as well as other graduate students. Differences in curricular demands among participants are considered in scheduling games so that neither academic nor athletic goals are compromised.

Traditionally, the School of Medicine is represented each year by teams or individuals in over 10 intramural sports. In recent years, medical student teams competed in men's and women's flag football, soccer, volleyball, cross country, basketball, swimming, softball and track and field as well as coed ultimate frisbee, volleyball, inner tube water polo and softball. In addition, there are different levels of competition so that the needs of both the competitive and recreational athlete can be met.

The School has always made a strong showing in both the mixed and graduate school division, as evidenced by the many championship T-shirts team members sport.

Transcript Service

The transcript service is run individually by the first and second year classes. It is a self-funded program in which written transcripts are produced for each lecture during the school year. Students alternate various duties, including tape recording, transcribing, copying and distributing the transcripts. It is a cooperative effort involving interested students (almost all students join) for a relatively modest fee, and is widely viewed as a valuable endeavor.

Student Research Fellowships

No matter what medical career is chosen, it will be essential for the student to evaluate and use fresh knowledge throughout his or her professional life. Student Research Fellowships in basic science or clinical areas, awarded each year to selected students who undertake research projects under the direction of faculty members, are an important part of the educational program. Research allows students to discover firsthand the problems and rewards of obtaining and assessing new information, thus adding another dimension to their experience as investigators. Selected School of Medicine faculty members serve as advisors to students interested in special research opportunities.

Fellowships are available to students after acceptance into the School. Students with academic encumbrances are not eligible. All research must be carried out at the School of Medicine. They carry a stipend for a two-month program. Application should be made to Student Research Fellowships, Drs. C. Rovainen and E. Li, Box 8228.

Alpha Omega Alpha (AOA)

Alpha Omega Alpha is a national medical honor society. Members are selected by a standing AOA committee during the final year of medical school. Selection is based upon academic performance during the first three years, in addition to other qualities such as leadership. Approximately one-sixth of the class is elected to AOA.

Students elected to AOA are honored at an awards dinner during the final year, and also at a special AOA lecture given by a speaker elected by the AOA inductees.

Awards and Prizes

Washington University School of Medicine publicly recognizes and rewards at two annual events outstanding scholarship, research accomplishments and community service of individual students. In December, the Student Awards Luncheon acknowledges academic excellence earned during the first three years of study. As part of the festive commencement activities in May, graduates are recognized for meritorious research and clinical achievements accomplished during their medical school careers.

The Academic Women's Network Leadership Award. Presented to a woman in the graduating class who has demonstrated outstanding leadership in service to or advancement of women in the community. The 1994 recipient: Victoria Fite Akins.

Morris Alex, M.D. Prize. Awarded each year to that medical student who is outstanding among his or her peers in the second-year course, Introduction to Clinical Medicine. The 1995 recipient: Penelope Ann Ewbank.

Alpha Omega Alpha Book Prize. Awarded at the end of the fourth year to a member of the graduating

class who has performed outstandingly for the entire medical course. The 1995 recipient: Krista Marie Johnson.

American College of Physicians Anne C. Goldberg Book Award. Presented annually to a member of the graduating class committed to a career in internal medicine in recognition of highest achievement in the field of internal medicine. The 1995 recipient: Krista Marie Johnson.

American College of Physicians Award for Excellence in Physical Diagnosis. Two recipients are selected annually based on their outstanding performance in the second year Clinical Medicine course. The 1995 recipients: Heather Joy Burgin and Penelope Ann Ewbank.

American College of Physicians Clerksships Award. Established in 1992 to be awarded to a student completing the third year of study with meritorious achievement in the internal medicine clinical clerkships. The 1995 recipient: Lisa Erlanger.

American Heart Association Research Fellowship Award. Given for outstanding performance in the American Heart Association Medical Student Research Fellowship Program. The 1995 recipient: Michael George Jakoby IV.

American Medical Women's Association Janet M. Glasgow Memorial Achievement Citations. Presented to women medical students graduating in the top 10 percent of their class. The 1995 recipients: Carol Frances Ellman, Lisa Erlanger, Krista Marie Johnson, Nancy Elizabeth MacDonald, Brenda Elaine Porter, Ann Elizabeth Starr, and Martha Sue Terry.

American Medical Women's Association Janet M. Glasgow Memorial Award. Presented to a woman who graduates first in her class.

Alexander Berg Prize. Awarded to the student presenting the best results in research in molecular microbiology. The 1995 recipient: Robert Todd Striker.

Jacques J. Bronfenbrenner Prize. Provided by Dr. Bronfenbrenner's students in memory of his inspiration as a teacher and scientist, and awarded to the member of the graduating class who, in the judgment of the Chairman of the Department of Medicine, has done the most outstanding work in infectious diseases or related fields. The 1995 recipients: Krista Marie Johnson and Jonathan David Primack.

Dr. Richard Brookings and Robert Carter Medical School Prizes. Provided for medical students through a bequest of Robert S. Brookings. The 1995 Dr. Richard S. Brookings recipients: Joshua Morrey Cooper, Amy Beth Heimberger, Michael Naylor, and Amy Rebecca Zarrin; the 1995 Robert Carter recipients: Amy Elizabeth Bane, Rosalia Chipelo Fonseca, and Michael George Jakoby IV (third and fourth year).

Dr. Harvey Butcher Prize in General Surgery. Awarded annually, in memory of Dr. Harvey Butcher, to the member of the graduating class who, in the opinion of the Department of Surgery, shows the greatest promise for general surgery. The 1995 recipient: David Andrew Oliak.

Kebar S. Chouke Prize. Awarded at the end of the first year to a medical student who has demonstrated superior scholarship in anatomy. The 1995 recipient: Ari Scott Brunschwig.

Ciba-Geigy Award for Outstanding Community Service. Recognizes a second year student who has performed laudable extracurricular activity within the community. The 1995 recipient: C. Todd Vedder.

Carl F. and Gerty T. Cori Prize in Biochemistry. Awarded at the end of the first year to the member of the class who has demonstrated superior scholarship in biochemistry. The 1995 recipient: Amy Rebecca Zarrin.

Edmund V. Cowdry Prize in Histology. Established in 1969 to honor Dr. Cowdry; awarded to a medical student in the First Year Class who has performed meritoriously in microscopic anatomy. The 1995 recipient: Amy Rebecca Zarrin.

Antoinette Frances Dames Prize in Cell Biology and Physiology. Awarded annually to a member of the First Year Class who has demonstrated superior scholarship in these fields. The 1995 recipients: Henry Ou, Aaron Shiels and Samuel Shishman.

Cecil M. DeGutis Memorial Prize in Bioorganic Chemistry. Annual prize awarded to a student in Bioorganic Chemistry who is within one year of completing a doctorate.

Elisabeth L. Demonchaux Prize in Pediatrics. Established in 1985, the prize is awarded annually to a graduating student who has done outstanding work in pediatrics. The 1995 recipient: Nancy Elizabeth MacDonald.

Steven Dresler Prize. Awarded to a graduating student who has demonstrated a commitment to promoting social good, civil rights and civil liberties through social action and volunteerism. The 1995 recipient: Lisa Erlanger.

William Ellis Vision Research Award. Established in 1990 by Dr. Ellis and awarded to a senior student in recognition of meritorious research in ophthalmology. The 1994 recipient: Ivan Tarle; the 1995 recipient: Jonathan Edmund Silbert.

The Lee C. Falke, Jr. Memorial Prize in Biophysics and Biomedical Engineering. Awarded to celebrate the memory of an extraordinary graduate student in biophysics and biomedical engineering. To be given to a graduate student or MSTP student who has demonstrated outstanding ability in biophysical research and/or design of instrumentation for use in biophysical research. The 1995 recipient: Patrick Jay.

Family Health Foundation of Missouri Scholarship Award. A plaque and check are awarded to the top graduating medical student entering the specialty of Family Practice. The 1995 recipient: Martha Sue Terry.

George F. Gill Prizes. One prize awarded at the end of the first year to a member of the class who has demonstrated superior scholarship in anatomy; one prize awarded to a member of the graduating class who has demonstrated superior scholarship in pediatrics. The 1995 recipients: Amy Elizabeth Bane and Charles W.M. Roberts.

Alfred Goldman Book Prize. Created in 1972 as an annual award to be given to a student in the School of Medicine who, in the opinion of the faculty, has done outstanding clinical work or research in diseases of the chest or pulmonary physiology. The 1995 recipient: Todd Ken Horiuchi.

Max and Evelyn Grand Prize. Established in 1985 by Dr. M. Gilbert Grand, the prize is awarded annually to a medical student in the Fourth Year Class for excellence in ophthalmic research or clinical ophthalmology. The 1995 recipient: Mike Chunguck Kim.

R. R. Hannas Award for Exceptional Performance in Emergency Medicine. Offered annually by the Missouri Chapter of the American College of Emergency Physicians. The 1995 recipient: Richard Frank Mickevicius.

Dr. J. E. Kirk Scholastic Award. Established in 1975 and awarded to a graduating student of high scholastic standing. The 1995 recipient: William Lee Lyons.

Louis and Dorothy Kovitz Senior Prize in Surgery. Senior award prize in surgery recognizing a member of the Fourth Year Class who has shown the most outstanding ability, zeal, and interest in surgical problems. The 1995 recipient: Ann Elizabeth Starr.

Lange Medical Publications Student Awards. Given to one graduating senior and one undergraduate for high scholastic standing. The 1995 recipients: Robert Arlo Bane and Martha Sue Terry.

I. Wallace Leibner, M.D. Award. Established in 1988 in memory of Dr. Leibner, the award is given to the member of the graduating class who has demonstrated outstanding ability in the clinical practice of medicine. The 1995 recipient: Michael George Jakoby IV.

Irwin Levy Memorial Fund. Established in 1980 by friends of Dr. Levy as a tribute to his commitment to clinical teaching. Provides a prize for the student who presents the best performance in the neurology and neurological surgery clerkship. The 1995 recipient: Howard Parker Goodkin.

Oliver H. Lowry Prize. Awarded to a second-year medical student for academic excellence in pharmacology. The 1995 recipient: Robert Lindsay Young.

Howard A. McCordock Book Prize. Awarded at the end of the second year to a member of that class for general excellence in pathology. The 1995 recipient: Robert Arlo Bane.

McGraw-Hill Book Prize. Awarded annually to a medical student for outstanding achievement in the first-year curriculum. The 1995 recipients: Amy Rebecca Zarrin and Amy Ellis Bane.

Edward Massie Prize for Excellence in Cardiology. Awarded to the member of the graduating class who, in the judgment of the Director of the Division of Cardiovascular Disease of the Department of Medicine, has done the most outstanding clinical or basic research work in the field of cardiovascular disease. The 1995 recipient: Michael John Kraujalis.

Medical Center Alumni Scholarship Prize. Given annually to a student who has shown excellence in his or her work during the preceding year. The 1995 recipient: Martha Sue Terry.

Medical Fund Society Prizes. One prize awarded annually to a student of the Fourth Year Class who has excelled in the study of internal medicine; one prize awarded annually to a student of the senior class who has excelled in the study of surgery. No individual is eligible for both prizes. The 1995 recipients: Steven Lynn St. Peter and Krista Marie Johnson.

Merck Manual Awards. Given annually to three graduating medical students for scholastic achievement in medical studies. The 1995 recipients: David Alan Hunstad, Brian Eric Lawner, and Soham Roy.

Minority Medical Students Scholarship Prize. Provided by black alumni and friends of Washington University School of Medicine, the prizes are awarded to Minority Scholarship recipients in recognition of their achievements in the first-year curriculum. The 1995 recipients: Alison Medearie Barnes and Natasha Leacock.

Missouri State Medical Association Award. Presented annually to an honor graduate of the senior class. The 1995 recipients: Gregory Dean Foltz, Lawrence Steven Kaskowitz, and Christopher Michael Palmer.

The Needleman Award. Established by his family in 1989, in honor of Dr. Needleman, Chairman of the Department of Pharmacology, 1976-1989. This annual award is given to a member of the graduating class for outstanding research in pharmacology. The 1995 recipients: Brian William Dubois and Donald Russell Johnson.

James L. O'Leary Neuroscience Prize. Awarded annually to students who demonstrate the best accomplishments in the neuroscience course. The 1995 recipients: Amy Elizabeth Bane.

James L. O'Leary Prize for Research in Neuroscience. Given annually to a predoctoral or postdoctoral student for the most original and important accomplishment in neuroscience research.

Dr. Philip Rosenblatt Award. Given to a third year medical student for distinguished performance during an elective in pathology or laboratory medicine. The 1995 recipient: Rennae Suzette Lattiboudere.

St. Louis Pediatric Society Senior Prize. Presented to the senior student showing the greatest promise in clinical pediatrics. The 1995 recipient: Justin Charles Alvey.

John R. Smith Memorial Fund Prize. Created in 1982 to be awarded annually to a medical student who has done meritorious clinical and/or research work in the Division of Cardiovascular Disease of the Department of Medicine. The 1995 recipient: Lance Elliot Jackson.

Margaret G. Smith Award. Given to a woman medical student for outstanding achievement in the first two years of medical school. The 1995 recipient: Deborah Suzanne Lindes.

Society for Academic Emergency Medicine Excellence in Emergency Medicine Award. Based on demonstrated excellence in the specialty of emergency medicine, it is awarded to a senior medical student at Commencement. The 1995 recipient: Nona Michelle Perez.

Samuel D. Soule Award in Obstetrics and Gynecology. Presented to a member of the Third or Fourth Year Class for meritorious achievement in either basic or clinical investigation in obstetrics and gynecology. The 1995 recipient: Ann Elizabeth Starr.

Upjohn Achievement Award. Given to the fourth-year student who has done the most meritorious work during his or her medical school career in the field of metabolism. The 1995 recipient: Michael Erran Blam.

Washington University School of Medicine Academic Achievement Award. Given annually to a student who has exhibited to an unusual degree the qualities of industry, perseverance, determination, and enthusiasm in the first-year academic program. The 1995 recipient: Joseph Simpson.

Washington University Internal Medicine Club Book Prize. Awarded to the member of the graduating class who has done the most significant research in any area of internal medicine. The 1995 recipient: Robert Todd Striker.

Samson F. Wennerman Prize. Donated by his wife, Zelda E. Wennerman, and awarded annually to that fourth-year student who has demonstrated promise in surgery. The 1995 recipient: William Lee Lyons.

Park J. White Prize. Created in 1992 by the Program for the Humanities in Medicine to honor the centennial of Dr. White's birth. He was a distinguished pediatrician, social activist, and pioneer teacher of medical ethics who introduced the first course on this subject to medical students in 1927. The prize is awarded to a first year student for outstanding performance in the courses offered by the Program for the Humanities in Medicine. The 1995 recipient: Daniel Schwartz.

Hugh M. Wilson Award for Meritorious Work in Radiology. Given annually to a graduating medical student in recognition of outstanding work in radiology-related subjects, either clinical or basic science. The 1995 recipients: Douglas James Ball and Michael Jay Naylor.

Dr. Ernst L. Wynder Prize in Preventive Medicine. An annual prize established in 1994 to be awarded to the senior medical student who has done the best research in preventive medicine. The 1995 recipients: Bobbi Joy Chambers Hawk, Krista Marie Johnson, Douglas Hartley Pogue, and Jonathan David Primack.

James Henry Yalem Prize in Dermatology. Established by Charles Yalem in memory of his son and awarded annually to a member of the Fourth Year Class for outstanding work in dermatology. The 1995 recipient: Michael Spencer Kolodney.

Lectureships and Visiting Professorships

Several established lectureships enable the School to bring to the Medical Center each year distinguished guests who contribute significantly to the richness of student life.

Ben T. Abelson Memorial Lectureship in Pediatric Hematology-Oncology. Established by Mrs. Ben T. (Ann) Abelson, the first lecture was held on January 8, 1988.

Harry Alexander Visiting Professorship. Established in 1964 by former house officers and friends of Dr. Harry Alexander to provide an annual visiting professor in the Department of Medicine.

Alpha Omega Alpha Lectureship. Given each year by a faculty member of the students' selection.

Daniel R. Biello Memorial Lectureship. Established in 1986 by friends, students and colleagues of Dr. Daniel R. Biello to provide an annual lectureship devoted to advances in radiology and nuclear medicine.

George H. Bishop Lectureship. Supported by funds made available by friends interested in the advancement of neurology.

Estelle Brodman Lectureship Fund. Established in 1981 by friends and colleagues of Dr. Brodman in honor of her distinguished contributions to the School of Medicine.

The James Barrett Brown Visiting Professorship in Plastic and Reconstructive Surgery. Created in 1969 by patients, friends, colleagues, and former students to honor Dr. Brown.

Thomas H. Burford Lectureship in Thoracic Surgery. Founded in 1971 by friends of Dr. Burford.

Glover H. Copher Lectureship in Cancer. Founded in 1971 with endowment provided by Dr. Copher and friends.

The Carl F. and Gerty T. Cori Visiting Professorship. Established in 1985 in honor of Nobel Laureates Carl and Gerty Cori by the Edward Mallinckrodt, Jr. Foundation, colleagues, faculty and former students.

Philip R. Dodge Lectureship. Established in 1987 by friends and colleagues to provide an annual lectureship in the Department of Pediatrics.

Joseph Erlanger Lectureship. Established in 1989 by the Department of Cell Biology and Physiology to honor Dr. Erlanger.

I. Jerome Flance Visiting Professorship. Established in 1977 by former students and friends of Dr. Flance to provide annually a visiting professor in the Division of Pulmonary Diseases.

Julia Hudson Freund Lectureship. Established in 1982 by S. E. Freund in memory of his wife to provide a visiting lectureship in clinical oncology.

Edwin F. Gildea, Jr., Lectureship in Psychiatry. Established in 1978 by friends, colleagues, and former students of Dr. Gildea.

Joseph J. Gitt Visiting Professorship in Clinical Neurology. Established in 1971 by his family and friends to honor Dr. Gitt.

Graham Colloquium. A gift from Mr. and Mrs. Evarts Graham, Jr., in 1963 to encourage opportunities for students to expand their views on social, philosophical, artistic, and political topics.

The Evarts A. Graham Lecture. Established in 1985 by the Washington University Alumni of the Phi Beta Pi medical fraternity to honor the memory of Dr. Evarts A. Graham.

Samuel B. Guze Lectureship. Established in 1990 by friends and colleagues to honor Dr. Guze.

Carl Gayler Harford Lectureship. Established in 1977 by the family of one of Dr. Harford's patients in gratitude for his contributions to teaching clinical medicine and virology.

Alexis F. Hartmann, Sr., Lectureship. Established in 1960 by friends interested in pediatrics to provide an annual lecture in Dr. Hartmann's honor.

Alex H. Kaplan Visiting Professorship/Lectureship. Established in 1986 by Dr. and Mrs. Alex H. Kaplan to support a visiting psychoanalyst.

Michael and Irene Karl Lectureship in General Internal Medicine. Created in 1983 by Mr. and Mrs. Meyer Kopolow to provide an annual lectureship in honor of Drs. Michael and Irene Karl.

Kroc Visiting Lectureship Program. Established in 1985 by The Kroc Foundation in honor of Ray A. and Robert L. Kroc.

Paul E. Lacy Lectureship in Pathology. Established in 1987 by The Kilo Diabetes and Vascular Research Foundation in honor of Dr. Lacy's many contributions to pathology and diabetes research, and to recognize his collaboration over the years with the co-founders of The Kilo Foundation.

Irwin Levy Memorial Fund. Supports the Dr. Irwin Levy Visiting Lectureship in Neurology, which was established in 1978 by Mr. and Mrs. Meyer Kopolow.

Oliver H. Lowry Lectureship. Established in 1978 by friends, colleagues, and former students of Dr. Lowry.

H. Relton McCarroll, Sr., Visiting Professorship in Orthopedic Surgery. Created in 1972 by patients, friends, colleagues, and former students in honor of Dr. McCarroll.

Edward Massie Lectureship in Cardiovascular Disease. Established in 1981 by Edward J. Simon, M.D., Bernard Shanker, and other grateful colleagues and patients.

G. Leland Melson II Lectureship. Established in 1993 in memory of Dr. Melson by his friends and colleagues.

Carl V. Moore Lectureship. Established in 1973 by friends and patients of Dr. Carl V. Moore.

Carl A. Moyer Visiting Professorship of Surgery. Established in 1978 by The Harry Freund Memorial Foundation to support an annual lecture in honor of Dr. Moyer's contribution to surgery.

Joseph H. Ogura Lectureship. Established in 1977 by friends and colleagues of Dr. Ogura as a tribute to his numerous scientific accomplishments and contributions to the School of Medicine, graduate medical education, and commitment to patient care.

National Kidney Foundation—Saulo Klahr, M.D., Lectureship. Established in 1991 by the Kidney Foundation to honor Dr. Klahr, past president of the National Kidney Foundation, and the John E. and Adaline Simon Professor and Vice Chairman of the Department of Medicine at Washington University.

Rose and Samuel Pollock Surgical Lectureship. Established in 1976 by Dr. Joseph H. Pollock in memory of his parents.

The Probstein Oncology Lectureship. Established in 1985 by Mr. and Mrs. Norman K. Probstein in appreciation of professional services provided by William Fair, M.D., former head of the urology division of the Department of Surgery, and Carlos Perez, M.D., professor of radiology and head of radiation oncology at the Medical Center's Mallinckrodt Institute of Radiology.

Eli Robins Lectureship in Psychiatry. Established in 1977 by friends, colleagues, and former students of Dr. Robins.

St. Louis Football Cardinals Visiting Professorship in Orthopedic Surgery. Made possible since 1971 by donations from the St. Louis Football Cardinals.

Henry G. Schwartz Lectureship. Created in 1983 by former residents and colleagues from the neurosurgery department to honor Dr. Schwartz.

Wendell G. Scott Memorial Lectureship. Established in 1972 by friends and colleagues of Dr. Wendell G. Scott.

Major G. Seelig Lectureship. Established in 1948 in the field of surgery by friends of Dr. and Mrs. Seelig.

Philip A. Shaffer Lectureship. Founded in 1957 by friends of Dr. Shaffer in recognition of his accomplishments in biochemistry.

Frank O. Shobe Lectureship. Established in 1986 by friends of Dr. Shobe to honor him as a physician and teacher.

Eduardo Slatopolsky Lectureship. Established in 1988 by Mr. and Mrs. William Wolff in honor of Dr. Slatopolsky's 25-year association with the School.

C. R. Stephen, M.D., F.F.A.R.C.S. Fund for Lecture and Clinical Research in Anesthesiology. Established in 1986 by former students, residents, faculty and friends in honor of Dr. Stephen, first Head of the Department of Anesthesiology.

Sterling Drug Visiting Professorship in Pharmacology. Established in 1986 to honor Ernst Zander, M.D., former medical director of Sterling Drug, Inc.

The Donald B. Strominger Visiting Professorship. Established in 1984 by family, friends, and colleagues, fellows, and patients of Dr. Strominger in honor and in memory of his dedication and contributions to their lives, their careers, and to the field of medicine in pediatrics.

The Richard A. and Betty H. Sutter Visiting Professorship in Occupational and Industrial Medicine. Established in 1985 by Dr. and Mrs. Sutter to encourage opportunities for students, faculty, other physicians, and the St. Louis community to expand the understanding and practice of Occupational Medicine.

Jessie L. Ternberg Pediatric Surgery Visiting Lectureship. Made possible from a fund established in 1977 by Mr. Meyer Kopolow to honor Dr. Ternberg.

Robert J. Terry Lectureship (1939) and Visiting Professorship (1982). Established by alumni and Charles S. Terry, his son, respectively, "for the purpose of fostering greater appreciation of the study of anatomy."

Mildred Trotter Lectureship. Established in 1975 by friends and former students of Mildred Trotter to bring a distinguished woman scientist to the School of Medicine each year.

Rudolph A. Tuteur Pulmonary Lectureship. This lectureship is endowed by family, friends, patients, and colleagues of the Tuteur family to memorialize Rudolph A. Tuteur. The goal of this annual fall event is to promote further understanding of problems associated with chronic pulmonary disease from which he suffered.

THE WASHINGTON UNIVERSITY GRADUATE

Residency Training

Although not required by all states for licensure, postgraduate residency training in an approved hospital is considered essential preparation for the practice of medicine. Most Washington University graduates serve three or more years of residency training, and some will gain additional experience as postdoctoral fellows.

In order to aid students in obtaining desirable residency appointments, an active counseling program is maintained by the Associate Dean for Student Affairs and the Associate Dean for Postgraduate Education. Thus, students in the Third Year Class are provided with general background information about the kinds of residencies available, special problems concerning certain extremely competitive residencies, and help in identifying faculty members for further assistance. Since the number of available residencies has recently decreased to approximately the same as that of graduates applying, students must make their choices with considerable care.

The Associate Dean for Postgraduate Education maintains an open file of brochures and other descriptive data regarding residencies throughout the country. Included are evaluations of the residency experience of our recent graduates. The School participates in the National Resident Matching Program, which offers distinct advantages to applicants.

Results of these efforts have been gratifying. The PGY-I residencies selected in the most recent residency matching (1995) are identified in the Register of Students beginning on page 176. The School maintains an active interest in its graduates and is pleased to assist them in subsequent years as they seek more advanced training or staff appointments in the communities in which they settle.

Postdoctoral Training

Those departments which offer Postdoctoral Fellowships individualize such educational activity up to a maximum of 36 months of academic time. Such fellowships lead integrally to certification by the appropriate specialty and/or subspecialty boards of the American Medical Association.

Fellowship And Other Funds

Alexander and Gertrude Berg Fellowship Fund. Created in 1952 through the bequest of Gertrude Berg to provide a fellowship in the Department of Molecular Microbiology.

Glover H. Copber Fellow in Surgical Research. Established in 1971 to support a postdoctoral fellow in surgery.

William H. Danforth Loan Fund for Interns and Residents in Surgery. Provides financial assistance in the form of loans for postdoctoral students in surgery.

Antonio Hernandez, Jr. Fellowship in Pediatric Cardiology. Established in 1987 as a memorial to Dr. Hernandez.

J. Albert Key Fellowship Fund. Provides a stipend for a fellow in orthopedic surgery.

Louis and Dorothy Kovitz Fellowship Fund. Established in 1970 by an alumnus and his wife to provide support for research by qualified residents or students interested in surgery, at the discretion of the Head of the Department of Surgery.

Stephen I. Morse Fellowship. Established in 1980 by Carl and Belle Morse in memory of their son; awarded to predoctoral or postdoctoral students pursuing research careers in microbiology, immunology, and infectious diseases.

The Esther and Morton Wohlgemuth Foundation Fellowship. Established to support a fellow in the Division of Cardiovascular Diseases.

Continuing Medical Education

The study of medicine is a lifelong process with continuing medical education being an integral part of the continuum. Since 1973 the School of Medicine has formally met its obligations to this learning endeavor through the operation of the Office of Continuing Medical Education. The objectives of this program are:

1. To provide high quality educational activities for alumni of Washington University School of Medicine and other physicians regionally and, on occasion, nationally.
2. To encourage lifelong learning by a variety of educational methods appropriate to the learners' needs.
3. To provide for the acquisition of new knowledge and skills and to aid in acquiring efficient problem-solving techniques for ultimate improvement in patient care.
4. To provide a forum where academic and practicing physicians can jointly explore solutions to health problems.

5. To translate the results of research and the habits of critical assessment of new data to the needs of practicing physicians.

Each year over 60 symposia and over 100 academic rounds and conferences as well as videos and monographs are provided with CME credit by this office. About 4,000 registrants attend these courses annually and receive more than 600 hours of instruction. The educational program is fully accredited by the Accreditation Council for Continuing Medical Education and provides credits to physicians seeking them for the Physician's Recognition Award of the American Medical Association, as well as various other types of state and specialty recertification and relicensure activities.

Washington University Medical Center Alumni Association

The Washington University Medical Center Alumni Association (WUMCAA) was organized more than 55 years ago to foster a continuing spirit of fellowship among graduates, and to maintain and enhance the tradition of excellence of the School of Medicine. Membership is provided to graduates and former house officers of the Medical Center.

The Association complements the goals and purposes of the School of Medicine through a variety of programs for its members and current students. Involvement in these activities also provides the opportunity to continue the relationships begun as students and to develop rewarding professional associations.

Student-Alumni Programs: Many students and residents meet alumni on an informal basis during the admissions process. Alumni can be helpful sources of information about many aspects of the School's programs. Entering students are welcomed to the School annually through a program sponsored by the Alumni Association. The WUMCAA also provides an activity fund for both the First and Second Year Classes and sponsors a reception for the graduating class, their families and faculty.

The Association supports a number of student-initiated community service activities, including a variety of health education programs in public schools and a summer program in biomedical research for St. Louis high school students.

The Academic Societies also benefit from support by WUMCAA. These provide opportunities for faculty and student interaction in a collegial environment.

Reunions and Other Events: The Annual Reunion is held in May for classes who return at five-year intervals, beginning with the class observing its 10th year following graduation and continuing through the class celebrating its 60th reunion. The reunion schedule includes a scientific program, social events, tours of the Medical Center, and the presentation of

Alumni/Faculty, Alumni Achievement, and Distinguished Service awards to alumni. Award recipients are chosen on the basis of personal accomplishment, professional achievement, and/or service to the School of Medicine. Members of the graduating class are special guests at the awards banquet and are officially welcomed into Association membership.

The Alumni Office sponsors special alumni activities in selected cities across the United States. Volunteers from each area assist in sponsoring these events, which help alumni to stay abreast of the educational and research activities at the School of Medicine. The Alumni Office also compiles class newsletters for selected classes, including those in the "Diamond+" years (all those classes who have celebrated their 60th reunion).

Alumni Support: Supporting their school generously is a tradition for a large percentage of alumni of the medical school and the allied health programs. Each year alumni and friends are solicited for gifts to the Annual Fund, which supports the School's depart-

ments, divisions and allied health programs, as well as scholarships and low-interest loan programs for students. Alumni also designate gifts for special purposes within the School, including specific research, education and training programs.

Developing additional sources of student financial aid is a priority for the Alumni Association, whose members have established the Distinguished Alumni Scholarship program to provide full-tuition, four-year scholarships to promising medical students in honor of great teachers and mentors, who were also alumni of the School of Medicine.

In 1977, School of Medicine members of the Eliot Society created the Alumni Endowed Professorship Program, through which gifts are used to establish an Alumni Endowed Chair in the School's departments. Six such chairs have been created thus far, one each in Pathology, Molecular Microbiology, Pediatrics, Molecular Biology and Pharmacology, Biochemistry and Molecular Biophysics, and Cell Biology and Physiology.

DEPARTMENT OF ANATOMY AND NEUROBIOLOGY

The structure of the human body is presented in two courses: gross anatomy, offered in the first semester, and microscopic anatomy, offered in the second semester. A third course, neuroscience, is taught in the second semester. Gross anatomy is largely a laboratory course, with lectures dealing with anatomical principles and with human growth and development. The course in microscopic anatomy focuses on cell and tissue biology, with laboratory sessions paralleling the lectures in these areas. This course is closely coordinated with the Physiology course offered concurrently by the Department of Cell Biology and Physiology. Neural science is an integrated course that deals with the structure, function, and development of the nervous system from molecular, cellular, and systems perspectives. Throughout all three courses attention is paid to the results of recent investigations and to major developments in each field. In addition, the department offers many graduate courses that may be taken as electives by students in any of the four years. The department is well-equipped for specialized work in several areas, including gross anatomy, electron microscopy, tissue culture, and all aspects of neurobiology.

FIRST YEAR

Bio 501. Human Anatomy

The course is based largely on the dissection of the human body. Lectures on functional and topographic anatomy emphasize the principles of organization of the various systems of the body. Lectures on developmental anatomy stress organogenesis as an adjunct to understanding the normal and abnormal anatomy. An extensive museum of labeled dissected specimens is housed in the dissecting room for ready reference by students who encounter abnormalities or variations in their dissections. Frequent use of CT and MRI scans, radiographs, and cross sections aid in the synthesis of knowledge gained through dissection into clinically useful information. Radiologic anatomy and clinical correlation conferences further aid in this process. Credit 6 units.

Bio 506. Microscopic Anatomy

The structure of cells, tissues and organs is studied with regard to the functional significance of the morphological features. The laboratories consist of the study of prepared slides and of electron micrographs. A microscope will be provided for each student. Credit 4 units.

Bio 554. Neural Sciences

The Medical Neuroscience course covers the structure, function, and development of the nervous system as seen from molecular, cellular, and systems oriented perspectives. The emphasis is on the organization and function of the nervous system in health, but there is frequent reference to the clinical relevance of material presented. The course meets two half-days per week during the spring semester. There are regular lectures, conference sessions, and laboratories, plus a number of clinically oriented presentations and Special Topics sessions that address selected issues in greater depth. Computer-aided instructional programs, accessible from a variety of locations, provide auxiliary modes of self-paced learning and review. The midterm (covering the first half of the course) and final (covering the entire course) emphasize the core body of important facts and principles presented in lectures and laboratories. Credit 5 units.

RESEARCH

Bio 590. Research Opportunities

These are offered in the following areas:

Modeling neurobiological systems. *Dr. Anderson*

Regulation of receptors for multi-purpose neuromodulators, histamine and bradykinin. *Dr. Baenziger*

Growth and differentiation of muscle. *Dr. Bischoff*

Cell biology of developing nerve and muscle cells. *Dr. Bridgman*

Development and adult structure and function of intracortical circuits. *Dr. Burkhalter*

Anatomy and physiology of the somatosensory cortex. *Dr. Burton*

Evolutionary quantitative genetics and morphology. *Dr. Cheverud*

Comparative primate anatomy and human evolution. *Dr. Conroy*

Mechanisms of gene expression in developing and adult CNS. *Dr. Gottlieb*

Molecular biology and functions of peptide-secreting and peptide-receptive neurons. *Dr. Krause*

Development of synaptic connections. *Dr. Lichtman*

Viruses as tools to study CNS autonomic pathways; central regulation of blood pressure and cardiac function. *Dr. Loewy*

The structure and function of the skin. *Dr. Menton*

Molecular genetic analysis of synaptic development and function in the nematode, *C. elegans*. *Dr. Nonet*

Molecular biology of dopaminergic synapses. *Dr. O'Malley*

Behavior, morphology and biology of living primate populations. *Dr. Phillips-Conroy*

The organization of the limbic forebrain and the relationship between aging and Alzheimer's Disease. *Dr. Price*

Molecular studies of embryonic induction in *Xenopus*. *Dr. Rao*

Molecular, genetic and physiological analysis of nerve and muscle membrane ion channels. *Dr. Salkoff*

Molecular bases of selective synapse formation. *Dr. Sanes*

Molecular, genetic and physiological studies of neuropeptide transmitters. *Dr. Tagbert*

Cellular neurophysiology of posture and movement control. *Dr. Thach*

Organization and function of visual cortex in primates. *Dr. Van Essen*

Axonal transport, cytoskeleton structure, and nerve regeneration. *Dr. Willard*

Development of connections in the mammalian retina. *Dr. Wong*

ELECTIVES

The department offers a number of graduate-level courses that may be taken as electives by medical students. The department participates in the Division of Biology and Biomedical Sciences, which also offers courses relevant to anatomy and neurobiology.

These course descriptions are presented in the section on Biology and Biomedical Sciences.

Bio 5404. Molecular Neurobiology

Bio 5562. Neural Development

Bio 5571. Cellular Neurobiology

Bio 5641. Computational Neuroscience

Bio 5651. Neural Systems

Bio 567. Advanced Tutorials in Neural Science

Note—The number preceding the course title indicates that the course is offered by the Division of Biology and Biomedical Sciences and carries credit in the Graduate School of Arts and Sciences.

Faculty

Edison Professor of Neurobiology and Head of Department

David C. Van Essen, Ph.D.,
Harvard University, 1971.

Professors Emeriti

Adolph I. Cohen, Ph.D.,
Columbia University, 1954. (See Department of Ophthalmology and Visual Sciences.)

Roy R. Peterson, Ph.D.,
University of Kansas, 1952. (And Lecturer.)

Professors

Harold Burton, Ph.D.,
University of Wisconsin, 1968. (See Department of Cell Biology and Physiology.)

James M. Cheverud, Ph.D.,
University of Wisconsin, 1979. (See Department of Genetics.)

Theodore J. Cicero, Ph.D.,
Purdue University, 1968. (See Department of Psychiatry.)

Glenn C. Conroy, Ph.D.,
Yale University, 1974. (Also Faculty of Arts and Sciences)

David I. Gottlieb, Ph.D.,
Washington University, 1971. (See Department of Biochemistry and Molecular Biophysics.)

Stephen M. Highstein, M.D.,
University of Maryland, 1965;
Ph.D., University of Tokyo, 1976.
(See Department of Otolaryngology.)

James E. Krause, Ph.D.,
University of Wisconsin, Madison, 1980.

Jeffery Lichtman, M.D., Ph.D.,
Washington University, 1980.

Arthur D. Loewy, Ph.D.,
University of Wisconsin, 1969.

Joseph L. Price, Ph.D.,
Oxford University, 1969.

Marcus E. Raichle, M.D.,
University of Washington, 1964.
(See Department of Radiology.)

Steven M. Rothman, M.D.,
State University of New York,
Upstate, 1973. (See Department of Pediatrics and Departments of Neurology and Neurological Surgery.)

Lawrence B. Salkoff, Ph.D.,
University of California, Berkeley, 1979. (See Department of Genetics.)

Joshua R. Sanes, Ph.D.,
Harvard University, 1976.

W. Thomas Thach, Jr., M.D.,
Harvard University, 1964. (See Departments of Neurology and Neurological Surgery.)

Robert H. Waterston, M.D., Ph.D.,
The University of Chicago, 1972.
(See Department of Genetics.)

Mark B. Willard, Ph.D.,
University of Wisconsin, 1971. (See Department of Biochemistry and Molecular Biophysics.)

Thomas A. Woolsey, M.D.,
The Johns Hopkins University, 1969. (See Departments of Neurology and Neurological Surgery and Department of Cell Biology and Physiology.)

Research Professor

Charles H. Anderson, Ph.D.,
Harvard University, 1962.

Professor (Adjunct)

Richard W. Brand, D.D.S.,
University of Pittsburgh, 1958.

Associate Professors

E. Richard Bischoff, Ph.D.,
Washington University, 1966.

Paul C. Bridgman, Ph.D.,
Purdue University, 1980.

Andreas H. Burkhalter, Ph.D.,
University of Zurich, 1977. (See
Departments of Neurology and
Neurological Surgery.)

John Csernansky, M.D.,
New York University, 1979. (See
Department of Psychiatry.)

Ursula W. Goodenough, Ph.D.,
Harvard University, 1969. (Also
Faculty of Arts and Sciences)

Christopher J. Lingle, Ph.D.,
University of Oregon, 1979. (See
Department of Anesthesiology.)

David N. Menton, Ph.D.,
Brown University, 1966.

Bruce L. Nock, Ph.D.,
Rutgers University, 1980. (See
Department of Psychiatry.)

Karen L. O'Malley, Ph.D.,
University of Texas, Austin, 1980.

Steven E. Petersen, Ph.D.,
California Institute of Technology,
1981. (Neuropsychology) (See
Departments of Neurology and
Neurological Surgery.)

Jane Phillips-Conroy, Ph.D.,
New York University, 1978. (Also
Faculty of Arts and Sciences)

Keith M. Rich, M.D.,
Indiana University, 1977. (See
Departments of Neurology and
Neurological Surgery.)

William D. Snider, M.D.,
University of North Carolina, 1977.
(See Departments of Neurology
and Neurological Surgery.)

Joseph H. Steinbach, Ph.D.,
University of California, San Diego,
1973. (See Department of
Anesthesiology.)

Paul H. Taghert, Ph.D.,
University of Washington, 1981.

Charles F. Zorumski, M.D.,
St. Louis University, 1978. (See
Departments of Neurology and
Neurological Surgery and Depart-
ment of Psychiatry.)

**Research Associate
Professor**

Nancy L. Baenziger, Ph.D.,
Washington University, 1971.

Assistant Professors

Mark P. Goldberg, M.D.,
Columbia University, 1984. (See
Departments of Neurology and
Neurological Surgery.)

Luci Kohn, Ph.D.,
University of Wisconsin, Madison,
1989. (See Occupational Therapy.)

Peter D. Lukasiewicz, Ph.D.,
University of Michigan, 1984. (See
Department of Ophthalmology and
Visual Sciences.)

Michael L. Nonet, Ph.D.,
Massachusetts Institute of
Technology, 1989.

Yi Rao, Ph.D.,
University of California, San
Francisco, 1991.

Carmelo Romano, Ph.D.,
Stanford University, 1981. (See
Department of Ophthalmology and
Visual Sciences.)

Daniel L. Silbergeld, M.D.,
University of Cincinnati, 1984. (See
Departments of Neurology and
Neurological Surgery.)

Lawrence Tychsen, M.D.,
Georgetown University, 1979. (See
Department of Ophthalmology and
Visual Sciences.)

Rachel O. L. Wong, Ph.D.,
Australian National University,
Canberra, 1985.

**Assistant Professor
(Adjunct)**

Susan M. Fitzpatrick, Ph.D.,
Cornell University, 1984.

DEPARTMENT OF ANESTHESIOLOGY

Anesthesiology is a medical specialty encompassing a broad range of medical and scientific activities. The clinical practice of anesthesiology includes:

(1) Assessment of, consultation for, and preparation of patients for anesthesia; (2) Provision of insensibility to pain during surgical, obstetric, therapeutic and diagnostic procedures; (3) Monitoring and restoration of physiologic homeostasis during the perioperative period, as well as homeostasis in the critically ill or seriously ill patient; (4) Diagnosis and treatment of painful syndromes and; (5) Clinical management and teaching of cardiopulmonary resuscitation (CPR). The realm of scientific investigation in anesthesiology also spans a broad range. Scientific efforts at the cellular and molecular level are directed to understanding the molecular mechanisms of anesthesia and analgesia. Clinical research in anesthesia includes broad epidemiological approaches to identifying indicators of outcome as well as prospective clinical studies examining new technologies, anesthetic agents and methods.

The Department of Anesthesiology presents the student with the opportunity to: (1) Acquire and apply pharmacologic knowledge related to anesthetic, narcotic, paralytic and sedative drugs and to drugs affecting the autonomic nervous system; (2) Understand and apply the basic principles of airway management and mechanical ventilation; (3) Understand and apply the basic principles of cardiopulmonary resuscitation; (4) Understand and apply the technical skills and anatomic and pharmacologic knowledge used in performing regional nerve blocks; (5) Learn and apply the fundamental principles of acute and chronic pain management and; (6) Learn and apply the basic principles of critical care medicine.

Anesthesiology bridges the gap between basic science and clinical medicine. It can provide experience in the clinical evaluation of patients and in applied physiology and pharmacology. The Department of Anesthesiology offers student experiences in the operating room, the intensive care unit, the pain clinic and in the laboratory.

Operating room anesthesiology clerkships are offered for either four or six-week periods. The pharmacology of inhalation, intravenous and local anesthetic drugs as well as sedatives, opiates and muscle relaxants is taught by practical application in the operating room. Airway management skills, including mask ventilation and endotracheal intubation, also are taught in the operating room setting. Opportunities to acquire proficiency in other techniques including central venous cannulation and insertion of arterial catheters also are offered. Students taking the operating room clerkship work directly with a senior resident who provides constant supervision and an attending who serves as a mentor. By the end of the clerkship, the student should be able to administer an anesthetic for an uncomplicated surgical procedure. Students are expected to attend the regular anesthesia conferences and seminars.

A four-week elective also is offered in critical care medicine that is designed to familiarize the student with the diagnosis and treatment of the critically-ill surgical patient. This is accomplished by the student becoming an integral part of the intensive care team.

The clerkship in pain management offers the student the opportunity to participate in comprehensive, multidisciplinary management of acute, chronic and cancer pain problems. Students will be expected to assist in the care of both inpatients and outpatients. Students will learn fundamental aspects of pain management which should provide the knowledge with which to manage routine acute and cancer pain in their subsequent practice.

Special electives in basic science research, as it applies to anesthesiology, can be arranged with the principal investigators in the Anesthesiology Research Unit under the direction of Joseph H. Steinbach, Ph.D. These laboratories focus on various aspects of molecular neurobiology, including ion channel structure and function, G-protein molecular biology, molecular mechanisms of volatile anesthetic action and genetics of anesthetic responsiveness. Arrangements for these special electives are made through the specific investigators: Walter A. Boyle III, M.D.; Alex S. Evers, M.D.; Narasimhan Gautam, Ph.D.; Richard Hotchkiss, M.D.; Christopher Lingle, Ph.D.; or Joseph H. Steinbach, Ph.D.

Faculty

Henry Eliot Mallinckrodt

Professor and Head of Department

Alex S. Evers, M.D.,
New York University, 1978. (See Departments of Medicine and Molecular Biology and Pharmacology.)

Professors Emeriti

Albert Roos, M.D.,
University of Groningen, 1940. (See Department of Cell Biology and Physiology.)

C. R. Stephen, M.D.C.M.,
McGill University, 1940.

Professors

Timothy G. Buchman, M.D.,
Ph.D., The University of Chicago, 1980.

Demetrios G. Lappas, M.D.,
Aristotelian University, 1961;
Ph.D., 1966.

William D. Owens, M.D.,
University of Michigan, 1965.

Peter Rock, M.D.,
The Johns Hopkins University, 1978.

Joseph H. Steinbach, Ph.D.,
University of California, San Diego, 1973. (See Department of Anatomy and Neurobiology.)

Professor (Clinical)

Bernard C. DeLeo, M.D.,
St. Louis University, 1958.

Associate Professor Emeritus

Glenn R. Weygandt, M.D.,
Washington University, 1947.

Associate Professors

- Gary E. Hirshberg, M.D.**,
Hannemann Medical College, 1972.
- Barbel Holtmann, M.D.**,
University of Missouri, 1968.
- James J. Jenkins, M.D.**,
University of North Carolina, 1970.
- Christopher J. Lingle, Ph.D.**,
University of Oregon, 1979. (See
Department of Anatomy and
Neurobiology.)
- J. Julio Pérez-Fontán, M.D.**,
Universidad de Santiago, 1977. (See
Department of Pediatrics.)
- Necita L. Roa, M.D.**,
University of the Philippines, 1969.
- René Tempelhoff, M.D.**,
University of Lyon, 1974. (See
Department of Neurological
Surgery.)
- Anastasios N. Triantafillou, M.D.**,
University of Athens, 1970.
- Carey Ira Weiss, M.D.**,
University of Illinois, 1979.

Associate Professor (Clinical)

- Milton L. Cobb, M.D.**,
University of Texas (Southwestern),
1968.

Assistant Professors

- Nabil Abboud, M.D.**,
St. Joseph's University, 1970.
- Spomenko Bauer, M.D.**,
University of Zagreb, 1968.
- Walter A. Boyle III, M.D.**,
University of California, San Francisco, 1977.
- George Despotis, M.D.**,
St. Louis University, 1985.
- Robert Feinstein, Ph.D.**,
University of Michigan, 1968; M.D.,
Texas A & M University, 1982.
- Walter H. Folger, D.D.S.**,
University of Tennessee, 1970;
M.D., 1984; Ph.D., University of
Florida, 1991.
- Narasimhan Gautam, Ph.D.**,
University of Bombay, 1983. (See
Department of Genetics.)
- Charles W. Hogue, M.D.**,
University of Illinois, 1986.
- Richard S. Hotchkiss, M.D.**,
University of Virginia, 1976.
- Barry P. Markovitz, M.D.**,
University of Pennsylvania, 1983.
(See Department of Pediatrics.)

- Mitchell R. Platin, M.D.**,
Northwestern University, 1987.
- Charles G. Pond, M.D.**,
St. Louis University, 1980.
- James M. Shear, M.D.**,
University of Missouri, 1981.
- Iris Soliman, M.B.B.Ch.**,
Cairo University, 1977.
- G. Ram Volotzky, M.D.**,
Sackler School of Medicine, 1979.
- Patricia Young-Beyer, M.D.**,
University of California, San Diego,
1981.

Assistant Professor (Clinical)

- Margaret M. Oakley, M.D.**,
St. Louis University, 1959. (Shriners
Hospital)

Instructors

- Hussein Y. Abukhudar, M.D.**,
Faculty of Medicine, 1980.
- Ioana Apostolidou, M.D.**,
University of Athens, 1986.
- Maura C. Berkelhamer, M.D.**,
Rush Medical College, 1988.
- Brad Bernstein, M.D.**,
St. Louis University, 1984.
- Matthew S. Bodner, M.D.**,
Washington University, 1980.
- Gerold N. Borodach, M.D.**,
Tufts University, 1959.
- Robert Cerza, M.D.**,
Northwestern University, 1970.
- Mary Ann Cheng, M.D.**,
University of Michigan, 1980.
- Ursula Class, M.D.**,
University of Tübingen, 1982.
- Jennifer W. Cole, M.D.**,
Washington University, 1984.
- Michael T. Connor, M.D.**,
Wayne State University, 1974. (See
Department of Pediatrics.)
- Charles M. Crowder, M.D., Ph.D.**,
Washington University, 1989.
- Mark H. Davis, M.D.**, UMDNJ,
Robert Wood Johnson Medical
School, 1990.
- Catherine M. Dunn, M.D.**,
University of Missouri, 1982.
- Edwin Duntzman, M.D.**,
University of Illinois, 1989.
- Stefan Eichhorn, M.D.**,
Indiana University, 1990.
- Steven T. Fogel, M.D.**,
University of Missouri, 1976.
- Robert Forstot, M.D.**,
Washington University, 1987.

- Barry A. Graff, M.D.**,
St. Louis University, 1976.
- Jennifer L. Hirsh, M.D.**,
Yale University, 1989.
- Frances M. Houghton, M.D.**,
University of Nebraska, 1974.
- Matthew Barry Jones, M.D.**,
UMDNJ, Robert Wood Johnson
Medical School, 1987.
- Menelaos Karanikolas, M.D.**,
Athens University, 1988.
- Shahrdad Khodamoradi, M.D.**,
Washington University, 1990.
- Catherine P. Krucylak, M.D.**,
UMDNJ, New Jersey Medical
School, 1986.
- Michael E. Leavell, M.D.**,
University of Kansas, 1984.
- John D. McAllister, M.D.**,
University of Manitoba, 1980.
- Scott A. McClure, M.D.**,
St. Louis University, 1989.
- Amrik S. Narula, M.B.B.S.**,
H.P. Medical College, 1972.
- Christopher D. Newell, M.D.**,
Washington University, 1990.
- Alice A. Otto, M.D.**,
St. Louis University, 1977.
- Debra D. Pulley, M.D.**,
St. Louis University, 1987.
- Joseph Rater, M.D.**,
University of Iowa, 1990.
- Elaine V. Riegle, M.D.**,
University of Iowa, 1967.
- Frank E. Robbins, M.D.**,
Washington University, 1977.
- Barbara M. Scavone, M.D.**,
Washington University, 1987.
- Hind Shabany-Bashiti, M.B.B.Ch.**,
Ain Shams University, 1971.
- Robert A. Swarm, M.D.**,
Washington University, 1983.
- Raghu TerKonda, M.D.**,
University of Missouri, 1987.
- Silvestre A. Tomeldan, M.D.**,
Far Eastern University, 1970.
- Lawrence S. Waldbaum, M.D.**,
Washington University, 1973.
- Karen L. Weiss, M.D.**,
Boston University, 1980.
- Kalvin L. White, D.O.**,
Oklahoma State University, 1990.
- Brett D. Wolff, M.D.**,
Washington University, 1991.

Instructor (Clinical)

- Donald L. Helfer, M.D.**,
Washington University, 1985.

DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOPHYSICS

The department offers an advanced course in biochemistry as well as several specialized courses in the major fields of biochemistry. Students of medicine or those in the Graduate School of Arts and Sciences may enroll in these courses or pursue research work under the direction of members of the faculty. The interests of the faculty, listed below, cover many aspects of biochemistry and biophysics with special emphasis on structure/function relationships in proteins, enzymology, metabolic regulation, molecular biology of gene expression and protein biosynthesis, lipid metabolism, and the dynamics of cytoskeletal proteins.

FIRST YEAR

Bio 531. Advanced Biochemistry

Designed primarily for medical students; study of major control systems of metabolic processes. The course begins with a treatment of protein structure and enzyme kinetics. Basic metabolic pathways are presented as a basis for the discussion of their regulation by hormone receptors and their signal transduction mechanisms and the role of kinases in metabolic regulation. Other topics include lipoproteins and the regulation of lipid metabolism, control of cellular proliferation and oncogenes. Coordinated with other first semester courses, Cell Biology and Molecular Genetics, to provide an integrated first semester curriculum in the basic sciences for medicine.

RESEARCH

Bio 590. Research Opportunities

These are offered in the following areas of biochemistry:

Biophysical chemistry of proteins and nucleic acids. Regulatory interactions in macromolecular assemblies. Mutagenic analysis of structure-function relationships in human hemoglobins and gene control systems. *Dr. Ackers*

Genetic engineering of plants to confer insect or virus resistance; DNA sequence analysis; thermostable DNA polymerase technology. *Dr. Barnes*

Molecular biology of yeast; control and fidelity of chromosomal DNA replication. *Dr. Burgers*

Biophysical studies of lipid-carrier proteins in normal and disease states, multidimensional NMR studies of ligand-protein complexes. *Dr. Cistola*

Theoretical, experimental and computational studies of thrombin and cooperativity. *Dr. Di Cera*

Interactions between cell surface and cytoskeleton. Mobility of molecules in animal cell surfaces. Forces and mechanisms that determine cell shape and cellular viscoelasticity. *Dr. Elson*

Structure and function of macromolecules involved in cell-matrix interaction and growth regulation in vascular cells. *Dr. Frazier*

Mechanism of protein folding and protein-protein interactions. Actin polymerization and actin binding proteins. Enzyme kinetic theory and enzyme mechanisms. *Dr. Frieden*

Structure and function of RNA molecules, studied by NMR spectroscopy, as well as chemical and biochemical methods. RNA-protein interactions. *Dr. Hall*

Kinetics, thermodynamics, and spectroscopy (FTIR) of ligand-binding reactions in hemoproteins, esp. hemoglobin and C-type cytochromes. *Dr. Holt*

Enzymes involved in the biosynthesis and processing of asparagine-linked oligosaccharides on glycoproteins. *Dr. Kornfeld*

Catalytic strategies of enzymes. Spectroscopic (NMR, FTIR, etc.) and kinetic studies of substrate, intermediate and transition state analog interactions with normal and mutant enzymes. *Dr. Kurz*

Intracellular signal transduction in receptor tyrosine kinases. Functional dissection of structural domains in signaling molecules. Role of the colony stimulating factor-1 receptor in malignancy and atherosclerosis. *Dr. Lee*

Equilibria and kinetic mechanisms of protein-DNA interactions, particularly those involved in replication, such as helicases and helix destabilizing proteins; polyelectrolyte properties of nucleic acids and proteins. *Dr. Lohman*

Transcriptional regulation of gene expression in retroviruses and yeast. *Dr. Majors*

Protein structure analysis by X-ray crystallography. Current studies involve redox and electron transfer proteins, particularly flavoenzymes and quinoproteins. *Dr. Mathews*

Mechanism of action of growth factors; phosphorylation of proteins on tyrosine, turnover of phosphatidylinositol. *Dr. Pike*

Computational models of protein mechanics, dynamics and folding; experimental protein engineering and peptide design. *Dr. J. Ponder*

Hepatic gene expression and hepatic gene therapy. *Dr. K. Ponder*

Hormonal control of gene expression; growth factor gene regulation and action. *Dr. Rotwein*

Lipid-mediated signal transduction; membrane lipid synthesis, assembly, organization and function in eukaryotes. *Dr. Silbert*

X-ray crystallographic studies of proteins involved in signal transduction. *Dr. Waksman*

ELECTIVES

Descriptions of the elective courses are listed under the Division of Biology and Biomedical Sciences. In some instances, these courses are offered in alternate years. The faculty member in charge of the course should be contacted for specific times.

Bio 5083. Principles of Protein Chemistry

Peptide synthesis, protein purification and sequencing, enzyme kinetics and allostery will be covered in the first half of the course. Subsequently, protein structure/function is examined through discussions of protein folding, site-directed mutagenesis studies and an introduction to the physical methods used to determine protein structure. *Dr. Pike*

Bio 5382. Membranes and Mediators

This course is an advanced analysis of current approaches to the study of membrane-mediated processes including membrane structure (both lipid and protein components), the biosynthesis of membrane components, the structure and function of receptors, signal transduction elements such as G proteins, kinases and phosphatases, and the roles of protooncogens in cellular signaling processes. Prerequisites, Bio 548, Bio 5063 and Bio 5083.

Drs. Frazier, Rotwein

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty

Wittcoff Professor and Head of Department

Gary K. Ackers, Ph.D.,
The Johns Hopkins University,
1964.

Professors Emeriti

Barbara I. Brown, Ph.D.,
Yale University, 1950.

David H. Brown, Ph.D.,
California Institute of Technology,
1948.

George R. Drysdale, Ph.D.,
University of Wisconsin, 1952.

Associate Professor Emeritus

William F. Holmes, Ph.D.,
University of Pennsylvania, 1960.
(See Biomedical Computer Laboratory.)

Professors

Thomas F. Deuel, M.D.,
Columbia University, 1961. (See Department of Medicine.)

Sarah C. R. Elgin, Ph.D.,
California Institute of Technology,
1971. (Also Department of Biology)

Elliot L. Elson, Ph.D.,
Stanford University, 1966.

William A. Frazier III, Ph.D.,
Washington University, 1973. (See Department of Cell Biology and Physiology.)

Alumni Endowed Professor of Biochemistry and Molecular Biophysics

Carl Frieden, Ph.D.,
University of Wisconsin, 1955.

Rosalind H. Kornfeld, Ph.D.,
Washington University, 1961. (See Department of Medicine.)

Stuart A. Kornfeld, M.D.,
Washington University, 1962. (See Department of Medicine.)

Timothy M. Lohman, Ph.D.,
University of Wisconsin, 1977.

Philip W. Majerus, M.D.,
Washington University, 1961. (See Department of Medicine.)

Garland R. Marshall, Ph.D.,
Rockefeller University, 1966. (See Department of Pharmacology and Institute for Biomedical Computing.)

F. Scott Mathews, Ph.D.,
University of Minnesota, 1959. (See Department of Cell Biology and Physiology.)

Joseph L. Roti Roti, Ph.D.,
University of Rochester, 1972. (See Department of Radiology and Department of Cell Biology and Physiology.)

Peter S. Rotwein, M.D.,
Albert Einstein College of Medicine, 1975.

J. Evan Sadler, M.D., Ph.D.,
Duke University, 1978; M.D., 1979.
(See Department of Medicine.)

David F. Silbert, M.D.,
Harvard University, 1962.

Robert E. Thach, Ph.D.,
Harvard University, 1964. (See Department of Cell Biology and Physiology.)

Associate Professors

Wayne M. Barnes, Ph.D.,
University of Wisconsin, 1974.

Peter M. J. Burgers, Ph.D.,
State University of Leiden, 1977.

Oscar P. Chilson, Ph.D.,
Florida State University, 1963.
(See Department of Cell Biology and Physiology.)

Enrico Di Cera, M.D.,
Università Cattolica, 1985.

Gregory I. Goldberg, Ph.D.,
Weizmann Institute of Science, 1977. (See Department of Medicine and Department of Molecular Microbiology.)

David I. Gottlieb, Ph.D.,
Washington University, 1971. (See Department of Anatomy and Neurobiology.)

Robert C. Harvey, M.D.,
University of Toronto, 1981; Ph.D.,
University of Western Ontario,
1977. (See Department of Surgery.)

Ellen Li, M.D., Ph.D.,
Washington University, 1980. (See Department of Medicine.)

Michael R. Lieber, Ph.D.,
The University of Chicago, 1981;
M.D., 1983. (See Department of Pathology.)

John E. Majors, Ph.D.,
Harvard University, 1977.

Stephen M. Moerlein, Ph.D.,
Washington University, 1982. (See
Department of Radiology.)

Linda J. Pike, Ph.D.,
Duke University, 1980.

David J. States, M.D., Ph.D.,
Harvard University, 1983. (See
Institute of Biomedical Computing.)

Mark B. Willard, Ph.D.,
University of Wisconsin, 1971. (See
Department of Anatomy and
Neurobiology.)

Assistant Professors

Usha P. Andley, Ph.D.,
Jawaharlal Nehru University, 1977.
(See Department of Ophthalmology
and Visual Sciences.)

David P. Cistola, Ph.D., M.D.,
Boston University, 1985.

Lucian V. Del Priore, M.D.,
University of Rochester, 1982;
Ph.D., Cornell University, 1984. (See
Department of Ophthalmology and
Visual Sciences.)

Kathleen B. Hall, Ph.D.,
University of California, Berkeley,
1984.

Chih-Lin Hsieh, Ph.D., University
of Texas, 1987. (See Department of
Obstetrics and Gynecology.)

Robert C. Landick, Ph.D.,
University of Michigan, 1983. (See
Department of Biology.)

Angel Wai-mun Lee, M.D., Ph.D.,
Harvard University, 1984.

Jay W. Ponder, Ph.D.,
Harvard University, 1984.

Katherine Parker Ponder, M.D.,
Washington University, 1983.

Douglas M. Tollefsen, M.D.,
Ph.D., Washington University, 1977.
(See Department of Medicine.)

Gabriel Waksman, Ph.D.,
University of Paris, 1982.

Research Assistant Professors

Jo Holt, Ph.D.,
Colorado State University, 1982.

Linda C. Kurz, Ph.D.,
Washington University, 1973.

Nader Sheibani-Karkhaneh,
Ph.D., University of Nebraska,
1989.

Changguo Tang, Ph.D.,
Massachusetts Institute of Technol-
ogy, 1990.

Research Instructors

Yingwen Huang, Ph.D.,
Southern Illinois University, 1991.

James J. Toner, Jr., Ph.D.,
St. Louis University, 1973.

Instructor

Walter L. Nulty, Jr., M.Sc.,
Southern Illinois University, 1957.

DEPARTMENT OF CELL BIOLOGY AND PHYSIOLOGY

The department offers instruction to medical and graduate students. A Cell Biology course in the first semester of the medical curriculum deals with introductory cell physiology, and cellular biophysics. This course is part of an integrated basic life sciences program offered in the first semester. A Physiology course in the second semester of the first year is designed to provide students with a foundation for their further study of clinical and applied physiology. In addition, advanced courses open to medical and graduate students provide for more detailed study of specific areas of cell biology, physiology, and cellular biophysics.

The following research interests are represented in the Department at the present time: the biology of extracellular-matrix and cell-matrix interactions, the mechanism of action of polypeptide hormones, transport across cell membranes, membrane channels and G proteins, molecular biology of epithelial transport, reconstitution of intracellular transport including secretion and endocytosis, yeast cell biology; the cytoskeleton and the mechanisms of signal transduction across biological membranes, renal physiology, neurophysiology, contractile activation of muscle, peripheral circulation, respiration, and the application of computer techniques to biological problems. Electron microscopy of nerve and muscle is used to relate structure and function in these tissues.

FIRST YEAR

Bio 502. Physiology

This course integrates and extends the basic principles of cell biology and physiology to the functions of the major organ systems of the body, i.e., muscle, cardiovascular, renal, respiratory, gastrointestinal and endocrine. Credit 6 units.

Bio 5061. Cell Biology

A course covering fundamental aspects of cell organization and physiology. The goal is to develop an understanding of fundamental cellular processes such as transport, secretion, motility, recognition, cell-matrix interaction, and to prepare students for the study of physiology. Credit 3 units.

RESEARCH

Bio 590. Research Opportunities

The department offers a variety of research opportunities, particularly in the following areas: macromolecular structure as studied by X-ray crystallography; synthesis and biological activities of polypeptides; reconstitution of membrane transport; lysosomes and

intracellular transport; neurophysiology, including nerve membrane, muscle, synaptic transmission, sensory systems (especially auditory and visual), electron microscopy of neural tissues, and biochemical regulation in neurons; circulation; respiration; renal physiology; and the application of computer sciences to physiological problems.

Responses of the arterial wall to injury and mediators of coagulation that may contribute to acute rethrombosis after coronary fibrinolysis and accelerated restenosis after balloon angioplasty. *Dr. Dana Abendschein*

Control of cell-to-cell signaling and cellular proliferation by receptors, G proteins, and protein kinases; molecular genetics, physiology, and biochemistry are the primary techniques. *Dr. Kendall J. Blumer*

The regulation of receptor-mediated ingestion by professional phagocytes. The mechanisms of signal transduction via a class of molecules known as integrins which act as receptors for extracellular matrix and potentially as organizers of cytoskeletal-membrane interaction in these cells.

Dr. Eric J. Brown

Evaluation of the effect of new technology on infant mortality; public policy and biologic mechanisms related to surfactant replacement therapy.

Dr. F. Sessions Cole

The role of actin polymerization and actin-binding proteins in cell motility, using a variety of techniques in molecular and cell biology. *Dr. John A. Cooper*

Cell and molecular biology of the mammalian vacuolar proton pump. Expression of H⁺ATPase in mammalian kidney development and during macrophage differentiation. *Dr. Stephen L. Gluck*

Cell Biology and biochemistry of prion proteins, which are involved in the pathogenesis of several unusual neurodegenerative diseases of humans (Creutzfeldt-Jakob disease, kuru) and animals (scrapie). Physiological functions of endogenous prion proteins. Endocytic targeting of glycolipid-anchored proteins. Cellular trafficking and posttranslational processing of mutant prion proteins. *Dr. David Harris*

Development of new methods for visualizing cells and molecules in three dimensions by means of electron microscopy, and for capturing macromolecular mechanisms through rapid freezing techniques.

Dr. John E. Heuser

Excitatory amino acid receptors and synaptic transmission in the central nervous system.

Dr. James Huettner

G protein-mediated signal transduction. Covalent lipid modifications of signaling proteins. Biology and enzymology of protein palmitoylation.

Dr. Maurine Linder

Understanding the complex process of extracellular matrix assembly and organization, including studying the intracellular pathways used to transport matrix

components to the cell surface and identifying helper or accessory proteins that facilitate trafficking and matrix assembly. Cell-matrix interactions in development and cellular mechanisms associated with connective tissue remodeling in vascular disease and heritable diseases of connective tissue.

Dr. Robert Mecham

Structure and function of cation transport proteins. Molecular biology of the Na,K-ATPase. Expression of Na,K-ATPase in insect cells using baculovirus. Characterization of the polarized sorting of plasma membrane proteins in epithelia. *Dr. Robert Mercer*

Depolarization-secretion coupling in endocrine cells (pancreatic β -cells and adrenal chromaffin cells), as well as in nerve terminals. Use of membrane capacitance and electrochemical amperometry techniques to examine the links between calcium entry and the exocytosis of hormone- or transmitter-containing granules. *Dr. Stanley Misler*

Molecular biology of the mammalian glucose transporter. Gene structure, biosynthesis and regulation. Expression of transfected cDNA in foreign cells. Mechanism of insertion of proteins into the rough endoplasmic reticulum membrane.

Dr. Mike Mueckler

Roles and regulation of potassium, particularly in the heart. Cloning and expression of ion channels in vertebrate and invertebrate systems. *Dr. Colin Nichols*

Molecular signals in the early development of mammalian cerebral cortex. Cell-cell and cell-substrate interactions during neuronal migration and the response of dividing and growing neurons to trophic factors are analyzed with in vivo and in vitro methods, including an organotypic slice culture assay. *Dr. Alan L. Pearlman*

Cellular biochemistry of genetic deficiency in which an abnormal α 1-antitrypsin molecule accumulates in the endoplasmic reticulum and induces liver injury in the host; characterization of a cell surface receptor for amyloid- β peptide and its role in Alzheimer's disease; regulation of gene expression during the host response to inflammation. *Dr. David H. Perlmuter*

Cell cycle regulation in eukaryotic organisms using molecular, biochemical, genetic and cell biological approaches. *Dr. Helen Piwnicka-Worms*

Brain blood vessels and models for stroke.

Dr. Carl M. Rovainen

Molecular mechanisms and regulation of acidification and ion transport by intracellular vesicles.

Dr. Paul Schlesinger

Macrophage Cell Biology - Mechanism of receptor internalization and recycling. Physiologic role of receptors that recognize sugar residue on proteins and other cells. Receptor-mediated endocytosis and the reconstitution of vesicular transport in broken cell preparations. *Dr. Philip D. Stahl*

Analysis of nuclear pore complex structure and function in nucleocytoplasmic communication, by molecular, genetic, cell biologic, and biochemical means. *Dr. Susan Wentz*

Synaptic structure and function; regulation of synaptic strength at the neuromuscular junction and in organotypic brain slice cultures.

Dr. Robert S. Wilkinson

ELECTIVES

Descriptions of the following courses may be found under the Division of Biology and Biomedical Sciences.

Bio 459. Vision

Bio 5062. Central Questions in Cell Biology

Bio 5063. Molecular Cell Biology

Bio 5111. Intracellular Transport of Macromolecules in Animal Cells

Bio 5132. Cell Motility and Cytoskeleton Journal Club

Bio 5134. Topics in Cell Motility and Cytoskeletal Function

Bio 559. Nerve, Muscle, and Synapse

Bio 567. Advanced Tutorials

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences. See course descriptions in the Graduate Training section of this catalog.

Faculty

Edward Mallinckrodt, Jr.
Professor and Head of
Department

Philip D. Stahl, Ph.D.,
West Virginia University, 1967.

Professors Emeriti

Carlton C. Hunt, M.D.,
Cornell University, 1942. (See
Departments of Neurology and
Neurological Surgery.)

Stanley Lang, Ph.D.,
The University of Chicago, 1953.

Lecturer

Albert Roos, M.D.,
University of Groningen, 1940. (See
Department of Anesthesiology.)

Professors

Jacques U. Baenziger, M.D.,
Ph.D., Washington University, 1975.
(See Department of Pathology.)

Eric J. Brown, M.D.,
Harvard University, 1975. (See
Department of Medicine.)

George J. Broze, Jr., M.D.,
University of Washington, 1972.
(See Department of Medicine.)

Harold Burton, Ph.D.,
University of Wisconsin, 1968. (See
Department of Anatomy and
Neurobiology.)

F. Sessions Cole, M.D.,
Yale University, 1973. (See
Department of Pediatrics.)

Jerome R. Cox, Jr., Sc.D.,
Massachusetts Institute of Technol-
ogy, 1954. (Biomedical Engineer-
ing), (See Biomedical Computer
Laboratory and also School of
Engineering and Applied Science.)

William A. Frazier III, Ph.D.,
Washington University, 1973. (See
Department of Biochemistry and
Molecular Biophysics.)

John E. Heuser, M.D.,
Harvard University, 1969.

F. Scott Mathews, Ph.D.,
University of Minnesota, 1959. (See
Department of Biochemistry and
Molecular Biophysics.)

Robert P. Mecham, Ph.D.,
Boston University, 1976. (See
Department of Medicine.)

Charles E. Molnar, Sc.D.,
Massachusetts Institute of Technol-
ogy, 1966. (Also Computer Systems
Laboratory)

Alan L. Pearlman, M.D.,
Washington University, 1961. (See
Departments of Neurology and
Neurological Surgery.)

David H. Perlmutter, M.D.,
St. Louis University, 1978. (See
Department of Pediatrics.)

Joseph L. Roti Roti, Ph.D.,
University of Rochester, 1972. (See
Department of Radiology.)

Carl M. Rovainen, Ph.D.,
Harvard University, 1967.

Louis Simchowicz, M.D.,
New York University, 1970. (See
Department of Medicine.)

Thomas A. Woolsey, M.D.,
The Johns Hopkins University,
1969. (See Department of Anatomy
and Neurobiology and Depart-
ments of Neurology and Neurologi-
cal Surgery.)

Research Professor

Una S. Ryan, Ph.D.,
Cambridge University, 1968. (See
Departments of Medicine and
Surgery.)

Associate Professors

Eric C. Beyer, Ph.D.,
University of California, San Diego,
1981; M.D., 1982. (See Department
of Medicine.)

John A. Cooper, M.D.,
The Johns Hopkins University,
1982; Ph.D., 1983.

Douglas C. Dean, Ph.D.,
University of Kansas, 1984. (See
Department of Medicine.)

Stephen L. Gluck, M.D.,
University of California, Los
Angeles, 1977. (See Department
of Medicine.)

Marc R. Hammerman, M.D.,
Washington University, 1972. (See
Department of Medicine.)

Michael J. Holtzman, M.D.,
Northwestern University, 1975.
(See Department of Medicine.)

Keith A. Hruska, M.D.,
Creighton University, 1969. (See
Department of Medicine.)

Robert W. Mercer, Ph.D.,
Syracuse University, 1980.

Stanley Misler, Ph.D.,
New York University, 1977; M.D.,
1978. (See Department of Medi-
cine.)

Mike Max Mueckler, Ph.D.,
University of Wisconsin, Madison,
1982.

Paul A. Schlesinger, M.D.,
The University of Chicago, 1970;
Ph.D., 1973.

Steven Strasberg, M.D.,
University of Toronto, 1963. (See
Department of Surgery.)

Lewis J. Thomas, Jr., M.D.,
Washington University, 1957. (See
Department of Anesthesiology and
Biomedical Computer Laboratory.)

Robert S. Wilkinson, Ph.D.,
University of Texas, Austin, 1974.

Research Associate Professor

Dana R. Abendschein, Ph.D.,
Purdue University, 1978. (See
Department of Medicine.)

Assistant Professors

Stuart R. Adler, M.D., Ph.D.,
Duke University, 1982. (See
Department of Medicine.)

Kendall J. Blumer, Ph.D.,
Duke University, 1986.

James R. Duncan, M.D., Ph.D.,
Washington University, 1988. (See
Department of Radiology.)

John C. Edwards, Ph.D.,
The University of Chicago, 1983;
M.D., 1985. (See Department of
Medicine.)

Jeffrey Gidday, Ph.D.,
University of Virginia, 1986. (See
Departments of Neurology and
Neurological Surgery.)

Peter M. Haney, Ph.D.,
Case Western Reserve University,
1984; M.D., 1986. (See Department
of Pediatrics.)

David A. Harris, M.D., Ph.D.,
Columbia University, N.Y., 1983.

James E. Huettner, Ph.D.,
Harvard University, 1987.

Maurine Linder, Ph.D.,
University of Texas, Dallas, 1987.

Gregory D. Longmore, M.D.,
McGill University, 1983.

James G. McNally, Ph.D.,
The University of Chicago, 1983.
(See Institute for Biomedical
Computing.)

Jeremiah J. Morrissey, Ph.D.,
St. Louis University, 1974.

Anthony Muslin, M.D.,
Harvard University, 1984. (See
Department of Medicine.)

Colin G. Nichols, Ph.D.,
University of Leeds, 1985.

William C. Parks, Ph.D.,
Medical College of Wisconsin, 1982.
(See Department of Medicine.)

Clay Semenkovich, M.D.,
Washington University, 1981. (See
Department of Medicine.)

Steven Shapiro, M.D.,
The University of Chicago, 1983.
(See Department of Medicine.)

Thomas H. Steinberg, M.D., New
York University, 1978. (See
Department of Medicine.)

Susan R. Wente, Ph.D.,
University of California, Berkeley,
1988.

Research Assistant Professors

Victor Gustavo Blanco, Ph.D.,
National University of Cordoba,
1985; M.D., 1990.

Michael Chua, Ph.D.,
Australian National University, 1986.

Maria I. Colombo, Ph.D.,
Juan Augustin Maza, 1986.

Elaine Davis, Ph.D.,
McGill University, 1992.

Anatoly Grishin, Ph.D.,
Leningrad State University, 1985.

Guangpu Li, Ph.D.,
Washington University, 1991.

Dorothy Schafer, Ph.D.,
University of Michigan, 1983.

Instructor

Shirley A. Sahrman, Ph.D.,
Washington University, 1973.

JAMES S. MCDONNELL DEPARTMENT OF GENETICS

The Department of Genetics is at the forefront in developing new methods for physical and genetic mapping of the human genome and for identifying and isolating genes that cause inherited disease or susceptibility to disease. The Department supports a broad program of preclinical and graduate instruction in genetics, with research opportunities ranging from established experimental organisms to humans, and from molecular genetics to population genetics. A significant portion of the first-year course in basic medical sciences is devoted to human and clinical genetics, and particularly to the impact of new genetic technologies on the practice of medicine. Advanced training in clinical genetics and in genetic research is available from the faculty in the Department of Genetics and from geneticists with principal appointments in many other departments within the Medical School.

The Department of Genetics offers a broad range of training opportunities in virtually all major areas of modern genetics. Numbered among the faculty are world leaders in genetic mapping, new methods of DNA manipulation and cloning, developmental genetics, neurogenetics, immunogenetics, human genetics, and population and evolutionary genetics. In addition to opportunities in human genetics, research opportunities with experimental organisms include genetic studies with the mouse, fruit flies, nematodes, yeast and bacteria.

Many advanced courses and seminars are offered that focus on such subjects as the genetics of inherited disease, gene expression, genetic mapping, molecular genetics, developmental genetics, microbial genetics, immunogenetics, and population and evolutionary genetics. Extraordinary opportunities for research training and experience are available in all of these areas and at all levels. The programs are tailored to meet the needs of medical students, graduate students, and both M.D. and Ph.D. postdoctoral students pursuing advanced training in biomedical research.

FIRST YEAR

Molecular Genetics

The course is divided into halves. The first half focuses on the mechanisms of regulation of gene expression in eukaryotes. This includes discussions of the structure of DNA and its means of replication, the organization and packaging of eukaryotic genomes, chromatin structure and the nucleosome, the organization of polymerase II class genes, the

processing of their primary transcripts, and the molecular basis for transcriptional and translational regulation including the use of transgenic mice to study cell-specific gene regulation. The second half focuses on how these concepts can be applied to an understanding of medical genetics. Topics covered include principles of Mendelian genetics, the molecular basis for various inborn errors of metabolism — their diagnosis and prenatal screening, the genetics of cancer, and finally, current strategies for mapping and characterizing the human genome.

Drs. Hansen (Genetics), Gordon (Molecular Biology and Pharmacology), and Staff

RESEARCH

Bio 590. Research Opportunities

Molecular genetics, gene cloning, genome mapping. *Dr. Douglas Berg* (Molecular Microbiology), *Dr. Timothy Fleming* (Ophthalmology and Visual Sciences), *Dr. Narasimhan Gautam* (Anesthesiology), *Dr. Paul Goodfellow* (Surgery), *Dr. David Gutmann* (Neurology and Neurological Surgery), *Dr. Mark Johnston* (Genetics), *Dr. Pui Kwok* (Medicine), *Dr. Timothy Ley* (Surgery), *Dr. Peter Rotwein* (Medicine), *Dr. Mark Sands* (Medicine), *Dr. David Schlessinger* (Molecular Microbiology), *Dr. David States* (Institute for Biomedical Computing), *Dr. Richard Todd* (Psychiatry), *Dr. Robert Waterston* (Genetics), *Dr. Richard Wilson* (Genetics)

Human linkage studies. *Dr. Helen Donis-Keller* (Surgery), *Dr. Daniela Gerbard* (Genetics), *Dr. Paul Goodfellow* (Surgery)

Developmental genetics, neurogenetics. *Dr. Clarissa Cheney* (Genetics), *Dr. Ian Duncan* (Biology), *Dr. J. Mark Petras* (Ophthalmology and Visual Sciences), *Dr. Lawrence Salkoff* (Anatomy and Neurobiology), *Dr. Tim Schedl* (Genetics), *Dr. Steve Skolnick* (Ophthalmology and Visual Sciences), *Dr. Robert Waterston* (Genetics)

Immunogenetics. *Dr. David Chaplin* (Medicine), *Dr. Janet M. Connolly* (Genetics), *Dr. Ted Hansen* (Genetics)

Population and evolutionary genetics. *Dr. Stanley Sawyer* (Mathematics), *Dr. Barbara Schaal* (Biology), *Dr. Alan Templeton* (Biology)

Prenatal diagnosis, genetic counseling, cytogenetics. *Dr. James Crane* (Obstetrics and Gynecology), *Dr. S. Bruce Downton* (Pediatrics), *Dr. Michael Watson* (Pediatrics)

Genetic epidemiology, psychiatric genetics, complex genetic disorders. *Dr. James Cheverud* (Anatomy and Neurobiology), *Dr. C. Robert Cloninger* (Psychiatry), *Dr. Daniela Gerbard* (Genetics), *Dr. Alison Goate* (Psychiatry), *Dr. Andrew Heath* (Psychiatry), *Dr. George Johnson* (Biology), *Dr. Dabeeru C. Rao* (Biostatistics), *Dr. Theodore Reich* (Psychiatry), *Dr. Brian Suarez* (Psychiatry)

ELECTIVES

Bio 548. Nucleic Acids and Protein Biosynthesis

Fundamental aspects of the structure, biosynthesis, and function of nucleic acids and the biosynthesis of proteins. Emphasis on mechanisms involved in the biosynthetic processes and the regulation thereof. Prerequisites: Bio 337, 449 or equivalent or permission of the instructor. *Dr. Johnston (Genetics), Dr. Majors (Biochemistry)*

Bio 5491. Advanced Genetics

Fundamental aspects of organismal genetics with emphasis on experimental studies that have contributed to the molecular analysis of complex biological problems. Examples drawn from bacteria, yeast, nematodes, fruit flies and mammalian systems. Prerequisite: graduate standing, or permission of instructor. *Drs. Schedl and Staff*

Bio 5011. Ethics and Research Science

Exploration of ethical issues research scientists confront on a daily basis. Topics will include: ethics and the genome initiative, student-mentor relationships, collaborators' rights and responsibilities, social issues in science, scientists' role in society, social responsibility and knowledge of misconduct, conflict of interest and confidentiality, and oversight role of institutions. Case study and scenario presentations will provide focus for discussions. *Dr. Donis-Keller and Staff*

Bio 512. Special Topics in Biology

This will be a special topics course that will focus on *Drosophila* developmental genetics. This course will

discuss current areas of research in this field, emphasizing relevant methodologies and techniques. Areas covered will include genetic analysis of signal transduction pathways in development, establishment of polarity and localization of cytoplasmic determinants in the early embryo, pattern formation during embryogenesis, and genetic analysis of cytoskeletal function in developmental processes. Relevant methodologies will include transposable element-related techniques, mosaic analysis by somatic recombination, gynandromorph fate mapping, phenotype-dependent and phenotype-independent mutant screens, screens for interacting genes, uses of enhancer traps and reporter gene constructs, and analysis of meiotic nondisjunction.

The emphasis of the course will be on discussion of current papers in the field. Two to three sessions will be led by the instructor and other faculty members. Other discussions will be led by students and will be based on a small number of recent papers. Each student should expect to lead two one-hour class sessions. Topics: Mutagenesis using P elements - "Designer deletions"; Mutagenesis using P elements - Local P hopping; Mutagenesis using chemicals; Mosaic analysis - somatic recombination; Mosaic analysis - FLP-FRT system; Mosaic analysis - germ-line clones and the dominant female sterile technique; P elements and enhancer traps; Phenotype independent screen for P inserts; Using attached chromosomes to measure meiotic nondisjunction; Gynandromorphs and blastoderm fate mapping; Interacting gene screens and signal transduction. *Dr. C. M. Cheney and Staff*

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty

James S. McDonnell Professor of Genetics and Head of Department

Robert H. Waterston, M.D., The University of Chicago, 1972; Ph.D., 1972. (See Department of Anatomy and Neurobiology.)

Professors

Douglas E. Berg, Ph.D., University of Washington, 1969. (See Department of Molecular Microbiology.)

James M. Cheverud, Ph.D., University of Wisconsin, 1979. (See Department of Anatomy and Neurobiology.)

C. Robert Cloninger, M.D., Washington University, 1970; M.D. (hon.), Umea University, 1983. (See Department of Psychiatry.)

Susan E. Cullen, Ph.D., Albert Einstein College of Medicine, 1971. (See Department of Molecular Microbiology.)

Helen Donis-Keller, Ph.D., Harvard University, 1979. (See Departments of Surgery and Psychiatry.)

Ted H. Hansen, Ph.D., University of Michigan, 1975.

George B. Johnson, Ph.D., Stanford University, 1972. (Also Faculty of Arts and Sciences)

Timothy J. Ley, M.D., Washington University, 1978. (See Department of Medicine.)

Dabeeru C. Rao, Ph.D., Indian Statistical Institute, 1971. (See Department of Psychiatry and Division of Biostatistics.)

Theodore Reich, M.D., McGill University, 1963. (See Department of Psychiatry.)

Stanley Sawyer, Ph.D., California Institute of Technology, 1964. (See Division of Biostatistics.) (Also Faculty of Arts and Sciences)

Barbara A. Schaal, Ph.D., Yale University, 1974. (Also Faculty of Arts and Sciences)

David Schlessinger, Ph.D., Harvard University, 1961. (See Departments of Medicine and Molecular Microbiology.)

Alan R. Templeton, Ph.D., University of Michigan, 1972. (Also Faculty of Arts and Sciences)

Associate Professors

David D. Chaplin, M.D., Ph.D., Washington University, 1980. (See Departments of Medicine and Molecular Microbiology.)

James P. Crane, M.D.,
Indiana University, 1970. (See
Departments of Obstetrics and
Gynecology and Radiology.)

Ian W. Duncan, Ph.D.,
University of Washington, 1978.
(Also Faculty of Arts and Sciences)

Alison M. Goate, D. Phil.,
University of Oxford, 1983. (See
Department of Psychiatry.)

Paul Goodfellow, Ph.D.,
Queens University, 1985. (See
Department of Surgery.)

Andrew C. Heath, Ph.D.,
University of Oxford, 1983. (See
Department of Psychiatry.)

H. Mark Johnston, Ph.D.,
University of California, Berkeley,
1980.

J. Mark Petrash, Ph.D.,
University of Texas, Galveston,
1981. (See Department of Ophthal-
mology and Visual Sciences.)

David J. States, M.D., Ph.D.,
Harvard University, 1983. (See
Institute for Biomedical Comput-
ing.)

Brian K. Suarez, Ph.D.,
University of California, Los
Angeles, 1974. (See Department of
Psychiatry.)

Richard D. Todd, Ph.D.,
University of Texas, Dallas, 1977;
M.D., University of Texas, San
Antonio, 1981. (See Department of
Psychiatry.)

Michael Zuker, Ph.D.,
Massachusetts Institute of Technol-
ogy, 1974. (See Institute for
Biomedical Computing.)

Research Associate Professor

Richard K. Wilson, Ph.D.,
University of Oklahoma, 1986.

Assistant Professors

Clarissa M. Cheney, Ph.D.,
University of Pennsylvania, 1979.

S. Bruce Dowton, M.D. (Syd.),
University of Sydney, 1994. (See
Department of Pediatrics.)

Timothy P. Fleming, Ph.D.,
University of Missouri, 1985. (See
Department of Ophthalmology.)

Narasimhan Gautam, Ph.D.,
University of Bombay, 1983. (See
Department of Anesthesiology.)

Daniela S. Gerhard, Ph.D.,
Cornell University, 1982. (See
Department of Psychiatry.)

Warren R. Gish, Ph.D.,
University of California, Berkeley,
1988.

David H. Gutmann, Ph.D.,
The University of Michigan, 1984;
M.D., 1986. (See Department of
Neurology.)

Pui-Yan Kwok, Ph.D.,
The University of Chicago, 1985;
M.D., 1987. (See Department of
Medicine.)

Peter S. Rotwein, M.D.,
Albert Einstein College of Medi-
cine, 1975. (See Department of
Medicine.)

Lawrence B. Salkoff, Ph.D.,
University of California, Berkeley,
1979. (See Department of Anatomy
and Neurobiology.)

Mark S. Sands, Ph.D.,
State University of New York,
Stony Brook, 1990. (See Depart-
ment of Medicine.)

Tim B. Schedl, Ph.D.,
University of Wisconsin, 1984.

Steven B. Scholnick, Ph.D.,
Cornell University, 1982.

Michael S. Watson, Ph.D.,
University of Alabama, 1981. (See
Department of Pediatrics.)

Research Assistant Professors

Janet M. Connolly, Ph.D.,
George Washington University,
1979.

Terence Featherstone, Ph.D.,
University of Birmingham, 1980.

Volker Nowotny, Ph.D.,
Technische Universitat, 1981.

Instructor

Raymond D. Miller, Ph.D.,
University of California, 1977.

Research Instructors

Elaine Mardis, Ph.D.,
University of Oklahoma, 1989.

Mark Vaudin, Ph.D.,
Molecular Research Council, 1991.

Research Scientist

Ladeana Hillier, M.S.,
Northwestern University, 1988.

JOHN MILLIKEN DEPARTMENT OF MEDICINE

The general medicine teaching services of the department are located at Barnes Hospital, Jewish Hospital, and Veterans Affairs Medical Center (St. Louis) under the following directors:

Barnes Hospital, *Dr. Atkinson*
House Staff Training Program,
Dr. Goodenberger
Jewish Hospital, *Dr. Klabr*
House Staff Training Program, *Dr. Lefrak*
Veterans Affairs Medical Center, *Dr. Chase*

In addition, for the purposes of both teaching and research, the Department of Medicine is divided into specialty divisions or sections at Barnes Hospital and Jewish Hospital under the following directors:

Allergy and Clinical Immunology, *Dr. Chaplin*
Bone Marrow Transplantation and Stem Cell
Biology, *Dr. DiPersio*
Bone and Mineral Diseases, *Dr. Avioli*
Cardiovascular Diseases, *Drs. Cain, Wickline*
Center for Health Behavior Research, *Dr. Fisher*
Dermatology, *Drs. Eisen, Welgus*
Emergency Medicine, *Dr. Lewis*
Endocrinology, Diabetes, and Metabolism,
Drs. Cryer, Avioli
Gastroenterology, *Drs. Alpers, Stenson*
General Medical Sciences, *Dr. Littenberg*
Geriatrics and Gerontology, *Dr. Holloszy*
Hematology, *Drs. Broze, S. Kornfeld, Majerus*
Infectious Diseases, *Drs. Medoff, E. Brown, Little*
Laboratory Medicine, *Dr. Miletich*
Lipid Disorders, *Dr. Schonfeld*
Clinical Oncology, *Dr. Ihde*
Molecular Oncology, *Dr. Korsmeyer*
Pulmonary and Critical Care Medicine,
Dr. Holtzman, Senior
Renal Diseases, *Dr. Hammerman, Hruska*
Rheumatology, *Dr. Yokoyama (Chief)*

Instruction in Medicine is provided during all four years of the medical curriculum, beginning with human genetics and an introductory course in the first year. Teaching in the second year has two main objectives: the correlation of the basic sciences with clinical aspects of disease and training in the technical methods of physical examination and laboratory diagnosis. By the beginning of the third year, the student is ready for supervised clinical study of individual patients. A clinical clerkship of 12 weeks, divided into two six-week periods, is served by third-year students on the medical services of the department. In the final year, students may elect a subinternship in general medicine and of a series of elective courses in the medical specialties.

FIRST YEAR

Clinical Medicine I

This is a course in interviewing technique and medical history taking. The primary goal is acquisition of fundamental interpersonal and clinical data collecting/recording skills, which the students will be called upon to adapt to diverse situations in their careers. Initially students observe their instructors with patients, then they go to the university-affiliated hospitals on their own. Videotapes of student-patient interviews are critiqued extensively by instructors in the small group setting. Preparation for and attendance at clinicopathological conferences expands the clinical vocabulary and basic knowledge base.
Dr. Abbey and Staff

SECOND YEAR

Teaching by the Department of Medicine is designed to (1) prepare students for the transition from the preclinical sciences to the study of the sick patient at the bedside, (2) help them analyze the clinical manifestations of disease in terms of the responsible mechanisms, and (3) introduce them to the techniques of examination which are used regularly on all clinical services. This instruction is undertaken jointly with members of other clinical departments and is coordinated with subject matter presented by the Department of Pathology.

Pathophysiology

The major areas of clinical medicine are presented in detail to illustrate the application of biochemical, physiological, and anatomical information to the understanding of pathological states. Cardiovascular, renal, neurological, gastrointestinal, pulmonary, hematological, metabolic, nutritional, and developmental diseases are discussed. Emphasis is placed on the use of fundamental information in approaching clinical problems as a way of thinking that prepares the student for a lifetime of medicine, during which new information will constantly be acquired.
Department of Medicine Staff

Clinical Medicine II

This course continues the development of medical history taking skills in conjunction with techniques of the physical examination. Further emphasis will be placed on written documentation and verbal presentation of the history and physical exam. Subsequently, the role of hospital admission laboratory tests and common imaging procedures in clinical decision making are integrated with the above. Course design includes lectures and practice sessions aimed at incremental addition of physical examination skills coupled with weekly patient interviews/presentations. Sensitive areas of the physical examination are taught with the help of clinical subjects. Exposure to acute care is obtained through scheduled

evenings in the Barnes Emergency Room. Students will attend those CPCs presented in the problem solving format. *Dr. Abbey and Staff*

THIRD YEAR

General Medicine

Supervised study of patients on the general medical teaching services of Barnes Hospital, Jewish Hospital, and St. Louis Veterans Hospital. Students are assigned as clinical clerks to the patients admitted to these services. Teaching is provided by the chief of service, attending physicians, house officers, consultants, chief residents, and at regularly scheduled conferences. Formal instruction is given in medical therapeutics and laboratory medicine during the clerkship. Students serve for six weeks each on two of the four services. *Drs. Atkinson, Chase, Klahr, Whelan and Staff*

Clinical Pathological Conference

The clinical course, laboratory and radiologic studies, and pathological findings of a patient are discussed at a weekly conference by members of the Departments of Medicine, Pathology and Radiology. *Dr. Atkinson, Chief Residents and Medical Staff; Dr. Dehner and Pathology Staff*

FOURTH YEAR ELECTIVES

Medical Subinternship

Medical subinternships, six weeks in length, are offered to a limited number of students on the following medical services: Barnes Hospital Blue and Red Services, Jewish Hospital and St. Louis Veterans Affairs Hospital. Duties and responsibilities, including nights on call, are those of an intern, with the proviso that requirements of Missouri state law must be met (e.g., orders must be countersigned by a licensed physician, etc.). The workload is lighter than that for interns to insure ample time for learning. Instruction and supervision will be provided by the appropriate chief of service, attending physicians, consultants, and house officers. Attendance at scheduled teaching conferences is required. The subinternship is especially valuable to students who plan to enter residencies in internal medicine, family medicine, or a preliminary internship before residency in another specialty. However, it offers valuable practical experience in preparation for any clinical residency. *Drs. Atkinson, Chase, Klahr and Staff*

Clinical Pathological Conference

Friday, 12:15-1:15 p.m., September to June. *Dr. Atkinson, Chief Residents and Medical Staff; Dr. Dehner and Pathology Staff*

Allergy and Clinical Immunology

(A) Allergy and Clinical Immunology. Students will participate in the Allergy Consult Service at Barnes and Jewish hospitals. The students will serve as the primary consult for the allergy team for inpatient and Emergency Room consultations. They will present patients to the allergy fellow on call and the attending physician. Students will attend the ward and private allergy clinics as well as the Asthma Center at Barnes West County Hospital. They will also participate in the other teaching activities of the Division of Allergy and Immunology. *Dr. H. J. Wedner and Staff*

(B) Research. Minimum of 12 weeks, full-time.

1. Definition of the roles of acute inflammatory cytokines *in vivo*; definition of the complete gene content of the HLA complex. *Dr. D. Chaplin*

2. Immunopathology of chronic hyperplastic sinusitis. *Dr. D. Hamilos*

3. Identification of antigens involved in autoimmune and allergic disorders. *Dr. A. Kulczycki*

4. Molecular Biology and Biochemistry of T Cell Regulation. *Dr. C. Parker*

5. Biology of Pollen and Fungal Allergens. Studies designed to characterize allergens from oak pollen and the spores of *Epicoccum nigrum*, a common allergenic mold. *Drs. H. J. Wedner and A. Dixit*

6. Psychosocial aspects of asthma care among inner-city African-American children and adult asthmatic patients. *Dr. H. J. Wedner*

Bio-organic Chemistry and Molecular Pharmacology

Research Elective. Lipid mediators of signal transduction in the cardiovascular system. Characterization of regulatory mechanisms responsible for the liberation of lipid second messengers during cellular activation. *Dr. Gross*

Bone Marrow Transplantation and Stem Cell Biology

Four weeks, all day. Students will have the opportunity to develop familiarity with the clinical and basic science issues involved in the treatment of patients with leukemia, lymphoma and marrow failure states as well as critical issues of stem cell transplantation. Students will have intense hands-on exposure to BMT patients and will participate in our interdisciplinary approach to BMT.

Cardiovascular Disease

(A) Cardiology Consult Service - Jewish Hospital. Six weeks. Students will receive intensive training in clinical electrocardiology and a broad exposure to consultative cardiology. Emphasis will also be placed on non-invasive techniques for evaluating cardiac disease. *Drs. Wickline, Rich, Kleiger, Krone and Staff*

(B) Cardiac Catheterization and Hemodynamics. Highly specialized elective. Four weeks. Students will attend cardiac catheterization procedures and conferences; will perform complete "workups" of patients in preparation for diagnostic and interventional catheterization and closely will observe hemodynamic and angiographic procedures. *Dr. Lasala and Staff*

(C) Cardiac Arrhythmias and Clinical Electrophysiology. Jewish Hospital. Provides the student with exposure and teaching in the diagnosis and treatment of complex rhythm disturbances. *Dr. Rottman*

(D) Cardiology/CCU. Jewish Hospital. Students will be introduced to cardiac graphics, electrocardiography, echocardiograms, and other non-invasive tests, then rotate through CCU as a subintern. Students are expected to perform initial evaluation and formulate management plan under resident's guidance, make brief oral presentations to CCU attendings. Night call every fourth night. *Dr. M. Rich*

(E) In-Patient Cardiology. Barnes Hospital. Students will participate as members of a comprehensive cardiology team which sees a large population of cardiac patients and follows them through all aspects of their in-hospital care. Emphasis placed on physical examination and the interpretation of modern cardiac diagnostic tests in clinical decision making. *Drs. Barzilai, Braverman, Nash, Reiss, Robiolio and Torres*

(F) Exercise Physiology. Barnes Hospital. Students will participate in the performance and interpretation of exercise testing, measurement of oxygen uptake and cardiac output, and management of patients undergoing exercise training. *Dr. Ehsani*

(G) Clinical Electrophysiology and Pacing. Barnes Hospital. Students will have a broad exposure to the diagnosis and management of supraventricular and ventricular tachyarrhythmias and bradyarrhythmias. The diagnostic evaluation will include interpretation of the electrocardiogram, ambulatory ECG monitoring, tilt-table testing, signal-averaged electrocardiography, and invasive electrophysiologic testing. Treatment modalities include antiarrhythmic drugs, radiofrequency catheter ablation, implantable cardioverters and defibrillators, and sophisticated pacemakers. *Drs. Cain, Frazier, Lindsay and Smith*

(H) Cardiac Echocardiography. Barnes Hospital. Ultrasonic assessment of cardiac structure and function. Students will participate in the performance and interpretation of echocardiograms, including Doppler color flow imaging, stress echocardiography with dobutamine infusion for exercise, and

transesophageal imaging modalities; 30-40 studies are performed daily; direct apprenticeship will be provided to learn about hemodynamics via noninvasive ultrasonic techniques. *Dr. Perez and Staff*

(I) Sub-internship in Cardiac Intensive Care Unit. Barnes Hospital. Selected highly motivated students may participate in a sub-internship in the Cardiac Intensive Care Unit. Students will function as interns supervised by second year medical residents and will be involved in the admission and management of patients with acute cardiac disease. Students will be expected to take call with a supervising resident every third night and admit at least one patient on each call day. Students will be responsible for the presentation of patients on attending rounds and the management of patients that are admitted. In addition, teaching in the CCU will include presentation of patients once a week to senior cardiology staff in a professor's rounds format. *Drs. Eisenberg and Winters*

(J) Research. Minimum of 12 weeks, all days.

1. Characterization of the responses of the arterial wall to injury. Students will participate in studies with experimental animals designed to define the determinants of procoagulant activity associated with the site of vascular injury and their changes with time, and to determine whether agents that inhibit the activity of procoagulation moieties can induce a nonthrombogenic luminal surface of the vessel and thereby alter vascular remodeling, leading to decreased acute thrombosis and subsequent restenosis. *Dr. Abendschein*

2. Characterization of myocardial blood flow and metabolism during ischemia and reperfusion, development of strategies which enhance myocardial function by altering intermediary metabolism, and development of mathematical models and radiopharmaceuticals for use with positron emission tomography (PET). *Dr. Bergmann*

3. Research in area of gene regulation. Working with the M and B creatine kinase genes that are regulated during development of skeleton muscle and myocardium, currently elucidating the mechanisms by which the plasminogen activator inhibitor type-1 gene is regulated by specific growth factors. *Dr. Billadello*

4. Delineation of mechanisms responsible for clinical arrhythmias. Improved identification of patients at risk for developing sudden cardiac death. Evaluation of new antiarrhythmic agents and pacing devices. *Dr. Cain*

5. Determination of the role of lipoprotein modification and metabolism on the development of atherosclerotic lesions. *Dr. Daugherty*

6. Physiology adaptations to exercise training in ischemic heart disease and effective exercise training on age-related deterioration in cardiovascular function. *Dr. Ehsani*

7. Characterization of the role of the coagulation and fibrinolytic system and complications of coronary and peripheral atherosclerotic vascular disease. The student will be exposed to techniques involved in study and coagulation of fibrinolytic proteins both in basic and clinical trials. Opportunities are available as well for involvement in ongoing clinical research involving measurement of coagulant and fibrinolytic markers in a wide variety of patients including those with coronary artery disease, coagulation abnormalities, and peripheral vascular disease. *Dr. Eisenberg*.

8. Delineation of the molecular genetic basis of inherited forms of cardiomyopathy and sudden death. Student will learn a variety of techniques used to detect mutations in genes that cause dilated and hypertrophic cardiomyopathy. Mutations will be correlated with the severity of the cardiomyopathy in a given individual as determined by clinical evaluation and several diagnostic modalities including echocardiography and cardiac positron emission tomography. *Dr. Kelly*

9. Hemodynamics, myocardial mechanics, and ventricular function (cardiac catheterization). *Dr. Ludbrook*

10. Ultrasonic assessment of cardiac structure and function including Doppler color flow imaging, and transesophageal imaging. *Dr. Perez*

11. Delineation of cellular electrophysiologic and ionic derangements contributing to arrhythmias including mechanisms underlying arrhythmogenic whole-cell currents, alteration in subcellular calcium handling, membrane transport by cardiac myocyte sarcoplasmic reticulum and its modulation by biochemical metabolites. *Dr. Yamada*

Center for Health Behavior Research

The Health Care Services program is an interdisciplinary program sponsored jointly by Washington University's School of Medicine, Department of Psychology, and University College. The purpose of the 30-unit graduate degree program is to produce professionals competent in the development and evaluation of health care services across a variety of settings. There is an emphasis on the importance of coordinated care services focusing on nonacute and preventive care delivered to diverse individuals, families and communities across multiple organizational settings. Skills in evaluation of these services is a focus of the program.

Dermatology

(A) Clinical Clerkship. Students participate in outpatient care. Stress is placed on the dermatologic variations normally encountered, identification of common skin diseases, dermatologic clues to systemic disease, etc. Instruction is given in cutaneous histopathology and clinical mycology. *Dr. Eisen and Staff*

(B) Research. Minimum of 12 weeks, all day.

1. Proteolytic degradation of the extracellular matrix. Behavior of fibroblasts in a collagen lattice (skin equivalent). *Dr. Eisen*

2. Role of secreted extracellular matrix metalloproteases in tissue remodeling. Structure and function of metalloproteases. *Dr. G. Goldberg*

3. Biochemical studies on the control of cellular differentiation of the medically important systemic mycotic agents in particular *Histoplasma capsulatum*. *Dr. Kobayashi*

4. Automated genetic mapping. Projects are directed toward automation in the many areas of molecular genetics. Specifically, we are developing ways to detect DNA sequence variations efficiently, generating genetic markers that can be typed rapidly, and studying large populations with these markers using automated methods. Opportunities to apply these methods to human diseases are available. *Dr. Kwok*

5. The mechanisms that cause metabolites of arachidonic acid to be produced after sunburn (ultraviolet injury) are being examined. The current emphasis is on the signal transduction pathway by which arachidonic acid release after ultraviolet light exposure occurs and the effect this process has on cell differentiation. *Dr. Pentland*

6. Enzymology and regulation of extracellular neutral proteases (matrix metalloproteinases). Enzymology includes cleavage site analysis, comparative kinetics, and development of inhibitors, as well as attempting crystallization. Regulation presently focuses on comparisons between different cellular environments, particularly emphasizing free-floating collagen matrices vs. cells cultured in monolayers. Investigating integrin-mediated regulation of matrix metalloproteinases in both normal and transformed cells. *Dr. Seltzer*

Emergency Medicine

(A) Clinical Emergency Medicine. Four weeks, Barnes Hospital. This rotation offers practical experience in the evaluation and management of acutely sick and injured patients. Students will function as subinterns, initially evaluating their assigned patients and developing a plan for further diagnostic studies and therapy. They will report directly to an attending physician. The student can expect to get an opportunity to perform a wide variety of procedural skills such as suturing, splinting, peripheral and central venous access, cardiopulmonary resuscitation and cardioversion/defibrillation. Shifts will be nine hours and students will rotate between day, evening, night and weekends in order to gain maximum exposure to all types of emergencies. Students will be expected to attend the emergency medicine didactic conferences during their rotation and will take a written test at the end of the rotation. *Dr. Lewis*

(B) Research Elective. Four weeks, Barnes Hospital. This rotation offers an opportunity to investigate a wide variety of clinical questions relevant to emergency medicine. Cardiopulmonary resuscitation, injury prevention, cost containment and the prehospital care of sick or injured patients are some areas of active research. A preceptor would assist the student with literature review, study design and data analysis. Students with original research ideas would be encouraged to complete their work to the point of abstract presentation or manuscript preparation. *Dr. Lewis*

(C) Four weeks, Jewish Hospital. Senior student functions as member of E.D. staff, evaluating and treating patients in the E.D. Emphasis on Internal Medicine patients, minor Surgery, and Gynecology cases. *Dr. Zwemer*

Gastroenterology

(A) Clinical Gastroenterology. Four weeks, all day. Students participate in the study of patients with a spectrum of digestive diseases, have responsibility for patients on whom consultations have been requested, observe biopsy, endoscopic and intubation techniques, and participate in the conferences and clinics run by the Division. *Drs. Clouse and Zuckerman*

(B) Research. Minimum of 12 weeks, all day.

1. Cell biology of polarized small intestinal epithelium; synthesis and secretion of intestinal proteins; regulation by dietary and hormonal factors in vivo and in cultured intestinal cells. Emphasis will be on unique secretory and transcellular pathways of alkaline phosphatase and cobalamin binding proteins. *Dr. Alpers*

2. Clinical applied research on viral hepatitis. Emphasis is placed on applying current immunological methodology to clinical and investigative studies of important and yet unanswered problems in the field of hepatitis, both acute and chronic. *Dr. Lissos*

3. Human cellular immunology; effect of cytokines and peptides on normal human peripheral blood, tonsillar and splenic B cells; immunoregulation of intestinal B and T lymphocytes; transgenic mouse studies targeting cytokines to the intestine and liver; immune development in the intestine. *Dr. Peters*

General Medical Sciences

(A) Clerkship in Primary Care in General Internal Medicine is designed to provide the student with firsthand experience in general internal medicine practice in a model ambulatory care setting, the Health Key Medical Group of St. Louis. The major component of the clerkship is direct patient care under the supervision of senior internists who are members of the group. *Dr. Scott Anderson and Staff*

(B) Clerkship in General Internal Medicine in a small community without medical subspecialists (Keokuk, IA). Emphasis during preceptorship will be on ambulatory care. Students will work with three internists. Exposure will include consultations from general surgeons and family practitioners and other responsibilities of the general internal medicine group including treadmill exercise testing, echocardiograms, Holter Monitor analysis and interpretation, etc. Students will also have direct inpatient care responsibility including evaluation and treatment of admissions to the CCU. *Drs. Austin, Davis and Hakes*

(C) Medicine Clinic Outpatient Experience. Four half-day sessions in General Internal Medicine and two half-day sessions in a Medicine Specialty. A new clinic patient will be assigned to each student for workup, followed by presentation to the Attending Physician and Medical Resident/Fellow who will follow the patient after the student has finished the rotation. Discussion of each case will include diagnosis, further workup, therapy and follow-up care. *Dr. Levitt*

(D) Primary Care Medicine. Students will gain confidence in the ability to deliver first-contact as well as ongoing care to ambulatory adult patients of all ages. Students will work with a more diverse range of patients than those encountered in most in-hospital rotations, thus providing a solid foundation for residency and future practice. Experiences will include office gynecology, rheumatology, geriatrics, patient education, the walk-in clinic, and other areas of interest to the student. No night or weekend duty. *Dr. Wren*

Geriatrics and Gerontology

Six weeks or four weeks, all day. Students will receive instruction in the principles and practice of geriatric medicine. Students will participate in the care of nursing home patients, the inpatient consultation service, and outpatient assessment clinic. Didactic lectures and clinical conferences will provide exposure to a wide variety of clinical and research topics. *Drs. Binder, Birge and Carr*

(A) Clinical Elective. Exercise in Medicine and Preventive Medicine. Six weeks, all day. Students will participate as members of Applied Physiology Section's clinical team, doing exercise-testing, with measurement of oxygen uptake and cardiac output, and metabolic studies; and working with patients with coronary artery disease, diabetes, and/or hypertension who are undergoing exercise-training as part of their treatment. *Drs. Ehsani and Holloszy*

(B) Research Elective. Physiology and Biochemistry of Exercise. Research deals with the acute and chronic responses to exercise. Areas include biochemical adaptations in muscle in response to

endurance exercise; cardiac adaptations to increased work load; the serum triglyceride lowering effect of exercise; the biochemical basis of muscle fatigue and the insulin-like effect of exercise. *Drs. Ehsani and Holloszy*

Hematology and Oncology

(A) Clinical Hematology. Four or six weeks. Students receive a broad experience in diagnosis and management of patients with nonmalignant hematologic disease. Individual instruction in morphology and laboratory-based hematology is provided. *Dr. M. Blinder*

(B) Research. Minimum of 12 weeks, all day.

1. Biochemistry, molecular biology of growth factors and their regulation, mechanisms of transformation and roles of growth and development. *Dr. T. Deuel*

2. Biochemistry of mammalian cell surfaces; synthesis, processing and sorting of glycoproteins, including lysosomal enzymes. *Drs. R. Kornfeld and S. Kornfeld*

3. Biochemistry of platelets, regulation of lipid metabolism in tissue culture; mechanism of platelet thrombus formation. *Dr. Majerus*

4. Biochemical studies of interactions of plasma protease inhibitors with coagulation proteases. *Dr. Tollefsen*

Infectious Disease

(A) Clinical Infectious Diseases. Fundamentals of evaluating clinical problems in infection and formulating plans for workup and therapy. Students see consultations in infectious diseases in every part of Barnes and Jewish hospitals under supervision of faculty member. They work closely with medical residents and infectious disease fellows, follow own patients and play an important role in their management. *Dr. Medoff*

(B) Clinical AIDS. Study of treatment of HIV infection and associated opportunistic infections at Washington University AIDS Clinical Trials Unit. *Dr. Powderly*

(C) Research.

1. Investigations into the molecular mechanism for regulation of the function of phagocytic cells. *Dr. Eric Brown*

2. Research focuses on the biochemistry of parasitic diseases. The organisms being studied include a protozoan that causes malaria, *Plasmodium falciparum*, and a helminth which causes ascariasis, *Ascaris suum*. *Dr. Goldberg*

3. Study of DNA replication in Herpes viruses, particularly Herpes simplex virus (HSV), overexpressed essential HSV replication gene in

variety of heterologous systems and study of the role of the products of these genes in replication process by using genetic and biochemical methodologies. *Dr. Paul Olivo*

4. Intercellular communication in macrophages, membrane transporters of macrophages, purinergic receptors and the role of extracellular nucleotides in macrophage function. *Dr. Steinberg*

5. Research on issues at the interface of virology and immunology by analyzing aspects of immunity that control infection, and aspects of viral structure/genetics that contribute to virulence and disease. We study both mucosal immunity to the dsRNA non-enveloped reoviruses and pathogenesis and latency of the much more complex dsDNA enveloped murine cytomegalovirus. *Dr. Virgin*

6. Disease mechanisms and recombinant vaccine development in the protozoan parasite *Entamoeba histolytica*. *Dr. Stanley, Jr.*

7. Research on parasitic disease (filariasis and river blindness) emphasizes development of improved diagnostic methods and studies of protective immunity. *Dr. Weil*

8. Epidemiologic studies of sexually transmitted diseases. *Dr. Stoner*

Laboratory Medicine

(A) Clinical Laboratory Medicine. Elective is designed to teach the student how the vast array of clinical assays are used in the diagnosis of disease and how the tests are actually performed in the clinical laboratory. *Dr. Miletich*

(B) Research (see also Department of Pathology).

1. Alternatives to blood; blood conservation and transfusion practice. Pharmacologic interventions, interventional hematology; photopheresis, peripheral stem cell pheresis. *Dr. Goodnough*

2. Studies on the control of cellular differentiation of the medically important systemic mycotic agents, in particular *Histoplasma capsulatum*. *Dr. Kobayashi*

3. Systemic study of the structural elements of the factor X molecule that mediate functional interactions using both traditional and novel cellular and molecular biological approaches, with particular emphasis on expression of recombinant proteins. *Dr. Miletich*

4. Phospholipid-derived mediators and insulin secretion. Study of glucose-induced insulin secretion by isolated pancreatic islets from rat and man and involvement of phospholipid-derived mediators in this signal transduction process. Involves mass spectrometry. *Dr. Turk*

Medical Informatics

Research seminar series concerning literature surveys and medical informatics research conducted by the Division of Medical Informatics. *Dr. Frisse and Staff*

Clinical Oncology

(A) Clinical Oncology. Cochran VA Hospital. Four weeks, all day. Students receive major exposure to management of non-small cell and small cell lung cancer and of carcinoma of the colon, prostate, head, and neck. General oncological topics such as pain management, hypercalcemia of malignancy, malignant effusions, and neurooncology will be treated. A wide variety of hematological disorders also will be encountered. *Drs. Abbey and Hickman*

(B) Clinical Medical Oncology Consultation Service. Barnes and Jewish Hospital. Six weeks, all day. Students will participate on the inpatient consultation service. Emphasis will be given to the work-up and initial management of patients with newly diagnosed cancers. *Dr. Mortimer*

(C) Clinical Medical Oncology Outpatient Service. Barnard Cancer Center. Six weeks, all day. Students will evaluate new patients and participate in the follow-up care of patients actively being treated for cancer. Schedules site-specific interdisciplinary conferences with surgery and radiation therapy for head and neck cancers, breast, thoracic, gastrointestinal and genitourinary cancers. *Dr. Mortimer*

Molecular Oncology

The division concentrates on a research laboratory approach to cancer. A basic cancer research program is included with basic science themes of cancer genetics and mouse developmental biology. The mechanisms of oncogenesis of the genes responsible for human cancers are emphasized.

Endocrinology, Diabetes and Metabolism

(A) Clinical Clerkship. Students see inpatients and outpatients with endocrine and metabolic disease and participate in the rounds and conferences of the Division. *Dr. Cryer and Staff*

(B) Research.

1. Studies of the physiology and pathophysiology of metabolic regulation in normal humans and patients with diabetes mellitus. *Dr. Cryer*
2. Regulation of plasma and body cholesterol levels studied in patients with atherosclerosis and hyperlipidemia. Whole body cholesterol metabolism and lipoprotein receptor structure, function and modification is investigated. *Dr. Ostlund*
3. Studies of genetic susceptibility to diabetes in man and experimental animal models through recombinant DNA techniques. *Dr. Permutt*
4. Molecular biology of growth hormone action; regulation of gene expression of members of the insulin-like growth factor family of peptides; growth factor action during cellular differentiation and development. *Dr. Rotwein*

Bone and Mineral Diseases

(A) Jewish Hospital, Barnes Hospital, St. Louis Children's Hospital, the Veterans Affairs Medical Center and the Shriners Hospital for Crippled Children. Designed to acquaint students with clinical radiological and pathological manifestations of metabolic bone disease, disorders of calcitropic (parathyroid hormone, vitamin D, calcitonin) hormone metabolism and activity, and to the current therapeutic concepts in skeletal disorders. *Drs. Avioli, Civitelli, Diemer, Pacifici, Towler and Whyte*

(B) Research.

1. Studies on bone cell differentiation, growth and metabolism in human cell models. Oncogenes in osteoblast differentiation and function. Role of cell adhesion and extracellular matrix in bone cell physiology. *Drs. Avioli, Cheng, Rifas and Towler*
2. Studies combine clinical, biochemical, molecular, genetic, and cell biological approaches to investigating the pathophysiology of heritable disorders of bone metabolism. The role of alkaline phosphatase in normal and aberrant mineralization. *Drs. Fedde and Whyte*
3. Mechanism of action of estrogen in bone with emphasis on the effects of estrogen on the local production of cytokines. Integrin receptors-mediated interactions between bone matrix proteins and bone cells and their effects on the production of cytokines and cytokine antagonists. *Dr. Pacifici*
4. Cell-cell communication in bone cell physiology, with emphasis on the function and regulation of gap junctions, and the role of cell-cell adhesion molecules. Modulation of intercellular communication in bone by hormones, cytokines, and mechanical factors. Signal transduction of calcitropic hormones. *Dr. Civitelli*
5. Transcriptional regulation of osteoblast-specific gene expression by homeodomain (Hox) factors. Modulation by cyclic AMP, growth factors and osteotrophic hormones. *Dr. Towler*

Renal Disease

(A) Clinical Nephrology. Barnes Hospital. Students work with a Renal Fellow evaluating inpatients with acute and chronic renal failure, and electrolyte disorders. They participate in daily rounds with an attending physician, and attend weekly Renal Grand Rounds. *Dr. Hammerman and Staff*

(B) Clinical Nephrology. Jewish Hospital. Students will be provided opportunity to evaluate patients on the renal consultant service, participate in daily clinical nephrology rounds, and participate in combined rounds. *Dr. Hruska and Staff*

(C) Mixed Clinical and Research Electives.

1. Clinical and metabolic studies in patients with renal disease and patients undergoing dialysis treatment. *Dr. Delmez*

2. Opportunity for research in molecular approaches to cellular chloride channels and development of epithelial polarity. *Dr. Edwards*

3. Students will have opportunity to participate in basic research on molecular biology of proton pumps and proton transport by the kidney. *Dr. Gluck*

4. Studies focusing on the role of the renal proximal tubule in vitro as an antigen presenting cell for CD4+T cells. *Dr. Hagerty*

5. Studies characterizing synthesis of polypeptide growth factors in renal tissue and the role(s) of polypeptide growth factors in renal development, growth and physiology. *Dr. Hammerman*

6. Matrix protein regulation of bone cell function. The nature of osteopontin/ $\alpha\beta_1$ mediated signal generation through c-src, P13 kinase and PLC γ . *Dr. Hruska*

7. Studies of the role of calcitropic hormones in vascular pathobiology. *Dr. Hruska*

8. Mechanisms involved in progression of renal disease. Methodology to assess renal function and prevent progression of renal disease in experimental animal models. *Dr. Klabr*

9. Hormonal modulation of renal metabolism and the pathophysiological consequences of urinary tract obstruction, including mechanisms of renal fibrosis and development of renal disease. *Dr. Klabr*

10. Role of ion channels in stimulus-secretion coupling in pancreatic islet β -cells; role of ion channels in volume regulation by neurons and glial cells. *Dr. Misler*

11. Regulation at a transcriptional and translational level of the cyclo-oxygenase gene(s) by the lymphokines IL-1 and TNF. Signal transduction mechanisms utilized by IL-1 β to induce COX II and iNOS. *Dr. Morrison*

12. Mechanisms of matrix protein expression, macrophage infiltration and nitric oxide synthesis regulation in normal and diseased kidney. *Dr. Morrissey*

13. Studies investigate the interrelationships between vitamin D metabolites and parathyroid metabolism. Research projects include pathogenesis of secondary hyperparathyroidism. Studies on calcium binding protein (calbindin 9k) and calcium transport. *Dr. Slatopolsky*

Pulmonary and Critical Care

(A) Barnes Hospital, four or six weeks. Students will acquire skills in the pulmonary function laboratory, follow patients with pulmonary diseases, attend regular pulmonary conferences. *Dr. Holtzman and Staff*

(B) Jewish Hospital, four or six weeks. Students will work up and follow both in-hospital and clinic patients, interpret pulmonary function tests, assist in procedures, participate in teaching conferences and rounds. *Drs. Senior, Lefrak and Staff*

(C) VA Hospital, four weeks. Evaluation and management of common respiratory disorders such as chronic obstructive lung disease, lung cancer, tuberculosis. Preoperative evaluations, fiberoptic bronchoscopy, pulmonary function and chest radiograph interpretation, and ventilator management. *Dr. C. Daughaday*

(D) Medical Intensive Care (four weeks). Opportunity to gain experience in acute, primary care medicine of the critically-ill patient. Work up patients with the MICU team. *Dr. Schuster*

(E) Research Electives.

1. Mechanisms of asthma. Students will be introduced to biochemical and clinical studies of patients with asthma aimed at understanding the mechanisms of the disease and goals for the development of new treatment strategies. *Dr. Holtzman*

2. Positron emission tomographic studies of acute lung injury. Students will be introduced to large-animal models of acute lung injury and techniques involving positron emission tomography, nuclear medicine and pulmonary physiology. *Dr. Schuster*

Section of Lipid Disorders

(A) Role of oxidative protein and lipid damage in pathogenesis of atherosclerosis mechanisms for generation of oxygen and carbon-centered free radicals. *Dr. Heinecke*

(B) Molecular genetics and pathophysiology of low LDL syndromes. Dietary and hormonal regulation of apolipoprotein production using cell biology and molecular techniques. Effect of exercise on lipoprotein levels, compositions and kinetics. *Dr. Schonfeld*

(C) Biochemistry and molecular biology of enzymes involved in fatty acid metabolism, specifically, lipoprotein lipase and fatty acid synthase; regulation of gene expression in human adipose tissue and skeletal muscle by exercise and diet; targeted inactivation of genes associated with adipocyte differentiation. *Dr. Semenkovich*

Rheumatology

(A) Clinical Rheumatology, Barnes, Jewish and VA, four weeks, all day. Students will participate in consultative service and clinic and inpatient practices. *Dr. Shuman and Staff*

(B) Research.

1. Analysis of intracellular signaling events involved with human B cell proliferation and subpopulation selection induced by different cytokines. *Dr. Ambrus*
2. Studies related to complement deficiency states and immunogenetics of complement proteins in humans and animals; biochemistry, and molecular biology of complement receptors and complement regulatory proteins. *Drs. Atkinson and Oglesby*
3. Research aimed at a detailed understanding of the highly regulated serine proteases that mediate the complement cascade, with emphasis on the biochemical mechanisms that underlie their activation and specificity, and the design of agents that would alter complement activity for therapeutic purposes. *Drs. Hourcade and Oglesby*

4. Ongoing projects include analysis of the triggering mechanisms involved in lupus nephritis, investigations on the role of leukocytes in glomerular inflammation and dysfunction, and efforts to detail the role and regulation of arachidonate in macrophage function. *Dr. Lefkowitz*
5. Ongoing studies of distribution, function and ontogeny of complement regulators in normal and pathologic conditions, with emphasis on the reproductive system. *Dr. Oglesby*
6. Opportunities exist for basic research aimed at understanding the physiology of human neutrophil function: specifically, the role of intracellular pH, chloride channels, and other anion transport processes in the regulation of phagocytosis, chemotaxis, degranulation, and superoxide radical generation. *Dr. Simchowitz*

Faculty

Adolphus Busch Professor and Chairman of Department

John P. Atkinson, M.D.,
University of Kansas, 1969. (See Department of Molecular Microbiology.)

John E. and Adaline Simon
Professor and Vice-Chairman of Department

Saulo Klahr, M.D.,
Universidad Nacional de Colombia, 1959.

Professors Emeriti

Elmer B. Brown, M.D.,
Washington University, 1950. (See Administration.)

Hugh Chaplin, Jr., M.D.,
Columbia University, 1947. (See Department of Pathology.)

Irene E. and Michael M. Karl
Professor of Endocrinology and Metabolism

William H. Daughaday, M.D.,
Harvard University, 1943.

M. Kenton King, M.D.,
Vanderbilt University, 1951. (See Administration.)

Virginia Minnich, M.S.,
Iowa State College, 1938.

H. Mitchell Perry, Jr., M.D.,
Washington University, 1946.

John A. Pierce, M.D.,
University of Arkansas, 1948.

Edward H. Reinhard, M.D.,
Washington University, 1939. (See Department of Radiology.)

Robert E. Shank, M.D.,
Washington University, 1939.

Professors

David H. Alpers, M.D.,
Harvard University, 1960.

Sydney M. and Stella H.
Schoenberg Professor

Louis V. Avioli, M.D.,
Yale University, 1957.

Steven R. Bergmann, M.D.,
Washington University, 1985;
Ph.D., Hahnemann Medical College, 1977. (Medical Physiology)

John P. Boineau, M.D.,
Duke University, 1959. (See Department of Surgery.)

Eric J. Brown, M.D.,
Harvard University, 1975. (See Department of Cell Biology and Physiology and Department of Molecular Microbiology.)

George J. Broze, Jr., M.D.,
Washington University, 1972.

Michael E. Cain, M.D.,
George Washington University, 1975.

David D. Chaplin (Howard Hughes Medical Institute Associate Investigator), M.D., Ph.D., Washington University, 1980. (See Department of Molecular Microbiology and Department of Genetics.)

Lewis R. Chase, M.D.,
Harvard University, 1964. (Chief, Washington University Medical Services, Cochran V.A. Hospital)

Ray E. Clouse, M.D.,
Indiana University, 1976.

Philip E. Cryer, M.D.,
Northwestern University, 1965. (Also Clinical Research Center.)

William H. Danforth, M.D.,
Harvard University, 1951. (See Administration.)

Lewis T. and Rosalind B. Apple
Professor of Oncology in Medicine

James A. Delmez, M.D.,
University of Rochester, 1973.

Thomas F. Deuel, M.D.,
Columbia University, 1961. (See Department of Biochemistry and Molecular Biophysics.)

Ali A. Ehsani, M.D.,
Tehran University, 1965. (See Irene Walter Johnson Institute of Rehabilitation.)

The Winfred A. and Emma R.
Showman Professor of Dermatology

Arthur Z. Eisen, M.D.,
University of Pennsylvania, 1957. (Dermatology)

Alex S. Evers, M.D.,
New York University, 1978. (See Department of Anesthesiology and Department of Molecular Biology and Pharmacology.)

Edward M. Geltman, M.D.,
New York University, 1971. (See Department of Radiology.)

Stephen L. Gluck, M.D.,
University of California, 1977. (See Department of Cell Biology and Physiology.)

Gregory I. Goldberg, Ph.D., Weizmann Institute of Science, 1977. (Dermatology) (See Department of Biochemistry and Molecular Biophysics and Department of Molecular Microbiology.)

Jeffrey I. Gordon, M.D., The University of Chicago, 1973. (See Department of Biochemistry and Molecular Biophysics and Department of Molecular Biology and Pharmacology.)

Richard W. Gross, M.D., New York University, 1976; Ph.D., Washington University, 1982. (See Department of Cell Biology and Pharmacology.) (Also Department of Chemistry)

Chromalloy Professor of Renal Diseases in Medicine

Marc R. Hammerman, M.D., Washington University, 1972. (See Department of Cell Biology and Physiology.)

John O. Holloszy, M.D., Washington University, 1957.

Selma and Herman Seldin Professor of Medicine

Michael J. Holtzman, M.D., Northwestern University, 1975.

Ira M. Lang Professor of Nephrology

Keith A. Hruska, M.D., Creighton University, 1969. (See Department of Cell Biology and Physiology.)

Daniel Ihde, M.D., Stanford University, 1969.

Distinguished University Professor of Medicine

David M. Kipnis, M.D., University of Maryland, 1951. (See Administration.)

Robert E. Kleiger, M.D., Harvard University, 1960.

George S. Kobayashi, Ph.D., Tulane University, 1963. (Microbiology) (See Department of Molecular Microbiology.)

Rosalind H. Kornfeld, Ph.D., Washington University, 1961. (Biochemistry) (See Department of Biochemistry and Molecular Biophysics.)

Stuart A. Kornfeld, M.D., Washington University, 1962. (See Department of Biochemistry and Molecular Biophysics.)

Stanley J. Korsmeyer (Howard Hughes Medical Institute Investigator in Medicine), M.D., University of Illinois, 1976. (See Department of Molecular Microbiology.)

Ronald Krone (John E. Simon Scholar in Medicine), M.D., The University of Chicago, 1966.

Jack H. Ladenson, Ph.D., University of Maryland, 1971. (Clinical Chemistry) (See Department of Pathology.)

Stephen S. Lefrak, M.D., State University of New York, Downstate, 1965. (See Administration.)

Timothy J. Ley, M.D., Washington University, 1978. (See Department of Genetics.)

J. Russell Little, Jr., M.D., University of Rochester, 1956. (See Department of Molecular Microbiology.)

Dennis Y. Loh (Howard Hughes Medical Institute Associate Investigator in Medicine), M.D., Harvard University, 1977. (See Department of Genetics and Department of Molecular Microbiology.)

Philip A. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Radiology.)

Kenneth Ludmerer, M.D., The Johns Hopkins University, 1973.

Vice Chairman Financial Affairs, Department of Internal Medicine

Philip W. Majerus, M.D., Washington University, 1961. (See Department of Biochemistry and Molecular Biophysics.)

Robert P. Mecham, Ph.D., Boston University, 1976. (See Department of Cell Biology and Physiology.)

Vice Chairman Hospital and Clinical Affairs, Department of Internal Medicine

Gerald Medoff, M.D., Washington University, 1962. (See Department of Molecular Microbiology.)

Jeffrey D. Milbrandt, M.D., Washington University, 1978; Ph.D., University of Virginia, 1983. (See Department of Pathology.)

Joseph P. Miletich, M.D., Ph.D., Washington University, 1979. (See Department of Pathology.)

Thalachallour Mohanakumar, Ph.D., Duke University, 1974. (See Departments of Pathology and Surgery.)

Aubrey R. Morrison, M.B., B.S., University of London, 1970. (See Department of Molecular Biology and Pharmacology.)

Patrick R. Murray, Ph.D., University of California, 1974. (Clinical Microbiology) (See Department of Pathology.)

Scott M. Nordlicht, M.D., State University of New York, Downstate, 1973.

Richard E. Ostlund, Jr., M.D., University of Utah, 1970.

Charles W. Parker, M.D., Washington University, 1953. (See Department of Molecular Microbiology.)

William A. Peck, M.D., University of Rochester, 1960. (See Administration.)

Julio E. Perez, M.D., University of Puerto Rico, 1973.

M. Alan Permutt, M.D., Washington University, 1965.

William G. Powderly, M.B., B.Ch., B.A.O., National University of Ireland, 1979.

Mabel L. Purkerson, M.D., Medical College of South Carolina, 1956. (See Administration and Department of Pediatrics.)

Lee Ratner, M.D., Ph.D., Yale University, 1979. (See Department of Molecular Microbiology.)

Peter S. Rotwein, M.D., Albert Einstein College of Medicine, 1975. (See Department of Genetics.)

J. Evan Sadler, (Howard Hughes Medical Institute Associate Investigator in Medicine), Ph.D., Duke University, 1978; M.D., 1979. (See Department of Biochemistry and Molecular Biophysics.)

Julio V. Santiago, M.D., University of Puerto Rico, 1967. (See Department of Pediatrics.)

Samuel A. Santoro, M.D., Ph.D., Vanderbilt University, 1979. (See Department of Pathology.)

David Schlessinger, Ph.D., Harvard University, 1960. (Microbiology) (See Department of Molecular Microbiology.)

William B. Kountz Professor of Medicine

Gustav Schonfeld, M.D., Washington University, 1960.

Dorothy R. and Hubert C. Moog Professor in Pulmonary Medicine

Robert M. Senior, M.D., George Washington University, 1961.

Barry A. Siegel, M.D., Washington University, 1969. (See Department of Radiology.)

Vice Chairman Research Affairs, Department of Internal Medicine

Louis Simchowicz, M.D., New York University, 1970. (See Department of Cell Biology and Physiology.)

Joseph Friedman Professor of Renal Diseases in Medicine

Eduardo Slatopolsky, M.D., University of Buenos Aires, 1959.

William F. Stenson, M.D., Washington University, 1971.

Douglas M. Tollefsen, M.D., Ph.D., Washington University, 1977. (See Department of Biochemistry and Molecular Biophysics.)

John W. Turk, M.D., Ph.D., Washington University, 1976. (See Department of Pathology.)

Alan N. Weiss, M.D., Ohio State University, 1966.

Howard G. Welgus, M.D., Washington University, 1977. (Dermatology)

Michael P. Whyte, M.D., State University of New York, Downstate, 1972.

Research Professors

Joseph J. H. Ackerman, Ph.D., Colorado State University, 1977. (Chemistry)

Edwin B. Fisher, Jr., Ph.D., State University of New York, 1972. (Psychology) (See Department of Psychology.)

Irene E. Karl, Ph.D., University of Wisconsin, 1940.

James G. Miller, Ph.D., Washington University, 1969. (Also Faculty of Arts and Sciences.)

Jeremiah J. Morrissey, Ph.D., St. Louis University, 1974.

Professors Emeriti (Clinical)

Ralph V. Gieselmann, M.D., Washington University, 1947.

Paul O. Hagemann, M.D., Washington University, 1934.

Norman P. Knowlton, M.D., Harvard University, 1945.

Morris D. Marcus, M.D., Washington University, 1934. (Dermatology)

Ernest T. Rouse, Jr., M.D., Washington University, 1943.

Franz U. Steinberg, M.D., University of Berne, 1938. (See Department of Surgery.)

Professors (Clinical)

Benjamin A. Borowsky, M.D., Washington University, 1958.

John D. Davidson, M.D., Washington University, 1972.

I. J. Flance, M.D., Washington University, 1935.

Bernard T. Garfinkel, M.D., Washington University, 1948.

Neville Grant, M.D., Columbia University, 1954.

James N. Heins, M.D., University of Louisville, 1961.

Harold J. Joseph, M.D., University of Texas, 1950.

Michael M. Karl, M.D., University of Louisville, 1938.

Robert S. Karsh, M.D., Washington University, 1952.

Charles Kilo, M.D., Washington University, 1959.

Philip E. Korenblat, M.D., University of Arkansas, 1960.

Larry Kristian Kvols, M.D., Baylor University, 1970.

Marvin E. Levin, M.D., Washington University, 1951.

Joseph Levitt, M.D., Washington University, 1949.

Virgil Loeb, Jr., M.D., Washington University, 1944.

Charles C. Norland, M.D., Washington University, 1959.

G. Charles Oliver, M.D., Harvard University, 1957.

Robert C. Packman, M.D., Washington University, 1956.

Robert Paine, M.D., Harvard University, 1944.

Lester T. Reese, M.D., Tulane University, 1966. (Dermatology)

Llewellyn Sale, Jr., M.D., Washington University, 1940.

Benjamin Schwartz, M.D., Ph.D., Albert Einstein College of Medicine, 1972.

Burton A. Shatz, M.D., Washington University, 1943.

Professors (Visiting)

Donald G. Davies, Ph.D., The Johns Hopkins University, 1970.

Professors (Adjunct)

Clifton A. Baile, Ph.D., University of Missouri, 1965. (Adjunct Professor of Nutrition in Medicine.)

Bernard B. Davis, M.D., University of Pittsburgh, 1961.

Burton E. Sobel, M.D., Harvard University, 1962.

Associate Professors

Julian L. Ambrus, M.D., Jefferson Medical College, 1979.

Benico Barzilai, M.D., University of Illinois, 1978.

Joseph Billadello, M.D., Georgetown University, 1978.

Stanley J. Birge, Jr., M.D., Washington University, 1963.

Robert Civitelli, M.D., Siena University, 1980.

William E. Clutter, M.D., Ohio State University, 1975. (Also Clinical Research Center.)

Carlos C. Daughaday, M.D., Washington University, 1971. (Clinical Academic)

Alan Daugherty, Ph.D.,
University of Bath, 1982.

Douglas C. Dean, Ph.D.,
University of Kansas, 1981. (See
Department of Cell Biology and
Pharmacology.)

John F. DiPersio, M.D., Ph.D.,
University of Rochester, 1980.

Seth A. Eisen, M.D.,
Washington University, 1966.
(Clinical Academic)

Paul R. Eisenberg, M.D.,
New York Medical College, 1980.

John Fortney, M.D.,
American University of the
Caribbean, 1983.

Mark E. Frisse, M.D.,
Washington University, 1978. (See
Biomedical Computing.)

Lawrence D. Gelb, M.D.,
Harvard University, 1967. (See
Department of Molecular Microbiol-
ogy.)

Stephen J. Giddings, Ph.D.,
Dartmouth College, 1973; M.D.,
University of Rochester, 1976.

Anne C. Goldberg, M.D.,
University of Maryland, 1977.

Lawrence T. Goodnough, M.D.,
University of Pennsylvania, 1975.
(See Department of Pathology.)

Gregory A. Grant, Ph.D.,
University of Wisconsin, 1975.
(Dermatology) (See Department of
Biochemistry and Molecular
Biophysics.)

Samuel B. Guze, M.D.,
Washington University, 1945. (See
Department of Psychiatry.)

Scot G. Hickman, M.D.,
Washington University, 1970.
(Clinical Academic)

Daniel P. Kelly, M.D.,
The University of Illinois, 1982.

Samuel Klein, M.D.,
Temple University, 1979.

Anthony Kulczycki, Jr., M.D.,
Harvard University, 1970. (See
Department of Molecular Microbiol-
ogy.)

James B. Lefkowitz, M.D.,
The Johns Hopkins University, 1979.
(See Department of Molecular
Biology and Pharmacology.)

Lawrence M. Lewis, M.D.,
University of Miami, 1976.

Ellen Li, M.D., Ph.D.,
Washington University, 1980. (See
Department of Biochemistry and
Molecular Biophysics.)

Bruce Lindsay, M.D.,
Jefferson Medical College, 1977.

Benjamin Littenberg, M.D.,
Case Western Reserve University,
1983.

Douglas M. Lublin, Ph.D.,
Stanford University, 1976; M.D.,
University of California, Los
Angeles, 1982. (See Department of
Pathology.)

Susan B. Mallory, M.D.,
University of Texas, Galveston,
1974. (Dermatology) (See Depart-
ment of Pediatrics.)

Stanley Misler, M.D., Ph.D.,
New York University, 1977. (See
Department of Cell Biology and
Physiology.)

Joanne E. Mortimer, M.D.,
Loyola University, 1977.

Moon H. Nahm, M.D.,
Washington University, 1974. (See
Department of Pathology.)

Roberto Pacifici, M.D.,
Perugia University, 1981.

Curtis A. Parvin, Ph.D.,
University of Minnesota, 1980.
(Clinical, Computer Science) (See
Department of Pathology and
Division of Biostatistics.)

Alice Pentland, M.D.,
University of Michigan, 1978.
(Dermatology) (See Department of
Molecular Biology and Pharmacol-
ogy.)

Marion G. Peters, M.B.B.S.,
Melbourne University, 1972. (See
Department of Molecular Microbi-
ology.)

Michael W. Rich, M.D.,
University of Illinois, 1979.

Brent Ruoff, M.D.,
St. Louis University, 1981.

Jeffrey E. Saffitz, Ph.D.,
Case Western Reserve University,
1977; M.D., 1978. (See Department
of Pathology.)

Daniel P. Schuster, M.D.,
Yale University, 1976.

Deborah Shure, M.D.,
Albert Einstein University, 1973.

Isaias Spilberg, M.D.,
University of San Marcos, 1963.

Samuel L. Stanley, Jr., M.D.,
Harvard University, 1980. (See
Department of Molecular Microbiol-
ogy.)

Gregory A. Storch, M.D.,
New York University, 1973. (See
Departments of Pediatrics and
Psychiatry.)

Alan J. Tiefenbrunn, M.D.,
Washington University, 1974. (See
Department of Radiology.)

Elbert P. Trulock III, M.D.,
Emory University, 1978.

Peter G. Tuteur, M.D.,
University of Illinois, 1966.

H. James Wedner, M.D.,
Cornell University, 1967.

Gary J. Weil, M.D.,
Harvard University, 1975. (See
Department of Molecular Microbiol-
ogy.)

Samuel A. Wickline, M.D.,
University of Hawaii, 1980.

David Windus, M.D.,
Creighton University, 1978.

Robert Woodward, Ph.D.,
Washington University, 1972.

Gary R. Zuckerman, D.O.,
Kansas City College of Osteopathic
Medicine, 1963.

Research Associate Professor Emerita

Norma Fletcher, Ph.D.,
University of Copenhagen, 1965.

Research Associate Professors

Dana R. Abendschein, Ph.D.,
Purdue University, 1978. (See
Department of Cell Biology and
Physiology.)

H. Dieter Ambos, C.E.E.,
Washington University, 1973. (See
Biomedical Computing.)

Alex J. Brown, Ph.D.,
University of Tennessee, 1982.

Thomas G. Cole, M.D.,
University of Missouri, 1974; Ph.D.,
1980. (See Department of Biochem-
istry and Molecular Biophysics.)

Daniel L. Crimmins, Ph.D.,
Washington University, 1980.

Osami Kanagawa, M.D., Okayama University, 1974; Ph.D., 1978. (See Department of Pathology.)

Wendy M. Kohrt, Ph.D., Arizona State University, 1986.

Kenneth B. Schechtman, Ph.D., Washington University, 1978. (See Division of Biostatistics and Institute for Biomedical Computing.)

Associate Professors Emeriti (Clinical)

Grace E. Bergner, M.D., Washington University, 1943.

Janina M. Brajtburg, Ph.D., University of Lodz, 1968.

Mary L. Parker, M.D., Washington University, 1953.

Associate Professors (Clinical)

Elliot E. Abbey, M.D., New York University, 1975. (Clinical Academic)

Gail A. Ahumada, M.D., University of California, San Diego, 1972.

Jack Barrow, M.D., Washington University, 1946.

William G. Bowen, M.D., University of North Carolina, 1974.

Robert M. Bruce, M.D., University of Minnesota, 1968.

J. William Campbell, M.D., Washington University, 1977.

John S. Daniels, M.D., University of Arkansas, 1974.

Arnold Dankner, M.D., Washington University, 1947.

Alexander Denes, M.D., University of Missouri, 1973.

Russell E. Eggebrecht, M.D., Washington University, 1971.

Lewis C. Fischbein, M.D., Washington University, 1974.

Arthur H. Gale, M.D., University of Missouri, 1959.

Siddhesh Gowda, M.B., B.S., Medical College Bellary Mysore, 1969.

John M. Grant, M.D., Washington University, 1954.

Sidney Jick, M.D., Washington University, 1949.

William G. Juergens, Jr., M.D., Washington University, 1961.

Owen S. Kantor, M.D., University of Missouri, 1968.

Robert W. Karr, M.D., University of Texas, 1975.

John J. Kelly, M.D., St. Louis University, 1963.

Morton A. Levy, M.D., Washington University, 1961.

David M. Lieberman, M.D., Vanderbilt University, 1949.

Harvey Liebhaber, M.D., New York University, 1957.

Herbert Lubowitz, M.D., Washington University, 1958.

Alan P. Lyss, M.D., Washington University, 1976.

William E. Magee, M.D., Duke University, 1950.

Robert S. Mendelsohn, M.D., Washington University, 1954.

Paul A. Mennes, M.D., Washington University, 1970.

Edward J. Miller, M.D., St. Louis University, 1962.

Matthew J. Orland, M.D., University of Miami, 1979.

MaryBeth Pereira, M.D., University of California, 1978.

Daniel E. Potts, M.D., Washington University, 1972.

Gary A. Ratkin, M.D., Washington University, 1967. (See Department of Radiology.)

Joseph F. Ruwitch, Jr., M.D., Washington University, 1966.

Shabbir H. Safdar, M.D., Nishtar Medical College, 1961.

James C. Sisk, M.D., Washington University, 1946. (Dermatology)

Donald A. Skor, M.D., Rush University, 1978.

Ross B. Sommer, M.D., Cornell University, 1949.

Robert M. Taxman, M.D., Washington University, 1964.

J. Allen Thiel, M.D., St. Louis University, 1960.

Stanley M. Wald, M.D., Washington University, 1946.

Elliot A. Wallach, M.D., St. Louis University, 1945. (Dermatology)

Alvin S. Wenneker, M.D., Washington University, 1953.

John A. Wood, M.D., University of Oklahoma, 1968.

Associate Professors (Adjunct)

Robert E. Kraetsch, M.D., Washington University, 1969.

Elaine S. Krul, Ph.D., McGill University, 1982.

Associate Professor (Visiting)

Bruno Maresca, Ph.D., University of Naples, 1974.

Assistant Professors

Douglas Adkins, M.D., Wright State University, 1986.

Giuseppe Aliperti, M.D., University of Naples, 1979.

Nizar Assi, M.D., American University, 1985.

Thomas C. Bailey, M.D., Washington University, 1984.

Nancy Bartlett, M.D., Washington University, 1986.

Eric C. Beyer, Ph.D., University of California, San Diego, 1981; M.D., 1982. (See Department of Cell Biology and Physiology and Department of Pediatrics.)

Ellen F. Binder, M.D., Washington University, 1981.

Thomas M. Birkenmeier, M.D., Washington University, 1982.

Morey A. Blinder, M.D., St. Louis University, 1981. (See Department of Pathology.)

David Blumenthal, M.D., Washington University, 1983.

Matthew S. Bosner, M.D., University of Texas, Houston, 1983.

Mitchell D. Botney, M.D., Ohio State University, 1984.

Alan Braverman, M.D., University of Missouri, 1985.

- Daniel C. Brennan, M.D.**,
University of Iowa, 1985.
- Steven Brody, M.D.**,
University of Michigan, 1980.
- Randy Brown, M.D.**,
Case Western Reserve University,
1979.
- David B. Carr, M.D.**,
University of Missouri, 1985.
- Mario Castro, M.D.**,
University of Missouri, Kansas City,
1988.
- Andrew C. Chan, M.D., Ph.D.**,
Washington University, 1986.
- Mary F. Chan, M.D.**,
University of Alabama, 1986.
- Ken Chiu, M.D.**,
Taipai Medical College, 1983.
- Steven M. Cohn, M.D., Ph.D.**,
Washington University, 1985.
- Patricia L. Cole, M.D.**,
Harvard University, 1981.
- Lynn A. Cornelius, M.D.**,
University of Missouri, 1980.
(Dermatology)
- Daniel W. Coyne, M.D.**,
Case Western Reserve University,
1983.
- Victor G. Davila, M.D.**,
University of Puerto Rico, 1981.
- William C. Dunagan, M.D.**,
Washington University, 1983.
- John C. Edwards, Ph.D.**,
The University of Chicago, 1983;
M.D., 1985.
- Bradley A. Evanoff, M.D.**,
Washington University, 1986.
- Larry E. Fields, M.D.**,
Harvard University, 1980.
- Paula Fracasso, M.D., Ph.D.**,
Yale University, 1984.
- Victoria Fraser, M.D.**,
University of Missouri, 1983.
- David Frazier, M.D.**,
Duke University, 1988.
- Satoshi Fujii, M.D.**,
Hokkaido University, 1987.
- Gary L. Gambill, M.D.**,
University of Oregon, 1974.
- Daniel E. Goldberg, M.D., Ph.D.**,
Washington University, 1985. (See
Department of Molecular Microbiol-
ogy.)
- Daniel M. Goodenberger, M.D.**,
Duke University, 1974.
- Eric D. Green, M.D., Ph.D.**,
Washington University, 1987. (See
Department of Pathology.)
- James E. Greenwald, Ph.D.**,
Ohio State University, 1980; M.D.,
1983. (See Department of Molecu-
lar Biology and Pharmacology.)
- Marvin Grieff, M.D.**,
McGill University, 1986.
- Robert J. Gropler, M.D.**,
University of Cincinnati, 1981.
- Carolyn Haase, M.D.**,
University of Missouri, 1987. (See
Department of Surgery.)
- David T. Hagerty, M.D.**,
St. Louis University, 1981.
- James R. Hansbrough, Ph.D.**,
Vanderbilt University, 1980; M.D.,
Washington University, 1983. (See
Department of Pediatrics.)
- Jay Heinecke, M.D.**,
Washington University, 1981.
- Elizabeth Hilliker, M.D.**,
Washington University, 1970.
- Kevin Ho, M.D.**,
Columbia University, 1987.
- William E. Hopkins, M.D.**,
The University of Chicago, 1985.
- Mitchell Horowitz, Ph.D.**,
CUNY, 1985; M.D., George
Washington University, 1988.
- George J. Hruza, M.D.**,
New York University, 1982.
(Dermatology) (See Department of
Surgery and Otolaryngology.)
- Mohammad Jahanzeb, M.D.**,
King Edward Medical College,
1986.
- Leslie E. Kahl, M.D.**,
Albany Medical College, 1978.
- Michael G. Kahn, M.D.**,
University of California, San Diego,
1979; Ph.D., University of Califor-
nia, San Francisco, 1988. (See
Biomedical Computing.)
- Joseph L. Kenzora, M.D.**,
University of New Mexico, 1975.
- Marin N. Kollef, M.D.**,
University of Rochester, 1983.
- Raphael Kopan, M.D.**,
The University of Chicago, 1989.
- Sandor J. Kovacs, Ph.D.**,
California Institute of Technology,
1977; M.D., University of Miami,
1979.
- Pui-Yan Kwok, M.D.**,
The University of Chicago, 1987.
(Dermatology)
- John M. Lasala, Ph.D.**,
St. Louis University, 1979; M.D.,
University of Connecticut, 1983.
- Marc S. Levin, M.D.**,
Columbia University, 1981.
- Frederik Lindberg, M.D.**,
Umea University, 1987.
- Michael B. Lippman, M.D.**,
State University of New York, 1977.
(Clinical Academic)
- Daniel Lips, M.D.**,
Washington University, 1983.
- Trevor Lisssoos, M.D.**,
University of the Witwatersrand,
1983.
- Gregory D. Longmore, M.D.**,
McGill University, 1983. (See
Department of Cell Biology and
Physiology.)
- Dwight Look, M.D.**,
University of Missouri, 1985.
- Angel Lopez-Candales, M.D.**,
University of Puerto Rico, 1986.
- Robinna G. Lorenz, M.D.**,
Washington University, 1990. (See
Department of Pathology.)
- John Lynch, M.D.**,
Georgetown University, 1989.
- Janet B. McGill, M.D.**,
Michigan State University, 1979.
(See Department of Pediatrics.)
- Robert C. McKnight, M.D.**,
Washington University, 1961. (See
Department of Radiology.)
- Ann Martin, M.D.**,
Case Western Reserve University,
1981. (Dermatology)
- Wade H. Martin III, M.D.**,
University of Kansas, 1977.
- Stephen B. Miller, M.D.**,
University of Missouri, Kansas City,
1983.
- Anthony Muslin, M.D.**,
Harvard University, 1984.
- Sunita Mutha, M.D.**,
Albany Medical College, 1988.
- Rosanne Naunheim, M.D.**,
The University of Chicago, 1978.
- Robert Nease, Jr., Ph.D.**,
Stanford University, 1989.
- Paul D. Olivo, M.D.**,
University of Florida, 1981; Ph.D.,
1982.

- William C. Parks**, Ph.D.,
Medical College of Wisconsin, 1982.
- Anders V. Persson**, Ph.D.,
University of Colorado, 1977; M.D.,
University of Miami, 1983.
- John D. Pfeifer**, Ph.D.,
University of California, 1987; M.D.,
1988. (See Department of Pathology.)
- Joel Picus**, M.D.,
Harvard University, 1984.
- Richard A. Pierce**, Ph.D.,
Rutgers University, 1990.
(Dermatology)
- Steven M. Pogwizd**, M.D.,
Washington University, 1981.
- Katherine P. Ponder**, M.D.,
Washington University, 1983. (See
Department of Biochemistry and
Molecular Biophysics.)
- Joseph Primrose**, M.D.,
University of Illinois, 1968.
- Craig K. Reiss**, M.D.,
University of Missouri, Kansas City,
1983.
- Joseph Rogers**, M.D.,
University of Nebraska, 1988.
- Daniel Rosenbluth**, M.D.,
Mt. Sinai School of Medicine, 1985.
- Marcos Rothstein**, M.D.,
University of Zulia, 1974.
- Jeffrey N. Rottman**, M.D.,
Columbia University, New York,
1982.
- Deborah C. Rubin**, M.D.,
Albert Einstein College of Medicine,
1981.
- Mark S. Sands**, Ph.D.,
State University of New York, 1990.
- Clay Semenkovich**, M.D.,
Washington University, 1981. (See
Department of Cell Biology and
Physiology.)
- Steven Shapiro**, M.D.,
The University of Chicago, 1983.
- Sherry Shuman**, M.D.,
Wayne State University, 1982.
- Gary Singer**, M.D.,
University of Toronto, 1987.
- Joseph M. Smith**, M.D.,
Harvard University, 1987.
- Thomas H. Steinberg**, M.D.,
New York University, 1978. (See
Department of Cell Biology and
Physiology.)
- Bradley Stoner**, M.D., Ph.D.,
Indiana University, 1987.
- Frank W. Torres**, M.D.,
University of California, San
Francisco, 1983.
- Dwight Towler**, M.D., Ph.D.,
Washington University, 1989.
- Serguei Troianovski**, Ph.D.,
All-Union Cancer Research Centre,
1981.
- Herbert W. Virgin IV**, M.D.,
Ph.D., Harvard University, 1985.
(See Departments of Pathology and
Molecular Microbiology.)
- Oksana Volshteyn**, M.D.,
Minsk State Medical Institute, 1976.
(See Department of Neurology.)
- Steven Weintraub**, M.D.,
Medical College of Virginia, 1985.
- Alison I. Whelan**, M.D.,
Washington University, 1986.
- Lynn K. White**, M.D.,
Harvard University, 1984.
- Karen Winters**, M.D.,
Southern Illinois University, 1983.
- Kenneth Winters**, M.D.,
Washington University, 1980.
- Megan Wren**, M.D.,
Washington University, 1985.
- Kathryn A. Yamada**, Ph.D.,
Georgetown University, 1982.
- Bulent Zaim**, M.D.,
Lausanne School of Medicine, 1983.
- Frank L. Zwemer, Jr.**, M.D.,
University of Southern California,
1983.
- Research Assistant
Professor Emeritus**
- Ida K. Mariz**, A.B.,
Washington University, 1940.
- Research Assistant
Professors**
- Thomas W. Allen**, Ed.D.,
Harvard University, 1966. (Education)
(See Graduate Institute of
Education.)
- Cynthia L. Arfken**, Ph.D.,
Yale University, 1985. (See
Biostatistics.)
- Grigori A. Bannikov**, Ph.D.,
All-Union Cancer Research Centre,
1973.
- Kenneth R. Boschert**, D.V.M.,
Mississippi State University, 1984.
(Comparative Medicine)
- Ramaswamy Chandrashekar**,
Ph.D., University of Bombay, 1988.
- Ivan E. Collier**, Ph.D.,
Florida State University, 1980.
- Michael R. Courtois**, M.A.,
University of Missouri, 1979.
- Adriana Dusso**, Ph.D.,
University of Rosari, 1985.
- Kenton N. Fedde**, Ph.D.,
The University of Chicago, 1983.
- David A. Ford**, Ph.D.,
University of Missouri, 1984.
- Stephen Gaioni**, Ph.D.,
Princeton University, 1976.
- Eric A. Gulve**, Ph.D.,
Harvard University, 1987.
- Debra L. Haire-Joshu**, M.D.,
Southern Illinois University, 1978.
- Dennis E. Hourcade**, Ph.D.,
Harvard University, 1978.
- Fong Fu Hsu**, Ph.D.,
University of Utah, 1986.
- Malgorzata Krych**, Ph.D.,
Polish Academy of Sciences, 1982.
- Joanne Markham**, M.D.,
Washington University, 1973.
- Babu Padanilam**, Ph.D.,
Medical College of Georgia, 1985.
- Sasanka Ramanadham**, Ph.D.,
Texas Tech University, 1985.
- Mitchell G. Scott**, Ph.D.,
Washington University, 1982.
(Clinical) (See Department of
Pathology.)
- Jo L. Seltzer**, Ph.D.,
Washington University, 1969.
(Dermatology)
- Allan Sheppard**, Ph.D.,
Sydney University, 1988.
- Robert J. Spina**, Ph.D.,
University of Pittsburgh, 1987.
- Raj Ajit Srivastava**, Ph.D.,
Gorakhpur University, 1983.
- Kevin E. Yarasheski**, Ph.D.,
Kent State University, 1986.
- Hsiu-Jeng Yeh**, M.D.,
Sun Yot Sen, 1953.

Research Assistant Professors (Adjunct)

- Ross C. Brownson**, Ph.D.,
Colorado State, 1985.
- Mary Anne Della-Fera**, V.M.D.,
University of Pennsylvania, 1979;
Ph.D., 1980.
- Grace S. Lo**, Ph.D.,
University of Texas, Austin, 1976.
- Carol L. McLaughlin**, Ph.D.,
University of Pennsylvania, 1981.

Assistant Professors Emeriti (Clinical)

- Louis F. Aitken**, M.D.,
Washington University, 1927.
- Morris Alex**, M.D.,
Washington University, 1943.
- Greta Camel**, M.D.,
University of Wisconsin, 1949.
- Duane E. Cozart**, M.D.,
Medical College of Virginia, 1959.
- William K. Hall**, M.D.,
Washington University, 1942.
(Dermatology)
- Robert C. Kingsland**, M.D.,
Washington University, 1937.
- Warren Lonergan**, M.D.,
Vanderbilt University, 1941.
- Leonard N. Newmark**, M.D.,
Washington University, 1963.
- Harold K. Roberts**, M.D.,
Ohio State University, 1939.
- Samuel Schechter**, M.D.,
Washington University, 1941.

Assistant Professors (Clinical)

- Charles C. Abel**, M.D.,
Washington University, 1956.
- Ingrid R. Albert**, M.D.,
Albert Einstein College of Medicine,
1971. (Dermatology)
- Jerome M. Aronberg**, M.D.,
Washington University, 1971.
(Dermatology)
- Howard J. Aylward, Jr.**, M.D.,
Vanderbilt University, 1970. (See
Medical Care Group.)
- Om P. Bahl**, M.R.C.P.,
University of Edinburgh, 1960.
- Robert W. Barton**, M.D., Ph.D.,
The University of Chicago, 1967.

- Frederick D. Bauschard**, M.D.,
University of Pittsburgh, 1968.
(Dermatology)
- Michael A. Berk**, M.D.,
Indiana University, 1979.
- Aaron M. Bernstein**, M.D.,
Chicago Medical School, 1952.
- F. Douglas Biggs**, M.D.,
Washington University, 1972.
- Aaron Birenbaum**, M.D.,
Washington University, 1948.
- Clifford A. Birge**, M.D.,
Washington University, 1961.
- Benje Boonshaft**, M.D.,
Washington University, 1961.
- Leslie M. Brandwin**, M.D.,
St. Louis University, 1971.
- Francis J. Catanzaro**, M.D.,
Washington University, 1948.
- Philip Comens**, M.D.,
Washington University, 1951.
- Ralph Copp, Jr.**, M.D.,
Washington University, 1952.
- Stephen R. Crespin**, M.D.,
Harvard College, 1965.
- Samuel E. Dagogo-Jack**, M.D.,
University of Ibadan, 1989.
- Rand E. Dankner**, M.D.,
Baylor College of Medicine, 1978.
- Vincent R. deMello**, M.B., B.S.,
Seth G.S. Medical College, 1964.
- John T. Ellena**, M.D.,
Southern Illinois University, 1985.
- James Etzkorn**, M.D.,
St. Louis University, 1973.
- Linda A. Fisher**, M.D.,
Harvard University, 1975.
- Arnold M. Goldman**, M.D.,
Washington University, 1959.
- Benjamin M. Goldstein**, M.D.,
Washington University, 1964.
- David A. Goran**, M.D.,
Washington University, 1976.
- Charlene Gottlieb**, M.D.,
Washington University, 1972.
- Guner B. Gulmen**, M.D.,
Hacettepe University, 1969.
- Paul F. Hintze**, M.D.,
University of Utah, 1978.
- Bruce J. Hookerman**, M.D.,
St. Louis University, 1968.
(Dermatology)
- Bernard Hulbert**, M.D.,
University of Wisconsin, 1941.

- Morris Jofus**, M.D.,
University of Illinois, 1967.
- Robert L. Kaufman**, M.D.,
Washington University, 1963.
- Donald K. King**, M.D.,
The Johns Hopkins University, 1970.
- John H. Kissel**, M.D.,
Harvard University, 1971.
- Micki Klearman**, M.D.,
Washington University, 1981.
- Ralph F. Kuhlman**, M.D.,
University of Illinois, 1964. (Also
Student Health Service.)
- Jerrold J. Lander**, M.D.,
Washington University, 1968.
- Steven A. Lauter**, M.D.,
Wayne State University, 1971.
- Douglas R. Lilly**, M.D.,
Washington University, 1956.
- Carl A. Lyss**, M.D.,
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- Jay M. Marion**, M.D.,
Vanderbilt University, 1977.
- Jay P. Marshall II**, M.D.,
University of Missouri, 1972.
- Thomas F. Martin**, M.D.,
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- Charles W. Miller**, M.D.,
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(Dermatology)
- J. Roger Nelson**, M.D.,
Washington University, 1953.
- David W. Ortals**, M.D.,
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- Deborah Parks**, M.D.,
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- James C. Peden, Jr.**, M.D.,
Washington University, 1955.
- William J. Phillips**, M.D.,
Washington University, 1963.
- Anne Pittman**, M.D.,
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- Lee S. Portnoff**, M.D.,
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(Dermatology)
- John A. Powell**, M.D.,
University of Michigan, 1971.
(Dermatology)
- Vincent J. Proskey**, M.D.,
Marquette University, 1964.
- Paul Robiolio**, M.S.,
Cambridge University, 1985.
- Leon R. Robison**, M.D.,
Case Western Reserve University,
1968.

Scott R. Sale, M.D.,
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Robert J. Saltman, M.D.,
Washington University, 1980.

Robert J. Schneider, M.D.,
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1976.

Dan Schuller, M.D.,
University Nacional Autonoma de
Medicine, 1985.

Bernard L. Shore, M.D.,
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Robert Shuman, M.D.,
University of Missouri, 1981.

Rand W. Sommer, M.D.,
Washington University, 1980.

William F. Southworth, M.D.,
Washington University, 1975.

Alan R. Spivack, M.D.,
St. Louis University, 1964.

Linda G. Stanton, M.D.,
Boston University, 1979.

Paul M. Stein, M.D.,
St. Louis University, 1971.

Kongsak Tanphaichitr, M.D.,
Siraraj Hospital Medical School,
1970.

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University of Missouri, 1972.
(Dermatology) (See Department of
Otolaryngology.)

Jeffrey Tillinghast, M.D.,
Washington University, 1980.

Dolores R. Tucker, M.D.,
Washington University, 1974.
(Dermatology)

John H. Uhlemann, M.D.,
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Albert L. Van Amburg III, M.D.,
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James W. Walsh, M.D.,
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Leonard B. Weinstock, M.D.,
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Washington University, 1961.

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Instructors

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Lawrence Brown, M.D.,
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Hitesh R. Chokshi, M.D.,
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Department of Surgery.)

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Department of Neurology.)

Gregory A. Ewald, M.D.,
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(See Department of Surgery.)

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Texas College of Osteopathic
Medicine, 1980.

David A. Katzman, M.D.,
St. Louis University, 1991.

Alen P. Klippel, M.D.,
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Kenneth Kovach, M.D.,
Texas Tech University, 1986.

Howard Kurz, M.D.,
New York Medical College, 1984.

Michael Kyzer, M.D.,
Vanderbilt University, 1991.

Daniel C. Link, M.D.,
University of Wisconsin, 1985.

Clark R. McKenzie, M.D.,
University of Missouri, 1989.

Karen L. Meredith, M.P.H.,
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University of Missouri, 1987.

Hector Molina-Vincenty, M.D.,
University of Puerto Rico, 1985.

Patrick J. Morello, M.D.,
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Edward B. Morgan, M.D.,
St. Louis University, 1970.

Michael P. Mullane, M.D.,
The Johns Hopkins University,
1985.

Robert Nease, Jr., Ph.D.,
Stanford University, 1989.

Doris Nussenbaum, M.D.,
Washington University, 1989.

John J. O'Brien, M.D.,
University of Missouri, 1981.

Samuel A. Ockner, M.D.,
University of Cincinnati, 1984.

Teresa J. Oglesby, M.D.,
University of South Alabama,
1980.

James Pautz, M.D.,
University of Missouri, 1989.

Kenneth J. Phillips, M.D.,
Medical College of Wisconsin, 1986.

Chandra Prakash, M.D.,
University of Calicut, 1990.

Dino Recchia, M.D.,
University of Michigan, 1988.

Mary Beth Scholand, M.D.,
Washington University, 1990.

Michelle Z. Schultz, M.D.,
University of Massachusetts, 1988.

William S. Schwab, Ph.D., M.D.,
Washington University, 1990.

David B. Schwartz, Ph.D.,
Washington University, 1986; M.D.,
1987.

Jay R. Seltzer, M.D.,
University of Missouri, 1987.

Anil Shah, M.D.,
Gujarat University, 1982.

John P. Sheehan, Jr., M.D.,
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William D. Staatz, M.D.,
University of Edinburgh, 1976. (See
Department of Pathology.)

Michael J. Thomas, M.D.,
West Virginia University, 1989.

Robert L. Wade, M.D.,
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Deborah Wenkert, M.D.,
University of Texas, 1987.

Julie Wiehl, M.D.,
St. Louis University, 1983.

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Suzhou Medical College, 1978;
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Research Instructors

May Mei Chen, B.S.,
Baker University, 1963.

Su-Li Cheng, Ph.D.,
University of Louisville, 1978.

Lloyd Coleman, Ph.D.,
Iowa State University, 1984.

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University of West Indies, 1987.

Ronald L. Gingerich, Ph.D.,
Indiana University, 1975. (See
Department of Pediatrics.)

Xianlin Han, Ph.D.,
Washington University, 1990.

Ellen B. Heath-Monnig, Ph.D.,
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Vanderbilt University, 1984.
(Cardiology)

Cheryl A. Houston, M.S.,
St. Louis University, 1990.

Norma J. Janes, M.S.,
State University of Iowa, 1964.
(Also Clinical Research Center.)

Sundararajan Jayaraman, Ph.D.,
Madurai University, 1977.

Robert Kimble, Ph.D.,
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Neil Kizer, Ph.D.,
University of Illinois, 1990.

Rajendra Krishnan, Ph.D.,
University of Madras, 1990.

Abraham Lee, Ph.D.,
Arizona State University, 1991.

Beth S. Lee, Ph.D.,
Stanford University, 1988.

Nong Lin, Ph.D.,
Washington University, 1990.

Daniel R. Martin, M.S.,
University of Missouri, St. Louis,
1985.

Terrence E. Riehl, Ph.D.,
Ohio University, 1980.

Leonard Rifas, M.S.,
University of Missouri, 1973.

Sharon A. Rogers, M.S.,
Southern Illinois University, 1983.

Richard Seip, Ph.D.,
University of Virginia, 1990.

Suresh D. Shah, M.S.,
St. Louis University, 1972. (Also
Clinical Research Center.)

Carol Stubblefield, MSN,
St. Louis University, 1982.

Linda K. Sussman, Ph.D.,
Washington University, 1983.

Teresa Tessner, Ph.D.,
Bowman Gray University, 1984.

Linton M. Traub, M.S.,
University of Witwatersrand, 1987.

Qingyu Wu, M.D.,
Suzhou Medical College, 1982.

John D. York, Ph.D.,
Washington University, 1993.

Research Instructor (Visiting)

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Seoul National University, 1991.
(Dermatology)

Instructors Emeriti (Clinical)

Axel R. Gronau, M.D.,
University of Naples, 1935.

J. Ted Jean, M.D.,
Washington University, 1928.

Richard W. Maxwell, M.D.,
The University of Chicago, 1937.

Arlen E. Morrison, M.D.,
Washington University, 1958.

Lamar H. Ochs, M.D.,
Washington University, 1944.

Hugh R. Waters, M.D.,
Washington University, 1945.

Herbert C. Wiegand, M.D.,
Washington University, 1943.

Instructors (Clinical)

Barry K. Abramson, M.D.,
University of Miami, 1985.

Jorge M. Alegre, M.D.,
San Marcos University, 1965.

Frank K. Anderson, M.D.,
Northeastern University, 1980. (See
Health Key Medical Group.)

Scott J. Anderson, Ph.D.,
Duke University, 1981; M.D., 1982.
(See Health Key Medical Group.)

Milton F. Austin, M.D.,
Yale University, 1980.

James G. Avery, M.D.,
University of Tennessee, 1990.

Fred J. Balis, M.D.,
Washington University, 1989.

David Ban, M.D.,
University of Oregon, 1980.

Daniel B. Bauwens, M.D.,
Washington University, 1975.

Richard C. Bell, M.D.,
Washington University, 1988.
(Dermatology)

William W. Benedict, M.D.,
Washington University, 1975.

Laurence A. Berarducci, M.D.,
Wayne State University, 1985.

Susan Berdy, M.D.,
St. Louis University, 1984.

- Douglas R. Berson, M.D.**,
Medical College of Pennsylvania,
1983.
- Stanley I. Biel, M.D.**,
University of Illinois, 1978.
- Gail L. Birkenmeier, M.D.**,
Washington University, 1987.
- Joyce E. Boehmer, M.D.**,
University of Missouri, 1979. (See
Health Key Medical Group.)
- Michael Bolger, M.D.**,
Washington University, 1981.
- Dee C. Boswell, M.D.**,
University of Illinois, 1963.
- Scott A. Brodarick, M.D.**,
University of Illinois, 1975.
- Jeffrey S. Brooks, D.P.M.**,
New York College of Podiatric
Medicine, 1974. (Podiatry)
- Kathleen S. Brunts, M.D.**,
St. Louis University, 1981. (See
Health Key Medical Group.)
- Stephen Carey, Ph.D.**,
Harvard University, 1983; M.D.,
University of South Carolina, 1987.
- John M. Cary, M.D.**,
St. Louis University, 1958.
- Duck Sung Chun, M.D.**,
Seoul National University, 1969.
- Kathleen M. Cizek, M.D.**,
The University of Chicago, 1990.
- Frank Cohen, M.D.**,
University of Toronto, 1939.
- John Costello, M.D.**,
St. Louis University, 1977.
- Charles Crecelius, Ph.D.**,
St. Louis University, 1984; M.D.,
1984.
- Robert B. Cusworth, M.D.**,
University of Rochester, 1974.
- Wilson L. Davis, Jr., M.D.**,
University of Iowa, 1978.
- Thomas Defer, M.D.**,
University of Missouri, 1989.
- Thomas A. Dew, M.D.**,
University of Arkansas, 1967.
- Jacquelyn M. Dilworth, M.D.**,
Howard University, 1983.
(Dermatology)
- Thomas D. Doerr, M.D.**,
The University of Chicago, 1983.
(See Health Key Medical Group.)
- Irl J. Don, M.D.**,
Washington University, 1972. (See
Health Key Medical Group.)
- James W. Donnelly,**
Washington University, 1986.
(Dermatology)
- Royal J. Eaton, M.D.**,
University of Missouri, 1964.
- James H. Epstein, M.D.**,
Washington University, 1969.
- Carol F. Evers, M.D.**,
Brown University, 1977.
- Michael J. Fedak, M.D.**,
University of Missouri, 1982. (See
Health Key Medical Group.)
- David Feldman, M.D.**,
Washington University, 1943.
- Norman Fishman, M.D.**,
Columbia, 1974.
- B. Todd Forsyth, M.D.**,
Washington University, 1947.
- Daniel Gaitan, M.D.**,
University of Mississippi, 1986.
- Kathleen M. Garcia, M.D.**,
Harvard University, 1980.
- William M. Gee, M.D.**,
Washington University, 1981.
- Kenneth W. Gentsch, M.D.**,
Washington University, 1958.
- Connie F. Gibstine, M.D.**,
University of Missouri, 1980.
(Dermatology)
- Andrew Gold, M.D.**,
University of Iowa, 1989.
- Laura Dyer Grady, M.D.**,
Washington University, 1989.
(Dermatology)
- Ronald K. Grady, M.D.**,
Washington University, 1966.
- C. Bruce Graves, M.D.**,
Washington University, 1988.
- Mark H. Gregory, M.D.**,
University of Vermont, 1986.
- Nancy Guggenheim, M.D.**,
Brown University, 1980.
- Jitendra K. Gupta, M.B., B.S.**,
King George Medical College,
1964.
- Thomas E. Hakes, M.D.**,
University of Iowa, 1978.
- Anne Herron, M.B., B.Ch.**,
Dublin University, 1965.
- William E. Hinkley, M.D.**,
Harvard University, 1969.
- Sandra S. Hoffman, M.D.**,
University of Kansas, 1976.
- Barbra A. Horn, M.D.**,
Washington University, 1982.
- John W. Hubert, M.D.**,
Washington University, 1975.
- Daryl L. Jacobs, M.D.**,
Washington University, 1983.
- Myron H. Jacobs, M.D.**,
Louisiana State University, 1969.
- Amy Joseph, M.D.**,
Vanderbilt University, 1986.
- Renee J. Kanan, M.D.**,
Washington University, 1986.
- David Kelley, M.D.**,
Howard University, 1980.
- Naeem Khan, M.D.**,
Khyber Medical College, 1973.
- Linda M. Klutho, M.D.**,
University of Missouri, 1984.
- Kevin L. Konzen, M.D.**,
University of Illinois, 1984.
- Alex H. Kosloff, M.D.**,
St. Louis University, 1980.
- Roop Lal, M.D.**,
Osmania Medical College, 1975.
- Daniel K. Lane, M.D.**,
Washington University, 1959.
(Dermatology)
- Howard S. Lite, M.D.**,
University of Missouri, 1983.
- Roberta Loeffler, M.D.**,
Washington University, 1984.
- Beverly A. Logan-Morrison, M.D.**,
Washington University, 1982.
- James F. Loomis, Jr., M.D.**,
University of Arkansas, 1985.
- Dan William Luedke, M.D.**,
Baylor Medical College, 1971.
- Michael E. McCadden, M.D.**,
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(Dermatology)
- Oliver McKee, M.D.**,
Royal College for Surgeons, 1981.
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- Gerald M. Mahon, M.D.**,
University of Texas, Dallas, 1983.
(See Health Key Medical Group.)
- Marylen L. Mann, M.A.**,
Washington University, 1959.
- Susan M. Manns-Rizzo, M.D.**,
St. Louis University, 1984. (See
Health Key Medical Group.)
- David M. Margolis, M.D.**,
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- David B. Marrs, M.D.**, University of Texas, Southwestern, 1978. (Dermatology)
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- Jerald Maslanko, M.D.**, Emory University, 1975. (See Health Key Medical Group.)
- Joan A. Mass, M.D.**, Duke University, 1990.
- Henry E. Mattis, M.D.**, Washington University, 1975.
- Austin F. Montgomery, M.D.**, University of Pittsburgh, 1954.
- Walton S. Moseley, M.D.**, Duke University, 1990.
- Patricia Nelson, M.D.**, Washington University, 1983.
- John E. Nester, M.D.**, University of Illinois, Chicago, 1985.
- G. Patrick O'Donnell, M.D.**, Autonomous University of Guadalajara, 1977.
- Robert F. Onder, Jr., M.D.**, Washington University, 1987.
- S. Michael Orgel, M.D.**, St. Louis University, 1965.
- Robert F. Owen, M.D.**, Yale University, 1952.
- Amanullah K. Pathan, M.D.**, Liaquat Medical College, 1969.
- Rebecca D. Peck, M.D.**, Washington University, 1986. (Dermatology)
- Thomas R. Powell, M.D.**, Ohio State University, 1990.
- Simeon Prager, M.D.**, University of California, 1991.
- David Prelutsky, M.D.**, St. Louis University, 1979.
- Patricia Quinley, M.D.**, University of Illinois, 1989.
- William R. Reilly, M.D.**, University of Illinois, 1980.
- Lisa B. Ring, M.D.**, Washington University, 1980. (Dermatology)
- Garry C. Robben, M.D.**, St. Louis University, 1962.
- H. Bryan Rogers, M.D.**, Washington University, 1965.
- Ernest T. Rouse III, M.D.**, Washington University, 1971.
- Kenneth J. Rybicki, M.D., Ph.D.**, University of Texas, Southwestern, 1987.
- Mehrdad Saeed-Vafa, M.D.**, Ferdowsi University, 1973.
- Lawrence E. Samuels, M.D.**, Washington University, 1976. (Dermatology)
- Guadalupe Sanchez, M.D., Ph.D.**, Duke University, 1980. (Dermatology)
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- Tania Schmid, M.D.**, University of Mississippi, 1985.
- Susan B. Schneider, M.D.**, Yale University, 1977.
- John S. Schoentag, M.D.**, Washington University, 1960. (Dermatology)
- Paul Schultz, M.D.**, University of Missouri, 1988.
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- Randy Silverstein, M.D.**, Columbia University, 1982.
- Carol M. Simmons, M.D.**, Washington University, 1979.
- Raymond Smith, M.D.**, University of Virginia, 1984.
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- William K. Sullivan, M.D.**, University of Missouri, 1974.
- Arnold S. Tepper, M.D.**, University of Missouri, 1970.
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- Mark Thoele, M.D., Ph.D.**, University of Illinois, Urbana, 1990.
- William M. Thomson, M.D.**, The Johns Hopkins University, 1973.
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- Richard C. Walters, M.D.**, Washington University, 1973. (Dermatology)
- Cassandra C. Weaver, M.D.**, Southern Illinois University, 1983. (Dermatology)
- Peter Weiss, M.D.**, Case Western Reserve University, 1980.
- Darren E. Wethers, M.D.**, Northwestern University, 1988.
- Daniel W. Whitehead, Jr., M.D.**, Washington University, 1980.
- James R. Wiant, M.D.**, Jefferson Medical College, 1959.
- Deborah Wienski, M.D.**, Tufts University, 1983.
- George A. William III, M.D.**, Medical College of Wisconsin, 1972.
- Nancy J. Williams, M.D.**, University of Kansas, 1987. (See Health Key Medical Group.)
- R. Jerome Williams, Jr., M.D.**, Duke University, 1977. (Also Health Service.)
- Wendell Williams, M.D.**, Baylor Medical College, 1982.
- Edward M. Wolfe, M.D.**, Washington University, 1960. (Dermatology)
- James A. Wood, M.D.**, Washington University, 1949.
- Michelle Woodley, M.D.**, SUNY, Stony Brook, 1986.
- Research Associates**
- Charlene A. Abrams, M.S.**, Weizmann Institute of Science, 1985.

- Jose R. Arribas**, M.D.,
Univeridad Complupense, 1985.
- Vorachert Auethavekiat**, M.D.,
Faculty of Science, Mahidol
University, 1981.
- Juan Carlos Bandres**, M.D.,
Universidad Complupense, 1983.
- Dong Rong Cao**, Ph.D.,
Wayne State University, 1994.
- Janette Coble**, M.S.,
Washington University, 1990.
- Masashi Denda**, M.D., Ph.D.,
Hamamatsu University, 1981.
- Gregory Dolecki**, Ph.D.,
Purdue University, 1977.
- Svetlana G. Elberg**, M.S.,
University of Kharkov, 1959.
- Michael Engle**, Ph.D.,
St. Louis University, 1976.
- Jane Lewis Finch**, B.S.,
Central Missouri State University,
1971.
- Michelle Fiordalisi**, B.A.,
Lawrence University, 1987.
- Robert J. George**, Ph.D.,
University of Texas, 1984.
- Marilyn M. Gordon**, B.A.,
Lindenwood College, 1956.
- Walter T. Gregory**, B.S.,
St. Louis University, 1960.
- Alane Gresham**, Ph.D.,
University of Hawaii, 1992.
(Dermatology)
- Minxiang Gu**, M.D.,
Shanghai Second Medical
University, 1984.
- Shigetsugu Hatakeyama**, M.D.,
Ph.D., Hokkaido University, 1994.
- Chaobin Hu**, Ph.D.,
Institute of Zoology, 1966.
- Lynda Hynes**, M.S.,
Dartmouth College, 1995.
- Guang-Jin Im**, Ph.D.,
University of North Carolina, 1992.
- Hiroshi Inoue**, M.D.,
Yamaguchi University, 1992.
- Anne B. Jefferson**, Ph.D.,
Stanford University, 1989.
- Shigehito Kamimura**, M.D.,
Kawasaki University, 1984; Ph.D.,
Okayama University, 1991.
- Tatiana Karelina**, M.D.,
Institute of Human Morphology,
1984. (Dermatology)
- Takumi Kawabe**, M.D.,
Kyoto University, 1983.
- Dale Kobayashi**, A.B.,
University of Missouri, 1984.
- Takeharu Koga**, M.D.,
Kumamoto University, 1987.
- Tatiana Kostrominova**, Ph.D.,
Institute of Cytology, 1991.
- Kun Linda Li**, M.D.,
Sun Yet Sen University, 1982.
- Xi-Lang Li**, Ph.D.,
Shanghai Institute of Plant Physiol-
ogy Academia Sinica, 1966.
- Chan-Lan Sun Lin**, Ph.D.,
Kansas State University, 1992.
- Fulu Liu**, M.D.,
Xian Medical University, 1968.
- Patricia M. McKeivitt**, M.S.W.,
Washington University, 1969.
- Hisato Maekawa**, M.D.,
University of Tokyo, 1985; Ph.D.,
Jichi University, 1992.
- Rama Malaviya**, Ph.D.,
Lucknow University, 1987.
(Dermatology)
- David Mancuso**, Ph.D.,
University of Pittsburgh, 1982.
- Keith A. Marrs**, M.S.,
Washington University, 1991.
- Mitsuru Matsumoto**, M.D.,
Ehime University, 1983; Ph.D.,
1988.
- Kun Meng**, Ph.D.,
Beijing Medical University, 1991.
- Noboru Motoyama**, M.D.,
Xian Medical University, 1968.
- Keiko Nakayama**, M.D.,
Tokyo Medical School, 1991.
- Atshushi Nishikazwa**, Ph.D.,
Oshaka University, Japan, 1993.
- Frank Norris**, M.D.,
Clemson University, 1991.
- Mary O'Sullivan**, Ph.D.,
Trinity College, 1995.
- Susanna Paetzold**, Ph.D.,
University of Karlsrut, 1989.
- Anna Pawlikowska-Haddal**,
M.D., Ph.D., Medical Academy of
Todz, 1989.
- Betty F. Perry**, A.B.,
Washington University, 1945.
- Olivera Petrovic**, M.D.,
Herzegovnia University, 1971.
- Antonio A. Postigo**, M.D.,
Hosp De La Prineesa, 1991; Ph.D.,
Autonomabe De Madrid University,
1992.
- Peiquing Qian**, Ph.D.,
Weizmann Institute of Science,
1992.
- Tamara Roach**, Ph.D.,
Nottingham University, 1987.
- William T. Roswit**, B.A.,
Washington University, 1973.
(Dermatology)
- Paul A. Schoening**, M.S.,
University of Minnesota, 1986.
- Anja Schweizer**, Ph.D.,
Biocenter University, 1991.
- Satoru Senju**, M.D.,
Kyushu University, 1987.
- Jian-Su Shao**, M.D.,
Shanghai Second Medical Univer-
sity, 1973.
- Christina Sorenson**, Ph.D.,
University of Nebraska, 1989.
- Stephen A. Spooner**, M.D.,
University of Tennessee, 1988.
- Neelam Srivastava**, M.A.,
Banaras Hindu University, 1992.
- Kairong Tian**, M.A.,
Shandong University, 1986.
- Alan D. Waggoner**, B.A.,
University of Missouri, St. Louis,
1984.
- Carla J. Weinheimer**, B.S.,
University of Illinois, 1984.
- Fen Hwa Wong**, M.D.,
National Tank-Hyng Medical
College, 1992.
- Shixin (Steven) Wu**, M.D.,
Peking Union Medical College,
1990.
- Qingmei Xie**, M.D.,
Tongji Medical University, 1987.
- Jiachun Xue**, M.D.,
Shanghai Medical University, 1983.
- Jianing Yang**, Ph.D.,
The Johns Hopkins University,
1993.
- Taisoon Yong**, M.D.,
Yonsei University, 1983; Ph.D.,
1991.
- Tonghai Zhang**, M.D.,
Tianjun Medical College, 1983.
- Xian-Feng Zhu**, M.D., Peking
Union Medical College, 1992.

Research Assistants

Kathryn T. Akers, B.S.,
St. Louis University, 1983.
(Dermatology)

Sharon E. Carmody, B.A.,
Webster College, 1960.

Xi Chen, Ph.D.,
Washington University, 1993.
(Dermatology)

Xianging Chen, Ph.D.,
University of Houston, 1994.

Nikolai Chitaev, Ph.D.,
Moscow State University, 1994.

Yi-Fu Fang, M.D.,
Suchow Medical School, 1985.

James E. Harley, M.D.,
Duke University, 1991.

Song He, B.S.,
Peking University, 1987.

Thomas Howard, Sr.

Masahiro Iyori, M.D.,
Keio University, 1985.

Ning Jiang, M.D.,
Zhejiang Medical University, 1982.

Jeong Kim, M.D.,
Yonsei University, 1983; Ph.D.,
1995.

Laura Lasater, M.S.,
Western University, 1989.

Qianme Li, M.D.,
Huber Medical University, 1988.

Wei Li, M.D.,
China Medical University, 1984.

Barry L. Marmer, B.S.,
University of Cincinnati, 1971.
(Dermatology)

Yuan-Yuan Meng, M.D.,
China Beijing Second Medical
College, 1984.

Dale F. Osborne, B.S.,
Louisiana State University, 1971.

Debra L. Rateri, B.S.,
University of Missouri, 1982.

Martin Rogers, B.S.,
Lane College, 1972.

Hirofumi Sawa, M.D.,
Hokkaido University, 1990.

Erick H. Schroetr, B.A.,
Lawrence University, 1985.

Reguina Troianovskaia,
Moscow State University, 1983.

Hamideh Zakeri, B.A.,
University of Missouri, 1990.
(Dermatology)

Min Zhong, M.A.,
Smith College, 1993.

Research Assistant (Visiting)

Aviv Shaish, Ph.D.,
Weizmann Institute of Science,
1992.

Assistants (Clinical)

Ann C. Agnew, M.D.,
University of Missouri, 1989.

Ana Alvarez-Jacinto, M.D.,
Santiago De Compostela, 1981.

William D. Birenbaum, M.D.,
University of Missouri, 1983.

Steven Cummings, M.D.,
St. Louis University, 1988.

Lakshaman Darsi, M.D.,
Guntur Medical College, 1987.

Marilyn Disch, M.D.,
University of Kansas, 1988.

George G. Gibbs, M.D.,
Washington University, 1990.

Rod E. Hartzel, M.D.,
Northwestern University, 1985.

David Jick, M.D.,
Washington University, 1982.

Brent Miller, M.D.,
Washington University, 1990.

Richard G. Mrad, M.D.,
St. Louis University, 1985.

Siobhan M. O'Connor, M.D.,
University of Texas, 1986.

John H. Rice, M.D.,
University of Missouri, 1980. (See
Health Key Medical Group.)

EDWARD MALLINCKRODT DEPARTMENT OF MOLECULAR BIOLOGY AND PHARMACOLOGY

Medical pharmacology is taught as part of the second-year curriculum of medical school. This course elaborates essential concepts in selective toxicity, drug metabolism, and mechanism of action. Detailed mechanisms of drug action in the treatment of a variety of pathological conditions from infection and neoplasia to the regulation of cardiovascular and neurological function are described.

Research in the department emphasizes application of the tools of genetics, molecular and cell biology and bio-organic chemistry to define mechanisms that regulate gene expression, cellular metabolism and differentiation, and to devise ways of modulating these processes in vivo. Students participate with the staff in weekly discussions of recent papers in the literature as well as their own work and that of their colleagues.

SECOND YEAR

Bio 507, 508. Pharmacology

It is the purpose of the pharmacology course, through discussions of existing drugs, to develop general principles that will be applicable as well to drugs of the future. Pharmacology draws heavily on biochemistry, physiology, and microbiology for an understanding of drug action. It looks toward pathology, medicine, and surgery for its uses.

(a) Lectures.

(b) Laboratory course. Credit 7 units for the year.
Dr. Covey and Staff

RESEARCH

Bio 590.

The facilities of the research laboratories are available to those who wish to carry on an original investigation on problems of their own or on those the faculty is prepared to suggest.

Molecular biology, morphology, and genetics of neural development in the *Drosophila* retina; signal transduction; cell-cell interactions and cell death in development. *Dr. Cagan*

Medicinal chemistry of modulators of ligand-gated ion channel function. *Dr. Covey*

The molecular mechanism of volatile anesthetic action studied both biochemically and by NMR spectroscopy. *Dr. Evers*

Synthetic organic model systems of membranes, cation and molecule complexes and transporters; synthetic analogs of fatty acids and coenzyme A.
Dr. Gokel

Analysis of lineage-specific gene expression and axial patterning in the developing and adult gastrointestinal tract of normal, transgenic and chimeric-transgenic mice; gut stem cell biology; genetic and biochemical analysis of protein N-myristoylation.
Dr. Gordon

Recombinant DNA-site specific mutagenesis and protein chemistry studies of the structure-function relationships in polypeptide neurotoxins that interact with acetylcholine receptors. *Dr. Grant*

Role of peptide hormones in cardiovascular, fluid and electrolyte homeostasis. *Dr. Greenwald*

Molecular regulation of phospholipases involved in signal transduction. *Dr. Gross*

Molecular markers for oxidative damage; biochemical mechanisms of tissue injury by activated white blood cells. *Dr. Heinecke*

Biology of nerve growth factor; neural development and regulation; mechanism(s) of cell death.
Dr. Johnson

Regulation of cardiac energy metabolic genes during development and in response to physiologic and pathophysiologic stimuli using transgenic mice; molecular genetic basis of cardiomyopathy. *Dr. Kelly*

Mechanism of insulin action; control of protein phosphorylation. *Dr. Lawrence*

Molecular and cellular mechanisms of renal inflammation. *Dr. Lefkowitz*

Neurochemistry; regulation of metabolism; quantitative histochemistry; the chemistry of individual human muscle fibers; metabolism of human ova.
Dr. Lowry

Molecular basis of recognition of drugs using NMR, analog synthesis, and computer modeling.
Dr. Marshall

Energy metabolism in hippocampal slices and its response to various stimulants. Implications for control mechanisms and neural-glial interaction.
Dr. McDougal

Synthesis, assembly, and function of synaptic proteins. *Dr. Merlie*

Regulation of prostaglandin endoperoxide gene transcripts by cytokines in the renal mesangial cell.
Dr. Morrison

Structure, function and regulation of voltage-dependent ion channels; development of "caged" neurotransmitters and second messengers.
Dr. Nerbonne

Biochemical and genetic analysis of Fibroblast Growth Factor Receptors. Developmental biology of bone. Cloning genes involved in vestibular system development. *Dr. Ornitz*

Mechanisms of ultraviolet light induced injury: Signalling, lipid mediator synthesis and membrane repair. *Dr. Penland*

Molecular pharmacology of multidrug resistance P-glycoprotein and homologous membrane transporters; diagnosis and therapeutic exploitation of lipophilic cations; functional imaging with metallopharmaceuticals. *Dr. Piwnica-Worms*

Regulation of neuronal stem cell proliferation and differentiation. *Dr. Roth*

The molecular basis of cell death in the regulation and function of the immune system. *Dr. Russell*

Receptor cell biology: intracellular pathways of ligands and receptors. *Dr. Schwartz*

Regulation of nuclear genes encoding mammalian mitochondrial proteins. Delineation of molecular defects in human genetic diseases. *Dr. Strauss*

Bone Biology: Regulation of osteoblast-specific gene expression by homeodomain transcription factors and anabolic hormones. *Dr. Towler*

Drug Pharmacology determined using radionuclide imaging techniques (Positron Emission Tomography). *Dr. Welch*

Regulation of gene expression in the cardiovascular system. Developmental biology of the heart. *Dr. Wilson*

Molecular mechanisms of alternative pre-mRNA splicing, biological functions of RNA-binding proteins and their involvement in pathogenesis of human diseases such as leukemia and mental retardation. *Dr. Wu*

ELECTIVES

Descriptions of the following courses are shown in the Division of Biology and Biomedical Sciences:

Bio 509, 510. Current Topics in Pharmacology
Bio 5461. Molecular Recognition

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty

Alumni Professor and Head of Department

Jeffrey I. Gordon, M.D.,
The University of Chicago, 1973.
(See Department of Medicine.)

Distinguished Professor Emeritus

Oliver H. Lowry, M.D., Ph.D.,
The University of Chicago, 1937.

Professor Emeritus

F. Edmund Hunter, Jr., M.D.,
University of Rochester, 1941.

Professors

Irving Boime, Ph.D.,
Washington University, 1970. (See Department of Obstetrics and Gynecology.)

Douglas F. Covey, Ph.D.,
The Johns Hopkins University, 1973.

Alex S. Evers, M.D.,
New York University, 1978. (See Department of Anesthesiology.)

George W. Gokel, Ph.D.,
University of Southern California, 1971.

Richard W. Gross, M.D.,
New York University, 1976; Ph.D., Washington University, 1982. (See Department of Medicine.)

Eugene M. Johnson, Jr., Ph.D.,
University of Maryland, 1970. (See Departments of Neurology and Neurological Surgery.)

David M. Kipnis, M.D.,
University of Maryland, 1951. (See Department of Medicine.)

David B. McDougal, Jr., M.D.,
The University of Chicago, 1947.

Garland R. Marshall, Ph.D.,
Rockefeller University, 1966. (See Department of Biochemistry and Molecular Biophysics and Institute for Biomedical Computing.)

John P. Merlie, Ph.D.,
University of Pennsylvania, 1973.

Aubrey R. Morrison (Burroughs Wellcome Clinical Pharmacology Scholar), M.B., B.S., University of London, 1970. (See Department of Medicine.)

Alan L. Schwartz, Ph.D.,
Case Western Reserve, 1974; M.D., 1976. (See Department of Pediatrics.)

Arnold W. Strauss, M.D.,
Washington University, 1970. (See Department of Pediatrics.)

Michael J. Welch, Ph.D.,
University of London, 1965. (See Department of Radiology.)

Professors (Adjunct)

Edward H. Blaine, Ph.D.,
University of Missouri, 1970.

Peter B. Corr, Ph.D.,
Georgetown University, 1975. (See Department of Medicine.)

Research Professor (Adjunct)

Philip Needleman, Ph.D.,
University of Maryland, 1964.

Associate Professors

Gregory A. Grant, Ph.D.,
University of Wisconsin, 1975. (See
Department of Medicine.)

John C. Lawrence, Jr., Ph.D.,
University of Virginia, 1978.

James B. Lefkowitz, M.D.,
The Johns Hopkins University,
1979. (See Department of Medi-
cine.)

Jeanne M. Nerbonne, Ph.D.,
Georgetown University, 1978.

Alice P. Pentland, M.D.,
University of Michigan, 1978. (See
Department of Medicine.)

David R. Piwnica-Worms, M.D.,
Ph.D., Duke University, 1984. (See
Department of Radiology.)

Kevin A. Roth, M.D., Ph.D.,
Stanford University, 1985. (See
Department of Pathology.)

John H. Russell, Ph.D.,
Washington University, 1974.

**Associate Professor
(Adjunct)**

Daniel P. Getman, Ph.D.,
University of Minnesota, 1982.

Assistant Professors

Walter A. Boyle III, M.D.,
University of California, San
Francisco, 1977. (See Department
of Anesthesiology.)

Ross L. Cagan, Ph.D.,
Princeton University, 1989.

James E. Greenwald, Ph.D.,
Ohio State University, 1980; M.D.,
1983. (See Department of Medi-
cine.)

Jay W. Heinecke, M.D.,
Washington University, 1981. (See
Department of Medicine.)

Daniel P. Kelly, M.D.,
University of Illinois, 1982. (See
Department of Medicine.)

Raphael Kopan, Ph.D.,
The University of Chicago, 1989.
(See Department of Medicine.)

David M. Ornitz, Ph.D.,
University of Washington, 1987;
M.D., 1988.

Dwight Towler, M.D., Ph.D.,
Washington University, 1989. (See
Department of Medicine.)

David B. Wilson, M.D., Ph.D.,
Washington University, 1986. (See
Department of Pediatrics.)

Jane Y. Wu, M.B.,
Shanghai Medical University, 1986;
Ph.D., Stanford University, 1991.
(See Department of Pediatrics.)

**Assistant Professors
(Adjunct)**

Per Falk, M.D., Ph.D.,
University of Gothenburg, 1986;
Ph.D., 1991.

Pamela T. Manning, Ph.D.,
Ohio State University, 1980.

Charles A. McWherter, Ph.D.,
Cornell University, 1984.

DEPARTMENT OF MOLECULAR MICROBIOLOGY

The Department of Molecular Microbiology teaches introductory courses in microbiology and pathogenic microorganisms for first-year medical students and graduate students. The course in medical microbiology is taught in collaboration with the Division of Infectious Diseases of the Department of Medicine. The Department also offers a number of advanced courses, primarily designed for graduate students, but open to medical students. Advanced elective research activities are offered by faculty in the Department.

FIRST YEAR

M30 501. Medical Microbiology

The Microbiology course is given in the second semester of the first year and combines topics in general medical microbiology and microbial pathogenesis. The first half of the course emphasizes on bacterial structure, physiology, and genetics, including lectures on the mechanisms of antibiotic action and resistance. The second half of the course addresses mechanisms of virulence, using bacteria and viruses as models to describe pathogen-host interactions in molecular detail. Additional topics cover the molecular biology and pathogenic importance of fungi, protozoa, and helminths. A set of laboratory exercises introduces the student to basic microbiological techniques and principles of diagnostic bacteriology.

RESEARCH

Bio 590.

These electives acquaint the student with the analyses that are used in present-day biomedical research, especially at the molecular level. *Staff*

Molecular mechanisms of bacteria-inflammatory cell interactions: Role of fimbrial adhesins in modulating mediator release and bacterial phagocytosis.

Dr. Abraham

Autoimmunity with an emphasis on the complement system and immune complex processing: functional, genetic, biochemical and molecular approaches.

Dr. Atkinson

Genome organization and gene function in gastric pathogen *Helicobacter pylori*. Molecular epidemiology and evolution. *Dr. Berg*

Mechanisms and control of phagocytic function, with particular emphasis on signal transduction from integrins during adhesion and phagocytosis.

Dr. Brown

Genetics of *Streptococcus pyogenes* and other gram positive bacterial pathogens. Biology of conjugative transposons. Pathophysiology of infections caused by gram positive bacteria. *Dr. Caparon*

Novel genes within the HLA complex. Analysis of cytokine function through targeted mutation *in vivo*. *Dr. Chaplin*

Genetics and molecular biology of *Mycobacterium leprae*, *Mycobacterium avium*, and *Mycobacterium tuberculosis*.

Dr. Clark-Curtiss

Regulation of complement and acute phase protein gene expression, pulmonary immunology, inflammation. *Dr. Colten*

Structure and biosynthesis of antibodies; role of immune system in ocular inflammatory disease.

Dr. Fleischman

Regulatory effects of the Kupffer cell of the liver on the local and systemic immune response and the induction of tolerance to organ allografts. *Dr. Flye*

Cellular biochemistry of malaria and parasitic helminths. *Dr. D. Goldberg*

Enzymology of connective tissue remodeling. *Dr. G. Goldberg*

Molecular basis of pathogenicity of *Histoplasma capsulatum* and *Bordetella pertussis*. In vitro models of respiratory tract infections and toxin effects. Biochemical analysis and genetic manipulation of virulence-related phenotypes. *Dr. Goldman*

Molecular biology of *Salmonella* pathogenesis. Mechanisms of bacterial resistance to host defense peptides. Evolution of virulence characters.

Dr. Groisman

Molecular biology of alphaviruses. Alphavirus gene expression vectors. Antiviral drug design. Structure-function of regulatory proteins. *Dr. Huang*

Study of an advanced macromolecular assembly system: the development of adhesive pili in pathogenic bacteria. Analysis of bacterial adhesins and the structural basis of the recognition function of periplasmic immunoglobulin-like chaperones and ushers required for this process. *Dr. Hultgren*

Biochemistry and genetics of macromolecule regulation; mRNA metabolism in bacteria.

Dr. Kennell

Histoplasmosis; host-parasite interaction and therapeutic strategies. *Dr. Kobayashi*

Molecular biology of the receptors for IgG. Role of bovine IgG in infant colic. Autoimmunity.

Dr. Kulczycki

Latency and molecular genetics of herpes simplex virus. *Dr. Leib*

Differentiation and function of mononuclear phagocytes. *Dr. Lin*

Colonization-infection relationship of *Staphylococcus aureus* in human hosts and molecular epidemiology of nosocomial infections. *Dr. Little*

Molecular mechanisms of bacterial attachment and bacterial sensing of the environment. *Dr. Normark*

Herpes simplex virus (HSV) DNA replication and the interaction of HSV with neuronal cells at the molecular level. *Dr. Olivo*

Cellular immunology. *Dr. Parker*

The role of cytokines in immunoregulation and homing of GI and liver in humans and mice including isograft mouse models of disease. *Dr. Peters*

Phagocytic processing of bacterial antigens. Mechanisms of immune response to intravacuolar pathogens such as *Salmonella typhimurium*. *Dr. Pfeifer*

Structure and function of human retroviruses, including HTLV-I, a cause of leukemia, and HIV, the cause of AIDS. The major focus is in studying the regulation of virus infectivity, replication, assembly, tissue tropism, and pathogenicity. *Dr. Ratner*

Molecular genetics of animal RNA viruses (alpha-viruses and flaviviruses such as yellow fever virus and hepatitis C virus): replication, packaging, and virus-host interactions; vaccine and antiviral therapeutic strategies. *Dr. Rice*

Mechanisms employed by the intracellular pathogens *Leishmania* and *Mycobacteria* to survive inside and exploit the potentially hostile environment within host phagocytes. *Dr. Russell*

Mapping and gene content of X chromosome, including several disease genes. *Dr. D. Schlessinger*

Interactions between RNA animal viruses and their host cells. Emphasis on maturation and assembly of viral proteins. Development of specific antiviral reagents. *Dr. M. Schlesinger*

Structure and replication of enveloped RNA animal viruses. *Dr. S. Schlesinger*

Biochemistry, molecular and cellular biology and physiology of cytokines and their receptors, especially interferon-gamma and tumor necrosis factor. *Dr. Schreiber*

Antibody response to polysaccharide antigens in children. Genetic and cellular analysis of antibody repertoire. *Dr. Shackelford*

Novel adaptations for intracellular parasitism by *Toxoplasma* including: cell motility and invasion, regulated secretion, and avoidance of host-cell endocytic processing. Development of molecular genetic methods for analysis of virulence determinants in *Toxoplasma*. *Dr. Sibley*

The molecular basis for the interaction between *Haemophilus influenzae* and human epithelium. *Dr. St. Geme*

Understanding *E. histolytica* pathogenesis at the molecular level. *Dr. Stanley*

Rapid diagnosis of viral disease emphasizing the use of PCR. *Dr. Storch*

The control of lymphocyte activation by protein tyrosine dephosphorylation. *Dr. Thomas*

Use of two different viral systems to investigate issues at interface between virology and immunology, particular attention paid to mucosal immunology and immunology of viral latency. *Dr. Virgin*

Protective immunity and immunodiagnosis of parasitic helminth infections. *Dr. Weil*

Molecular immunology studies which include: (1) immune deficiencies; (2) gene regulations; and (3) chemoattractant receptors. *Dr. Wetsel*

ELECTIVES

At present the primary enrollees in these courses are students working for a Ph.D. degree in one of the basic sciences. However, these courses are recommended for interested medical students, especially those who may be considering a career in medical research. Emphasis is placed on the organization and function of living systems at the molecular level. The courses combine formal lectures with student-directed seminars. Those courses most relevant to the field of microbiology are listed under the Division of Biology and Biomedical Sciences.

Bio 5221. Molecular Basis of Microbial Pathogenesis

Primarily for graduate and MSTP students, this seminar course involves discussion of current research on pathogenic microorganisms and their virulence determinants. Emphasis on new research strategies (examining the cellular and molecular basis) of host-pathogen interactions. One and one-half class hours per week, 2 units credit. *Dr. Sibley*

Bio 5392. Molecular Microbiology and Pathogenesis

The first half of this course focuses on microbial physiology and genetics, with special attention to recent discoveries in gene regulation and protein processing. The second half is devoted to microorganisms that cause disease, with emphasis on the molecular interactions between pathogen and host. This is a lecture-based course with discussions of primary research literature. 3 class hours per week, 3 units credit. *Dr. Goldman*

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty

Associate Professor and Interim Head of Department

Charles M. Rice, Ph.D.,
California Institute of Technology,
1981.

Professors

John P. Atkinson, M.D.,
Kansas University, 1969. (See
Department of Medicine.)

Alumni Professor in Molecular Microbiology

Douglas E. Berg, Ph.D.,
University of Washington, 1969. (See
Department of Genetics.)

Harvey R. Colten, M.D.,
Case Western Reserve University,
1963. (See Department of Pediatrics.)

Susan E. Cullen, Ph.D.,
Albert Einstein College of Medicine,
1971. (See Department of Genetics.)

M. Wayne Flye, M.D.,
University of North Carolina, 1967;
Ph.D., Duke University, 1980; M.A.
(hon.), Yale University, 1985. (See
Department of Surgery.)

David E. Kennell, Ph.D.,
University of California, 1959.

George S. Kobayashi, Ph.D.,
Tulane University, 1963. (See
Department of Medicine.)

J. Russell Little, Jr., M.D.,
University of Rochester, 1956. (See
Department of Medicine.) (Jewish
Hospital)

Gerald Medoff, M.D.,
Washington University, 1962. (See
Department of Medicine.)

Charles W. Parker, M.D.,
Washington University, 1953. (See
Department of Medicine.)

Lee Ratner, M.D., Ph.D.,
Yale University, 1979. (See Depart-
ment of Medicine.)

Milton J. Schlesinger, Ph.D.,
University of Michigan, 1959.

Sondra Schlesinger, Ph.D.,
University of Michigan, 1960.

David Schlessinger, Ph.D.,
Harvard University, 1961. (See
Departments of Genetics and
Medicine.)

Robert D. Schreiber, Ph.D.,
State University of New York, 1973.
(See Department of Pathology.)

Research Professor

Staffan J. Normark, M.D., Ph.D.,
University of Umea, 1971.

Professor (Adjunct)

Joseph M. Davie, Ph.D.,
Indiana University, 1966; M.D.,
Washington University, 1968.

Associate Professors

Eric J. Brown, M.D.,
Harvard University, 1975. (See
Department of Cell Biology and
Physiology and Department of
Medicine.)

David D. Chaplin, M.D., Ph.D.,
Washington University, 1980. (See
Department of Medicine.)

Julian B. Fleischman, Ph.D.,
Harvard University, 1960.

Lawrence D. Gelb, M.D.,
Harvard University, 1967. (See
Department of Medicine.)

William E. Goldman, Ph.D.,
University of North Carolina, 1980.

Henry V. Huang, Ph.D.,
California Institute of Technology,
1977.

Scott J. Hultgren, Ph.D.,
Northwestern University, 1988.

Anthony Kulczycki, Jr., M.D.,
Harvard University, 1970. (See
Department of Medicine.)

Hsiu-san Lin, M.D.,
National Taiwan University, 1960;
Ph.D., The University of Chicago,
1968. (See Department of Radiology.)

David G. Russell, Ph.D.,
London University, 1982.

Penelope G. Shackelford, M.D.,
Washington University, 1968. (See
Department of Pediatrics.)

Samuel H. Speck, Ph.D.,
Northwestern University, 1980. (See
Department of Pathology.)

Samuel L. Stanley, Jr., M.D.,
Harvard University, 1980. (See
Department of Medicine.)

Gregory A. Storch, M.D.,
New York University, 1973. (See
Department of Pediatrics.)

Research Associate Professor

Josephine E. Clark-Curtiss, Ph.D.,
Medical College of Georgia, 1974.

Associate Professor (Adjunct)

Martin L. Bryant, Ph.D.,
University of Southern California,
1977; M.D., 1982.

Assistant Professors

Soman N. Abraham, Ph.D.,
University of Newcastle Upon Tyne,
England, 1981. (See Department of
Pathology.)

Michael G. Caparon, Ph.D.,
University of Iowa, 1985.

Daniel E. Goldberg, M.D., Ph.D.,
Washington University, 1985. (See
Department of Medicine.)

Eduardo A. Groisman, Ph.D.,
The University of Chicago, 1986.

David A. Leib, Ph.D.,
University of Liverpool, 1986. (See
Department of Ophthalmology and
Visual Sciences.)

Dennis Y. Loh, M.D.,
Harvard University, 1977. (See
Departments of Genetics and
Medicine.)

Paul D. Olivo, M.D.,
University of Florida, 1981; Ph.D.,
1982. (See Department of Medicine.)

Marion G. Peters, M.D.,
Melbourne University, 1972. (See
Department of Medicine.)

John D. Pfeifer, Ph.D.,
University of California, 1987; M.D.,
1988. (See Department of Pathol-
ogy.)

Joseph W. St. Geme, M.D.,
Harvard University, 1984. (See
Department of Pediatrics.)

L. David Sibley, Ph.D.,
Louisiana State University, 1985. (See
Department of Molecular Microbiol-
ogy.)

Matthew L. Thomas, Ph.D.,
University of Utah, 1981. (See
Department of Pathology.)

Herbert W. Virgin IV, M.D., Ph.D.,
Harvard University, 1985.

Gary J. Weil, M.D.,
Harvard University, 1975. (See
Department of Medicine.)

Rick A. Wetsel, Ph.D.,
University of Texas, 1982. (See
Department of Pediatrics.)

Research Assistant Professors

Bernard Brownstein, Ph.D.,
University of California, 1968.

Gregory I. Goldberg, Ph.D.,
Weizmann Institute of Science, 1977.
(See Department of Medicine.)

Instructors

Ramaswamy Chandrashekar,
Ph.D., University of Bombay, 1987.

Linda G. Eissenberg, Ph.D.,
University of North Carolina, 1982.

Research Instructor

Anand K. Srivastava, Ph.D.,
Banaras Hindu University, 1986.

DEPARTMENTS OF NEUROLOGY AND NEUROLOGICAL SURGERY

Neurology and Neurological Surgery concern themselves with the diseases of brain, spinal cord, peripheral nerves, and muscles. An introduction to the anatomy and physiology of the nervous system is presented in the first-year course in neural sciences directed by the Departments of Anatomy and Neurobiology, with participation of faculty from Neurology and Neurological Surgery. In the second year, the Departments of Neurology and Neurological Surgery present the course in Pathophysiology of Nervous System Disorders. The course emphasizes how knowledge derived from basic or clinical investigations leads to improvements in clinical care. The Departments also participate in the Clinical Medicine course, providing lectures, demonstrations and teaching exercises with patients in neurological physical diagnosis. In the third year, a three-week clerkship in Neurology and a one-week clerkship in Neurological Surgery introduce students to the clinical care of patients with diseases of the nervous system. Questions pertaining to neurorehabilitation and ethical issues in management of neurological problems are also addressed. In the fourth year, there are opportunities for many varieties of advanced clinical or research experience.

Several Divisions exist within Neurology and Neurological Surgery:
James L. O'Leary Division of Experimental Neurology and Neurological Surgery: *Dr. Woolsey* (Director)

Division of Neuropsychology: *Dr. Petersen* (Director), *Drs. Corbetta, Deuel, Miezin, Shulman*

Division of Pediatric Neurology: *Dr. Rothman* (Director), *Drs. Bourgeois, Brunstrom, Connolly, Deuel, Dodge, Dodson, Mink, Neil, Noetzel, Prenskey, Thurston, Yamada*

Division of Pediatric Neurosurgery: *Drs. Park, Kaufman*

Division of Rehabilitation: *Drs. Baum, Deusinger, Dromerick, Lux, Paczynski, Sahrmann, Sunwoo, Thach, Volshteyn*

In addition, several groups of faculty members are established for specialized research and teaching purposes. They include:

Center for the Study of Nervous System Injury: *Dr. Choi* (Director), *Drs. Dugan, Elliott, Goldberg, Gutmann, Holtzman, Hsu, Jacquin, Rothman, J. Snider, W. Snider, Xu, Yamada, Yu*

Cerebrovascular Disease Section: *Dr. Hsu* (Director), *Drs. Diring, Dromerick, Goldberg, Landau, Paczynski, Powers, Wittenborn*

Clinical Neurophysiology Section: *Miller and Yee* (Section Co-Directors)

EEG: Sleep and Evoked Potentials: *Miller* (Director), *Arnold, Bourgeois, Duntley, Prenskey, Riaz, Snyder, Yamada*

EMG: *Yee* (Director), *Al-Lozi, Blume, Connolly, Elliott, Lee, Lopate*

Dementia and Aging Section: *Dr. Berg* (Director), *Drs. Buckles, Coats, Coben, Dugan, Holtzman, Hosto, Johnson, Koepke, LaBarge, Morris, J. Snider, Storandt, Wittenborn*

Epilepsy and Clinical Neuropharmacology Section: *Drs. Bourgeois, Dodson, Goldring, Miller, Park, Rothman, Silbergeld, Yamada*

Functional Neuroanatomy Section: *Dr. Raichle* (Director), *Drs. Carl, Corbetta, Larson, Miezin, Perlmutter, Petersen, Powers, Shulman, Snyder, Videen*

Movement Disorders Section: *Dr. Perlmutter* (Director), *Drs. Black, Landau, Thach*

Neurological Critical Care Section: *Dr. Diring* (Director), *Drs. Adams, Manno, Paczynski*

Neurodevelopment Section: *Dr. Pearlman* (Director), *Drs. Brunstrom, Deuel, Elliott, Gutmann, Jacquin, Johnson, Noetzel, Rothman, W. Snider, Woolsey*

Neuroimmunology Section: *Dr. Trotter* (Director), *Drs. Cross, Racke*

Neuromuscular Diseases Section: *Dr. Pestronk* (Director), *Drs. Al-Lozi, Connolly, Doster, Elliott, Ms. Florence, Drs. Lopate, Mozaffar, W. Snider, Yee*

Neurorehabilitation Section: *Dr. Thach* (Director), *Baum, Burns, Deusinger, Dromerick, Lux, Sahrmann, Sunwoo, Volshteyn*

Areas of Neurosurgical specialization include:

Epilepsy Surgery, *Drs. Silbergeld, Goldring*
Cranial Base Surgery, *Drs. Grubb, Vollmer*
Pituitary Surgery, *Dr. Coxe*
Neuro-oncology, *Drs. Rich, Silbergeld, Dacey*
Pediatric Neurosurgery, *Drs. Coxe, Park, Kaufman*
Cerebrovascular Surgery, *Drs. Dacey, Grubb, Rich*
Spinal Neurosurgery, *Dr. Vollmer*

SECOND YEAR

Neurological Pathophysiology and Introduction to Clinical Neurology and Neurological Surgery

Lectures, demonstrations, and case conferences covering disease mechanisms. *Dr. Pearlman and Neurology-Neurosurgery Staff*

Neurological Examination in Clinical Diagnosis

(Part of interdepartmental course in clinical diagnosis)

Lectures, demonstrations, and practice examinations of neurological patients. *Dr. Pearlman and Staff*

THIRD YEAR

Neurology Clerkship

A full-time, three-week clerkship is provided on the neurology services at Barnes and St. Louis Regional Medical Center. Patients are assigned to students who evaluate and follow them with the resident staff and discuss them regularly in conferences with the senior neurological staff. Students also work in the neurology clinic under staff supervision. *Dr. Choi and Staff*

Neurosurgical Clerkship

During a one-week, full-time clerkship on the neurosurgery service, the third year student learns: (1) how to evaluate the comatose or head-injured patient, (2) about clinical presentation, diagnostic work-up and treatment of cervical and lumbar disc disease, (3) how to evaluate and treat patients with hemorrhagic and ischemic stroke. *Dr. Dacey and Staff*

FOURTH YEAR ELECTIVES

Research

A six- to twelve-week elective is available in many areas such as neuroanatomy, neurophysiology, cerebral metabolism and circulation, neurochemistry, neuropharmacology, etc. Facilities are available for qualified students in any year to undertake original research in the laboratories of the department or in the clinics and wards. *Drs. Dacey, Choi, and Staff*

Neurology Subinternship, Consult Neurology, Aging and Dementia

One Subinternship is available at Barnes and one at St. Louis Regional Medical Center. Both have

assignments similar to those of interns while meeting the legal restrictions of the State of Missouri. The consult elective at Barnes Hospital involves close collaboration with the consult resident and senior staff. An elective in the clinical aspects of aging and dementia focuses on the clinical assessment and practical management of the elderly patient. *Drs. Choi, Clifford, Morris and Staff*

Clinical Neurosurgery

The goal of the six-week clerkship at Barnes Hospital is to provide an overview of neurological surgery. Responsibilities include patient workup, pre- and post-operative care, and attendance at selected neurosurgical operations. Daily teaching rounds are held with a member of the attending staff. Students also work in the Neurosurgical Clinic and attend the weekly staff conferences. *Dr. Dacey and Staff*

Staff Conferences

Students are invited to attend the Conjoint Neurological Conference (neuropathology, neuroradiology, medical neurology, pediatric neurology, and neurological surgery) held on Wednesday at 3:30 p.m. in the West Pavilion Auditorium. The format of the conference includes clinical presentations, symposia, and CPCs. Neurosurgery Grand Rounds are held weekly at 7:15 a.m. on Wednesday in the Neurosurgery conference room, second floor, McMillan Hospital. Case Management Conference is held every Monday at 5:00 p.m. in Scarpellino Auditorium. Professor's rounds in Neurosurgery are held at 8:00 a.m. on Saturday in 506 McMillan. Regular research conferences on various topics are held throughout the week.

Faculty

NEUROLOGY

Andrew B. and Gretchen P. Jones Professor of Neurology and Head

Dennis W. Choi, M.D., Ph.D., Harvard University, 1978.

Norman J. Stupp Professor of Neurology

Eugene M. Johnson, Jr., Ph.D., University of Maryland, 1970. (See Department of Molecular Biology and Pharmacology.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prensky, M.D., New York University, 1955. (See Department of Pediatrics.)

Ernest and Jane G. Stein Professor of Development Neurology

Steven M. Rothman, M.D., State University of New York, Upstate, 1973. (See Department of Anatomy and Neurobiology and Department of Pediatrics.)

August A. Busch, Jr., Professor Emeritus of Neurological Surgery and Lecturer

Henry G. Schwartz, M.D., The Johns Hopkins University, 1932.

Professors Emeriti

Philip R. Dodge, M.D., University of Rochester, 1948. (See Department of Pediatrics.)

Sven G. Eliasson, Ph.D., University of Lund, 1952; M.D., 1954.

Jean H. Thurston, M.D., University of Alberta, 1941. (Neurochemistry) (See Department of Pediatrics.)

Professors

Leonard Berg, M.D., Washington University, 1949.

Blaise F. D. Bourgeois, M.D., University of Geneva, 1971. (See Department of Pediatrics.)

David B. Clifford, M.D., Washington University, 1975. (St. Louis Regional Hospital)

Ruthmary K. Deuel, M.D., Columbia University, 1961. (See Department of Pediatrics.)

W. Edwin Dodson, M.D., Duke University, 1967. (See Department of Pediatrics.)

Chung Y. Hsu, M.D., Ph.D.,
National Taiwan University, 1970.

William M. Landau, M.D.,
Washington University, 1947.

Alan L. Pearlman, M.D.,
Washington University, 1961. (See
Department of Cell Biology and
Physiology.)

Alan Pestronk, M.D.,
The Johns Hopkins University,
1970. (See Pathology.)

Marcus E. Raichle, M.D.,
University of Washington, 1964.
(See Department of Radiology.)

Martha Storandt, Ph.D.,
Washington University, 1966.
(Psychology) (See Department of
Psychology.)

W. Thomas Thach, Jr., M.D.,
Harvard University, 1964. (See
Departments of Anatomy and
Neurobiology.)

John L. Trotter, M.D.,
Washington University, 1969.
(Gordon R. and Thelma B. Coates
Scholar in Neurology)

Richard D. Wetzel, Ph.D.,
St. Louis University, 1974. (Medical
Psychology)

Thomas A. Woolsey, M.D.,
The Johns Hopkins University,
1969. (George H. and Ethel R.
Bishop Scholar in Neuroscience in
Neurology and Neurological
Surgery.) (Neuroscience) (See
Neurological Surgery and Depart-
ment of Anatomy and Neurobiol-
ogy, and Department of Cell
Biology and Physiology.)

Research Professors

Mark F. Jacquin, Ph.D.,
City University of New York, 1980.

Kenneth B. Larson, Ph.D.,
Massachusetts Institute of Technol-
ogy, 1964. (See Institute for
Biomedical Computing.)

Professors (Clinical)

Herbert E. Rosenbaum, M.D.,
University of Oregon, 1949.

E. Robert Schultz, M.D.,
Washington University, 1955. (See
Department of Psychiatry.)

Stuart Weiss, M.D.,
Washington University, 1954.

Associate Professor Emeritus

Lawrence A. Coben, M.D.,
Case Western Reserve University,
1954.

Associate Professors

Warren E. Lux, M.D.,
New York University, 1970.

John W. Miller, M.D.,
University of Illinois, 1977; Ph.D.,
1981.

John C. Morris, M.D.,
University of Rochester, 1974.
(Jewish Hospital) (See Department
of Pathology.)

Michael J. Noetzel, M.D.,
University of Virginia, 1977. (See
Department of Pediatrics.)

Joel S. Perlmuter, M.D.,
University of Missouri, 1979. (See
Department of Radiology.)

Steven E. Petersen, Ph.D.,
California Institute of Technology,
1981. (Neuropsychology) (See
Department of Anatomy and
Neurobiology and Neurological
Surgery.)

William J. Powers, M.D.,
Cornell University, 1975. (See
Department of Radiology.)

Shirley A. Sahrmann, Ph.D.,
Washington University, 1973.
(Neurophysiology) (See Depart-
ment of Cell Biology and Physiol-
ogy and Program in Physical
Therapy.)

William D. Snider, M.D.,
University of North Carolina
Medical School, 1977.

Research Associate Professor

Lyndon S. Hibbard, Ph.D.,
Michigan State University, 1977.
(Neuroscience Imaging) (See
Institute for Biomedical Comput-
ing.)

Associate Professors (Clinical)

Joseph T. Black, M.D.,
State University of New York,
Upstate, 1965.

Garrett C. Burris, M.D.,
University of Southwestern
Louisiana, 1968. (See Department
of Pediatrics.)

Joseph M. Dooley, Jr., M.D.,
St. Louis University, 1958.

Walter Lemann, M.D.,
Tulane University, 1979.

James R. Rohrbaugh, M.D.,
Ohio State University, 1974. (See
Department of Pediatrics.)

Richard S. Sohn, M.D.,
The University of Chicago, 1968.

Research Scientists

Francis Miezin, M.S.,
University of Wisconsin, 1972.

Gordon L. Shulman, Ph.D.,
University of Oregon, 1979.
(Neuropsychology) (See Depart-
ment of Psychology.)

Assistant Professors

Janet Duchek Balota, Ph.D.,
University of South Carolina, 1982.
(See Program in Occupational
Therapy.)

M. Carolyn Baum, Ph.D.,
Washington University, 1993. (See
Program in Occupational Therapy.)

Anne M. Connolly, M.D.,
Indiana University, 1984.

D. Anne Cross, M.D.,
University of Alabama, 1980.

Michael N. Diringer, M.D.,
University of Kentucky, 1982.

Alexander W. Dromerick, M.D.,
University of Maryland, 1986.

Laura L. Dugan, M.D.,
Ohio State University, 1987.

Stephen P. Duntley, M.D.,
University of Washington, 1988.

Dorothy F. Edwards, Ph.D.,
Washington University, 1980. (See
Program in Occupational Therapy.)

Mark P. Goldberg, M.D.,
Columbia University, 1984.

David H. Gutmann, M.D., Ph.D.,
University of Michigan, 1986. (See
Departments of Genetics and
Pediatrics.)

David M. Holtzman, M.D.,
Northwestern University, 1985.

Edward M. Manno, M.D.,
Medical University of South
Carolina, 1984.

Jeffrey J. Neil, M.D., Ph.D.,
Washington University, 1984. (See
Department of Pediatrics.)

Michael K. Racke, M.D.,
University of New Jersey and
Dentistry of New Jersey, 1985.

Abraham Zvi Snyder, Ph.D.,
The Rockefeller University, 1977;
M.D., State University of New York
at Buffalo, 1981.

Oksana Volshteyn, M.D., Minsk
State Medical Institute, 1976. (See
Department of Medicine.)

J. Richard Wittenborn, Jr., M.D.,
Washington University, 1973.

Kelvin A. Yamada, M.D.,
Baylor College of Medicine, 1983.
(See Department of Pediatrics.)

Woon Chee Yee, M.D.,
University of Malaysia, 1971.

Research Assistant Professors Emeriti

Joe Inukai (See Neurological
Surgery.)

Lloyd N. Simpson (See Neurologi-
cal Surgery.)

Research Assistant Professors

Virginia D. Buckles, Ph.D.,
University of Wisconsin, Madison,
1981.

Michael Chua, Ph.D.,
University of New South Wales,
1986.

Julaine Florence, M.H.S.,
Washington University, 1983.

Robert E. Hanlon, Ph.D.,
City University of New York, 1988.

Hiroyuki Kato, M.D.,
Tohoku University, 1981; Ph.D.,
1985.

Kathleen Mann Koepke, Ph.D.,
University of North Carolina, 1983.
(Psychology)

Emily A. LaBarge, Ed.D.,
University of Missouri, 1990. (See
Department of Psychology.)

Tom O. Videen, Ph.D.,
University of Washington, 1981.
(Neurophysiology) (See Department
of Radiology.)

Jian Xu, Ph.D.,
Shanghai Institute of Materia
Medica, 1991.

Shan Ping Yu, M.D., Ph.D.,
Capital Institute of Medicine, 1979.

Assistant Professor Emeritus (Clinical)

William B. Hardin, M.D.,
University of Texas, Galveston,
1957.

Assistant Professors (Clinical)

Denis I. Altman, M.B.,
University of the Witwatersrand,
1975. (See Department of Pediat-
rics.)

Richard J. Ferry, M.D.,
St. Louis University, 1962.

Joseph Hanaway, M.D.,
McGill University, 1960.

J. Michael Hatlelid, M.D.,
Washington University, 1977.

John F. Mantovani, M.D.,
University of Missouri, 1974. (See
Department of Pediatrics.)

Robert P. Margolis, M.D.,
St. Louis University, 1975.

David F. Mendelson, M.D.,
Indiana University, 1948.

David M. Reisler, M.D.,
Washington University, 1961.

Eli R. Shuter, M.D.,
Washington University, 1960.

Howard I. Weiss, M.D.,
Tulane University, 1972.

Instructors

Robert E. Adams, M.D.,
University of Virginia, 1990.

Muhammad T. Al-Lozi, M.D.,
King Edward Medical College,
1980.

Gregory M. Blume, M.D.,
University of Kansas, 1989.

Janice E. Brunstrom, M.D.,
Medical College of Virginia, 1987.
(See Department of Pediatrics.)

Bernard C. Burns, D.O.,
University of Health Sciences, 1985.

Sara Doster, M.D., Ph.D.,
Washington University, 1985.

Jeffrey L. Elliott, M.D.,
Washington University, 1988.

Glenn Lopate, M.D.,
Ohio State University, 1987.

Tahseen Mozaffar, M.B.B.S.,
Aga Kahn University, 1989.

Yoram Nevo, M.D.,
Sackler School of Medicine, 1979.

Richard P. Paczynski, M.D.,
Mayo Medical School, 1989.

Hemanth Rao, M.D.,
Madras Medical College, 1988.

Awaiz Riaz, M.B.B.S.,
King Edward Medical College, 1985.

Joy B. Snider, M.D., Ph.D.,
University of Texas Southwestern
Medical School, 1986.

In-Sook Sunwoo, M.D.,
Woo Sok University, 1959. (See
Department of Medicine.)

Kun Xu, M.D.,
Zhongshan Medical University,
1978.

Research Instructors

Juanita Carl, M.A.,
Washington University, 1962.

Mary A. Coats, B.S.N.,
Southern Illinois University, 1980.

Maurizio Corbetta, M.D.,
University of Pavia, 1985.

Terri L. Hosto, M.S.W.,
University of Michigan, 1986.

Instructors (Clinical)

Sylvia Awadalla, M.D.,
Ohio State University, 1985.

James S. Bonner, M.D.,
University of Missouri, 1980. (See
Department of Pediatrics.)

David J. Callahan, M.D.,
Washington University, 1986. (See
Department of Pediatrics.)

Bennett D. Frank, M.D., Ph.D.,
Baylor College of Medicine, 1988.

Gerlyn Friesenhahn, M.D.,
University of Texas, San Antonio,
1986.

James M. Goldring, Ph.D.,
Washington University, 1977; M.D.,
1986.

David Peebles, M.D.,
The University of Chicago, 1986.

Daniel Phillips, M.D.,
Washington University, 1980.

Julie Thompson-Dobkin, D.O.,
Chicago College of Osteopathic
Medicine, 1983.

NEUROLOGICAL SURGERY

Professor and Head

Ralph G. Dacey, Jr., M.D.,
University of Virginia, 1974.

August A. Busch, Jr., Professor Emeritus and Lecturer

Henry G. Schwartz, M.D.,
The Johns Hopkins University,
1932.

Professor Emeritus

Sidney Goldring, M.D.,
Washington University, 1947.

Professors

William S. Coxe, M.D.,
The Johns Hopkins University,
1948.

Mokhtar Gado, DMRE,
Cairo University, 1960. (See
Department of Radiology.)

Herbert Lourie Professor of Neurological Surgery

Robert L. Grubb, Jr., M.D.,
University of North Carolina, 1965.
(See Department of Radiology.)

Carlton C. Hunt, M.D.,
Cornell University, 1942. (See
Neurology and Department of Cell
Biology and Physiology.)

Tae Sung Park, M.D.,
Yonsei University, 1971.

Richard D. Wetzel, Ph.D.,
St. Louis University, 1974. (See
Neurology and Department of
Psychiatry.)

Thomas A. Woolsey, M.D.,
The Johns Hopkins University,
1969. (Ethel R. and George H.
Bishop Scholar in Neuroscience)
(See Neurology and Department of
Anatomy and Neurobiology and
Department of Cell Biology and
Physiology.)

Associate Professors

Andreas H. Burkhalter, Ph.D.,
University of Zurich, 1977. (See
Department of Anatomy and
Neurobiology.)

Steven E. Petersen, Ph.D.,
California Institute of Technology,
1981. (See Neurology and Depart-
ment of Anatomy and Neurobiol-
ogy.)

Keith M. Rich, M.D.,
Indiana University, 1977. (See
Department of Anatomy and
Neurobiology.)

Rene Tempelhoff, M.D.,
University of Lyon, 1984. (See
Department of Anesthesiology.)

Research Associate Professor

Jack R. Engsborg, Ph.D.,
University of Iowa, 1985.

Assistant Professors

Michael N. Diringer, M.D.,
University of Kentucky, 1982. (See
Neurology.)

Robert E. Drzymala, Ph.D.,
University of Oklahoma, 1977. (See
Department of Radiology.)

Marc E. Eichler, M.D.,
Washington University, 1988.

Jeffrey M. Gidday, Ph.D.,
University of Virginia, 1986. (See
Department of Ophthalmology and
Department of Cell Biology and
Physiology.)

Bruce A. Kaufman, M.D.,
Case Western Reserve University,
1982.

Daniel L. Silbergeld, M.D.,
University of Cincinnati, 1984. (See
Department of Anatomy and
Neurobiology.)

Dennis G. Vollmer, M.D.,
University of Texas, 1979.

Assistant Professor (Adjunct)

Matthew A. Howard, M.D.,
University of Cincinnati, 1984.

Research Scientists

Gary W. Harding, M.S.E.,
University of Washington, 1983.

Gordon L. Shulman, Ph.D.,
University of Oregon, 1979. (See
Neurology and Department of
Psychology.)

Research Associates

Hans H. Dietrich, Ph.D.,
Ruhr University, 1986.

Ernesto Delarosa Gonzales,
B.S.N., Arellano University, 1981.

Yasukazu Kajita, M.D.,
Nagoya University, 1984; Ph.D.,
1994.

Dagian Liu, M.D.,
Norman Bethune University, 1983.

Bradley Miller, Ph.D.,
Cornell University, 1991.

Jianxin Tong, M.D.,
Zhejiang University, 1982.

Ling Wei, M.D.,
Beijing Institute of Medicine, 1977.

Yun Zhu, M.D.,
Harbin Medical University, 1984.

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

The student's involvement in obstetrics and gynecology consists of a thorough exposure to the basic concepts in reproductive biology and an active participation in the delivery of medical care to women with gestations normal or at risk, congenital anomalies of the pelvic viscera, structural disorders secondary to difficult childbirth, reproductive endocrinopathies and infertility, and gynecologic malignancies. The third-year clerkship is conducted at Barnes Hospital, Jewish Hospital, and St. Louis Regional Medical Center. Fourth-year electives may be taken at Barnes Hospital or in the many affiliated hospitals in St. Louis. Regularly held conferences in reproductive endocrinology, maternal-fetal medicine, OB-GYN pathology, and gynecologic oncology supplement the student's education.

SECOND YEAR

Second-year students are introduced to obstetrics and gynecology with lectures in reproductive biology which apply the pelvic anatomy and physiology taught in the first year, physiology of tubal transport and ovarian control, myometrial function, placental perfusion, steroidogenesis, genetics, and prenatal diagnosis.

THIRD YEAR

Comprehensive study of the reproductive health needs of women is the focus of the six-week curriculum. Opportunity for supervised active participation is emphasized in outpatient clinics, outpatient surgery, pre- and post-operative surgical management, routine and high risk obstetrics, and care of the infertile and oncology patient. Students are assigned to two clinical rotations at either Barnes, Jewish, or Regional Medical Center. Teaching is provided by the faculty and house staff. Students participate in all teaching conferences offered by the department, as well as attend a core curriculum lecture series. Student assessment is based on the two clinical rotations and a written examination.

FOURTH YEAR

Fourth-year students wishing to take an externship or research elective can choose from a variety of courses:

Ob-Gyn Subinternships

(A) Endocrinology-Infertility Subinternship. In the office and hospital, the extern participates in the study and treatment of women with reproductive

endocrine disorders and infertility. The extern participates in conferences, has assigned reading, and obtains experience in a busy ambulatory care setting. *Dr. Odem*

(B) Pathology Subinternship. The elective elucidates the principles of anatomic pathology as applied to operative material in obstetrics and gynecology. The extern examines gross and microscopic specimens in the Ob-Gyn Pathology Laboratory and reviews pertinent literature with a senior pathologist. *Dr. Gersell*

(C) Gyn Oncology Subinternship. This elective concerns itself with the diagnosis and treatment of malignant tumors of the female reproductive tract. The extern is involved in all aspects of the care of women with gyn malignant tumors. This experience will include surgical treatment, radiation therapy, and chemotherapy. *Dr. Mutch*

(D) Maternal-Fetal Medicine Subinternship. The subintern participates in the care of women with gestations at risk (e.g., diabetes, hypertension, renal disease, hematologic abnormalities, preterm labor, etc.). Antepartum evaluation and monitoring of the pregnant woman and her fetus are emphasized. *Dr. Holcomb*

(E) Perinatal Medicine Subinternship at St. Louis Regional Medical Center. The subintern is provided with practical experiences and theoretical aspects of the high risk pregnancy and an opportunity to explore a chosen aspect of the field in depth. The subintern will be assigned patients for initial evaluation and continuing care on the inpatient antepartum service and outpatient High Risk Clinic. The subintern will also be involved in the prenatal testing laboratory. The elective will provide experience in medical and obstetrical complications (e.g., diabetes, hypertension, renal diseases, Rh disease, tocolysis). *Dr. Staisch*

(F) OB/GYN Outpatient Care Subinternship. This experience is designed to acquaint the subintern with the diagnosis and care of outpatients. While primarily located in the Gynecology Clinic and Outpatient Surgery unit, it should provide a more general overview of how to evaluate, diagnose, and provide definitive treatment (both medical and surgical) without hospital admission. The subintern will spend morning or afternoon half days in the patient clinics under the supervision of staff or house staff. He or she also will spend time in the outpatient operating room and meet once a week with staff for didactic sessions on outpatient care topics. *Dr. Rai*

Research Electives

(A) Regulation of Placental Hormone Synthesis. The laboratory is interested in the biosynthesis and assembly of multisubunit hormones of the placenta and pituitary. These interests can be divided into two general categories: (1) elucidating the mechanism of several post-translational reactions in the assembly and secretion of newly synthesized hormonal subunits, and (2) studies of the factors governing the expression of several placental and pituitary hormone genes. The approaches to these problems involve the use of site-directed mutagenesis and transgenic animals. These studies have led to the design of gonadotropin analogs for potential therapeutic use. Students will be concerned with concepts and techniques of molecular biology as applied to the above research. *Dr. Boime*

(B) Bio-Organic Chemical Endocrinology. Estrogen and progesterone control of the development and function of the female reproductive system. Laboratory research is focused on the biosynthesis, transport, and mechanism of hormones with emphasis on

the interactions between steroid hormones and macromolecules. New steroid hormone analogs are synthesized and tested for these studies. Also, new potential drugs for treating human ovarian cancer are synthesized and tested *in vitro* and *in vivo*. *Dr. Sweet*

(C) Transcriptional Regulation. Currently a variety of approaches, e.g.: transient transfections of reporter genes, *in vitro* binding studies, RT, PCR, and differential display, are being used to study regulation of gene expression. Corticotropin Releasing Hormone (CRH), a peptide hormone produced in the neuroendocrine cells of the hypothalamus, also is expressed in a species-specific pattern in human, but not rodent, placenta. The molecular basis of this species difference is currently being studied. Tamoxifen, an anti-estrogen compound used for chemotherapy of breast cancer, can act as a true estrogen in the regulation of gene expression in other tissues, such as endometrium. The molecular mechanisms of tamoxifen action as both agonist and antagonist are currently being investigated. *Dr. Adler*

Faculty**Professor and Head of Department**

James R. Schreiber, M.D.,
The Johns Hopkins University,
1972.

Professors Emeriti

H. Marvin Camel, M.D.,
Creighton University, 1950.

James C. Warren, M.D.,
University of Kansas, 1954; Ph.D.,
University of Nebraska, 1961. (See
Department of Biochemistry and
Molecular Biophysics.)

Walter G. Wiest, Ph.D.,
University of Wisconsin, 1952.

Professors

Irving Boime, Ph.D.,
Washington University, 1970. (See
Department of Pharmacology.)

James P. Crane, M.D.,
Indiana University, 1970. (See
Departments of Genetics and
Radiology.)

Ernst R. Friedrich, M.D.,
University of Heidelberg, 1954.

D. Michael Nelson, M.D., Ph.D.,
Washington University, 1977.

Kenneth L. Polakoski, Ph.D.,
University of Georgia, 1972.

Ronald C. Strickler, M.D.,
University of Toronto, 1967.

Frederick Sweet, Ph.D.,
University of Alberta, 1968.

Professors Emeriti (Clinical)

A. Norman Arneson, M.D.,
Washington University, 1928. (See
Department of Radiology.)

John E. Hobbs, M.D.,
Washington University, 1927.

Frank B. Long, Jr., M.D.,
Washington University, 1947.

William H. Masters, M.D.,
University of Rochester, 1943. (See
Department of Psychiatry.)

Melvin A. Roblee, M.D.,
Washington University, 1925.

Professors (Clinical)

Robert Burstein, M.D.,
Washington University, 1948.

S. Michael Freiman, M.D.,
Washington University, 1955.

Andrew E. Galakatos, M.D.,
University of Missouri, 1965.

Marvin Rennard, M.D.,
Washington University, 1952.

Associate Professor Emeritus

George J.L. Wulff, Jr., M.D.,
Washington University, 1933.

Associate Professors

Jeffrey M. Dicke, M.D.,
Ohio State University, 1978.

Deborah J. Gersell, M.D.,
Washington University, 1975. (See
Department of Pathology.)

Asko I. Kivikoski, M.D.,
University of Turku, 1958; D.Sc.,
1967.

Diane F. Merritt, M.D.,
New York University, 1976.

David G. Mutch, M.D.,
Washington University, 1980.

Randall R. Odem, M.D.,
University of Iowa, 1981.

Michael J. Paul, M.D.,
Northwestern University, 1980.

Jacques Sauvage, M.D.,
University of Liege, 1957.

Klaus J. Staisch, M.D.,
Free University of Berlin, 1966.

Associate Professors Emeriti (Clinical)

Robert S. Goell, M.D.,
Washington University, 1960.

J. Barlow Martin, M.D.,
Washington University, 1955.

James Pennoyer, M.D.,
University of Rochester, 1939.

Associate Professors (Clinical)

Michael J. Gast, M.D.,
Ohio State University, 1975; Ph.D.,
Washington University, 1981.

Richard A. Hartman, M.D.,
University of Missouri, 1978.

Godofredo M. Herzog, M.D.,
Washington University, 1957.

Jacob Klein, M.D.,
Jefferson Medical College, 1968.

Lee A. Rigg, M.D.,
Washington University, 1971.

Chotchai Srisuro, M.D.,
Siriraj Faculty of Medical Sciences,
1967.

Eugene D. Taylor, M.D.,
Howard University, 1954.

Assistant Professors

Stuart R. Adler, M.D., Ph.D.,
Duke University, 1982. (See
Department of Cell Biology and
Physiology.)

Rita Basuray, Ph.D.,
University of Illinois, 1983.

Diana L. Gray, M.D.,
University of Illinois, 1981.

William L. Holcomb, Jr., M.D.,
Indiana University, 1975.

Chih-Lin Hsieh, Ph.D.,
University of Texas, Austin, 1987.

Rebecca P. McAlister, M.D.,
University of Kentucky, 1979.

Lorraine A. Milio, M.D.,
Rush Medical College, 1981.

Lisa M. Olson, Ph.D.,
University of Illinois, 1986.

Janet S. Rader, M.D.,
University of Missouri, 1983.

Yoel Sadovsky, M.D.,
Hebrew University, 1985.

Jaye M. Shyken, M.D.,
University of Missouri, 1980.

Andrea L.P. Stephens, M.D.,
UCLA, 1987.

Daniel B. Williams, M.D.,
University of Missouri, 1985.

Research Assistant Professors

Gary L. Murdock, Ph.D.,
Medical University of South
Carolina, 1976.

James L. Thomas, Ph.D.,
University of Alabama, 1981.

Assistant Professors Emeriti (Clinical)

William Berman, M.D.,
Washington University, 1935.

Willard C. Scrivner, M.D.,
Washington University, 1930.

Mitchell Yanow, M.D.,
Washington University, 1941.

Assistant Professors (Clinical)

Robert L. Becker, M.D.,
Washington University, 1969.

Joe E. Belew, M.D.,
St. Louis University, 1957.

Bruce L. Bryan, M.D.,
Washington University, 1977.

Shih-Chung Chang, M.D.,
Chung-Shan Medical College, 1968.

Robert S. Cohen, M.D.,
State University of New York, 1962.

Ira C. Gall, M.D.,
University of Cincinnati, 1951.

C. Richard Gulick, M.D.,
University of Rochester, 1971.

Randall L. Heller, Jr., Ph.D.,
University of Missouri, 1968; M.D.,
University of Texas, 1976.

Darwin C. Jackson, M.D.,
Washington University, 1976.

Mark J. Jostes, M.D.,
University of Missouri, 1981.

Justin F. Kraner, M.D.,
University of Michigan, 1949.

David J. Levine, M.D.,
Autonomous University of
Guadalajara, 1976.

Carolyn M. Martin, M.D.,
Washington University, 1976.

Nathaniel H. Murdock, M.D.,
Meharry Medical College, 1963.

Jorge Pineda, M.D.,
National University of Honduras,
1972.

Jonathan R. Reed, M.D.,
Meharry Medical College, 1965.

Chinda Rojanasathit, M.D.,
Siriraj Medical School, 1967.

M. Bryant Thompson, M.D.,
University of California, 1961.

Albro C. Tobey, M.D.,
University of Dublin, 1972.

Randall W. Tobler, M.D.,
Washington University, 1984.

J. Leslie Walker, M.D.,
University of Tennessee, 1960.

Instructors

Lisa M. Adler, M.D.,
The University of Chicago, 1987.

Jan L. Albrecht, M.D.,
St. Louis University, 1989.

Steven R. Allen, M.D.,
Washington University, 1984.

Robert H. Ball, M.D.,
Oxford University, 1985.

Lisa M. Bernhard, M.D.,
Louisiana State University, 1985.

Vicente M. Colon-Alcaraz, M.D.,
Ponce School of Medicine, 1982.

Jane E. Corteville, M.D.,
Washington University, 1983.

Khaled I. Dibbs, M.D.,
American University, 1989.

N. Edward Dourron, M.D.,
Medical College of Georgia, 1990.

Thomas J. Herzog, M.D.,
University of Cincinnati, 1986.

John D. Isaacs, M.D.,
University of Mississippi, 1989.

Edward R. Kost, M.D.,
Uniformed Services University,
1989.

Kelle H. Moley, M.D.,
Yale University, 1988.

Dorothea J. Mostello, M.D.,
The Johns Hopkins University,
1982.

Jodie Rai, M.D.,
University of Illinois, 1988.

Valerie S. Ratts, M.D.,
The Johns Hopkins University,
1987.

Instructor Emeritus (Clinical)

Theodore Merrims, M.D.,
Washington University, 1954.

Instructors (Clinical)

John K. Appelbaum, M.D.,
Washington University, 1984. (See
Health Key Medical Group.)

Frederick V. Behm, M.D.,
University of Kansas, 1989.

James E. Belcher, M.D.,
Washington University, 1976.

Scott W. Biest, M.D.,
University of Missouri, Kansas City,
1989.

Kathryn L. Botney, M.D.,
Washington University, 1984.

Joseph C. Boveri, M.D.,
St. Louis University, 1959.

Lawrence V. Boveri, M.D.,
University of Missouri, Kansas City,
1988.

Craig W. Boyd, M.D.,
University of Illinois, 1983.

Robert J. Brown, M.D.,
Washington University, 1983.

Christine M. Cernik, M.D.,
Rush University, 1983.

Ronald J. Chod, M.D.,
University of Texas, 1983.

Catherine L. Dean, M.D.,
University of Missouri, Kansas City,
1983.

Michelle R. de Vera, M.D.,
Washington University, 1989.

Russell B. Dietrich, M.D.,
University of Illinois, 1970.

Josiah O. Ekunno, M.D.,
University of Ibadan, Nigeria, 1971.

Renee D. Ewing, M.D.,
Southern Illinois University, 1984.

Cathleen R. Faris, M.D.,
University of Kansas, 1982.

Gordon M. Goldman, M.D.,
St. Louis University, 1966.

Carol A. Graham, M.D.,
Northwestern University, 1989.

Joseph Hazan, M.D., Ege
University, 1971.

William E. Houck, M.D.,
University of Cincinnati, 1981.

Laura R. Hulbert, M.D.,
Washington University, 1981.

Michael K. Johnson, M.D.,
St. Louis University, 1975.

Vernon L. Johnson, M.D.,
St. Louis University, 1985.

Christine M. Ladd, M.D.,
University of Missouri, 1990.

Gary G. Lee, D.O.,
Kirksville College of Osteopathic
Medicine, 1976.

Daniel S. McDonald, M.D.,
University of Missouri, 1989.

Darryl N. McKinney, M.D.,
Washington University, 1980.

Theodore M. Meiners, M.D.,
Washington University, 1948.

Jerry N. Middleton, M.D.,
Washington University, 1963.

Sam Momtazee, M.D.,
Shiraz Medical School, 1961.

Alvaro Mora, M.D.,
Antioquia University.

Gerald Newport, M.D.,
Washington University, 1953.

Joseph D. O'Keefe, M.D.,
Washington University, 1950.

Anthony C. Pearlstone, M.D.,
Washington University, 1985.

Carlton S. Pearse, M.D.,
Washington University, 1978.

Louis T. Riley, M.D.,
University of Kentucky, 1980.

Jerome D. Sachar, M.D.,
University of Missouri, 1979.

Kevin B. Schaberg, M.D.,
Washington University, 1966.

Daniel J. Semenoff, M.D.,
St. Louis University, 1963.

D. Elan Simckes, M.D.,
Hebrew University, 1989.

John A. Stopple, M.D.,
University of Wisconsin, 1969.

Jean A. Thomas, M.D.,
Faculte de Medecine et de
Pharmacie d'Haiti, 1972.

Jacqueline S. Turner, M.D.,
Tulane University, 1983.

Daniel G. Wagner, M.D.,
St. Louis University, 1989.

Gary M. Wasserman, M.D.,
University of Missouri, Kansas City,
1980.

Mark S. Wasserman, M.D.,
University of Missouri, Kansas City,
1984.

David L. Weinstein, M.D.,
St. Louis University, 1985.

Parker H. Word, M.D.,
Howard University, 1944.

Research Instructor

Roger D. Johnson, Ph.D.,
University of Tennessee, 1990.

DEPARTMENT OF OPHTHALMOLOGY AND VISUAL SCIENCES

Instruction begins in the second year with examination of the eye and a series of lectures on various aspects of ocular disease. During the third year, students are assigned to an ophthalmology clerkship for one week. In the fourth year, six-week and twelve-week clinical or research electives are offered.

SECOND YEAR

Introduction to clinical ophthalmology begins in the second year with a lecture and practicum (peer exam) on taking an ocular history and performing an ocular exam. Emphasis is on the use of the ophthalmoscope. Additionally, during the second year, there is a series of lectures on various aspects of ocular disease. The emphasis is on ocular manifestations of common systemic diseases, e.g.: diabetic retinopathy, hypertensive retinopathy, optic neuritis, papilledema, Grave's ophthalmopathy, as well as common eye diseases, e.g.: cataracts and glaucoma. This series of lectures is presented as case problems on which students work prior to the lecture. This "problem-solving" approach has proved to be more successful and more informative than the strict didactic lecture approach. *Dr. M. Smith and Staff*

THIRD YEAR

In the third year, students spend one week in the outpatient eye clinic examining patients with ophthalmology residents. During this week, the students have discussion sessions on various topics with members of the faculty, e.g.: differential diagnosis of the "red eye," how to interpret an ophthalmologic consult note, how to handle an ocular emergency in the emergency room (chemical burns, etc.). During this one week, there is again emphasis on the use of the ophthalmoscope, and a problem solving case history-photo album is worked on by the students. *Dr. M. Smith and Staff*

FOURTH YEAR ELECTIVE

The fourth year is a clinical clerkship geared to the student who plans to enter the specialty of ophthalmology. The student's role is that of an extern in that he/she performs the history and ocular exam on patients in the outpatient clinic and/or the various services within the department, e.g.: University Eye Service, glaucoma unit, neuro-ophthalmology unit. The student is expected to present cases at rounds and conferences. There are one or two students on each of these services for six or 12 weeks.

Dr. M. Smith and Staff

RESEARCH ELECTIVES

Molecular mechanisms of cataractogenesis.

Dr. Andley

Immunological, biochemical and molecular mechanisms of uveitis. *Dr. Bora*

Transplantation of retinal pigment epithelium.

Dr. Del Priore

Ocular immunology. *Dr. Ferguson*

Molecular mechanisms in melanomas. *Dr. Fleming*

Ocular immunology. *Dr. Gao*

Compliance to medical therapy. *Dr. Gordon*

Visual information processing. *Dr. Groszof*

Computer application to visual fields and to the ocular fundus. *Dr. Hart*

Immunopathogenesis of uveitis. Transplantation of the retina. *Dr. Kaplan*

Genetics of herpes simplex. *Dr. Leib*

Neurobiology research involving the retina. *Dr. Lukasiewicz*

Molecular biology of glaucoma. *Dr. Patil*

Immunology and molecular virology. *Dr. Pepose*

Neurobiology, neurochemistry, neuropharmacology; also glaucoma. *Dr. Romano*

Ocular immunology. *Dr. Stuart*

Strabismus and amblyopia. *Dr. Tychsen*

Biochemistry and pharmacology in glaucoma. *Dr. Wax*

Faculty**Professor and Head of Department**

Henry J. Kaplan, M.D.,
Cornell University, 1968.

Professor Emeritus

Bernard Becker, M.D.,
Harvard University, 1944.

Adolph I. Cohen, Ph.D.,
Columbia University, 1954. (See Department of Anatomy and Neurobiology.)

Robert A. Moses, M.D.,
University of Maryland, 1942.

Professors

David C. Beebe, Ph.D.,
University of Virginia, 1974.

William M. Hart, Jr., Ph.D.,
University of Maryland, 1970; M.D., 1970.

Michael A. Kass, M.D.,
Northwestern University, 1966.

Allan E. Kolker, M.D.,
Washington University, 1957.

Jay S. Pepose, Ph.D.,
University of California, Los Angeles, 1980; M.D., 1982. (See Department of Pathology.)

Morton E. Smith, M.D.,
University of Maryland, 1960. (See Department of Pathology.)

Professor Emeritus (Clinical)

Edward Okun, M.D.,
University of Vermont, 1956.

Professors (Clinical)

George M. Bohigian, M.D.,
St. Louis University, 1965.

Robert C. Drews, M.D.,
Washington University, 1955.

Jack Hartstein, M.D.,
University of Cincinnati, 1955.

Jack Kayes, M.D.,
Washington University, 1957.

Benjamin Milder, M.D.,
Washington University, 1939.

James E. Miller, M.D.,
Medical College of Alabama, 1949. (See Department of Pediatrics.)

Stephen R. Waltman, M.D.,
Yale University, 1964.

Associate Professor

Philip L. Custer, M.D.,
Vanderbilt University, 1978.

Mae Gordon, Ph.D.,
University of Wisconsin, 1978. (See Division of Biostatistics.)

J. Mark Petrash, Ph.D.,
University of Texas, Galveston, 1981. (See Department of Genetics.)

Martin B. Wax, M.D.,
University of Southern California, 1978.

Mitchel L. Wolf, M.D.,
Albert Einstein College of Medicine, 1968.

Associate Professors Emeriti (Clinical)

Glen P. Johnston, M.D.,
Washington University, 1956.

Theodore E. Sanders, M.D.,
University of Nebraska, 1933.

Associate Professors (Clinical)

Neva P. Arribas, M.D.,
Manila Central University, 1954.

James C. Bobrow, M.D.,
The Johns Hopkins University, 1970.

Isaac Boniuk, M.D.,
Dalhousie University, 1962.

Dean B. Burgess, M.D.,
University of California, 1967.

Robert M. Feibel, M.D.,
Harvard University, 1969.

M. Gilbert Grand, M.D.,
Yale University, 1968.

Stephen A. Kamenetzky, M.D.,
Washington University, 1970.

Terence G. Klingele, M.D.,
University of California, 1970.

Harry L. Knopf, M.D.,
Harvard Medical School, 1967.

Robert Joseph Olk, M.D.,
Rush Medical College, 1975.

Louis J. Rosenbaum, M.D.,
Washington University, 1963.

Bernd Silver, M.D.,
University of Louisville, 1956.

Assistant Professors

Usha P. Andley, Ph.D.,
Jawaharlal Nehru University, 1977. (See Department of Biochemistry and Molecular Biophysics.)

Steven Bassnett, Ph.D.,
University of East Anglia, 1987.

Adam Berger, M.D.,
State University of New York, Brooklyn, 1988.

Lucian V. Del Priore, M.D.,
University of Rochester, 1982; Ph.D., Cornell University, 1984. (See Department of Biochemistry and Molecular Biophysics.)

Thomas A. Ferguson, Ph.D.,
University of Cincinnati, 1982. (See Department of Pathology.)

Timothy P. Fleming, Ph.D.,
University of Missouri, 1985. (See Department of Genetics.)

Cynthia Z. Kenneally, M.D.,
University of Missouri, 1982.

David A. Leib, Ph.D.,
The University of Liverpool, 1986. (See Department of Molecular Microbiology.)

Anthony J. Lubniewski, M.D.,
University of Florida, 1985.

Gregg T. Lueder, M.D.,
University of Iowa, 1985. (See Department of Pediatrics.)

Peter D. Lukasiewicz, Ph.D.,
University of Michigan, 1984. (See Department of Anatomy and Neurobiology.)

Carmelo Romano, Ph.D.,
Stanford University, 1981. (See Department of Anatomy and Neurobiology.)

Carla Siegfried, M.D.,
University of Missouri, Kansas City, 1989.

Lawrence Tychsen, M.D.,
Georgetown University, 1979. (See Department of Anatomy and Neurobiology and Department of Pediatrics.)

Research Assistant Professors

Nalini S. Bora, Ph.D.,
All India Institute of Medical Science, 1981. (See Department of Pathology.)

Er-Kai Gao, M.D.,
Peking Medical College, 1983. (See
Department of Pathology.)

David H. Groszof, Ph.D.,
University of California, Berkeley,
1989.

Rajkumar V. Patil, Ph.D.,
National Chemical Laboratory, 1985.

Patrick M. Stuart, Ph.D.,
Northwestern University, 1985.

Assistant Professors Emeriti (Clinical)

William H. Meinberg, M.D.,
Washington University, 1932.

Arthur W. Stickle, Jr., M.D.,
University of Oklahoma, 1943.

Philip Venable, M.D.,
Wayne State University, 1940.

Assistant Professors (Clinical)

Nevinkumar J. Amin, M.B.B.S.,
Bombay University, 1966.

Stanley C. Becker, Ph.D.,
Washington University, 1951; M.D.,
Chicago Medical School, 1955.

Edward F. Berg, M.D.,
Washington University, 1964.

Ronald C. Bilchik, M.D.,
Washington University, 1967.

Samuel A. Canaan, Jr., M.D.,
Meharry Medical College, 1954.

Lawrence A. Gans, M.D.,
Case Western Reserve University,
1977.

James M. Gordon, M.D.,
University of Minnesota, 1966.

Kenneth O. Green, M.D.,
University of Missouri, 1960.

Michael J. Isserman, M.D.,
Washington University, 1975.

William S. Joffe, M.D.,
Washington University, 1963.

Robert L. Lamberg, M.D.,
Washington University, 1976.

Barry D. Milder, M.D.,
Washington University, 1973.

Duane L. Mitzel, M.D.,
Washington University, 1977.

Matthew Newman, M.D.,
Columbia University, 1959.

F. Thomas Ott, M.D.,
Washington University, 1965.

John C. Perlmutter, M.D.,
Cornell University, 1971.

Michael B. Rumelt, M.D.,
Washington University, 1966.

Matthew A. Thomas, M.D.,
Harvard University, 1981.

William L. Walter, M.D.,
Ohio State University, 1954.

Stephen A. Wexler, M.D.,
University of Michigan, 1982.

Instructors

Carrie S. Gaines, O.D.,
University of Missouri, 1988.

Mary Migneco, O.D.,
University of Missouri, 1991.

V. Nathan Ravi, M.D.,
University of Miami, 1988; Ph.D.,
Virginia Tech, 1980.

Research Instructor

Keith A. Laycock, Ph.D.,
University of Bristol, 1989.

Instructors Emeritus (Clinical)

Ruth S. Freedman, M.D.,
Washington University, 1942.

Maxwell Rachlin, M.D.,
University of Toronto, 1942.

Instructors (Clinical)

William L. Becker, M.D.,
Washington University, 1987.

Gregg J. Berdy, M.D.,
St. Louis University, 1983.

Rebekah A. Braslow, M.D.,
Yale University, 1987.

Bruce H. Cohen, M.D.,
The Johns Hopkins University,
1980.

Nicholas N. Colosi, M.D.,
St. Louis University, 1968.

Bruce S. Frank, M.D.,
Washington University, 1976.

Paul F. Nichols, M.D.,
University of California, 1982.

Mickey L. Salmon, M.D.,
Louisiana State University, 1959.

Steven M. Shields, M.D.,
Washington University, 1986.

Mark H. Spurrier, M.D.,
Washington University, 1980.

Instructors (Adjunct)

Henry W. Allhoff, O.D.,
Illinois College of Optometry, 1981.

P. Douglas Becherer, O.D.,
Southern College of Optometry,
1975.

Frank J. Bier, O.D.,
University of Missouri, 1984.

Michael K. Billings, O.D.,
University of Missouri, 1987.

Gerald P. Birkmann, O.D.,
Southern College of Optometry,
1968.

Mark G. Birkmann, O.D.,
University of Missouri, 1992.

Jerald D. Boring, O.D.,
University of Houston School of
Optometry, 1969.

Larry G. Brokering, O.D.,
Illinois College of Optometry, 1972.

Marc R. Brown, O.D.,
Southern College, 1980.

Carmen Frank Castellano, O.D.,
Illinois College of Optometry, 1982.

Earl S. Changar, O.D.,
Southern College of Optometry,
1958.

Pamela A. Coslic, O.D.,
University of Missouri, 1987.

David L. Davidson, O.D.,
Southern College of Optometry,
1964.

Larry J. Davis, O.D.,
Indiana University School of
Optometry, 1987.

James A. DeClue, O.D.,
Illinois College of Optometry, 1949.

Gary W. DeLancey, O.D.,
Illinois College of Optometry, 1964.

Paul E. Diehl, O.D.,
Illinois College of Optometry, 1959.

John R. Eigenbrodt, O.D.,
University of Missouri, 1988.

Lawrence V. Ernst, O.D.,
University of Missouri, 1990.

Raymond F. Fada, Jr., O.D.,
University of Missouri, 1989.

Kurt W. Finklang, O.D.,
State University of New York, 1981.

Frank D. Fontana, O.D.,
Illinois College of Optometry, 1950.

Stephen M. Garnett, O.D.,
Indiana University, 1980.

Louis Gemoules, O.D.,
Illinois College of Optometry, 1954.

N. Rex Ghormley, O.D.,
Southern California College of
Optometry, 1964.

Richard B. Hamm, O.D.,
Illinois College of Optometry, 1982.

Alexander D. Harris, O.D.,
University of Missouri, 1986.

William L. Herbold, O.D.,
Southern College of Optometry,
1967.

Douglas L. Huff, O.D.,
Southern California College of
Optometry, 1981.

Jeffrey H. Jacob, O.D.,
Southern California College of
Optometry, 1980.

Lawrence J. Jehling, O.D.,
Illinois College of Optometry, 1978.

Deborah L. Kerber, O.D.,
University of Missouri, 1992.

William F. Kiefer, Jr., O.D.,
Illinois College of Optometry, 1975.

Lesla M. Klein, O.D.,
University of Missouri, 1989.

Mark A. Kleindorfer, O.D.,
Indiana University, 1979.

Vivian M. Kloke, O.D.,
University of Missouri, 1990.

Ronald J. Knox, O.D.,
Southern College of Optometry,
1956.

Thomas E. Kraemer, O.D.,
Indiana University School of
Optometry, 1972.

Paul A. LaPoint, O.D.,
Southern College of Optometry,
1963.

Scott W. Lewis, O.D.,
Southern California College of
Optometry, 1977.

James W. Lieber, O.D.,
Illinois College of Optometry, 1981.

Lynette S. Lui, O.D.,
Illinois College of Optometry, 1978.

Lisa M. Mackey, O.D.,
University of Missouri, 1993.

Charles J. Metz, O.D.,
University of Missouri, 1986.

Eugene J. Mobley, O.D.,
Northern Illinois College of
Optometry, 1950.

Robert L. Mobley, O.D.,
Illinois College of Optometry, 1958.

Kathryn A. Reynolds, O.D.,
University of Missouri, 1992.

Michael D. Rohde, O.D.,
University of Missouri, 1987.

Shelton K. Sago, O.D.,
University of Missouri, 1984.

Russell C. Saphian, O.D.,
Southern College of Optometry,
1956.

Frederick W. Schwager, O.D.,
Illinois College of Optometry, 1957.

Christopher G. Seep, O.D.,
University of Missouri, 1984.

David B. Seibel, O.D.,
University of Missouri, 1987.

Daniel D. Seibert, O.D.,
Illinois College of Optometry, 1979.

Charles D. Signorelli, O.D.,
Southern College of Optometry,
1957.

Claud R. Snowden, O.D.,
Illinois College of Optometry, 1974.

Craig H. Sorce, O.D.,
University of Missouri, 1992.

James F. Strieter, O.D.,
Chicago College of Optometry,
1954.

Brian P. Sumner, O.D.,
Illinois College of Optometry, 1978.

Gary L. Vogel, O.D.,
Ohio State University, 1977.

James J. Wachter, O.D.,
Illinois College of Optometry, 1991.

Donald E. Walter, Jr., O.D.,
University of Houston, 1972.

Michael R. Wiejaczka, O.D.,
Chicago College of Optometry,
1950.

Diane G. Wilson, O.D.,
University of Missouri, 1988.

Bernita B. Wolf, O.D.,
University of Missouri, 1987.

Michael L. Wolf, O.D.,
University of Missouri, 1987.

DEPARTMENT OF ORTHOPAEDIC SURGERY

The Department of Orthopaedic Surgery has educational activities at six affiliated hospitals. These include Barnes Hospital, Jewish Hospital, Children's Hospital, St. Louis Shriners Hospital for Crippled Children, St. Louis Regional Hospital, and St. Louis Veterans Administration Hospital. The orthopaedic activities at Barnes Hospital are divided into five services: Hand Surgery Service, Spine Surgery Service, Sports Medicine Service, Reconstructive Surgery Service, and the Orthopaedic Trauma Service. Students work with orthopaedic house officers and attending surgeons. It is anticipated that students will assist in the care of patients in the surgical wards, scrub in on surgical procedures, attend outpatient clinics, and participate in the coverage of the Emergency Room. All students on Orthopaedic Surgery also participate in program-wide conferences on Tuesday morning, Wednesday morning and Saturday morning, in addition to service conferences at each of the individual hospitals.

THIRD YEAR

The third-year student rotations are three weeks in length. Because of the popularity of the specialty, many rotations have been established at the affiliated hospitals. These include Barnes Reconstructive Surgery Service (*Dr. Sutherland*), Barnes Trauma Surgery Service (*Dr. Perry*), Jewish Hospital (*Dr. Gilden*), Children's Hospital (*Dr. Schoenecker*), St. Louis Regional Hospital (*Dr. Pearson*) and Veterans Administration Hospital (*Dr. Miller*). Night call is optional, but encouraged.

FOURTH YEAR

Orthopaedic Hand Surgery Elective

A clinical elective will be available for a four-week period during which time the student will work with attending surgeons primarily at Barnes Hospital.

FACULTY

**Fred C. Reynolds Professor of
Orthopaedic Surgery**

Richard H. Gelberman, M.D.,
University of Tennessee, 1969.

Professor Emeritus

Lee T. Ford, M.D.,
University of Tennessee, 1940.

Professor

Paul R. Manske, M.D.,
Washington University, 1964.

Associate Professors

Keith H. Bridwell, M.D.,
Washington University, 1977.

Clayton R. Perry, M.D.,
St. Louis University, 1977.

Perry L. Schoenecker, M.D.,
University of Wisconsin, 1968.

Activities will include participation in the care of hospital patients, participation in inpatient and outpatient procedures, attendance at designated attending office hours, attendance at designated orthopaedic conferences, and dissection of upper extremity anatomical specimens. *Dr. Manske and Staff*

Orthopaedic Spine Surgery Elective

This clinical elective is available for a six-week period. Students will work with attending surgeons and senior residents at Barnes Hospital and St. Louis Children's Hospital. Participation will include evaluation and management of inpatients and outpatients, serving as an assistant on anterior and posterior spinal decompressions and instrumentations. *Dr. Bridwell*

Orthopaedic Reconstructive Surgery Elective

This clinical elective is available for four weeks during which time the student will participate in orthopaedic conferences, outpatient clinics, surgical cases, and patient rounds; night call is optional. The medical students electing this clerkship will serve as an active and integral part of the orthopaedic team. *Dr. Sutherland*

Orthopaedic Trauma Elective

Clinical elective available for a four- to six-week period, during which time the student will work in orthopaedic trauma primarily at Barnes Hospital and St. Louis Regional Medical Center. Activities will include participation in the care of hospital patients, participation in inpatient and outpatient procedures, attendance at designated orthopaedic conferences and participation in ongoing research projects. *Dr. Perry*

Pediatric Orthopaedic Surgery Elective

Clinical elective available for four weeks during which time the student will work with attending surgeons primarily at St. Louis Shriners and Children's hospitals observing and assisting in outpatient and inpatient clinics. Attendance at and participation in the weekly pediatric orthopaedic conference activities are required. *Dr. Schoenecker*

William B. Strecker, M.D.,
St. Louis University, 1975.

Associate Professors Emeriti (Clinical)

Marshall B. Conrad, M.D.,
Washington University, 1945.

Harry C. Morgan, M.D.,
Harvard University, 1953.

Assistant Professor Emeritus

J. Otto Lottes, Ph.G.,
St. Louis College of Pharmacy,
1928; M.D., University of Louisville,
1937.

Assistant Professors

Jerome J. Gilden, M.D.,
Washington University, 1952.

Lawrence G. Lenke, M.D.,
Northwestern University, 1986.

Matthew J. Matava, M.D.,
University of Missouri, Kansas City,
1987.

Kurt D. Merkel, M.D.,
St. Louis University, 1980.

Gary A. Miller, M.D.,
Jefferson Medical College, 1977.

Donald L. Pruitt, M.D.,
New Jersey Medical School, 1983.

Robert A. Shively, M.D.,
University of Illinois, 1969.

Charles J. Sutherland, M.D.,
Yale University, 1971.

Research Assistant Professors

Kenton N. Fredde, Ph.D.,
The University of Chicago, 1983.

Basem Koudsi, M.D.,
Damascus Medical University,
1978.

Jueren Lou, M.D.,
Kiangi Medical College, 1983.

Assistant Professors (Clinical)

Jordon H. Ginsburg, M.D.,
University of Illinois, 1972.

Robert E. Kuhlman, M.D.,
Washington University, 1956.

Marvin R. Mishkin, M.D.,
University of Illinois, 1955.

Instructors

Donald O. Burst, M.D.,
St. Louis University, 1945.

J. Eric Gordon, M.D.,
University of California, 1988.

Enes M. Kanlic, M.D.,
University of Sarajevo, 1971.

Richard L. Pearson, M.D.,
University of Illinois, 1974.

Rick W. Wright, M.D.,
University of Missouri, 1988.

Instructor Emeritus (Clinical)

W. Edward Lansche, M.D.,
Washington University, 1952.

Instructors (Clinical)

Donald R. Bassman, M.D.,
Washington University, 1975.

Donald H. Brancato, M.D.,
Northwestern University, 1967.

William S. Costen, M.D.,
Washington University, 1954.

James P. Emanuel, M.D.,
Washington University, 1983.

Ronald C. Hertel, M.D.,
Washington University, 1956.

Barrett K. Holder, M.D.,
Washington University, 1969.

Robert S. Kramer, M.D.,
Washington University, 1983.

Robert C. Lander, M.D.,
University of Illinois, 1972.

Charles I. Mannis, M.D.,
University of Missouri, 1969.

Alan H. Morris, M.D.,
University of Illinois, 1963.

Margaret M. Oakley, M.D.,
St. Louis University, 1959. (Shriners
Hospital for Crippled Children)

DEPARTMENT OF OTOLARYNGOLOGY

Otolaryngology is presented to students in the second-, third-, and fourth-year classes. A clinical pathologic correlation lecture series is presented to sophomores. In the third year of the medical curriculum, each student spends one week on one of the services in East Pavilion, St. Louis Veterans Administration, or St. Louis Regional Hospital. During this period there is teaching at the bedside, in the operating room, and in the clinic, supplemented by daily afternoon lectures, grand rounds on Wednesdays, and an introduction to audiology as well as to basic ENT research.

Fourth-year students who show a special interest may take a rotating elective in ENT suited to their interests. Some possibilities include research or clinical work. Ample research facilities and ongoing projects are available. Clinical exposure could include oncologic diseases related to the head and neck, otologic diseases, otoneurology, audiology, or middle-ear surgery.

The postgraduate program in Otolaryngology at Washington University School of Medicine consists of one year of general surgery, one year of research and four years of otolaryngology. During the clinical years of training, residents rotate on various services, which include the Head and Neck Surgery Service at Barnes Hospital, the ENT Clinic, Otolaryngology, Plastic Surgery Service, the Veterans Administration Hospitals, Children's Hospital, Jewish Hospital, and St. Louis Regional Hospital. During that time, the resident serves in all aspects of patient care including the outpatient clinic, inpatient hospital care, and the operating room, as well as the various ENT diagnostic laboratories such as vestibular and audiology. There is an increasing degree of responsibility given to residents as they proceed during the training program, depending upon the year in training and also the resident's professional development during this time. Didactic teaching consists of a basic science course during the first year of clinical residency. There is also a temporal bone otology course, as well as a head and neck dissection course. Throughout the year, there are didactic lectures on a weekly basis. These lectures consist of Grand Rounds, Morbidity and Mortality Conference and a series of instructional lectures throughout the year which cover all aspects of otolaryngology. During the clinical years, residents are expected to participate in clinical and/or basic research and to publish papers in peer-reviewed journals, and they are expected to make presentations at the lectures or Grand Rounds. They are encouraged to submit papers and to make presentations at regional and national otolaryngology meetings. There is a national course consisting of literature given by the American Academy of Otolaryngology in which residents are expected to

participate throughout the year. There is also an In-Training Examination given by the American Academy of Otolaryngology which all residents must take on a yearly basis. Throughout their residency, residents receive training in all aspects of otolaryngology including general otolaryngology, head and neck cancer surgery, microvascular reconstructive techniques, facial plastic surgery, otology and neurotology, pediatric otolaryngology including pediatric endoscopy, allergy and endoscopic nasal sinus surgery.

SECOND YEAR

Otolaryngology and Physical Diagnosis

Clinical pathologic correlative lectures in otolaryngology are given to the entire class. Subjects include ear disease, vertigo, nose, sinus and larynx problems, and head and neck cancer. *Dr. Goebel*

THIRD YEAR

Otolaryngology Clerkship

Practical instruction in diagnosis and treatment. Students rotate on the ENT service. This consists of ENT Outpatient Clinic, in-hospital patients and the operating room. One week. *Dr. Goebel*

FOURTH YEAR ELECTIVES

Clinical Clerkship in Otolaryngology

Six-week rotation includes evaluation of ENT problems presented to specialist for diagnosis and treatment. The student participates in the clinic, hospital and operating room. This also includes time on the Pediatric ENT Service, Audiology Voice Laboratory and Vestibular Evaluation Laboratory. Two students are accepted for each rotation. Students select their own options depending on their needs. *Dr. Thawley*

Practicum in Clinical Audiology

Guidance provided in the administration and interpretation of audiometric tests. Emphasis on defining the severity of auditory dysfunction in addition to identifying sites of pathological processes. Theoretical bases of acoustics, anatomy and physiology, and electronics reviewed as they relate to auditory assessment. Modification of conventional test paradigms and hearing aid procedures covered according to each student's interests and needs. *Dr. Skinner*

Neurotology

Active student participation in the physical exam, advanced testing and management of patients with balance dysfunction. Attend patient clinic two days a week and test patients on ENG, rotary chair and computerized platform three days a week. Research participation welcome with prior arrangements. *Dr. Goebel*

RESEARCH ELECTIVES

Inner ear microanatomy and pathology (light and electron microscopy). The effects of various ototraumatic agents (e.g., noise, radiation, etc.) on the structure of the inner ear are determined using light and electron microscopic evaluation of the cochlear tissues. *Dr. Bohne*

Topics in microvascular surgery. *Drs. Fredrickson, Haughey*

Glass microelectrodes, intra- and extra-cellular labels, computers, light and electron microscopy are used to study aspects of the central and peripheral vestibular system with an emphasis on vestibular efferents in anesthetized and alert fish and squirrel monkeys. *Dr. Highstein*

Evaluation and treatment methods for disorders of the velopharynx and larynx in children. *Dr. Muntz*

Clinical laboratory diagnosis and research into normal and non-normal speech with special emphasis on voice disorders. Students will become familiar

with diagnostic procedures and instrumental techniques. *Dr. Painter*

Computer-based studies of head and neck cancer treatment and results. *Dr. Sessions*

Molecular genetics of head and neck tumors. Molecular biological and immunohistochemical approaches are being used to understand the relationship between the genetic alterations associated with carcinogenesis and the clinical behavior of the resulting tumors. Special attention is directed toward the development of diagnostic/prognostic tools. *Drs. Scholnick, Haughey*

Research in implantable hearing aids. *Drs. Skinner, Fredrickson*

Biochemistry and pharmacology of the inner ear. *Dr. Thalmann*

Advanced testing of the vestibulo-ocular reflex (VOR), rotary chair and headshake testing. Posture control testing utilizing computerized dynamic platform posturography. *Dr. Goebel*

Faculty

Lindburg Professor and Head of Department

John M. Fredrickson, M.D.,
University of British Columbia,
1957; FRCS(C), 1963; Ph.D. (hon.),
Sweden, 1975.

Professors Emeriti

S. Richard Silverman, Ph.D.,
Washington University, 1942.
(Audiology), (Also Central Institute
for the Deaf and Faculty of Arts
and Sciences)

Malcolm H. Stroud, M.D., Ch.B.,
University of Birmingham, 1945;
L.R.C.P., M.R.C.S., 1946; F.R.C.S.,
1949.

Ruediger Thalmann, M.D.,
University of Vienna, 1954.

Professors

Barbara A. Bohne, Ph.D.,
Washington University, 1971.

Stephen M. Highstein, M.D.,
University of Maryland, 1965; Ph.D.,
University of Tokyo Faculty of
Medicine, 1976. (See Department of
Anatomy and Neurobiology.)

John Gail Neely, M.D.,
University of Oklahoma, 1965.

Colin Painter, Ph.D.,
University of London, 1969.

Allen Sclaroff, D.D.S.,
Temple University, 1972.

Donald G. Sessions, M.D.,
Washington University, 1962.

Gershon J. Spector, M.D.,
University of Maryland, 1964.

Research Professor Emeritus and Lecturer

Donald H. Eldredge, M.D.,
Harvard University, 1946. (Also
Central Institute for the Deaf and
Faculty of Arts and Sciences)

Research Professors

Ira J. Hirsh, Ph.D.,
Harvard University, 1948. (Audiol-
ogy), (Also Central Institute for the
Deaf and Faculty of Arts and
Sciences)

James D. Miller, Ph.D.,
Indiana University, 1957. (Central
Institute for the Deaf)

Professors Emeriti (Clinical)

Benard C. Adler, M.D.,
Washington University, 1937.

Harold M. Cutler, M.D.,
Tufts University, 1937.

Morris Davidson, M.D.,
Indiana University, 1938.

Charles C. Jacobs, M.D.,
Washington University, 1945.

Associate Professors

W. Donald Gay, D.D.S.,
University of Tennessee, 1966.

Joel A. Goebel, M.D.,
Washington University, 1980.

Rodney P. Lusk, M.D.,
University of Missouri, 1977. (See
Department of Pediatrics.)

Harlan R. Muntz, M.D.,
Washington University, 1977. (See
Department of Pediatrics.)

Alec N. Salt, Ph.D.,
University of Birmingham, 1977.

Margaret W. Skinner, Ph.D.,
Washington University, 1976.

Stanley E. Thawley, M.D.,
University of Texas Medical Branch,
1967.

Michael Valente, Ph.D.,
University of Illinois, 1975. (Audiol-
ogy)

Research Associate Professor

A. Maynard Engebretson, D.Sc.,
Washington University, 1970.

Research Associate Professor (Adjunct)

Roanne G. Karzon, Ph.D.,
Washington University, 1982.
(Audiology)

Associate Professors Emeriti (Clinical)

- Guerdan Hardy, M.D.**,
Washington University, 1929.
Robert E. Votaw, M.D.,
State University of Iowa, 1929.

Associate Professors (Clinical)

- Laurence A. Levine, M.D.**,
Albany Medical College, 1971.
Edward H. Lyman, M.D.,
Washington University, 1937.
Philip L. Martin, M.D.,
St. Louis University, 1968.
Wayne A. Viers, M.D.,
University of Oklahoma, 1956.
Joseph W. West, M.D.,
Duke University, 1944.

Assistant Professors

- Randal A. Clary, M.D.**,
University of Illinois, 1994. (See
Department of Pediatrics.)
Dennis P. Fuller, Ph.D.,
St. Louis University, 1982.
(Speech Pathology)
James M. Hartman, M.D.,
University of Missouri,
Kansas City, 1988.
Bruce H. Haughey, M.B., Ch.B.,
University of Auckland, 1977.
Randal C. Paniello, M.D.,
University of Illinois, 1984.
Jay F. Piccirillo, M.D.,
University of Vermont, 1985.
Brock D. Ridenour, M.D.,
Tulane University, 1985.
Steven B. Scholnick, Ph.D.,
Cornell University, 1982.
Mark S. Wallace, M.D.,
Louisiana State University, 1987.

Research Assistant Professor

- Isolde Thalmann, Ph.D.**,
California Western University, 1982.

Assistant Professors Emeriti (Clinical)

- Donald R. Ingram, M.D.**,
University of Illinois, 1956.
Herbert M. Smit, M.D.,
St. Louis University, 1933.

Assistant Professors (Clinical)

- Louis S. Altshuler, D.D.S.**,
Ohio State University, 1945.
Gerald Bart, M.B.B.S.,
Karnatak University, 1963.
Wallace P. Berkowitz, M.D.,
Boston University, 1967.
Sheldon Davis, M.D.,
University of Michigan, 1973.
Norman S. Druck, M.D.,
University of Illinois, 1970.
Jeffrey Fierstein, M.D.,
Albert Einstein College of
Medicine, 1971.
Jacques A. Herzog, M.D.,
University of Missouri,
Kansas City, 1980.
George J. Hruza, M.D.,
New York University, 1982.
Dee Jay Hubbard, Ph.D.,
University of Iowa, 1967.
(Speech Pathology)
Timothy N. Kaiser, M.D.,
Harvard University, 1982.
Claire Matthews, Ph.D.,
University of Kansas, 1980.
(Speech Pathology)
Margaret G. Peak, Ph.D.,
Columbia University, 1975.
(Audiology)
Supote Phipatanakul, M.D.,
Chulalongkorn Hospital Medical
School, 1965.
Albert F. Ruehl, M.D.,
St. Louis University, 1973.
Peter G. Smith, Ph.D.,
Purdue University, 1972; M.D.,
Medical University of South
Carolina, 1976.
J. Regan Thomas, M.D.,
University of Missouri, 1972.
Lloyd Thompson, M.D.,
Howard University, 1964.

Instructors

- Carl F. Ehrlich, M.D.**,
University of Missouri, 1965.
Mark F. Stroble, M.D.,
University of Missouri, 1985.

Instructors (Clinical)

- Marc B. Abrams, D.D.S.**,
University of Missouri, 1972.
Perry J. Bartels, D.D.S.,
Marquette University, 1991.
Phadung Chadaratana, M.D.,
Mahidol University, 1964.
Sheldon C. Cohen, D.M.D.,
Southern Illinois University, 1976.
J. Michael Conoyer, M.D.,
Vanderbilt University, 1975.
Tamara K. Ehlert, M.D.,
University of Wisconsin, 1983.
James A. Fernandez, M.D.,
St. Louis University, 1981.
Jay F. Hauser, D.D.S.,
University of Iowa, 1988.
George R. Kletzker, M.D.,
University of Missouri, 1984.
Richard Maack, M.D.,
University of Maryland, 1985.
Murray D. McGrady, M.D.,
University of Illinois, 1986.
John W. McKinney, M.D.,
University of Missouri, 1979.
Michael J. Pernoud, D.D.S.,
University of Missouri,
Kansas City, 1975.
Harold R. Schreiber, D.D.S.,
University of Missouri, 1977.
Richard E. Schrick, M.D.,
University of Missouri, 1977.
Herman Turner, D.D.S.,
Georgetown University, 1951.
Thomas J. Veraldi, D.M.D.,
Washington University, 1979.
Alan P.K. Wild, M.D.,
Tulane University, 1983.

**Instructor (Clinical)
(Adjunct)**

Virginia W. Jenison, M.A.,
University of Tennessee, 1978.
(Audiology)

**Research Instructor
Emeritus**

Marion P. Bryan, A.B.,
Washington University, 1931.

Research Instructors

Thomas H. Comegys, B.A.,
Central Methodist College, 1966.

John E. Demott, M.A.,
University of Missouri, 1978.

Research Associate

William Clark, Ph.D.,
University of Michigan 1975. (Also
Central Institute for the Deaf)

Research Assistant

Timothy A. Holden, B.S.E.,
University of Iowa, 1984.

Research Scientist

Gary W. Harding, M.S.E.,
University of Washington, 1983.

DEPARTMENT OF PATHOLOGY

Modern pathology is concerned with the molecular and ultrastructural basis of disease. Historically, morphologic studies provided the foundations of our concepts of disease, and ultrastructural studies continue to add to our understanding, but modern pathology utilizes virtually all of the tools of basic science. Pathologists are involved in diagnostic, teaching, and research activities.

In addition to the second year of pathology, the department conducts numerous combined conferences which third- and fourth-year students attend as part of individual clinical clerkships. These are described below.

Students, usually in their fourth year, may elect to participate in advanced courses or clerkships in autopsy or surgical pathology or laboratory medicine, or to pursue research in experimental pathology.

The department offers a course of study leading to the Ph.D. degree. Medical students who desire to combine graduate and medical programs of study should consult Dr. Jacques Baenziger.

For the purpose of teaching, research, and service, the department is divided into specialty divisions under the following directors:

Division of Anatomic Pathology, *Dr. L. Dehner*
Division of Laboratory Medicine, *Dr. J. Miletich*
Division of Molecular Oncology, *Dr. S. Korsmeyer*
Division of Neuropathology, *Dr. R. Schmidt*
Center for Immunology, *Dr. E. Unanue*
Autopsy Pathology, *Dr. J. Saffitz*
Jewish Hospital/Department of Pathology,
Dr. S. Teitelbaum
Graduate Program in Immunology,
Dr. R. Schreiber
Pathology Course/Coursemaster,
Dr. S. El-Mofty

SECOND YEAR

Bio 515, 516. General Pathology

This course is a comprehensive survey of the biology and morphology of human disease. The year begins with a review of basic mechanisms of disease at the cellular and molecular level. Subsequently, the characteristics of major pathologic entities affecting the organ systems of the human body are presented, employing both lectures and laboratory sessions. In the laboratories, small groups of students directly examine gross and microscopic specimens with the assistance of members of the faculty and house staff. These exercises reinforce the material presented in lecture and give students an opportunity to acquire the basic skills required for making pathologic diagnoses. *Staff*

THIRD AND FOURTH YEARS

Clinical Pathological Conference

The clinical history and treatment of patients who have died are discussed before the class by the physicians and surgeons of the departments concerned. These conferences afford students an opportunity to interpret the clinical observations in light of the postmortem findings. One hour a week during the year. *Staff*

Laboratory Medicine Conference

One hour each week for 12 weeks during Internal Medicine rotations. Problem cases and general principles of Laboratory Medicine are discussed. *Staff*

Tumor Conference

One hour each week for 12 weeks during the surgery and obstetrics and gynecology clerkships. Problem cases are presented for illustration and discussion of all aspects of neoplastic disease. *Staff*

RESEARCH

Bio 590. Research Opportunities

Molecular mechanisms of bacteria-inflammatory cell interactions. *Dr. Abraham*

The department encompasses all the major areas of investigation in experimental pathology, immunobiology, and cell biology. Examples include: Biochemistry of protein handling in immune induction. *Dr. Allen*

Examination of glycoprotein oligosaccharides and their role in endocytosis and cellular recognition. *Dr. Baenziger*

Cytopathology. *Dr. L. Boucher*

Collagen metabolism and pulmonary pathology. *Dr. Crouch*

Academic surgical pathology. *Dr. L. Dehner*

Oncogenes, in particular the role of the retinoblastoma gene. *Dr. S. Dowdy*

Biology and Biochemistry of adhesion molecules. *Dr. M. Dustin*

Major focus on neoplasia of the head and neck; particularly salivary gland tumors and carcinoma of the upper aerodigestive tract. *Dr. S. El-Mofty*

Hematopathology. Hematological malignancies. *Dr. J. Hess*

Cell and molecular biology of genitourinary neoplasias. *Dr. P. Humphrey*

The regulation of T cell activation. *Dr. O. Kanagawa*

Immunology of autoimmune diabetes. *Dr. J. Katz*

Renal pathology, pediatric pathology. *Dr. Kissane*

Molecular biology of hematological neoplasia. *Dr. S. Korsmeyer*

Experimental diabetes mellitus, tissue culture of islets, transplantation of islets. *Dr. Lacy*

Development of monoclonal antibodies for assessing cardiac disease. *Dr. Ladenson*

Molecular immunology—mechanisms of DNA recombination. *Dr. M. Lieber*

Molecular and cellular investigation of mucosal immunity. *Dr. Lorenz*

Lipid modifications of proteins. *Dr. Lublin*

Experimental diabetes: biochemical studies of insulin release mechanisms *in vitro*. *Dr. McDaniel*

Pathology of Alzheimer's Disease. *Dr. McKeel*

Structure-function analysis of immediate-early transcription factors—from molecules to mice. *Dr. Milbrandt*

Molecular biology of blood coagulation. *Dr. Miletich*

Transplantation immunology. *Dr. Mohanakumar*

Use of transgenic mice to examine lymphocyte activation. *Dr. K. Murphy*

Development and evaluation of diagnostic microbiology tests, particularly in the areas of septicemia and antimicrobial resistance. *Dr. Murray*

Studies of human IgG subclass expression. *Dr. Nahm*

Statistical theory and computer technology applications in laboratory medicine. *Dr. Parvin*

Phagocytic processing of bacterial antigens; molecular basis of bacterial virulence. *Dr. J. Pfeifer*

Characterization of the neuroendocrine cellular system. *Dr. K. Roth*

Experimental cardiovascular pathology; structure-function relationships in ischemic heart disease. *Dr. Saffitz*

Genetics, mechanisms, and *in vitro* detection of bacterial resistance to antimicrobial agents. *Dr. Sahm*

Structure, function, and regulation of cell adhesion receptors. *Dr. Santoro*

Pathogenesis of experimental diabetic autonomic neuropathy. *Dr. Schmidt*

Biochemistry and biology of lymphokines. *Dr. Schreiber*

The role of tyrosine kinases in T cell activation. *Dr. A. Shaw*

Placental transport and surface membrane structure and function. *Dr. C. Smith*

Molecular biology of Epstein-Barr virus. *Dr. S. Speck*

Phenotypic characterization of reactive and neoplastic human cells, primarily using immunohistochemical techniques, with special emphasis on pediatric and soft tissue neoplasms. *Dr. P. Swanson*

Metabolic bone disease. *Dr. Teitelbaum*

The control of lymphocyte activation by protein tyrosine dephosphorylation. *Dr. Thomas*

Arachidonic acid biochemistry and the regulation of insulin secretion. *Dr. Turk*

Immunobiology and immunopathology of lymphocyte-macrophage interactions. *Dr. Unanue*

Structural proteins of intracellular vesicles including coated vesicles. *Dr. E. Ungewickell*

Pediatric pathology. *Dr. F. White*

Immunocytochemistry and electron microscopy. *Dr. M. Wick*

Vascular structure and function; pathophysiology of diabetic and ischemic vascular disease. *Dr. Williamson*

Alterations in gene expression in hematopoietic differentiation and malignancy. *Dr. M. Zutter*

ELECTIVES

Advanced Special Pathology

A series of seminars discussing timely selected topics in special pathology of human disease, augmented by illustrative cases and emphasizing clinicopathologic correlations. Reading lists will be circulated and active discussion is encouraged. If the size of the group makes it practical to do so, each student will prepare and conduct a session on a subject of their choice. *Drs. Dehner, Wick and Kissane*

Autopsy Pathology

A full-time elective held during periods 4-8. Students assist in performing autopsies and participate fully in the activities of the Autopsy Service. Supervision is by faculty and house staff pathologists. Emphasis is placed on the student learning as much gross pathology as possible as a preparation to be a pathologist or to serve as a general background in medical, surgical, and neurologic diseases. Weekly conferences include gross and microscopic neuropathology, specialty pathology conference, two research seminars, CPC and autopsy case review conference. Students will help prepare preliminary and final autopsy reports and will do a clinicopathologic project and present their results to the house staff and attending faculty. *Dr. Saffitz and Staff*

Cell Biology of the Immune System

This is a seminar course on the biology of lymphocytes and macrophages and their interaction in normal and pathological conditions. Some background in immunology is desirable. The course places emphasis on current research on how macrophages function in regulating the immune system in normal conditions, in infectious diseases, and in autoimmunity. Students will read and discuss two to three papers per session. *Drs. Unanue, Allen, Schreiber and Thomas*

Neuropathology

Clinical pathological correlations of neurological diseases will be investigated by the case study method using current and documented material. Participants will partake in gross neuropathological examinations and will be assigned selected cases for discussion of clinical data and gross and microscopic pathological findings, especially in relationship to evolution and mechanism of disease processes. Topics covered will include vascular, infectious, demyelinating, and neuronal diseases, as well as neoplasms of the nervous system. *Dr. Schmidt*

Clinical Laboratory Medicine

See Department of Medicine. *Dr. Miletich and Staff*

Anatomic Pathology—Jewish Hospital

This elective is designed to acquaint students who have had some clinical experience with the morphological basis of disease and to permit them to relearn normal morphological relationships. During the elective students will learn to perform gross autopsy dissections and will be taught how to select appropriate tissue samples for further microscopic, histochemical, immunofluorescent, and electron microscopy study. Subsequently, they will learn how to perform these procedures under supervision of members of the anatomic pathology staff and how to interpret their results. Following completion of appropriate studies, an in-depth report of clinical pathological correlations will be prepared for each autopsy performed. This elective is considered appropriate for students who intend careers in internal medicine, surgery and radiology. *Dr. Teitelbaum and Staff*

Surgical Pathology—Jewish Hospital

This elective is designed to acquaint students with the discipline of surgical pathology and to permit them to develop basic skills in histopathological interpretation. This elective will be offered to only one student/period in order to permit maximum interaction with the surgical pathology staff and house officers. During the course of the elective, the student will be taught to function as a junior house officer. The student will participate in the examination and dissection of gross specimens, take operating room calls, learn frozen section diagnosis, and formulate histopathological diagnoses, all in conjunction with members of the senior staff. Since the Laboratory of

Surgical Pathology at Jewish Hospital processes a broad range of medical biopsy material as well as specimens derived from busy surgical subspecialty practice, the elective is considered desirable for students who plan careers in internal medicine and surgery as well as for those who intend to enter the field of pathology. *Dr. Crouch*

Surgical Pathology

Surgical pathology offers an elective for a six-week period under Surgical Pathology I. Students participate fully in activities of the division of surgical pathology and they are responsible for dissection and description of gross specimens and microscopic diagnosis under supervision of the senior staff of the division. Students attend morning conferences with the director, surgical and medical grand rounds, tumor and subspecialty conferences. In addition, Surgical Pathology II includes rotations through selected subspecialties: neuropathology, hematopathology, dermatopathology, ENT pathology, and gynecologic pathology. *Drs. Debnar, Wick and Staff*

Obstetrical and Gynecological Surgical Pathology

This six-week elective offers an intensive experience in Ob-Gyn pathology involving current surgical material from the Ob-Gyn service. Students will be expected to participate fully in the daily activities in the examination of specimens under the supervision of the senior staff. Slide reviews and conference material will be discussed. Students will attend departmental conferences and the Gyn Tumor Conference. *Dr. Gersell and Staff*

In addition to the above, the department offers several advanced courses in the Division of Biology and Biomedical Sciences. These courses are listed below, but are described in the offerings of the Division of Biology and Biomedical Sciences.

Bio 504. Environmental Pathology

Bio 518, 519. Pathology Research Seminar

Bio 5271, 5272. Topics in Immunology

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

Faculty

Edward Mallinckrodt Professor and Head of Department

Emil R. Unanue, M.D.,
University of Havana, 1960.

Professors Emeriti

Hugh Chaplin, Jr., M.D.,
Columbia University, 1947. (See Department of Medicine.)

Paul E. Lacy, M.D.,
Ohio State University, 1948; Ph.D.,
University of Minnesota, 1955.

Ruth Silberberg, M.D.,
University of Breslau, 1931. (Also Lecturer)

Professors

Robert L. Kroc Professor

Paul M. Allen, Ph.D.,
University of Michigan, 1981.

Jacques U. Baenziger, M.D.,
Washington University, 1975; Ph.D.,
1975. (See Department of Cell
Biology and Physiology.)

Edmond C. Crouch, Ph.D.,
University of Washington, 1978;
M.D., 1979.

Louis P. Dehner, M.D.,
Washington University, 1966.

Deborah J. Gersell, M.D.,
Washington University, 1975.

Gerald Kessler, Ph.D.,
University of Maryland, 1954.

John M. Kissane, M.D.,
Washington University, 1952. (See
Department of Pediatrics.)

Stanley J. Korsmeyer, M.D.,
University of Illinois, 1976. (See
Department of Medicine.)

Michael Kyriakos, M.D.,
Albert Einstein College of Medicine,
1962.

**Oree M. Carroll and Lillian B.
Ladenson** *Professor of Clinical
Chemistry*

Jack H. Ladenson, Ph.D.,
University of Maryland, 1971. (See
Department of Medicine.)

Michael L. McDaniel, Ph.D.,
St. Louis University, 1970.

Jeffrey D. Milbrandt, M.D.,
Washington University, 1978; Ph.D.,
University of Virginia, 1983. (See
Department of Medicine.)

Joseph P. Miletich, M.D., Ph.D.,
Washington University, 1979. (See
Department of Medicine.)

Thalachallour Mohanakumar,
Ph.D., Duke University, 1974. (See
Department of Medicine and
Department of Surgery.)

Patrick R. Murray, Ph.D.,
University of California, 1974. (See
Department of Medicine.)

John W. Olney, M.D.,
University of Iowa, 1963. (See
Department of Psychiatry.)

Alan Pestronk, M.D.,
The Johns Hopkins University,
1970. (See Department of Neurology
and Neurological Surgery.)

Jeffrey E. Saffitz, Ph.D.,
Case Western Reserve University,
1977; M.D., 1978. (See Department
of Medicine.)

Samuel A. Santoro, M.D., Ph.D.,
Vanderbilt University, 1979. (See
Department of Medicine.)

Robert E. Schmidt, M.D., Ph.D.,
Washington University, 1976.

Alumni Professor of Pathology

Robert D. Schreiber, Ph.D.,
State University of New York, 1973.
(See Department of Molecular
Microbiology.)

Carl H. Smith, M.D.,
Yale University, 1959. (See
Department of Pediatrics.)

Morton E. Smith, M.D.,
University of Maryland, 1960. (See
Department of Ophthalmology and
Visual Sciences.)

Wilma and Roswell Messing Professor

Steven L. Teitelbaum, M.D.,
Washington University, 1964.

John W. Turk, M.D., Ph.D.,
Washington University, 1976. (See
Department of Medicine.)

Mark R. Wick, M.D.,
University of Wisconsin, 1978.

Joseph R. Williamson, M.D.,
Washington University, 1958.

Professor (Clinical)

Richard Torack, M.D.,
Georgetown University, 1952.

Associate Professors

Julian L. Ambrus, M.D.,
Jefferson Medical College, 1979.
(See Department of Medicine.)

Talal A. Chatila, M.D.,
American University, 1984. (See
Department of Pediatrics.)

John F. DiPersio, M.D., Ph.D.,
University of Rochester, 1980. (See
Department of Medicine.)

Samir K. El-Mofty, Ph.D.,
Temple University, 1975.

Jonathan D. Gitlin, M.D.,
University of Pittsburgh, 1978. (See
Department of Pediatrics.)

Lawrence T. Goodnough, M.D.,
University of Pennsylvania, 1975.
(See Department of Medicine.)

Peter A. Humphrey, M.D., Ph.D.,
University of Kansas, 1984.

Osami Kanagawa, M.D.,
Okayama University, 1974; Ph.D.,
1978. (See Department of Medi-
cine.)

Michael R. Lieber, Ph.D.,
The University of Chicago, 1981;
M.D., 1983. (See Department of
Medicine and Department of
Biochemistry.)

Douglas M. Lublin, Ph.D.,
Stanford University, 1976; M.D.,
University of California, Los
Angeles, 1982. (See Department of
Medicine.)

Daniel W. McKeel, M.D.,
University of Virginia, 1966.

Kenneth M. Murphy, Ph.D.,
The Johns Hopkins University,
1982, M.D., 1984.

Moon H. Nahm, M.D.,
Washington University, 1974. (See
Department of Medicine.)

Jay S. Pepose, Ph.D.,
University of California, 1980; M.D.,
1982. (See Department of Ophthal-
mology and Visual Sciences.)

Kevin A. Roth, M.D., Ph.D.,
Stanford University, 1985. (See
Department of Molecular Biology
and Pharmacology.)

Daniel F. Sahm, Ph.D.,
Oklahoma University, 1981. (Jewish
Hospital)

Samuel H. Speck, Ph.D.,
Northwestern University, 1980.
(See Department of Molecular
Microbiology.)

Paul E. Swanson, M.D.,
Oregon Health Sciences University,
1984.

Matthew L. Thomas, Ph.D.,
University of Utah, 1981. (See
Department of Microbiology.)

Ernst J. Ungewickell, Ph.D.,
Free University, Berlin, 1976.

Mary M. Zutter, M.D.,
Tulane University, 1981.

Research Associate Professor

Barbara A. Zehnbaauer, Ph.D.,
The University of Chicago, 1979.
(See Department of Pediatrics.)

Associate Professor (Clinical)

Steven L. Leary, D.V.M.,
Iowa State University, 1971. (See
Division of Comparative Medicine.)

Research Associate Professor (Clinical)

Curtis A. Parvin, Ph.D.,
University of Minnesota, 1980. (See
Department of Medicine and
Division of Biostatistics.)

Assistant Professors

Soman N. Abraham, Ph.D.,
University of Newcastle Upon Tyne,
1981.

Morey A. Blinder, M.D.,
St. Louis University, 1981. (See
Department of Medicine.)

Leslie D. Boucher, M.D.,
University of Kentucky, 1989.

Steven L. Carroll, Ph.D.,
Baylor College of Medicine, 1986;
M.D., 1988.

Andrew C. Chan, M.D., Ph.D.,
Washington University, 1986. (See
Department of Medicine.)

Rosa Maria Davila, M.D.,
University of Puerto Rico, 1981.

Steven F. Dowdy, Ph.D.,
University of California, 1990. (See
Department of Medicine.)

Michael L. Dustin, Ph.D.,
Harvard University, 1990.

Thomas A. Ferguson, Ph.D.,
University of Cincinnati, 1982. (See
Department of Ophthalmology and
Visual Sciences.)

Larry E. Fields, M.D.,
Harvard University, 1980. (See
Department of Medicine.)

David T. Hagerty, M.D.,
St. Louis University, 1981. (See
Department of Medicine.)

Jay L. Hess, M.D., Ph.D.,
The Johns Hopkins University,
1989.

Phyllis C. Huettner, M.D.,
University of Pennsylvania, 1985.

Jonathan D. Katz, Ph.D.,
University of California, Los
Angeles, 1990.

Helen Liapis, M.D.,
University of Athens, 1972.

Robinna G. Lorenz, M.D., Ph.D.,
Washington University, 1990. (See
Department of Medicine.)

John C. Morris, M.D.,
University of Rochester, 1974. (See
Department of Neurology.)

John D. Pfeifer, Ph.D.,
University of California, San Diego,
1987; M.D., 1988. (See Department
of Medicine and Department of
Molecular Microbiology.)

Jon R. Ritter, M.D.,
University of Minnesota, 1988.

Andrey S. Shaw, M.D.,
Columbia University, 1984.

Herbert W. Virgin IV, M.D., Ph.D.,
Harvard University, 1985. (See
Department of Medicine and
Department of Microbiology.)

Frances V. White, M.D.,
University of North Carolina, 1978.

Research Assistant Professors

Nalini S. Bora, Ph.D.,
All India Institute of Medical
Science, 1981. (See Department of
Ophthalmology and Visual
Sciences.)

Er-Kai Gao, M.D.,
Peking Medical College, 1983. (See
Department of Ophthalmology.)

Timothy L. Ratliff, Ph.D.,
University of Arkansas, 1977. (See
Department of Surgery.)

Frederick P. Ross, Ph.D.,
University of Warwick, 1976.

Terry Woodford-Thomas, Ph.D.,
Virginia Polytech, 1982.

Research Assistant Professor (Clinical)

Mitchell G. Scott, Ph.D.,
Washington University, 1982. (See
Department of Medicine.)

Instructors

John A. Corbett, Ph.D.,
Utah State University, 1990.

William D. Staatz, Ph.D.,
University of Edinburgh, 1976.

Research Instructors

Katherine C. Chang, Ph.D.,
University of Iowa, 1974.

Dorothy J. Fiete, B.S.,
Marymount College, 1966.

Theresa L. Murphy, Ph.D.,
The Johns Hopkins University,
1983.

Kathleen C. Sheehan, Ph.D.,
St. Louis University, 1986.

Research Assistants

C. Joan Fink, B.A.,
Lindenwood College, 1958.

Katherine E. Frederick, B.S.,
Bradley University, 1977.

Karen G. Green, B.S.,
Maryville College, 1978.

Yvonne Landt, M.S.,
University of Illinois, 1972.

Mary Pat Leckie, B.S.,
University of Toledo, 1967.

Connie A. Marshall, B.S.,
Southeast Missouri State University,
1978.

Jitka Z. Olander, Ph.D.,
Washington University, 1969.

Shirley J. Petzold, M.S.,
Case Western Reserve University,
1991.

Santiago B. Plurad, Ph.D.,
University of Missouri, 1967.

EDWARD MALLINCKRODT DEPARTMENT OF PEDIATRICS

The primary aim of the teaching program of the Department of Pediatrics is to stimulate interest in developmental biology, especially human growth and development, and to provide the student with a foundation sufficiently comprehensive so that he or she will have an appreciation of clinical pediatric problems regardless of his or her future career choice in medicine.

The major clinical and research facilities are in St. Louis Children's Hospital and the newborn services at Barnes Hospital and Jewish Hospital. St. Louis Children's Hospital is a facility with 235 beds that accepts patients through 21 years of age with all types of medical and surgical problems. Hospital admissions average 11,000 annually. Pediatric Medical Ambulatory activity, including subspecialty and emergency visits, averages about 90,000 visits a year. Nearly 5,000 infants are born annually in the Medical Center.

SECOND YEAR

Students are introduced to pediatrics and to the faculty through a series of lectures and symposia designed to acquaint them with the concepts of human growth and development and the effects of age and maturity on reactions to injury and disease. The unique aspects of the physical examination of the infant and child are presented in the Introduction to Clinical Medicine Course. Members of the faculty are active participants in the Sophomore Pathophysiology Course.

THIRD YEAR

A clerkship of six weeks is scheduled in which the student participates in the following:

1. Care of inpatients and outpatients, sharing responsibility with resident physicians.
2. Daily rounds and bedside conferences with house staff and attending physicians.
3. Patient management conferences on basic pediatric problems emphasizing pathophysiologic mechanisms.
4. Weekly Grand Rounds.
5. Weekly case conference.
6. Weekly professors rounds.
7. Pediatric research conferences.

FOURTH YEAR

This year is devoted to elective time which may be spent according to the individual preferences of the

student who may serve as an intern substitute, in the research laboratory or combine clinical and laboratory work. The following electives are offered:

Cardiology

(A) Clinical Elective—Inpatient. The student works as a subintern and is assigned selected patients on the pediatric cardiology ward. *Dr. Strauss and Staff*

(B) Clinical Elective—Outpatient. The student will see patients attending all of the outpatient units including both new referrals and follow-up visits. The student also will be responsible for the interpretation of electrocardiograms, echocardiograms, and 24-hour Holter monitor examinations performed in the cardiology non-invasive laboratory. *Dr. Strauss and Staff*

(C) Clinical Elective: Cardiac Catheterization Laboratory. The student receives an introduction to the hemodynamic evaluation of congenital heart disease, as well as the technology utilized in invasive evaluation. She or he will attend the daily cardiac catheterization laboratory conferences (8:00 a.m.) as well as the weekly combined cardiology/cardiac surgery conference (Wednesday at 7:30 a.m.), observe diagnostic and interventional procedures in the cardiac catheterization laboratory, and learn the basics of acquisition and interpretation of the hemodynamic and angiographic data. She or he will also be introduced to digital imaging and computerized data analysis. The degree of participation in procedures will vary according to the student's interest and aptitude. *Dr. Balzer*

(D) Research.

1. Clinical studies on cardiac transplantation in infants, children, and adolescents. Use of non-invasive imaging techniques (ultrasound, nuclear magnetic resonance) for evaluation and management of congenital heart diseases. *Dr. Canter*
2. Studies concern the biosynthesis of mitochondrial proteins, regulation of the nuclear genes encoding them, and delineation of the molecular basis of human deficiencies in these genes. This research involves recombinant DNA technology, cloning of various DNA fragments and cell biological techniques. *Dr. Strauss*

Clinical Laboratories

(A) Studies concern the mechanism by which glucose increases insulin secretion by pancreatic Beta cells. Of particular interest are the roles of calcium-dependent protein kinases in this mechanism. *Dr. Landt*

(B) Studies investigate the cellular processes underlying the transport of nutrients by the human placental syncytiotrophoblast. Plasma membranes isolated specifically from the maternal- and fetal-facing surfaces and cultured trophoblast cells are used to investigate the transport and metabolism of amino acids and calcium. *Dr. Smith*

(C) Studies dealing with the rapid diagnosis of viral infections. Techniques include immunofluorescence, DNA probes, polymerase chain reaction amplification of DNA/RNA and flow cytometry for detection of viral antigens/nucleic acids. Specific areas of investigation include the evaluation of quantitative virologic parameters in the diagnosis of cytomegalovirus and Epstein-Barr virus infection in solid organ transplant recipients and the application of PCR to the diagnosis of systemic, neurologic, ocular, and congenital infections. *Drs. Storch and Arens*

(D) The Molecular Diagnostic Laboratory efforts focus on the clinical molecular genetics basis of both inherited genetic disorders and acquired neoplastic diseases. Both direct and indirect methods for DNA mutation detection are used in the diagnostic evaluation of affected individuals and family members. *Dr. Zehnbaumer*

Emergency Medicine

(A) Clinical Elective. The goal of this elective is to provide the senior medical student with a broad introductory clinical experience in pediatric emergency medicine. Functioning as a subintern in the Emergency Unit of St. Louis Children's Hospital, the student will have the opportunity to evaluate and manage patients with a wide variety of emergent and urgent medical and surgical problems. Examples include: respiratory distress, abdominal pain, lacerations, bone injuries, rashes, fever. *Dr. Jaffe*

(B) Research.

1. (a) Infectious disease: Conjointly with the division of infectious disease, involved in a five-center study that is evaluating the performance of the Roche Amplicor enterovirus PCR assay for diagnosing enteroviral meningitis in children. All children 18 years or less, requiring a spinal tap in the Emergency Department, are eligible for enrollment in the study that compares CSF viral culture with the enteroviral PCR assay of the CSF; (b) Pre-hospital care: Developing outreach and education mechanisms customized to primary care and pediatric emergency medicine issues facilitating pediatric patients' access to all levels of the EMSC system in the Southwestern Illinois-St. Louis Bistate Region. *Dr. Bourlier*

2. The efficacy of "high dose" and standard dose epinephrine in pediatric cardiopulmonary arrest. *Dr. Carlson*

3. (a) Pediatric injury control: Developing models for intervention and research of injury control of intercity, suburban and rural children. Coordination of related data surveillance systems with models for intervention and research of injury control; (b) Pediatric emergency medicine educational resources: Teaching and maintaining knowledge, skills and confidence (with specific attention to retention over time) to care on an infrequent basis for the acutely ill and injured pediatric patient. This work targets all healthcare professionals who see the acute pediatric patient on an infrequent basis—paramedics, primary care physicians, nurses, and physicians working in emergency settings outside specialized tertiary care pediatric facilities. Two different educational paradigms are being examined: (1) *Field setting*—rural and inner city, evaluating existing, structured course work such as Pediatric Advanced Life Support (PALS), Emergency Nursing Pediatric Course (ENPC). (2) *Pediatric academic ED setting*—developing an educational tool to teach emergency physicians outside a tertiary care setting how to achieve safe and appropriate emergent intubation of the acutely ill and injured pediatric patient. *Dr. Gnauck*

4. (a) Occult bacteremia—identification, clinical decision making; (b) Trauma—injury prevention, head and cervical spine injuries; (c) Resuscitation—high dose epinephrine, collaborative clinical trials; (d) Healthcare delivery system—role of the pediatric emergency department; (e) Conscious sedation. *Dr. Jaffe*

5. Evaluation of techniques for management of pain and distress in pediatric emergencies. *Dr. Kennedy*

Endocrinology and Metabolism

(A) Clinical Endocrinology and Metabolism. This elective is designed to include broad clinical experience in pediatric endocrine and metabolic problems. The student has the opportunity to evaluate many pediatric endocrine patients and to see some adult patients during weekly rounds. Emphasis is placed on the practical management of common problems such as diabetes, short stature, thyroid, adrenal and other endocrine and metabolic disorders. The student attends rounds and clinics (endocrine, metabolic, and diabetic) and the joint metabolism seminars and rounds held with the medical service. About four to six patients with varied problems are studied in depth every week during the elective. *Drs. Santiago, Hollander, Kupfer, Marshall, Tollefsen, White, and Staff*

(B) Research.

1. Transcriptional regulation of genes activated by androgen and glucocorticoid receptors; identification

of steroid hormone receptor-associated proteins that confer transcriptional specificity; characterization of crosstalk between insulin and steroid hormone signal transduction pathways. *Dr. Kupfer*

2. Ongoing studies involve implementation of intensive insulin therapy, including insulin pumps, to determine its role in halting or slowing the progression of diabetes complications and the progressive loss of islet cell function in newly-diagnosed diabetic children. Cross-sectional studies of the natural history of diabetes complications and especially the relationship to puberty are also underway through the Diabetes Registry of the DRTC. *Drs. White and Santiago*

3. This laboratory is engaged in the development and application of biochemical techniques to study the structure and function of oligosaccharide units on glycoproteins. The laboratory is currently investigating the biosynthesis and glycosylation of insulin and insulin-like growth factor I (IGF 1) receptors. *Dr. Tollefsen*

Gastroenterology

(A) Natural history studies of pediatric gastrointestinal illness including Henoch Schonlein purpura, x-linked glycogen storage disease, vitamin E deficiency and nutritional problems in chronic illness. *Dr. Rothbaum*

(B) Cellular biochemistry of a genetic defect in transport of alpha-1-antitrypsin through the endoplasmic reticulum; biochemical mechanism for liver and lung injury in alpha-1-antitrypsin deficient individuals; cell specific regulation of alpha-1-antitrypsin gene expression in hepatocytes, enterocytes and macrophages; structure and function of a cell surface receptor for antitrypsin complexes and amyloid- β peptide. *Dr. Perlmutter*

(C) The mechanisms involved in the ontogenic expression of canalicular bile acid transport during development. The cellular biology of targeting of the bile acid transport protein to its appropriate domain and subsequent comparison to targeting of other cell surface specific proteins. *Dr. Sippel*

(D) Transcriptional regulation of the lipolytic proteins, lipase and colipase, is a primary interest. Elements modulating cell-specific expression and secretagogue-regulated expression of these genes are identified by transfecting portions of the gene into cultured cells and then measuring expression of a reporter gene. Additionally, the relationship of lipase and colipase protein structure to their unique function is being investigated by site-specific mutagenesis of the respective cDNAs. *Dr. Lowe*

General Pediatrics

(A) General Clinical Pediatrics—St. Louis Children's Hospital. The student will be assigned patients on pediatric inpatient divisions. The student works as an extern and is expected to take night call every fourth night. Students work directly under the supervision of the senior resident, and teaching rounds are conducted by the faculty. The elective will provide experience in management of many pediatric medical conditions including a wide variety of acute and chronic disorders. Aspects of growth and development, preventive medicine and the use of Medical Center and community resources for promotion of child health will be emphasized. The details of rotation should be discussed with the coursemaster if the student wishes to spend part of the time in an office setting. *Drs. Colten, Keating and Staff*

(B) Primary Care in General Pediatrics. This elective is designed to provide the student with firsthand experience in general pediatric practice in a model ambulatory care setting, the Health Key Medical Group. The major component of the elective is direct patient care under the supervision of senior physicians who are members of the group. The objective of this elective is to provide the student with the actual experience of serving as a general pediatrician providing comprehensive health services to the families of a typical, broadly-based population. Health Key Medical Group is a teaching and research multi-specialty practice with an office on the School of Medicine campus. (Two optional alternate facilities are located in St. Louis County.) *Dr. Simons*

Genetics

(A) Clinical Genetics. Students will be exposed to a broad variety of clinical problems encountered in the division of medical genetics. Patients will be seen during inpatient consultation as well as during genetics clinic. Emphasis during this rotation will be placed in several areas: (1) learning physical examination skills appropriate for dysmorphic patients; (2) approaches to patients with hereditary metabolic disorders and families with genetic disease; (3) integration of diagnostic laboratory and radiographic studies with clinical information in genetic diseases. *Dr. Downton and Staff*

(B) Research.

1. Research focuses on the classical and molecular cytogenetics of heritable diseases. Current focuses are several: (a) The identification of regions of the genome harboring genes involved in congenital heart disease (CHD). Candidate regions are narrowed down to the smallest region of overlap at the molecular level through the evaluation of patients with chromosomal causes for CHD. (b) Collaboration with other labs in the search for genes involved in

the development of various cancers. (c) Active involvement in the transition of new types of genetic testing from research to clinical service.

Dr. Watson

2. Studies include: (a) The molecular regulation of acute phase protein biosynthesis as model of understanding gene transcription. (b) Phenotype-genotype correlation in several heritable disorders including skeletal dysplasias, craniofacial disorders and malformation syndromes. *Dr. Downton*

3. A variety of clinical research protocols are used to investigate the biochemical basis of inherited human enzymopathies. Disorders under study include phenylketonuria and Gaucher disease for which enzyme replacement therapy is being utilized.

Dr. Steiner

4. Studies directed toward defining the telomeric structure of chromosome 7q are being pursued. In addition, molecular genetic techniques are being utilized to delineate the cause for inherited skeletal malformation complexes. The role of genes in contiguity with the elastin locus in the pathogenesis of Williams syndrome are also being investigated using a variety of molecular genetic technologies.

Dr. Hing

5. Studies focus on regulation of gene expression, especially at the step of pre-mRNA splicing. The mechanism of alternative splicing and its role in pathogenesis of human disease including leukemia and mental retardation is being studied. *Dr. Wu*

Hematology and Oncology

(A) Clinical Hematology and Oncology. During this elective students will see a variety of children with hematologic disorders and malignancies. The student will follow patients in the hematology-oncology outpatient unit, work up inpatient consultations, and attend daily hospital rounds on the hematology-oncology patients. The course also includes formal instruction on interpretation of peripheral blood and bone marrow morphology and teaching rounds and conferences. *Dr. Schwartz and Staff*

(B) Research.

1. Basic cell and molecular biological studies are aimed at elucidation of the structure and function of gap junction proteins. *Dr. Beyer*

2. Scientific interests include investigating the regulation of T cell mediated immune responses with specific interests in the mechanisms of tolerance. *Dr. Hayashi*

3. Research focuses on the regulation of globin gene expression by DNA-binding proteins. *Dr. Horwitz*

4. Investigative efforts are aimed at understanding the regulation of coagulation by Tissue Factor Pathway Inhibitor. *Dr. Luchtman-Jones*

5. Research interests are directed toward understanding the biology of the Fibroblast Growth Factor family, both in oncogenesis and normal embryogenesis, using molecular and cellular approaches.

Dr. MacArthur

6. Investigative efforts are aimed at the cell biology of cell surface receptors. Using biochemical approaches, we are dissecting the mechanisms responsible for receptor-mediated endocytosis of nutrients and growth factors. *Dr. Schwartz*

7. Current clinical investigations are directed toward (a) new agent (phase I) studies in pediatric cancer and (b) multiagent (phase I and III) national and international trials in pediatric cancer. *Dr. Vietti*

8. Research interests focus on the regulation of gene expression and role of tissue-specific transcription factors in early mammalian development. *Dr. Wilson*

9. Studies focus on the role of bcl-2 and related molecules in oncogenesis. *Dr. Yang*

Immunology and Rheumatology

(A) Clinical Immunology and Rheumatology. During this elective students will care for children with a number of immunologic and rheumatologic diseases. The student will follow patients with JRA, SLE and other rheumatologic disorders in the outpatient clinics at Children's and Shriners hospitals. Patients with immunologic disorders will be evaluated and followed in the outpatient clinics. In addition, students will work up inpatient consultations, attend daily work rounds and learn to perform and interpret diagnostic immunologic studies. The course includes formal instruction on the immunobiology of the developing child and the characterization of inherited defects leading to undue susceptibility to infection. Students will attend and participate in weekly clinic conferences and combined adult/pediatric rheumatology rounds. *Dr. Gülin and Staff*

(B) Research.

1. Research in the lab focuses on the mechanisms of calcium-mediated signal transduction in T-lymphocytes centering around a newly defined family of CAM kinases. Additional studies are focused on defining the genetic defects in children with inherited abnormalities in lymphocyte signal transduction leading to undue susceptibility to infection.

Dr. Chatila

2. Investigative efforts are aimed at defining the molecular mechanisms resulting in the generation of reactive oxygen species and the role of these molecules in regulating redox sensitive events in lymphocytes biology including signaling transduction pathways, gene transcription and apoptosis.

Dr. Gülin

3. Research interests are focused on the mechanisms of cytokine regulation of the innate immune system. Specific areas of interest include the molecular events defining the chronic inflammatory state and the immunobiology of the innate immune response to specific microorganisms such as *Borrelia* which can result in chronic arthritis in children. *Dr. Tripp*

Infectious Diseases

(A) Clinical Infectious Diseases. This elective is designed to introduce students to the clinical aspects of infectious diseases in children. Students will consult on both inpatients and outpatients. Regular daily activities will include evaluation of new patients, work rounds on inpatient consults, microbiology teaching rounds in the bacteriology lab, and teaching rounds with the infectious disease attending. Formal teaching sessions include weekly pediatric infectious disease case conferences, a weekly joint clinical conference with the adult infectious disease group, and a weekly journal club. *Dr. Shackelford and Staff*

1. The Development of the Human B Cell Response to Polysaccharide Antigens. These studies concern the maturation in children of the subclass repertoire and clonal diversity of antibodies produced in response to bacterial polysaccharide (PS) antigens. We are examining V region gene expression using human hybridomas specific for *Haemophilus influenzae* type b. Correlates between antibody structure and function will be examined using chimeric antibodies. *Dr. Shackelford*

2. Rapid Diagnosis of Viral Infections. The molecular diagnostics section of the diagnostic virology laboratory is studying the use of the polymerase chain reaction for the diagnosis of viral infections. Current projects include the detection of herpes simplex virus, cytomegalovirus and JC virus on cerebrospinal fluid and parvovirus B19 in blood and amniotic fluid. Future projects will explore other viral infections that are not easily diagnosed using existing methods. *Drs. Storch, Buller and Staff*

3. Role of Mac-1 (CD11b/CD18) in Phagocytosis and Adhesion. Mac-1 is a membrane glycoprotein involved in phagocytosis and adhesion by neutrophils and monocytes. In addition to ligand binding, Mac-1 is involved in second messenger generation during adhesion related functions. We are investigating the mechanism of Mac-1's role in signal transduction. The results of this work are applicable both to understanding host defense and for the control of neutrophil mediated tissue destruction of inflammatory sites. *Dr. Grabam*

4. The molecular mechanism of nontypable *Haemophilus influenzae* pathogenicity. Nontypable *H. influenzae* is an important cause of human respiratory tract diseases and a source of substantial morbidity. Interest is in characterizing the bacterial

and host cell determinants of *H. influenzae* respiratory tract colonization, an essential early step in the pathogenesis of disease. These studies will assist efforts to develop a strategy for preventing nontypable *Haemophilus* disease and will provide insights into host-parasite interactions in general. *Dr. St. Geme*

5. Care of the HIV-infected patient. This elective is designed to introduce students to the diagnosis and management of HIV-exposed and HIV-infected children, in coordination with the medical management of their parents. Students will be involved in both inpatient and outpatient care at St. Louis Children's, Barnes and Jewish Hospitals. Specifically, they will rotate through the joint Maternal-Child Care clinic. *Drs. Fraser, McGann, Storch and Staff*

Nephrology

(A) Clinical Nephrology. This course is designed to provide the student with a wide exposure to all aspects of pediatric renal disease and an opportunity to explore a desired aspect of the field in depth. The student will be an integral part of the Renal Team and as such will see a large number of both inpatients and outpatients. Students will have an opportunity to follow the courses of patients with acute renal disease as well as those with more chronic problems and will help to plan the evaluation and therapeutic management of these patients. Discussions and rounds with the attending staff and fellows emphasize the relationship between clinical problems and the pathophysiology of the underlying disease. These informal teaching sessions are supplemented by more formal sessions. These include renal attending rounds, renal research rounds, and journal clubs which are conducted weekly in conjunction with the renal divisions, Barnes and Jewish hospitals. Attendance at the weekly pediatric Grand Rounds and pediatric case conferences is encouraged. Students will be required to present one or two in-depth reviews of areas of interest to them either in renal physiology or clinical topics. *Dr. B. Cole and Staff*

(B) Research.

1. Major interests of the investigator are the study of glomerular and tubular dysfunction in transplant recipients, and the study of hypertension in children with polycystic kidney disease. *Dr. B. Cole*

2. The laboratory is investigating complement gene expression in the kidney and its role in the pathogenesis of glomerulonephritis. *Dr. Ault*

3. Clinical research interests include pathogenetic factors in lupus nephritis and the epidemiology of chronic renal insufficiency in children. *Dr. Hmiel*

Neurology

(A) Clinical Neurology. The student participates as a full member of the neurology service team and is directly responsible for a proportion of the patients on the service under the direction of the senior resident. If the student so chooses, he or she will have the opportunity to take night call every third or fourth night, during which time he or she is responsible for the medical care of the entire unit, as well as for emergency admissions. The student will also see outpatients one day a week, during which time he or she will be able to evaluate common neurological problems in children. Students also may elect to spend their elective on the combined consultation-office service. *Dr. Rothman and Staff*

(B) Research.

1. Research in neuropsychology of higher order motor and spatial functions and related cerebral metabolism. *Dr. Deuel*
2. Pharmacokinetics and pharmacodynamic interactions of anticonvulsant drugs. *Drs. Bourgeois and Dodson*
3. The use of NMR for quantitation of cerebral blood flow. The use of NMR to quantitate brain injury in neonates. *Dr. Neil*
4. Biochemistry of cytoskeletal proteins in developing rat brain and spinal cord. *Dr. Noetzel*
5. Physiology and pharmacology of central synaptic transmission; biology of anoxic neuronal injury; imaging calcium and mitochondria in human neurodegenerative diseases. *Dr. Rothman*
6. Physiology of excitatory synaptic transmission in the mammalian central nervous system. *Dr. Yamada*
7. The immunology of peripheral neuropathies in children. *Dr. Connolly*

Newborn Medicine

(A) Clinical Newborn Medicine. The goal of this course is to provide students with responsibility for caring for newborn infants (who range from normal, through acutely ill to chronically ill) and their families. The physiology of the transition from fetal to extrauterine existence, the pathophysiology of specific diseases, and primary accountability of the student for patient management decisions and procedures will be emphasized. In addition, collaboration with nursing staff and other health care providers in decision-making (especially concerning the viability of individual infants) and family management will be regularly required.

Two students during each rotation will be assigned to the Special Care Nursery at St. Louis Children's Hospital and two students to the Labor and Delivery Services at Barnes and Jewish Hospitals. Students assigned to the St. Louis Children's Hospital

Special Care Nursery also will have the opportunity to become involved in the transport of acutely ill infants, while those on the Labor and Delivery Service will routinely be involved in normal newborn care and delivery room management. The student will be expected to rotate patient responsibilities every third night. *Dr. Cole and Staff*

(B) Research.

1. (a) Effects of biologic need and payer source on resource allocation for newborn infants; (b) Effect of surfactant therapy on racial disparities in infant mortality. *Dr. Cole*
2. Biology of pain in the newborn infant including behavioral, physiological, biochemical, and neurodevelopmental outcome variables. *Dr. Porter*
3. Studies include: (a) mechanical and neural mechanisms in regulation of upper airway patency in infants and in an animal model; and (b) pathophysiology of sleep apnea, apneic episodes, and Sudden Infant Death Syndrome in young infants. *Dr. Thach*
4. Histologic and functional characterization of pulmonary ischemia-reperfusion injury by positron emission tomography. *Dr. Hamvas*
5. Regulation of expression of gastrointestinal-specific genes using transgenic mice. *Dr. Hauff*
6. Nutritional needs of pregnant and lactating women. *Dr. Downey*
7. Regulation of Expression of Clara Cell secretory protein in lung. *Dr. Hackett*
8. Understanding clinical presentation of infants with chronic lung disease. *Dr. August*
9. Regulation of glucose transporter localization and function. *Dr. Haney*
10. Developmental regulation of growth factor production and response in different populations of human placental cells. *Dr. Fant*
11. Developmental regulation of expression of unique ileal protein using transgenic mice. *Dr. Crossman*
12. Follow-up and treatment of high risk infants and families. *Dr. Wickline*
13. Assessment of neonatal brain injury using near infrared spectroscopy. *Dr. Rosenbaum*
14. Development of academically based community neonatal services. *Dr. Dawson*

Pulmonary Diseases

(A) Genetic regulation and ontogeny of the tissue specific expression of complement genes and acute phase proteins as models of inflammation. *Dr. Colten*

(B) Determination of the molecular genetic basis of immune deficiencies and delineation of molecular

mechanisms that mediate the inflammatory response, including structure/function and expression studies of chemoattractant receptors. *Dr. Wetzel*

(C) Research in childhood asthma, with projects ranging from long-term outcome studies, delivery of care in low-income minority populations, and studies to determine the basic mechanisms of airway inflammation in viral induced asthma. Two NIH funded clinical asthma studies are the Childhood Asthma Management Program (CAMP), a randomized, placebo-controlled clinical trial carried out in 960 children with asthma in eight centers to determine the long-term effects of treatment on FEV₁ over five to six and one-half years, and a Minority Asthma Grant, designed to impact on underutilization of regular asthma care in low-income, African-American children. *Dr. Strunk*

(D) (1) Factors contributing to sleep hypoventilation during early infancy; (2) central airway mechanics and control in infancy, particularly airways hysteresis

and causes of recurrent cyanosis; (3) suffocation as a mechanism for Sudden Infant Death Syndrome.

Dr. J. Kemp

(E) (1) Pediatric lung transplantation—immunologic, physiologic, psychologic and ethical aspects; (2) sleep-related breathing disorders in pediatrics; (3) flexible fiberoptic bronchoscopy in the investigation of pediatric airway and pulmonary disorders. *Dr. G. Mallory, Jr.*

(F) Clinical studies of childhood asthma, including studies of management problems, therapeutic strategies, and new pharmacologic agents. *Drs. Smith and Strunk*

(G) (1) Studies of mechanisms of pharmacologic interventions to prevent mediator release from inflammatory cells; and (2) Investigations of basic mechanisms of inflammation in asthma. *Drs. Smith and Sanchez*

Faculty

Alumni Endowed Professor of Pediatrics and Head of Department

Alan L. Schwartz, Ph.D.,
Case Western Reserve University,
1974; M.D., 1976. (See Department
of Pharmacology.)

Harriet B. Spoebrer Professor

Harvey R. Colten, M.D.,
Case Western Reserve University,
1963; M.A. (hon.), Harvard University,
1978. (See Department of
Molecular Microbiology.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prenskey, M.D.,
New York University, 1955. (See
Departments of Neurology and
Neurological Surgery.)

Ernest and Jane G. Stein Professor of Developmental Pediatrics

Steven M. Rothman, M.D.,
State University of New York,
Upstate, 1973. (See Department of
Anatomy and Neurobiology and
Department of Neurology and
Neurological Surgery.)

Professors Emeriti

John C. Herweg, M.D.,
Washington University, 1945.

Lawrence I. Kahn, M.D.,
Louisiana State University, 1945.
(Health Care Research)

Jean H. Thurston, M.D.,
University of Alberta, 1941. (See
Departments of Neurology and
Neurological Surgery.)

Professor Emeritus and Lecturer

Phillip R. Dodge, M.D.,
University of Rochester, 1948. (See
Departments of Neurology and
Neurological Surgery.)

Professors

F. Sessions Cole, M.D.,
Yale University, 1973. (See
Department of Cell Biology and
Physiology.)

Louis P. Dehner, M.D.,
Washington University, 1966. (See
Department of Pathology.)

Ruthmary K. Deuel, M.D.,
Columbia University, 1961. (See
Departments of Neurology and
Neurological Surgery.)

W. Edwin Dodson, M.D.,
Duke University, 1967. (See
Departments of Neurology and
Neurological Surgery.)

Alexis F. Hartmann, Jr., M.D.,
Washington University, 1951.

James P. Keating, M.D.,
Harvard University, 1963.

John M. Kissane, M.D.,
Washington University, 1952. (See
Department of Pathology.)

William H. McAlister, M.D.,
Wayne State University, 1954. (See
Department of Radiology.)

J. Neal Middelkamp, M.D.,
Washington University, 1948.

Tae Sung Park, M.D.,
Yonsei University, 1971. (See
Departments of Neurology and
Neurological Surgery.)

David H. Perlmutter, M.D.,
St. Louis University, 1978. (See
Department of Cell Biology and
Physiology.)

Julio V. Santiago, M.D.,
University of Puerto Rico, 1967.
(See Department of Medicine.)

Gary D. Shackelford, M.D.,
Washington University, 1968. (See
Department of Radiology.)

Penelope G. Shackelford, M.D., Washington University, 1968. (See Department of Molecular Microbiology.)

Marilyn J. Siegel, M.D., State University of New York, Downstate, 1969. (See Department of Radiology.)

Carl H. Smith, M.D., Yale University, 1959. (See Department of Pathology.)

Gregory A. Storch, M.D., New York University, 1973. (See Department of Medicine.)

Arnold W. Strauss, M.D., Washington University, 1970. (See Department of Biochemistry and Molecular Biophysics.)

Robert C. Strunk, M.D., Northwestern University, 1968.

Jessie L. Ternberg, Ph.D., University of Texas, 1950; M.D., Washington University, 1953; Sc.D. (hon.), Grinnell College, 1972. (See Department of Surgery.)

Bradley T. Thach, M.D., Washington University, 1968.

Teresa J. Vietti, M.D., Baylor University, 1953. (See Department of Radiology.)

John B. Watkins, M.D., Case Western Reserve University, 1964.

Michael P. Whyte, M.D., State University of New York, Downstate, 1972. (See Department of Medicine.)

Professor Emeritus (Clinical)

Helen E. Nash, M.D., Meharry Medical College, 1945.

Professors (Clinical)

Gordon R. Bloomberg, M.D., University of Illinois, 1959.

Elliot F. Gellman, M.D., University of Missouri, 1961.

Maurice J. Keller, M.D., Columbia University, 1940.

Maurice J. Lonsway, M.D., Washington University, 1950.

James E. Miller, M.D., Medical College of Alabama, 1949. (See Department of Ophthalmology and Visual Sciences.)

Homer E. Nash, Jr., M.D., Meharry Medical College, 1951.

Frederick D. Peterson, M.D., Washington University, 1957.

Steven I. Plax, M.D., University of Missouri, 1961.

George Sato, M.D., Washington University, 1947.

Warren G. Sherman, M.D., Tulane University, 1969.

Argyrios A. Tsiftis, M.D., Aristotelion University of Thessalonika, 1954.

Associate Professor Emeritus

James K. Turner, M.D., Washington University, 1953.

Associate Professors

Eric C. Beyer, Ph.D., University of California, 1981; M.D., 1982.

Charles E. Canter, M.D., St. Louis University, 1979.

Talal A. Chatila, M.D., American University, 1984.

Barbara R. Cole, M.D., University of Kansas, 1967.

John F. DiPersio, M.D., Ph.D., University of Rochester, 1980. (See Department of Medicine.)

S. Bruce Dowton, M.D. (Syd.), University of Sydney, 1994. (See Department of Genetics.)

Robert P. Foglia, M.D., Georgetown University, 1974. (See Department of Surgery.)

Jonathan D. Gitlin, M.D., University of Pittsburgh, 1978. (See Department of Pathology.)

Gary E. Hirschberg, M.D., Hahnemann Medical College, 1972. (See Department of Anesthesiology.)

David M. Jaffe, M.D., The University of Chicago, 1978.

Robert M. Kennedy, M.D., Medical College of Georgia, 1980.

Jacob C. Langer, M.D., University of Toronto, 1980. (See Department of Surgery.)

Benjamin C. P. Lee, M.B.B.S., University of London, 1966. (See Department of Radiology.)

Rodney P. Lusk, M.D., University of Missouri, 1977. (See Department of Otolaryngology.)

Susan B. Mallory, M.D., University of Texas, 1974. (See Department of Internal Medicine.)

Charles B. Manley, Jr. (Genitourinary Surgery), M.D., University of Missouri, 1958. (See Department of Surgery.)

Jeffrey L. Marsh, M.D., The Johns Hopkins University, 1970. (See Department of Surgery.)

Michael J. Noetzel, M.D., University of Virginia, 1977. (See Department of Neurology and Neurological Surgery.)

J. Julio Pérez Fontán, M.D., Universidad de Santiago, 1977.

Robert J. Rothbaum, M.D., The University of Chicago, 1976.

Paul S. Simons, M.D., Washington University, 1967. (See Health Key Medical Group.)

Thomas F. Smith, M.D., University of Virginia, 1974.

Sherida E. Tollefsen, M.D., Washington University, 1975.

Michael S. Watson, Ph.D., University of Alabama, 1981. (See Department of Genetics.)

Neil H. White, M.D., Albert Einstein College of Medicine, 1975.

Research Associate Professors

Michael L. Landt (Laboratory Medicine), Ph.D., University of Oregon, 1976. (See Department of Pathology.)

Barbara A. Zehnauer, Ph.D., The University of Chicago, 1979. (See Department of Pathology.)

Associate Professors Emeriti (Clinical)

Helen M. Aff, M.D., Washington University, 1934.

Stanley L. Harrison, M.D., Washington University, 1930.

Sol Londe, M.D., Washington University, 1927.

Frank S. Wissmath, M.D.,
Washington University, 1943.

Associate Professors (Clinical)

Walter F. Benoist, M.D.,
Washington University, 1972.

C. Read Boles, M.D.,
Washington University, 1943.

Garrett C. Burris, M.D.,
Louisiana State University, 1968.
(See Departments of Neurology and
Neurological Surgery.)

James M. Corry, M.D.,
Washington University, 1974.

Charles H. Dougherty, M.D.,
University of Rochester, 1973.

Robert H. Friedman, M.D.,
Washington University, 1948.

Gene H. Grabau, M.D.,
Washington University, 1942.

Marshall B. Greenman, M.D.,
University of Illinois, 1948.

Kenneth A. Koerner, M.D.,
Washington University, 1941.

Richard L. Lazaroff, M.D.,
St. Louis University, 1978.

John C. Martz, M.D.,
Washington University, 1942.

Kevin J. Murphy, M.D.,
St. Louis University, 1978.

James R. Rohrbaugh, M.D.,
Ohio State University, 1974. (See
Departments of Neurology and
Neurological Surgery.)

William J. Ross, M.D.,
Washington University, 1972.

Mary A. T. Tillman, M.D.,
Howard University, 1960.

Assistant Professors

Anna M. August, M.D.,
University of Alabama, 1986.

Burt I. Bromberg, M.D.,
University of South Alabama, 1981.

Douglas W. Carlson, M.D.,
Southern Illinois University, 1984.

Anne M. Connolly, M.D.,
Indiana University, 1984. (See
Departments of Neurology and
Neurological Surgery.)

Michael W. Crossman, Ph.D.,
St. Louis University, 1985; M.D.,
1986.

Jeffrey G. Dawson, M.D.,
University of Louisville, 1982.

Joan C. Downey, M.P.H., M.D.,
Harvard University, 1985.

Michael E. Fant, M.D., Ph.D.,
Vanderbilt University, 1980.

Katherine A. Gnauck, M.D.,
Universite Libre de Bruxelles, 1985.

Irene L. Graham, M.D.,
Baylor College of Medicine, 1982.

David H. Gutmann, Ph.D.,
University of Michigan, 1984; M.D.,
1986. (See Departments of
Neurology and Neurological
Surgery.)

Brian P. Hackett, Ph.D.,
Boston University, 1984; M.D.,
1986.

Aaron Hamvas, M.D.,
Washington University, 1981.

Peter M. Haney, Ph.D.,
Case Western Reserve University,
1984; M.D., 1986.

Sherrie M. Hauff, M.D.,
University of Texas, 1984.

Abby L. Hollander, M.D.,
University of Cincinnati, 1986.

James S. Kemp, M.D.,
Creighton University, 1976.

Stuart R. Kupfer, M.D.,
University of Florida, 1984.

Mark E. Lowe, M.D.,
University of Miami, 1984.

Gregg T. Lueder, M.D.,
University of Iowa. (See Depart-
ment of Ophthalmology and Visual
Sciences.)

Craig A. MacArthur, M.D., Ph.D.,
Washington University, 1987.

Kathleen A. McGann, M.D.,
University of Pennsylvania, 1985.

George B. Mallory, Jr., M.D.,
Albert Einstein College of Medi-
cine, 1974.

Mark J. Manary, M.D.,
Washington University, 1982.

Barry P. Markovitz, M.D.,
University of Pennsylvania, 1983.
(See Department of Anesthesiol-
ogy.)

Jean Pappas Molleston, M.D.,
Washington University, 1986.

Harlan R. Muntz, M.D.,
Washington University, 1977. (See
Department of Otolaryngology.)

Jeffrey J. Neil, M.D., Ph.D.,
Washington University, 1984. (See
Department of Neurology.)

R. Mark Payne, M.D.,
University of Texas, 1983.

Fran L. Porter, Ph.D.,
Washington University, 1977.

Mabel L. Purkerson, M.D.,
Medical College of South Carolina,
1956. (See Administration and
Department of Medicine.)

Joan L. Rosenbaum, M.D.,
University of Texas, 1983.

Joseph W. St. Geme, M.D.,
Harvard University, 1984.

Angela M. Sharkey, M.D.,
St. Louis University, 1986.

C. Jeffrey Sippel, Ph.D.,
St. Louis University, 1980; M.D., 1983.

Robert D. Steiner, M.D.,
University of Wisconsin, 1987.

Catherine S. Tripp, M.D., Ph.D.,
Washington University, 1988.

Lawrence Tychsen, M.D.,
Georgetown University, 1979. (See
Department of Anatomy and
Neurobiology and Department of
Ophthalmology and Visual Sciences.)

Rick A. Wetsel, Ph.D.,
University of Texas, San Antonio,
1982. (See Department of Molecular
Microbiology.)

Karen M. Wickline, M.D.,
St. Louis University, 1986.

David B. Wilson, M.D., Ph.D.,
Washington University, 1986. (See
Department of Molecular Biology and
Pharmacology.)

Janet Y. Wu, M.D.,
Shanghai Medical University, 1986;
Ph.D., Stanford University, 1991. (See
Department of Molecular Biology and
Pharmacology.)

Kelvin A. Yamada, M.D.,
Baylor College of Medicine, 1983.
(See Departments of Neurology and
Neurological Surgery.)

Research Assistant Professors

Max Q. Arens, Ph.D.,
Virginia Polytechnic Institute, 1971.

David L. Haviland, Ph.D., University
of California, 1987.

Aaron J. Moe, Ph.D.,
Virginia Polytechnic Institute, 1984.
Zhi-Fang Zhang, M.D.,
Shanghai Second Medical University, 1962.

Assistant Professors Emeriti (Clinical)

Martin Calodney, M.D.,
New York University, 1936.
Samuel W. Gollub, M.D.,
Washington University, 1941.
Edith C. Robinson, M.D.,
The Johns Hopkins University, 1932.
Alfred S. Schwartz, M.D.,
The Johns Hopkins University, 1936.

Assistant Professors (Clinical)

Denis I. Altman, M.B., B.Ch.,
University of the Witwatersrand, 1975. (See Departments of Neurology and Neurological Surgery.)
Patricia J. Amato, M.D.,
Medical College of Ohio, 1982. (See Health Key Medical Group.)
Jill M. Baer, M.D.,
University of Kentucky, 1975.
Edward T. Barker, M.D.,
Washington University, 1957.
Susan L. Baumer, M.D.,
University of Pennsylvania, 1975.
Max H. Burgdorf, M.D.,
Washington University, 1974.
John C. Davis, M.D.,
University of Michigan, 1980.
Ray S. Davis, M.D.,
University of Louisville, 1978.
Tulay Dincer, M.D.,
Hacettepe University, 1977.
Gerald J. Duling, M.D.,
St. Louis University, 1959.
Jay Stuart Epstein, M.D.,
Emory University, 1983.
Ira J. Friedman, M.D.,
University of Arkansas, 1960.
Florentina U. Garcia, M.D.,
University of the Philippines, 1965.
Tessa D. Gardner, M.D.,
Harvard University, 1972.
James A. Gerst, M.D.,
University of Missouri, 1972.

Santosh Gupta, M.B.B.S.,
Lucknow University, 1963; D.C.H.,
University of London, 1966.
J. Larry Harwell, M.D.,
University of Missouri, 1961.
Robert J. Hoffman, M.D.,
St. Louis University, 1976.
Nancy E. Holmes, M.D.,
University of Missouri, 1976.
William L. Johnson, M.D.,
University of Missouri, 1981. (See Health Key Medical Group.)
Joseph A. Kahn, M.D.,
University of Missouri, 1977.
Michele E. Kemp, M.D.,
Washington University, 1981.
Shirley M. Knight, M.D.,
Washington University, 1980.
Henry L. Knock, M.D.,
The Johns Hopkins University, 1953.
Katherine L. Kreusser, M.D.,
Indiana University, 1978.
Norton S. Kronemer, M.D.,
University of Missouri, 1962.
Jack A. Land, Jr., M.D.,
University of Mississippi, 1977.
Barry Light, Ph.D.,
University of Missouri, 1977; M.D.,
1980.
David L. Lohmeyer, M.D.,
University of Missouri, 1977.
Thomas C. McKinney, M.D.,
Washington University, 1980. (See Health Key Medical Group.)
John F. Mantovani, M.D.,
University of Missouri, 1974. (See Departments of Neurology and Neurological Surgery.)
M. Michael Maurer, M.D.,
Washington University, 1972.
Susan Pittman, M.D.,
University of Missouri, 1963.
Jerry L. Rosenblum, M.D.,
Washington University, 1974.
Martin D. Rudloff, M.D.,
Washington University, 1981.
Richard W. Sato, M.D.,
Washington University, 1977.
Blaine M. Sayre, M.D.,
Washington University, 1968.
Robert H. Strashun, M.D.,
New York University, 1982.
M. Anne Street, M.D.,
University of Illinois, 1976.

Abby L. Wasserman, M.D.,
The Johns Hopkins University, 1970. (See Department of Psychiatry.)
Marc E. Weber, M.D.,
University of Tennessee, 1974; J.D.,
St. Louis University, 1982.
Zila Welner, M.D.,
Hebrew University, 1961. (See Department of Psychiatry.)
George T. Wilkins, Jr., M.D.,
University of Illinois, 1957.
Patricia B. Wolff, M.D.,
University of Minnesota, 1972. (See Health Key Medical Group.)
Gerald Wool, M.D.,
Washington University, 1962.

Instructors

Bettina H. Ault, M.D.,
University of Tennessee, 1984.
David T. Balzer, M.D.,
St. Louis University, 1985.
Diane M. Bourlier, D.O.,
University of Health Sciences, 1987.
Janice E. Brunstrom, M.D.,
Medical College of Virginia, 1987. (See Departments of Neurology and Neurological Surgery.)
Guojun Bu, Ph.D.,
Virginia Polytechnic Institute, 1990.
Michael T. Connor, M.D.,
Wayne State University, 1974. (See Department of Anesthesiology.)
John N. Constantino, M.D.,
Washington University, 1988. (See Department of Psychiatry.)
Douglas G. Cottrell, D.O.,
University of Health Sciences, 1979.
Janet L. Cranshaw-Mink, M.D.,
Washington University, 1988.
Lisa S. Etzwiler, M.D.,
The Johns Hopkins University, 1985.
Anna M. Fitz-James, M.D.,
George Washington University, 1981.
Gary S. Gottesman, M.D.,
University of Michigan, 1988.
Melanie G. Hampton, M.D.,
University of Louisville, 1981.
Z. Leah Harris, M.D.,
Chicago Medical School, 1987.
Robert J. Hayashi, M.D.,
Washington University, 1986.

Robert O. Heuckeroth, M.D.,
Ph.D., Washington University, 1990.

S. Paul Hmiel, M.D., Ph.D.,
Case Western Reserve University,
1989.

Anne V. Hing, M.D.,
Washington University, 1985. (See
Department of Surgery.)

Donald V. Huebener (Dental
Medicine), D.D.S., Washington
University, 1969. (See Department
of Radiology.)

Mark C. Johnson, M.D.,
The Johns Hopkins University,
1982.

Lynn W. Keene, M.D.,
University of Florida, 1988.

Fiona H. Levy, M.D.,
New York Medical College, 1987.

Lori Luchtman-Jones, M.D.,
University of California, San Diego,
1987.

William A. McManus, M.D.,
St. Louis University, 1986.

Bess A. Marshall, M.D.,
Vanderbilt University, 1986.

Robert T. Paschall, M.D.,
University of Tennessee, 1974.

Kimberly S. Quayle, M.D.,
Washington University, 1988.

L. Fernando Sanchez-Legrand,
M.D., San Carlos University, 1978;
Ph.D., Kobe University, 1985.

Brian S. Skrainka, M.D.,
University of Missouri, Columbia,
1985.

Stephen A. Spooner, M.D.,
University of Tennessee, Memphis,
1988. (See Department of Medicine.)

Jeffrey H. Teckman, M.D.,
Washington University, 1989.

Alison I. Whelan, M.D.,
Washington University, 1986. (See
Department of Medicine.)

Research Instructors

Richard S. Buller, Ph.D.,
University of Montana, 1983.

Sharon L. Pontious, Ph.D.,
New Mexico State University, 1980.

Sankar K. Saha, Ph.D., Calcutta
University, 1981.

Instructors (Clinical)

Laura E. Al-Sayed, M.D.,
University of Texas, Houston, 1988.

Bonnie J. Aust, M.D.,
University of Texas, San Antonio,
1979. (See Health Key Medical
Group.)

Arthur Baum, M.D.,
SUNY, Downstate, 1971.

Robert A. Bergamini, M.D.,
Albany Medical College, 1978.

Huldah C. Blamoville, M.D.,
Meharry Medical College, 1965.

Robert J. Bradshaw, M.D.,
St. Louis University, 1980.

Seth J. Brownridge, M.D.,
Washington University, 1982.

Tattamangalam P. Chandrika,
M.S.B.S., Calicut Medical College,
1973. (See Health Key Medical
Group.)

Tammy S. Chi, M.D.,
University of California, Los
Angeles, 1990.

Scott S. Cole, M.D.,
Uniformed Services University,
1984.

Michael E. Danter, M.D.,
University of Illinois, 1987.

David P. Dempsher, M.D., Ph.D.,
The Johns Hopkins University,
1982.

Robert W. Edmonds, M.D.,
Washington University, 1960.

Elliott H. Farberman, M.D.,
St. Louis University, 1973.

Edward B. Fliesher, M.D.,
St. Louis University, 1978.

Dharam P. Goel, M.B., B.S.,
All India Institute of Medical
Sciences, 1978.

Joseph K. Goldenberg, M.D.,
University of Missouri, Kansas City,
1980.

Roman E. Hammes, M.D.,
University of Iowa, 1954.

David E. Hartenbach, M.D.,
University of Missouri, 1987.

J. Joseph Horan, M.D.,
St. Louis University, 1971.

Carl S. Ingber, M.D.,
Boston University, 1972.

Aidan W. Ip, M.D.,
The University of Chicago, 1979.

Joyce D. Johnson, M.D.,
Case Western Reserve University,
1982.

Larry A. Jones, M.D.,
The Johns Hopkins University, 1976.

Sheldon Kessler, M.D.,
St. Louis University, 1951.

Joel S. Koenig, M.D.,
Vanderbilt University, 1982.

Katherine L. Komendowski, M.D.,
Uniformed Services University, 1984.

Leland M. Laycob, M.D.,
University of Missouri, 1968.

Robert D. Lins, M.D.,
University of Missouri, 1969.

Elaine Miller, M.D.,
Medical College of Alabama, 1949.

Suzanne L. Miller, M.D.,
University of Illinois, 1978.

Alison C. Nash, M.D.,
Baylor College of Medicine, 1981.

Susan J. Nelson, M.D.,
Washington University, 1978.

David S. Olander, Ph.D.,
Washington University, 1967; M.D.,
1974.

Jerome H. O'Neil, Jr., M.D.,
St. Louis University, 1981.

Eugenia M. Pierce, M.D.,
St. Louis University, 1958.

Juanita C. Polito, M.D.,
Southwestern University, 1979.

Joseph L. Portnoy, M.D.,
University of Kansas, 1974.

Robert L. Quaas, M.D.,
The University of Chicago, 1975.

Mohammad H. Rahman, M.B.B.S.,
University of Karachi, 1960.

Jesse R. Ramsey, D.O.,
Texas College of Osteopathic
Medicine, 1974.

Emanuel Rashet, M.D.,
St. Louis University, 1962.

Janis B. Robinson, M.D.,
University of Pennsylvania, 1977.

Isabel L. Rosenbloom, M.D.,
University of Maryland, 1984. (See
Health Key Medical Group.)

Janet M. Ruzyski, M.D.,
Washington University, 1981.

Howard J. Schlansky, M.D.,
University of Missouri, Kansas City,
1978.

Seymour M. Schlansky, M.D.,
Chicago Medical School, 1950.

Paula C. Schlesinger, M.D.,
Yale University, 1982.

Martin P. Schmidt, M.D.,
St. Louis University, 1986.

Pamela M. Schuler, M.D.,
University of Michigan, 1979.

Jeffrey I. Schulman, M.D.,
University of Kentucky, 1974.

Eleanor M. Shaw, M.D.,
University of Missouri, 1983.

Nareshkumar Solanki, B.M., B.S.,
University of Nairobi, 1975.

Robert D. Spewak, M.D.,
St. Louis University, 1979.

Norman P. Steele, M.D.,
Indiana University, 1972.

Anita R. Stiffelman, M.D.,
New York University, 1987.

Robert W. Tolan, M.D.,
Washington University, 1987.

Jeanne M. Trimmer, M.D.,
Northwestern University, 1988.

Garland R. Tschudin, M.D.,
University of Missouri, 1975.

Roger J. Waxelman, M.D.,
University of Missouri, 1969.

Don Weiss, M.D.,
University of Medicine and
Dentistry of New Jersey, 1986.

Jeffrey M. Wright, M.D.,
Washington University, 1979.

Kathie R. Wuellner, M.D.,
St. Louis University, 1978.

Instructor (Adjunct)

Mary L. Krywanio, D.N.S.,
Louisiana State University, 1993.

Assistants (Clinical)

Susan E. Adams, Ph.D.,
University of Kansas, 1984; M.D.,
Washington University, 1991.

William S. Adams, M.D.,
University of Missouri, 1987.

Juli A. Antonow, M.D.,
University of Minnesota, 1975.

Angela L. Bard, M.D.,
Indiana University, Indianapolis,
1981.

Earl C. Beeks, Jr., M.D.,
University of Missouri, 1981.

Marietta O. Belen, M.D.,
Far Eastern University, 1963.

Jean E. Birmingham, M.D.,
University of Missouri, 1988.

Carlos Borromeo, M.D.,
Santo Tomas University, 1960.

Earline A. Brownridge, M.D.,
University of Missouri, 1982.

David J. Callahan, M.D.,
Washington University, 1986. (See
Departments of Neurology and
Neurological Surgery.)

Rubilinda Q. Casino, M.D.,
University of Santo Thomas, 1979.

Anita Chacko, M.D.,
Kasturba Medical College, 1981.

William T. Chao, M.D.,
University of Illinois, 1979.

Darryl S. Cohen, D.O.,
Texas College of Osteopathic
Medicine, 1981.

Myrto Frangos, M.D.,
St. Louis University, 1985.

Maurice J. Gabriel, M.D.,
Universidad de Sevilla, 1970.

John P. Galgani, Jr., M.D.,
St. Louis University, 1982.

Gary M. Goodman, M.D.,
University of Wisconsin, 1982.

Rosita J. Guzon, M.D.,
Manila Central University, 1975.

Richard A. Hack, M.D.,
University of Missouri, 1988.

Kenneth A. Haller, M.D.,
Creighton University, 1980.

Elinor F. Hancock, M.D.,
Meharry Medical College, 1982.

Thomas P. Harrison, Jr., M.D.,
University of Missouri, 1979.

Christina G. Ingram, M.D.,
Washington University, 1990.

Denise R. Johnson, M.D.,
Loma Linda University, 1984.

Pamela B. Kane, M.D.,
University of Illinois, 1990.

Robert S. Kebler, M.D.,
St. Louis University, 1984.

Peter S. Kieffer, M.D.,
Washington University, 1990.

Benton B. Levie, M.D.,
Duke University, 1969.

Kenneth C. Levy, M.D.,
Chicago Medical School, 1988.

Margaret A. Martin, M.D.,
University of Wisconsin, 1986.

Diane J. Matsumoto, M.D.,
Washington University, 1991.

Mary R. Morgan, M.D.,
Washington University, 1990.

David A. Nile, M.D.,
St. Louis University, 1981.

Irma I. Ortiz-Arroyo, M.D.,
University of Puerto Rico, 1985.

Radha Patil, M.B., B.S.,
Lokmanya Tilak Municipal Medical
College, 1973.

Santiago B. Plurad, D.O.,
Kirksville College of Osteopathic
Medicine, 1987.

Jennifer S. Quinn, M.D.,
University of Kentucky, 1986.

Habibur Rahman, M.B., B.S.,
Dacca University Medical College,
1972.

A. GuyAnne Ransom, M.D.,
University of Arkansas, 1987.

Catherine R. Remus, M.D.,
Rush University, 1983.

Carol A. Robinson, M.D.,
University of Missouri, 1985. (See
Health Key Medical Group.)

Caroline Rowlands, M.D.,
Washington University, 1991.

Joseph Schachter, M.D.,
Indiana University, 1979.

Margaret A. Schmandt, M.D.,
St. Louis University, 1987.

Lisa D. Schrock, M.D.,
University of Missouri, 1990.

Martha A. Sewall, M.D.,
University of Missouri, 1985.

A. James Shapiro, M.D.,
Washington University, 1973.

Hsin-Chin Shih, M.D.,
Kaoshiung Medical College, 1964.

Craig A. Spiegel, M.D.,
Case Western Reserve University,
1982.

Rosa M. Suárez-Solar, M.D.,
University Central del Caribe, 1991.

Joan L. Warren, M.D.,
University of Missouri, Kansas City,
1982.

Elizabeth P. Zachary, M.D.,
University of Missouri, Kansas City.

DEPARTMENT OF PSYCHIATRY

Instruction in psychiatry is given in the last three years of the medical course. Emphasis is on teaching psychiatry as a medical discipline, including the biological, social, and psychological mechanisms and manifestations of psychiatric illness, as well as psychological reactions to other illnesses. Recognition of current limitations of knowledge combined with an appreciation of what is known leads to a spirit of constructive skepticism. This attitude permits the student to study psychiatry in depth and broadly without preconceived theories.

SECOND YEAR

Introduction to Clinical Psychiatry

This course emphasizes the diagnosis of major psychiatric illnesses. Psychiatric diseases are described in terms of epidemiology, clinical presentation, natural history, genetics, differential diagnosis and clinical management. Biological and psychological influences on these diseases will be presented. Interviewing techniques and performance of the mental status exam will be demonstrated by occasional patient interviews. *Dr. M. Jarvis and Staff*

THIRD YEAR

Psychiatry Clerkship

Students in groups of about 15 spend six weeks on the inpatient services of Barnes and Malcolm Bliss Mental Health Center at St. Louis State Hospital. The diversity of clinical settings for student-patient contact provides exposure to patients suffering from a wide variety of psychiatric disorders. Emphasis is upon developing interviewing and mental status examination skills, diagnostic capabilities for major psychiatric illnesses, and preliminary understanding of pharmacologic and behavioral/psychotherapeutic treatment strategies. *Dr. Drevets and Staff*

FOURTH YEAR

"A" Electives

(A) Outpatient and Community Psychiatry. This is a flexible clerkship tailored to the student's interests. Adult psychiatric patients in the Washington University Psychiatric Clinic present a variety of psychological and interpersonal problems similar to those encountered in the office practice of a psychiatrist, an internist, or a family physician. Students have an opportunity to learn a variety of treatment techniques under supervision. Students also manage patients in a community mental health center located in an inner-city area. There, students see how psychiatry works with social agencies, schools, and other institutions utilizing paramedical personnel in the detection and treatment of mental illness. *Dr. Smith*

(B) Clinical Psychiatry in Barnes Hospital. This is a fourth-year elective providing students with an opportunity to expand their knowledge of inpatient clinical psychiatry by functioning as externs. The student attends all staffing and teaching conferences given to first-year psychiatry residents, takes patients in rotation and shares night call with other first-year residents approximately every fifth night. Immediate supervision is provided by the inpatient attending. Teaching emphasis is directed toward psychiatric diagnosis, appropriate use of psychopharmacologic agents, personal and family psychotherapeutic intervention, use of community resources and pursuit of the psychiatric scientific literature. *Dr. Rubin*

(C) Child Psychiatry, Children's Hospital Outpatient Clinic. This clerkship in child psychiatry gives students an appreciation of the intricacies of diagnosis and treatment of children and teenagers with psychiatric disorders. The clerkship involves working up a small number of preadolescent as well as adolescent children under the supervision of senior staff members. Didactic teaching is available, as well as individual supervision of patients. Students gain an appreciation of medication and other treatment modalities. They are exposed to the roles of community agencies, such as juvenile court and welfare agencies, with which a child psychiatrist must work. Students also gain appreciation of the roles of nurse, social worker, teacher, and occupational therapist in collaboration with individuals of these disciplines. *Dr. Mattison and Staff*

(D) Psychiatry Consult Service. The fourth-year student will work closely with the consult resident and consult attending in the evaluation and treatment of patients referred to the psychiatry consult service. The student attends consultation conferences and may attend inpatient and outpatient teaching conferences in addition to Grand Rounds and Research Rounds. *Dr. Dean*

(E) Clinical Psychiatry in a Community Mental Health Center—Inpatient Services. The senior course will provide the student with the opportunity to become a key medical member of a psychiatric treatment team dealing with the evaluation of patients in the emergency room; selective admissions of certain cases; diagnosis and management of particular patients. Individual supervision will be provided by the inpatient director and supervising psychiatrist instructor in charge of the ward that the student is assigned to. The student will participate in the teaching sessions arranged for the first year psychiatric residents in training. *Dr. Csernansky*

(F) Substance Abuse Treatment. The rotation gives the student the opportunity to learn about the inpatient treatment of alcohol and licit and illicit drug abuse. Students will be expected to become familiar

with the theoretical basis of Relapse Prevention therapy, the conduct of therapy groups, and the medical complications of substance abuse.

Dr. Compton

(G) Electroconvulsive Therapy (ECT). The student will be involved in the neuropsychiatric assessment of patients referred for ECT. In addition, the student will receive training in the application of ECT and in the clinical management of patients receiving ECT. The student will be encouraged to review appropriate literature and make clinically-relevant case-oriented presentations. *Dr. Isenberg*

RESEARCH

The Department of Psychiatry has a long and distinguished history of research in the neurobiology, epidemiology and genetic determinants of behavior, basic mechanisms of central nervous system function and psychiatric disturbances. The excellent balance of clinical and biomedical researchers has a strong research focus on alcoholism, drug abuse, behavioral medicine, schizophrenia, affective disorders and other psychiatric disturbances. Studies are currently underway with both human and animal models as well as computer and mathematical modeling. The department has a long-standing commitment to the classification and assessment of psychiatric problems as medical disorders, the development of standardized diagnostic tasks, familial and molecular genetic approaches to understanding the basis of psychiatric syndromes, the epidemiology of drug abuse, alcoholism, affective disorders and schizophrenia and molecular biological approaches to the study of brain-behavior relationships. The department's research program fosters collaboration within its various sub-units as well as with numerous pre-clinical and clinical departments throughout the Medical Center. Most of our faculty are interested in providing research opportunities. Below are a few examples:

Our research program focuses on the role of endogenous opioid peptides (EOP) in the control of hypothalamic-pituitary function. We are especially interested in the mechanisms by which EOP influences the release of hypothalamic releasing factors, particularly luteinizing hormone releasing hormone (LHRH), and the role these peptides play in the regulation of spermatogenesis and steroidogenesis in the testes. In addition to our strong interest in the interaction between EOP and the endocrine system, we are also examining the influence of abused substances on neuroendocrine function. Our interests fall into two general areas. First, the effects of substances of abuse administered during the prepubescent period on the onset of puberty and sexual maturation. As an integral part of these studies we are also exploring the hypothesis that the maturation of the EOP system represents the "trigger" for the onset

of puberty which has eluded identification. Second, we have observed that treatment of male rats with several abused compounds, such as morphine and alcohol, for a brief period of time followed by a drug free period has adverse effects on their male offspring, particularly with respect to their sexual maturation. The mechanisms underlying these potentially important transgenerational effects of substances of abuse are actively under investigation. Our studies involved many levels of analysis: whole animal pharmacology, tissue culture, in vitro superfusion of various organs, biochemical analyses and a variety of other techniques in molecular biology. *Dr. Cicero*

Our investigations in psychiatric genetics attempt to understand the familial aggregation of the major psychiatric illnesses. We aim to characterize complex mechanisms of transmission and to localize abnormal genes using DNA linkage markers. A broad range of research opportunities are available, such as locating and interviewing families participating in genetic studies and working in a genetics lab. Laboratory techniques include the formation and culture of lymphoblastoid cell lines; DNA extraction; and the detection of DNA polymorphisms. Psychiatric disorders under study include schizophrenia; bipolar manic depressive illness; and alcoholism.

Dr. Cloninger

A research program focusing on schizophrenia and related clinical problems operates at several Washington University Medical Center sites, as well as affiliated units at Malcolm Bliss Mental Health Center. This program is focused on testing hypotheses related to the neurochemical, neuroendocrine, and cognitive consequences of neuroanatomical damage linked to schizophrenia. This program encompasses a set of investigations in inpatients and outpatients with schizophrenia, as well as normal subjects, incorporating basal and dynamic assessments of specific neurochemical and neuroendocrine systems, along with symptom and neuropsychological assessments. The development of animal models for the functional neurochemical abnormalities of interest, as well as a variety of neurochemical experiments, are performed. *Dr. Csernansky*

There are several NIDA-funded projects pertaining to four broad areas of research: (1) factors leading to AIDS high risk behaviors in drug users, (2) testing the reliability/validity of the substance use disorders, (3) determining comorbidity of antisocial personality disorder, psychiatric diagnosis, and substance abuse, and (4) community outreach programs to bring drug users to treatment. In addition, we are one of the five NIMH sites to study use and need of mental health services among four to 17 year olds. *Dr. Cottler*

A research program focuses on the neuroendocrinology of cognitive function during normal aging and during medical and neuropsychiatric illness such as schizophrenia. The effect of glucocorticoids on cognitive performance, hippocampal volumes and

psychopathology in aging and schizophrenia is a current major project. The regulatory role of glucose/insulin on memory function is also studied in healthy aging adults and patients with schizophrenia. Endogenous and exogenous glucocorticoid effects on cognitive performance in normal subjects and medically ill populations also are studied. Overall, the role of glucocorticoids in the regulation of memory function in humans is a long-term interest of the laboratory. Individual projects or participation in ongoing projects can be arranged. *Dr. Newcomer*

Faculty

Spencer T. Olin Professor and Head of Department

Samuel B. Guze, M.D., Washington University, 1945. (See Department of Medicine.)

Wallace Renard Professor

C. Robert Cloninger, M.D., Washington University, 1970; M.D., (hon.), Umea University, Sweden, 1983. (See Department of Genetics and Department of Psychology.)

Gregory B. Couch Professor

John Csernansky, M.D., New York University, 1979. (See Department of Anatomy and Neurobiology.)

Professors Emeriti

George E. Murphy, M.D., Washington University, 1952.

Saul Rosenzweig, Ph.D., Harvard University, 1932. (Medical Psychology) (See Department of Psychology.)

Professors

Robert M. Carney, Ph.D., Washington University, 1978. (Medical Psychology) (See Department of Psychology.)

Theodore J. Cicero, Ph.D., Purdue University, 1968. (Neuropharmacology) (See Administration and Department of Anatomy and Neurobiology.)

Helen Donis-Keller, Ph.D., Harvard University, 1979. (Genetics) (See Department of Genetics.)

Richard W. Hudgens, M.D., Washington University, 1956.

Blake W. Moore, Ph.D., Northwestern University, 1952. (Biochemistry)

Bharat Raj Nakra, M.D., Punjab University, 1966.

John W. Olney, M.D., Iowa University, 1963. (See Department of Pathology.)

Dabeeru C. Rao, Ph.D., Indian Statistical Institute, 1971. (Biostatistics) (See Department of Genetics and Division of Biostatistics.)

Theodore Reich, M.D., McGill University, 1963. (See Department of Genetics.)

John P. Rice, Ph.D., Washington University, 1975. (Mathematics) (See Division of Biostatistics.)

Lee N. Robins, Ph.D., Radcliffe College, 1951. (Sociology) (See Faculty of Arts and Sciences.)

Eugene H. Rubin, M.D., Ph.D., Washington University, 1978.

William R. Sherman, Ph.D., University of Illinois, 1955. (Biochemistry)

Brian K. Suarez, Ph.D., University of California, Los Angeles, 1974. (Genetics) (See Department of Genetics.)

Richard D. Wetzel, Ph.D., St. Louis University, 1974. (Medical Psychology) (See Departments of Neurology and Neurological Surgery.)

WILLIAM GREENLEAF ELIOT DIVISION OF CHILD PSYCHIATRY

The Division of Child Psychiatry offers a varied teaching program for medical students, residents in psychiatry, and fellows in child psychiatry at St. Louis Children's and Barnes Hospitals. Outpatient services are organized through the Child Psychiatry Center located at St. Louis Children's Hospital, and inpatient services are provided through a Barnes 10-bed psychiatric unit. Active consultation with all medical and surgical units of the hospital is also maintained. Trainees are assigned to these various services, where they participate in diagnostic evaluations and see patients in treatment under supervision.

Charles F. Zorumski, M.D., St. Louis University, 1978. (See Department of Anatomy and Neurobiology.)

Professor (Adjunct)

Norman Sartorius, M.D., University of Zagreb, 1958.

Research Professor

Madelon T. Price, Ph.D., Washington University, 1973. (Neurobiology)

Professors Emeriti (Clinical)

Margaret C. L. Gildea, M.D., Yale University, 1936.

Sydney B. Maughs, M.D., Washington University, 1935.

Patricia L. O'Neal, M.D., Washington University, 1948.

Professors (Clinical)

Alex H. Kaplan, M.D., St. Louis University, 1936.

Marcel T. Saghir, M.D., American University, 1963.

Associate Professor Emeritus (Clinical)

Edward H. Kowert, M.D., Washington University, 1943.

Associate Professors

Linda B. Cottler, Ph.D., Washington University, 1987. (Epidemiology) (See Health Administration.)

Kenneth E. Freedland, Ph.D.,
University of Hawaii, 1982. (Medical
Psychology) (See Department of
Psychology.)

Alison M. Goate, D.Phil.,
University of Oxford, 1983.
(Genetics) (See Department of
Genetics.)

Andrew C. Heath, D.Phil.,
University of Oxford, 1983.
(Psychology) (See Department of
Genetics and Department of
Psychology.)

Barry Hong, Ph.D.,
St. Louis University, 1982 (Medical
Psychology) (See Department of
Psychology.)

Keith E. Isenberg, M.D.,
Indiana University, 1978.

Collins E. Lewis, M.D.,
Harvard University, 1971.

Patrick J. Lustman, Ph.D.,
Michigan State University, 1980.
(Medical Psychology) (See Depart-
ment of Psychology.)

Bruce L. Nock, Ph.D.,
Rutgers University, 1980. (Neurobi-
ology) (See Department of
Anatomy and Neurobiology.)

Daniel D. Pugh, M.D.,
Washington University, 1964.

John Rohrbaugh, Ph.D.,
University of Illinois, 1973. (Psy-
chology) (See Department of
Psychology.)

Elizabeth M. Smith, Ph.D.,
Washington University, 1978.
(Social Work)

Associate Professors (Clinical)

John T. Biggs, Jr., M.D.,
University of Tennessee, 1968.

Jack L. Croughan, M.D.,
Kansas University, 1968.

Fred W. Gaskin, M.D.,
University of Minnesota, 1968.

Robert S. Hicks, M.D.,
University of Arkansas, 1958.

Wanda M. Lamb, M.D.,
Washington University, 1948.

Jay L. Liss, M.D.,
Washington University, 1966.

Joseph McKinney, M.D.,
Washington University, 1958.

Jay Meyer, M.D.,
St. Louis University, 1960.

Mary Ann Montgomery, M.D.,
Northwestern University, 1973.

Rashmi Nakra, M.B.B.S.,
Lady Hardinge, 1970.

Paul M. Packman, M.D.,
Washington University, 1963.

Thomas F. Richardson, M.D.,
Washington University, 1963.

William M. Riedesel II, M.D.,
Cornell University, 1973.

E. Robert Schultz, M.D.,
Washington University, 1955. (See
Departments of Neurology and
Neurological Surgery.)

James B. Smith, M.D.,
University of Missouri, 1967.

Harold D. Wolff, M.D.,
State University of Iowa, 1955.

Associate Professors (Adjunct)

Christer Allgulander, M.D.,
Karolinska Institute, 1973.

Richard M. Kurtz, Ph.D.,
University of Cincinnati, 1966.
(Psychology)

Assistant Professors

Wilson Compton III, M.D.,
Washington University, 1986.

Jon Todd Dean, M.D.,
University of Texas, 1987.

Stephen H. Dinwiddie, M.D.,
Eastern Virginia Medical School,
1982.

Wayne C. Drevets, M.D.,
University of Kansas, 1983. (See
Department of Radiology.)

Daniela S. Gerhard, Ph.D.,
Cornell University, 1982. (See
Department of Genetics.)

Michael R. Jarvis, Ph.D.,
University of Illinois, 1982; M.D.,
Washington University, 1985.

Steven O. Moldin, Ph.D.,
Yeshiva University, 1988. (Medical
Psychology) (See Department of
Psychology.)

Elliot Nelson, M.D.,
University of Illinois, 1986.

John Newcomer, M.D.,
Wayne State University, 1985.

Carol S. North, M.D.,
Washington University, 1983.

Yvette I. Sheline, M.D.,
Boston University, 1979. (See
Department of Radiology.)

Dragan Svrakic, M.D.,
Belgrade University, 1978; D.Sc.,
1989.

Paul Van Eerdewegh, Ph.D.,
Washington University, 1982.
(Mathematics)

Sean Yutzy, M.D.,
Eastern Virginia Medical School, 1982

Research Assistant Professors

Michael Adams, Ph.D.,
Medical College of Virginia, 1987.
(Neuropharmacology)

Mark Bardgett, Ph.D.,
University of Missouri, 1991.
(Neurobiology)

Michelle Bidaut-Russell, Ph.D.,
St. Louis University, 1989; Ph.D.,
University of Bordeaux II, 1980.
(Epidemiology)

Kathleen K. Bucholz, Ph.D.,
Yale University, 1986. (Epidemiology)

Luis A. Giuffra, M.D.,
Universidad Peruana Cayetano
Heredia, 1986; Ph.D., Yale University,
1991.

John W. Haller, Ph.D.,
University of Missouri, 1991. (Psychol-
ogy) (See Department of Radiology.)

Paul P. Hipps, Ph.D.,
North Dakota State University, 1971.
(Biochemistry)

Yukitoshi Izumi, M.D.,
Yamagata University, 1985; Ph.D.,
1989. (Neurobiology)

Rosalind J. Neuman, Ph.D.,
Washington University, 1981 (Math-
ematics)

Lynn H. O'Connor, Ph.D.,
Rutgers University, 1983. (Neuroendo-
crinology)

Abbas Parsian, Ph.D.,
Western Michigan University, 1986.
(Genetics)

Rumi K. Price, Ph.D.,
University of California, 1988.
(Epidemiology)

Thomas Przybeck, Ph.D.,
Washington University, 1983.
(Anthropology)

David Wozniak, Ph.D.,
Washington University, 1984.
(Neurobiology) (See Department of
Psychology.)

Assistant Professors Emeriti (Clinical)

Hyman H. Fingert, M.D.,
State University of Iowa, 1934.

Reese H. Potter, M.D.,
Washington University, 1935.

Assistant Professors (Clinical)

Ahmad Ardekani, M.D.,
Pahlavi University, 1974.

William W. Clendenin, M.D.,
University of Tennessee, 1963.

Juan C. Corvalan, M.D.,
Argentina National University, 1965.

Alejandro M. Datuin, M.D.,
University of Santo Tomas, 1965.
(Malcolm Bliss Hospital.)

Mary Davis, M.D.,
Washington University, 1952.

Plaridel C. Deza, M.D.,
University of Santo Tomas, 1956.
(Malcolm Bliss Hospital)

Terry A. Fuller, M.D.,
Washington University, 1974.

Frederick G. Hicks, M.D.,
University of Minnesota, 1981.

Sheldon G. Holstad, Pharm.D.,
University of Iowa, 1986. (Phar-
macy) (St. Louis College of
Pharmacy)

Saaïd Khojasteh, M.D.,
Shiraz University, 1981.

Scott McCormick, M.D.,
The University of Chicago, 1985.

James R. Mikolajczak, M.D.,
St. Louis University, 1972.

Thomas Nowotny, M.D.,
Washington University, 1985.

Eric J. Nuetzel, M.D.,
St. Louis University, 1976.

Elizabeth F. Pribor, M.D.,
St. Louis University, 1985.

James L. Rutherford, M.D.,
University of Iowa, 1980.

Jo-Ellyn M. Ryall, M.D.,
Washington University, 1975.

Paul W. Sheffner, M.D.,
Washington University, 1974.

Reed E. Simpson, M.D.,
Washington University, 1976.

Wayne A. Stillings, M.D.,
Washington University, 1975.

Edwin D. Wolfgram, M.D.,
State University of Iowa, 1959.

Christopher Wuertz, M.D.,
University of Illinois, 1984.

Instructors

Laura Bierut, M.D.,
Washington University, 1987.

Kevin Black, M.D.,
Duke University, 1990. (See
Neurology.)

Diane DeMallie, M.D.,
Duke University, 1991.

Nuri Farber, M.D.,
Washington University, 1989.

Cynthia Florin, M.D.,
Columbia University, 1984.

Aileen Lee, Ph.D.,
Ohio State University, 1977.
(Medical Psychology)

Susan Minchin, M.D., Ph.D.,
University of Iowa, 1991.

Devna Rastogi-Cruz, M.D.,
Washington University, 1991.

Research Instructors

Robert F. Clark, Ph.D.,
University of California, Irvine, 1988
(Genetics)

Linda Griffith, M.S.W.,
St. Louis University, 1978. (Social
Work) (See School of Social Work.)

Corinne Lendon, Ph.D.,
King's College, 1991.

Pamela Madden, Ph.D.,
University of Pittsburgh, 1992.
(Psychology)

Michael A. Sesma, Ph.D.,
University of California, 1981.
(Neurobiology)

Instructors (Clinical)

Dale J. Anderson, M.D.,
Washington University, 1979.

Richard H. Anderson, M.D.,
St. Louis University, 1989; Ph.D.,
Brigham Young University, 1986.

Scott J. Arbaugh, M.D.,
St. Louis University, 1985.

Kelly Askins, M.D.,
Washington University, 1989.
(Malcolm Bliss Hospital)

Savita Bhat, M.D.,
Lokmanya Tilak Municipal Medical
College, 1986. (Malcolm Bliss
Hospital)

Allyson Boyle, M.D.,
Columbia University, 1983.

Shael Bronson, M.D.,
Washington University, 1945.

David M. Conner, M.D.,
University of Oklahoma, 1983.

David J. Goldmeier, M.D.,
Washington University, 1982.

Thomas Hartnett, M.D.,
University of Ottawa, 1959.

Linda S. Horne, M.D.,
Ohio State University, 1986.

F. Timothy Leonberger, Ph.D.,
University of Southern Mississippi,
1986. (Medical Psychology)
(Malcolm Bliss Hospital)

Douglas McCoy, M.D.,
Southern Illinois University, 1990.

Virgil L. Malmberg, M.D.,
University of Missouri, 1978.

Gregory Mattingly, M.D.,
Washington University, 1989.

Diane Rankin, M.D.,
University of Colorado, 1968.

Berette Salazar, M.D.,
University of New Mexico, 1982.

Nathan Simon, M.D.,
Washington University, 1955.

Lecturers (Adjunct)

Amy Bertelson, Ph.D.,
Ohio State University, 1979.
(Psychology)

Jane Grady, Ph.D.,
Washington University, 1989.
(Psychology)

Director of the Division of Child Psychiatry

Blanche F. Ittleson Associate
Professor

Richard Mattison, M.D.,
Cornell University, 1972. (Child
Psychiatry)

Professor Emeritus

E. James Anthony, D.P.M., University of London, 1947 (Child Psychiatry); M.D., 1949.

Professors

Barbara Geller, M.D., Albert Einstein College of Medicine, 1964. (Child Psychiatry)

Richard D. Todd, Ph.D., University of Texas, 1977; M.D., 1981 (Child Psychiatry) (See Department of Genetics.)

Associate Professor

Michele Van Eerdewegh, M.D., Free University of Brussels, 1970 (Child Psychiatry).

Associate Professors (Clinical)

Haruo Kusama, M.D., Washington University, 1965. (Child Psychiatry)

Zila Welner, M.D., Hebrew University, 1961. (Child Psychiatry) (See Department of Pediatrics.) (Hawthorne Children's Psychiatric Hospital)

Assistant Professor Emeritus

Loretta K. Cass Seleski, Ph.D., Ohio State University, 1950. (Medical Psychology)

Assistant Professors

Kelly N. Botteron, M.D., University of Kansas, 1988. (Child Psychiatry) (See Department of Radiology.)

Joan Luby, M.D., Wayne State University, 1985. (Child Psychiatry)

Barbara Swarzenski, M.D., Case Western Reserve University, 1986 (Child Psychiatry)

Research Assistant Professor

Gwendolyn G. Reich, Ph.D., Washington University, 1978. (Anthropology Child Psychiatry)

Assistant Professors (Clinical)

James E. Edwards, M.D., University of Tennessee, 1962. (Child Psychiatry)

Syed Raza, M.D., University of Karachi Pakistan, 1960. (Child Psychiatry)

Adolfo E. Rizzo, M.D., Buenos Aires University, 1955. (Child Psychiatry)

Jagdish Suri, M.D., King George Medical College, 1964. (Child Psychiatry)

Abby L. Wasserman, M.D., The Johns Hopkins University, 1970. (Child Psychiatry)

Instructors

John N. Constantino, M.D., Washington University, 1988. (Child Psychiatry) (See Department of Pediatrics.)

Barbara S. Silverstein, Ph.D., St. Louis University, 1994; M.S.W., Washington University, 1981. (Social Work)

Instructors (Clinical)

Michael R. Banton, M.D., St. Louis University, 1985. (Child Psychiatry)

Kimberli McCallum, M.D., Yale University, 1986. (Child Psychiatry)

Vinod Suri, M.D., Punjab University, 1962. (Hawthorne Children's Psychiatric Hospital)

DEPARTMENT OF RADIOLOGY

The Mallinckrodt Institute of Radiology (MIR) serves as the Department of Radiology for Washington University School of Medicine, helping to guide the consulting physician in the discovery, treatment, and, ultimately, the healing of disease. Established in 1930, MIR is one of the largest and most scientifically sophisticated radiological centers worldwide.

Internationally recognized for its groundbreaking research, the institute continues to pioneer new radiological techniques for better patient care.

Milestones:

- development of the first diagnostic test for gallbladder disease
- design and construction of the first cross-sectional X-ray laminagraph
- collaboration on design and installation of the first cyclotron located in a U.S. medical center
- development of positron emission tomography (PET)
- installation of one of the world's first computed tomography (CT) and magnetic resonance (MR) scanners
- interfacing of a minicomputer with a gamma camera, improving accuracy and efficiency of nuclear medicine procedures
- integration of CT and MR scans with three-dimensional technology
- application of modern organic chemistry to the preparation of radiopharmaceuticals used in medical imaging
- measurement of cerebral blood flow and metabolism
- establishment of the region's most comprehensive vascular and interventional radiology center
- application of PET for measuring metabolic activity in relation to blood flow in the heart
- development of a three-dimensional treatment planning program for cancer
- collaboration on development and installation of the world's first Tandem Cascade Accelerator.

The Institute occupies more than 320,000 total square feet, comprising its own 13-story building with satellite facilities in Barnes, Barnard, Jewish, St. Louis Children's and Wohl hospitals and in the Clinical Sciences Research, Forest Park, and East buildings. The department provides diagnostic radiology, nuclear medicine, radiation physics, and radiation oncology services for all hospitals in the Washington University Medical Center, Barnes West County Hospital, and Barnes St. Peters Hospital.

The first floor of the institute houses a film library, reception and scheduling areas, consultation viewing rooms, and the 118-seat Scarpellino Auditorium.

Clinical facilities for the Radiation Oncology Center at Barnes Hospital are on the ground and first floors of the institute, in Barnard Hospital, and in the Barnes Hospital West Pavilion. Additionally, a large, modern radiation oncology facility is at Jewish Hospital. Therapy equipment consists of state-of-the-art Clinac linear accelerators: 2300, 2100C, 6-100, and 4MV. Six state-of-the-art simulators, a CT simulator, several computers, and three-dimensional advanced planning systems are available for treatment planning. Facilities and sources for interstitial and intracavitary therapy and advanced remote afterloading equipment for interstitial and external hyperthermia are available. A program for stereotactic irradiation has been operational for two years. On-line portal imaging and multihead collimation devices are integral components of the Radiation Oncology Center's armamentarium.

MIR clinical facilities are on the second floor (chest radiology, body computed tomography, operating room imaging, and computed radiography); third floor (neuroradiology, angiography, MRI); fourth floor (gastrointestinal and genitourinary radiology); and the fifth floor (MRI and CT body). PET clinical and research facilities are available on the seventh floor. A comprehensive vascular and interventional radiology center occupies the eighth floor. Nuclear medicine is on the ninth floor of the Barnes Hospital West Pavilion. The tenth floor of the West Pavilion houses ultrasonography and outpatient radiology, including a comprehensive Breast Diagnostic Center. Orthopedic X-ray facilities are on the eleventh floor of the West Pavilion and in the Wohl Clinic. In the north wing of St. Louis Children's Hospital, the first floor houses a complete pediatric radiology facility offering ultrasound, nuclear medicine, CT, and MRI. The recently renovated diagnostic radiology facilities at Jewish Hospital offer state-of-the-art equipment and a staff of talented specialists in abdominal and chest radiology, mammography, musculoskeletal radiology, MR, nuclear medicine, and vascular and interventional radiology.

The Institute has 92 examination rooms for diagnostic radiology, eight CT scanners with spiral CT capability, four PET scanners, six MR scanners, 16 ultrasound machines, 11 digital vascular imaging systems, and six linear accelerators. In addition, as part of the department's community outreach effort, the institute cosponsors with Barnes Hospital a mobile mammography van that provides screening services at corporate and public sites in the St. Louis metropolitan area.

Research facilities are on the third (hyperthermia and brachytherapy) and sixth (physics) floors of Barnard Hospital, the Clinical Sciences Research Building (radiation oncology, radiation sciences, nuclear medicine), and the East Building (electronic radiology and three-dimensional image processing). The Clinical Sciences Research Building also houses sophisticated computer facilities that are utilized for

clinical, research, and teaching applications. Administrative, teaching, and support functions occupy the ninth through twelfth floors of the institute. The Forest Park Building houses radiation oncology, cancer biology, the oncology data and computer center, and the Radiation Oncology Center's administrative offices.

The Mallinckrodt Institute of Radiology at Washington University Imaging Center is an extension of the medical school campus East Building. Opened in November 1994, the Imaging Center's 70,000 square feet of space is dedicated to PET, MR, and related sciences research. One of the best equipped multidisciplinary facilities worldwide, the imaging center provides centralized resources for the scientific evaluation of imaging technology and for the development and application of advanced imaging systems. Researchers have access to advanced PET systems, a 4.7 Telsa MR scanner, three Siemens Vision 1.5 Telsa MR scanners with Echo Planar Imaging capability, a Tandem Cascade Accelerator, in vivo MR spectroscopy, radiopharmaceutical laboratories, animal care facilities, a neuropsychology laboratory, electrical engineering laboratories for image reconstruction, a three-dimensional image processing laboratory, high-end graphics workstations, and a Siemens Somatom Plus Spiral CT Diagnostic Image Evaluation/Reconstruction console.

FIRST YEAR

In their first year, medical students are introduced to radiology in two separate ways. During the first semester of the gross anatomy course, conferences are given by several members of the radiology staff in the following areas: neuro, chest, cardiac, musculoskeletal, and abdominal radiology. These sessions are arranged to coincide with the particular area of the body being studied in the anatomical dissection classes. Conferences are conducted in small groups giving students an opportunity to relate directly with the radiologists. *Dr. Vannier*

The second form of contact with radiology is a five-week elective seminar. This course seeks to reinforce the first semester anatomy experience by relating previously learned anatomical information to radiographic images. Radiologists from different subspecialties moderate these seminars in which students work in small groups. Each group presents selected radiological topics to the remainder of the students taking the elective. *Dr. Kotner*

SECOND YEAR

Twenty hours of lecture are devoted to an introduction to radiology. The majority of the course is devoted to diagnostic radiology including computed tomography, ultrasound, nuclear medicine, and magnetic resonance. Radiation biology and radiation oncology are also introduced. *Dr. M. Siegel*

ELECTIVES

Research Electives

Opportunities are available to carry out research in the laboratories under the guidance of the staff in the fields of diagnostic radiology, therapeutic radiology, radiation physics, and nuclear medicine.

Dr. Vannier

Summer Oncology Clerkship for First-Year Students

An eight-week summer clerkship program is available for first-year medical students. The students participate in the clinical activities of the Division of Radiation Oncology and are exposed to the fundamental concepts of cancer biology and clinical radiation therapy in a series of lectures, seminars, and case presentation conferences. They have the opportunity to conduct either laboratory research or clinical investigation under the direction of the staff members of the sections of clinical radiation oncology and cancer biology. *Dr. Simpson*

FOURTH YEAR ELECTIVES

Clerkship in Radiation Oncology

A four- or six-week elective in which the student has the opportunity to see patients being evaluated and treated in radiation oncology. Emphasis is on techniques of cancer diagnosis and localization, selection of therapy, indications for irradiation and techniques on treatment planning, simulation, and irradiation of a variety of tumors. There are several conferences in which the students participate, including new case-planning conferences, a clinical physics conference, a protocol conference, and interdepartmental conferences with pediatric oncology, thoracic oncology, gynecologic oncology, surgery, and pathology.

Drs. Simpson or Perez

Diagnostic Radiology Electives

The role of radiology in the solution of clinical diagnostic problems is emphasized in this clerkship. Each student will spend one or two weeks in each of three or more subspecialty sections within the department (abdomen, musculoskeletal, interventional, chest, neuroradiology, nuclear medicine, pediatric radiology, radiation oncology, computed tomography, and magnetic resonance imaging) under the supervision of a senior faculty member. The student will have a chance to observe special procedures and emergency radiological examinations, as well as routine imaging studies. During the clerkship, the student will spend part of one evening reviewing films in the emergency room with the radiology resident on call. Conferences intended to complement the subspecialty approach to radiology round out this experience.

Clerkships in diagnostic radiology with a slightly different format are also offered at Jewish Hospital. *Dr. Kotner*

Nuclear Medicine - Clinical

A four- or six-week elective in which the student will be exposed to the full range of radionuclide imaging techniques, including SPECT and PET, and also to radionuclide therapy. In conjunction with the staff, the student will be responsible for planning and interpreting nuclear medicine studies of patients referred to the department. Emphasis is placed on integration of nuclear medicine data with clinical and radiologic findings. There are daily conferences and scan interpretation sessions. Participation in clinical and laboratory research projects may also be arranged if desired. *Dr. B. Siegel*

Nuclear Medicine - Research

Research projects are available in ongoing studies related to the oncologic applications of positron emission tomography (PET). Current projects include: (1) non-invasive assessment of estrogen receptors and androgen receptors in breast cancer and prostate cancer; (2) evaluation of positron-emitting radiolabeled monoclonal antibodies in colorectal carcinoma; (3) assessment of regional tumor hypoxia; (4) evaluation of somatostatin receptors in small cell lung cancer; and (5) role of PET in diagnosis and staging of cancers of the breast, lung, and pancreas. *Drs. B. Siegel, Dehdashti, and Dobkin*

Research opportunities are available in studies utilizing single-photon emission computed tomography (SPECT) and positron emission tomography, magnetic resonance imaging and echocardiography, to investigate (1) the relationship between myocardial perfusion, intermediary metabolism, and mechanical function in humans; (2) the impact of various disease states, particularly acute and chronic coronary syndromes, on myocardial energy production and transduction; and (3) the effects of various therapeutic interventions for these diseases on myocardial energy production and transduction. *Dr. Gropler*

Research projects are available in computer applications in nuclear medicine, including: (1) development of three-dimensional display software for tomographic imaging (both PET and SPECT); (2) quantitative analysis of cardiac PET studies; (3) development of tomographic reconstruction algorithms; and (4) image registration. The student can undertake either practical computer applications, including program and hardware development, or more theoretical, mathematically based projects. Prior training in calculus and some computer experience are essential. *Drs. Miller and Wallis*

Faculty

Elizabeth E. Mallinckrodt
Professor, Head of Department
and Director of the
Mallinckrodt Institute of
Radiology

Ronald G. Evens, M.D.,
Washington University, 1964. (See
Department of Economics.)

Professors

Joseph J. H. Ackerman, Ph.D.,
Colorado State University, 1977.
(See Department of Chemistry.)

D. Clair Anderson, M.D.,
Washington University, 1971.

Dennis M. Balfe, M.D.,
Medical College of Wisconsin, 1975.

Steven R. Bergmann, M.D.,
Washington University, 1985; Ph.D.,
Hahnemann Medical College, 1977.
(See Department of Internal
Medicine, Cardiovascular Division.)

G. James Blaine III, D.Sc.,
Washington University, 1974. (See
Institute for Biomedical Comput-
ing.)

Ralph V. Clayman, M.D.,
University of California, 1973. (See
Department of Surgery.)

James P. Crane, M.D.,
Indiana University, 1970. (See
Department of Genetics and
Department of Obstetrics and
Gynecology.)

John O. Eichling, Ph.D.,
Washington University, 1970.

Mokhtar Gado, DMRE,
Cairo University, 1960. (See
Neurological Surgery.)

Louis A. Gilula, M.D.,
University of Illinois, 1967. (See
Department of Surgery.)

Harvey S. Glazer, M.D.,
Washington University, 1976.

Robert L. Grubb, Jr., M.D.,
University of North Carolina, 1965.
(See Departments of Neurology
and Neurological Surgery.)

E. Mark Haacke, Ph.D.,
University of Toronto, 1978.

Jay P. Heiken, M.D.,
Columbia University, 1978.

R. Gilbert Jost, M.D.,
Yale University, 1969. (Also School
of Engineering and Applied
Science, Department of Computer
Science.)

Daniel K. Kido, M.D.,
Loma Linda University, 1965.

Philip A. Ludbrook, M.B., B.S.,
University of Adelaide, 1963. (See
Department of Medicine.)

William H. McAlister, M.D.,
Wayne State University, 1954. (See
Department of Pediatrics.)

Jeffrey L. Marsh, M.D.,
The Johns Hopkins University,
1970. (See Departments of Surgery
and Pediatrics.)

Michael I. Miller, Ph.D.,
The Johns Hopkins University,
1983. (See Department of Electrical
Engineering.)

Thomas R. Miller, Ph.D.,
Stanford University, 1971; M.D.,
University of Missouri, 1976.

Michael K. Pasque, M.D.,
University of Oklahoma, 1989. (See
Department of Surgery.)

Gordon W. Philpott, M.D.,
Washington University, 1961. (See
Department of Surgery.)

Daniel D. Picus, M.D.,
The University of Chicago, 1981.

Marcus E. Raichle, M.D.,
University of Washington, 1964.
(See Neurology.)

Henry D. Royal, M.D.,
St. Louis University, 1974.

Stuart S. Sagel, M.D.,
Temple University, 1965.

Gary D. Shackelford, M.D.,
Washington University, 1968. (See
Department of Pediatrics.)

Barry A. Siegel, M.D.,
Washington University, 1969. (See
Department of Medicine.)

Marilyn J. Siegel, M.D.,
State University of New York, 1969.
(See Department of Pediatrics.)

Donald L. Snyder, Ph.D.,
Massachusetts Institute of Technol-
ogy, 1966. (See Department of
Electrical Engineering.)

William G. Totty, M.D.,
University of Tennessee, 1975.

Michael W. Vannier, M.D.,
University of Kentucky, 1976. (See
Department of Surgery, and
Division of Plastic and Reconstructive
Surgery.)

Michael J. Welch, Ph.D.,
University of London, 1965. (Also
Faculty of Arts and Sciences,
Department of Chemistry.)

Professors Emeritus and Lecturers

Fred J. Hodges III, M.D.,
University of Wisconsin, 1946.

Michel M. Ter-Pogossian, Ph.D.,
Washington University, 1950. (See
Department of Medicine.)

Professor (Clinical)

Noah Susman, M.D.,
Washington University, 1952.

Professor (Adjunct)

Edward A. Deutsch, Ph.D.,
Stanford University, 1967.

Associate Professors

James A. Brink, M.D.,
Indiana University, 1984.

Jeffrey J. Brown, M.D.,
University of California, San Diego,
1983.

Michael D. Darcy, M.D.,
Ohio State University, 1979.

Keith C. Fischer, M.D.,
The Johns Hopkins University,
1971.

Fernando R. Gutierrez, M.D.,
University of Valladolid, 1974.

Marshall E. Hicks, M.D.,
University of Kentucky, 1982.

Charles F. Hildebolt, D.D.S.,
Ohio State University, 1970; Ph.D.,
Washington University, 1987.

Rexford L. Hill, M.S.,
University of Cincinnati, 1966.
(Also School of Engineering and
Applied Science, Department of
Computer Science.)

Lawrence M. Kotner, Jr., M.D.,
Washington University, 1968.

Benjamin C. P. Lee, M.B., B.S.,
University of London, 1966.

Robert G. Levitt, M.D.,
University of California, 1972.

Robert C. McKnight, M.D.,
Washington University, 1961. (See
Department of Medicine.)

William D. Middleton, M.D.,
Duke University, 1981.

Scott A. Mirowitz, M.D.,
Washington University, 1985.

Stephen M. Moerlein, Ph.D.,
Washington University, 1982.

Barbara S. Monsees, M.D.,
Washington University, 1975.

Christopher J. Moran, M.D.,
St. Louis University, 1974.

Joel S. Perlmutter, M.D.,
University of Missouri, 1979. (See
Departments of Neurology and
Neurological Surgery.)

Steven E. Petersen, Ph.D.,
California Institute of Technology,
1982. (See Neurology.)

David R. Piwnica-Worms, M.D.,
Ph.D., Duke University, 1984.

William J. Powers, M.D.,
Cornell University, 1975. (See
Departments of Neurology and
Neurological Surgery.)

William R. Reinus, M.D.,
New York University, 1979. (See
Department of Medicine.)

Keith M. Rich, M.D.,
Indiana University, 1977. (See
Neurological Surgery.)

Daniel P. Schuster, M.D.,
Yale University, 1976. (See
Department of Internal Medicine.)

Franz J. Wippold II, M.D.,
St. Louis University, 1977.

Associate Professors (Clinical)

Sumner Holtz, M.D.,
St. Louis University, 1948.

Philip J. Weyman, M.D.,
Yale University, 1972.

Assistant Professor Emeritus

Armand Diaz, R.N., R.T.,
Havana University, 1948.

Assistant Professors

Carolyn J. Anderson, Ph.D.,
Florida State University, 1990.

Mark M. Bahn, M.D.,
University of Minnesota, 1981;
Ph.D., University of California, Los
Angeles, 1988.

Prem Sri T. Barton, M.D.,
Mahidol University, 1973.

Harold F. Bennett, M.D., Ph.D.,
University of Illinois, 1988.

Joseph A. Borrello, M.D.,
University of Michigan, 1983.

Kelly N. Botteron, M.D.,
University of Kansas, 1988. (See
Department of Psychiatry.)

Thomas E. Conturo, M.D., Ph.D.,
Vanderbilt University, 1989.

DeWitte T. Cross III, M.D.,
University of Alabama, 1980.

P. Duffy Cutler, Ph.D.,
University of California, Los
Angeles, 1992.

William B. Dawson, M.D.,
University of Oklahoma School of
Medicine, 1973.

Farrokh Dehdashti, M.D.,
Pahlavi University, 1977.

Steven Don, M.D.,
Vanderbilt University, 1985.

Wayne C. Drevets, M.D.,
University of Kansas, 1983. (See
Department of Psychiatry.)

James R. Duncan, M.D., Ph.D.,
Washington University, 1988. (See
Department of Cell Biology and
Physiology.)

Edward M. Geltman, M.D.,
New York University, 1971. (See
Department of Medicine.)

Mary L. Graham, M.D.,
University of Missouri, Kansas City,
1985.

Diana L. Gray, M.D.,
University of Illinois, 1981. (See
Department of Obstetrics and
Gynecology.)

Robert J. Gropler, M.D.,
University of Cincinnati, 1981.

John W. Haller, Ph.D.,
University of Missouri, St. Louis,
1991. (See Department of Psychia-
try.)

Thomas E. Herman, M.D.,
The Johns Hopkins University, 1975.

David M. Hovsepian, M.D.,
Columbia University, 1986.

Michael G. Kahn, M.D., Ph.D.,
University of California, San
Francisco, 1988. (See Department of
Internal Medicine.)

Debiao Li, Ph.D.,
University of Virginia, 1992.

Zhaohai Li, Ph.D.,
Columbia University, 1989.

Weili Lin, Ph.D.,
Case Western Reserve University,
1993.

Kevin W. McEnery, M.D.,
Georgetown University, 1986.

**Elizabeth Gerard McFarland,
M.D.**, University of California, San
Diego, 1987.

Mary A. Middleton, M.D.,
Medical College of Wisconsin, 1982.

Roberto Pacifici, M.D.,
Perugia University, 1981. (See
Department of Medicine.)

Tracy L. Roberts, M.D.,
University of South Carolina, 1986.

**Douglas D. Robertson, Jr., M.D.,
Ph.D.**, Georgetown University,
1982. (See Department of Surgery.)

Janice R. Semenkovich, M.D.,
Washington University, 1981.

Yvette I. Sheline, M.D.,
Boston University, 1979. (See
Department of Psychiatry.)

Peter E. Shile, M.D.,
Yale University, 1985. (See Depart-
ment of Medicine.)

Cary L. Siegel, M.D.,
University of Michigan, 1987.

Celette S. Skinner, Ph.D.,
University of North Carolina,
Chapel Hill, 1991.

Richard M. Sloan, M.D.,
University of Florida, 1989.

Emily L. Smith, M.D.,
Washington University, 1968.

Sharlene A. Teeffy, M.D.,
University of Hawaii, 1980.

Alan J. Tiefenbrunn, M.D.,
Washington University, 1974. (See
Department of Medicine.)

Thomas M. Vesley, M.D.,
Mayo Medical School, 1986.

Jerold W. Wallis, M.D.,
Stanford University, 1981.

Ge Wang, Ph.D.,
SUNY, Buffalo, 1992.

O. Clark West, M.D.,
Washington University, 1986.

Darryl A. Zuckerman, M.D.,
SUNY, Syracuse, 1983.

Research Assistant Professors

Gary E. Christensen, D.Sc.,
Washington University, 1994. (See
Department of Surgery.)

**Sampathkumaran S.
Kondapuram, M.S.**,
McMaster University, 1976. (See
Department of Medicine.)

Stephen M. Moore, M.S.,
Washington University, 1984.

Tom O. Videen, Ph.D.,
University of Washington, 1981.
(See Neurology.)

Assistant Professors (Clinical)

John L. Bardsley, M.D.,
University of Illinois, 1964.

Enrique Cubillo, M.D.,
University of Madrid, 1962.

Gene L. Davis, Jr., M.D.,
University of Virginia, 1972.

James W. Debnam, M.D.,
University of Louisville, 1962.

Guillermo C. Geisse, M.D.,
University of Chile, 1965.

Albert E. Hesker, M.D.,
University of Missouri, 1964.

Daniel J. Leary, Jr., M.D.,
Washington University, 1966.

Allan H. McCown, M.D.,
Washington University, 1964.

Ben R. Mayes, Jr., M.D.,
Washington University, 1966.

Gary H. Omell, M.D.,
University of Tennessee, 1967.

Naris Rujanavech, M.D.,
Faculty of Medicine, Siriraj Hospital,
1972.

Robert F. Scheible, M.D.,
Washington University, 1972.

Steven L. Solomon, M.D.,
The University of Chicago, 1985.

Chandrakant C. Tailor, M.B., B.S.,
Maharaja Sayajirao University of
Baroda, 1972.

Assistant Professors (Adjunct)

Milorad M. Rogic, Ph.D.,
University of Belgrade, 1961.

Christopher G. Ullrich, M.D.,
SUNY, Upstate, 1976.

Instructors

Carlos F. Aquino-Aponte, M.D.,
University of Puerto Rico, 1985.

Kim Baker, M.D.,
University of Alberta, 1989.

Gulab Bhatia, M.S.,
Southern Illinois University,
Edwardsville, 1987.

Gregory R. Cizek, M.D.,
Washington University, 1990.

G. Glenn Coats, M.D.,
University of California, Irvine, 1990.

Constance S. Courtois, M.D.,
Medical University of South
Carolina, 1985.

Michael G. Crowley, Ph.D.,
University of Florida, 1982.

Colin P. Derdeyn, M.D.,
University of Virginia, 1988.

Robert J. Feiwell, M.D.,
University of California, San Diego,
1990.

Glenn Fletcher, Ph.D.,
Michigan State University, 1981.

Kenneth L. Ford III, M.D.,
Baylor College of Medicine, 1991.

Donald F. Frei, Jr., M.D.,
University of Cincinnati, 1989.

David S. Gierada, M.D.,
Wayne State University, 1988.

Rachael E. Gordon, M.D.,
University of Colorado, 1990.

Phillip B. Gunther, M.D.,
University of Colorado, 1990.

Glenn M. Hammer, M.D.,
University of Iowa, 1991.

Paul Sek-Bin Hsieh, M.D.,
University of Michigan, 1989.

Robert Y. Kanterman, M.D.,
University of Miami, 1991.

Keith A. Kronemer, M.D.,
Tulane University, 1990.

Dennis L. Lambert, Ph.D.,
Washington University, 1994. (See
Health Administration.)

Gary D. Luker, M.D.,
Washington University, 1991.

Timothy J. McCarthy, Ph.D.,
University of Liverpool, 1989.

James D. Matthews, M.D.,
Medical College of Virginia, 1989.

William B. Mehard, M.D.,
Medical University of South Carolina,
1990.

James M. Milburn, M.D.,
University of Missouri, Kansas City,
1990.

Mitchell A. Miller, M.D.,
Stanford, 1988.

Sean M. Muldowney, M.D.,
University of North Carolina, 1991.

Nathan C. Nelson, M.S.,
University of Colorado, 1993.

Thomas K. Pilgram, Ph.D.,
University of California, Berkeley,
1982.

Linda King Proctor, M.D.,
University of Pennsylvania, 1989.

Vallabhaneni V. Rao, Ph.D.,
University of Hyderabad, 1987.

Valerie C. Reichert, M.D.,
Stanford University, 1990.

David J. Scherer, M.S.,
Virginia Polytechnic Institute, 1982.

Francis J. Schlueter, M.D.,
University of Cincinnati, 1990.

Ken L. Schreiber, M.D.,
Case Western Reserve University,
1991.

Sharon Schubach, M.D.,
New York Medical College, 1990.

Vijay Sharma, Ph.D.,
Panjab University, 1987.

Kurt R. Simpson, M.D.,
Washington University, 1991.

Isabel C. Soroeta, M.D.,
University of Puerto Rico, 1989.

Glenn M. Strome, M.D.,
University of California, San
Francisco, 1991.

Avinash M. Sud, M.D.,
University of Tennessee, 1986.

Robert C. Volger, M.D.,
University of North Carolina, 1991.

Michael J. Wallace, M.D.,
University of Texas, 1990.

Pamela K. Woodard, M.D.,
Duke University, 1990.

Terry D. Yeager, M.D.,
Washington University, 1988.

Research Instructors

Carmen S. Dence, M.S.,
Florida State University, 1972.

Sally W. Schwarz, M.S.,
University of Southern California,
1976.

Instructors (Clinical)

Stephen F. Albert, M.D.,
St. Louis University, 1968.

Maryellen E. Amato, M.D.,
Case Western Reserve University,
1981.

Arthur F. Bishop, M.D.,
University of Illinois, 1977.

Charles F. Garvin, M.D.,
University of Missouri, Kansas City,
1982.

James A. Junker, M.D.,
St. Louis University, 1979.

John H. Niemeyer, M.D.,
Washington University, 1982.

Edward F. Ragsdale, M.D.,
Washington University, 1964.

Jerry Tobler, M.D.,
Yale University, 1983.

Research Associates

Laura A. Bass, Ph.D.,
Washington University, 1994.

David E. Beecher, M.S.,
Washington University, 1980.

Cathy S. Cutler, Ph.D.,
University of Cincinnati, 1993.

Kim A. Deal, Ph.D.,
University of Wisconsin, 1993.

Paritosh Dhawale, Ph.D.,
Case Western Reserve University,
1994.

David C. Ficke, B.S.E.E.,
Southern Illinois University, 1974.

Julie A. Fiez, Ph.D.,
Washington University, 1992. (See
Neurology.)

Kenneth B. Larson, Ph.D.,
Massachusetts Institute of Technology,
1964.

Eyal Mishani, Ph.D.,
Tel-Aviv University, 1994.

David E. C. Reichert, Ph.D.,
University of Illinois, 1994.

Robert A. Whitman, M.S.,
Washington University, 1989.

Ming Xu, M.S.,
University of Tennessee, 1992.

Dmitriy A. Yablonskiy, Ph.D.,
Institute for Physics and Engineering
of the Ukrainian Academy of Sciences,
1981.

Research Associates (Adjunct)

Pietro R. Biondetti, M.D.,
Padova University, 1977.

Arjun Godhwani, Ph.D.,
University of Arkansas, 1971.

Research Assistants

Erbil Akbudak, M.S.,
Washington University, 1992.

Nilesh R. Gohel, M.S.E.E.,
Washington University, 1994.

Zhonghong Guan, M.D., Ph.D.,
Tonji Medical University, 1993.

Gary R. Hoffman, B.A.,
University of Missouri, 1976.

Menelaos N. Karamichalis, M.S.E.E.,
Washington University, 1993.

Shantanu V. Kaushikkar, M.S.,
Case Western Reserve University,
1993.

Frederick G. Kuhns, M.S.E.E.,
Washington University, 1991.

Yi Li, B.S.,
University of Science and Technology
of China, 1991.

Ann Mary MacLeod, B.S.,
Eastern New Mexico University, 1988.

David L. Melson, B.S.E.E.,
Washington University, 1993.

Gregory C. Reiker, M.S.,
Washington University, 1993.

Helmut Stark, M.S.,
Technical Institute of München, 1992.

Yuming Yin, M.D.,
Beijing Medical University, 1983.

DIVISION OF RADIATION ONCOLOGY

Professor and Director

Carlos A. Perez, M.D.,
University of Antioquia, 1960.

Professors

Bahman Emami, M.D.,
Tehran University, 1968. (See
Department of Otolaryngology.)

Perry W. Grigsby, M.D.,
University of Kentucky, 1982.

Hsiu-san Lin, M.D.,
Taiwan University, 1960; Ph.D., The
University of Chicago, 1968. (See
Department of Molecular Microbiol-
ogy.)

James A. Purdy, Ph.D.,
University of Texas, 1971. (Radi-
ation Physics). (See Institute for
Biomedical Computing.)

Joseph L. Roti Roti, Ph.D.,
University of Rochester, 1972.
(Cancer Biology) (See Department
of Cell Biology and Physiology and
Department of Biochemistry and
Molecular Biophysics.)

Teresa J. Vietti, M.D.,
Baylor University, 1953. (Radiation
Oncology) (See Department of
Pediatrics.)

Todd H. Wasserman, M.D.,
University of Rochester School of
Medicine and Dentistry, 1972.

Jeffrey F. Williamson, Ph.D.,
University of Minnesota, 1982.
(Radiation Physics)

Associate Professors

Andrei Laszlo, Ph.D.,
University of California, 1981.
(Cancer Biology)

Robert J. Myerson, Ph.D.,
University of California, 1974; M.D.,
University of Miami, 1980.

Gilbert H. Nussbaum, Ph.D.,
Harvard University, 1967. (Radiation
Physics)

Joseph R. Simpson, Ph.D.,
The University of Chicago, 1967;
M.D., Harvard University, 1973.

Associate Professor Emeritus (Clinical)

A. Norman Arneson, M.D.,
Washington University, 1928. (See
Department of Obstetrics and
Gynecology.)

Associate Professors (Clinical)

Venkata R. Devineni, M.D.,
Osmania Medical College, 1974.

Bruce J. Walz, M.D.,
Washington University, 1966.

Assistant Professors

Robert E. Drzymala, Ph.D.,
University of Oklahoma, 1977.
(Radiation Physics) (See Neurologi-
cal Surgery.)

Prabhat Goswami, Ph.D.,
Gauhati University, 1983. (Cancer
Biology)

Mary V. Graham, M.D.,
University of Missouri, 1985.

Clayton Hunt, Ph.D.,
The University of Chicago, 1979.
(Cancer Biology)

Daniel A. Low, Ph.D.,
Indiana University, 1988. (Radiation
Physics)

Michael A. Mackey, Ph.D.,
University of California, San
Francisco, 1987. (Cancer Biology)

Jeff M. Michalski, M.D.,
Medical College of Wisconsin, 1986.

Eduardo G. Moros, Ph.D.,
University of Arizona, Tucson,
1990. (Radiation Physics)

Douglas R. Spitz, Ph.D.,
University of Iowa, 1984. (Cancer
Biology)

Research Assistant Professor

Ryuji Higashikubo, Ph.D.,
Bowling Green State University,
1978. (Cancer Biology)

Assistant Professors (Clinical)

Eric E. Klein, M.S.,
University of Massachusetts, 1985.

McDonald B. Logie, M.D.,
Northwestern University, 1967.

Instructors

Walter R. Bosch, D.Sc.,
Washington University, 1990.
(Radiation Physics)

Kun-san Chao, M.D.,
Kaohsiung Medical College, 1982.

Yihong A. Cheng, M.S.,
Washington University, 1987.
(Radiation Physics)

Ming-shun Chen, Ph.D.,
Kansas State University, 1991. (Cancer
Biology)

Seymour Fox, Ph.D.,
University of Oklahoma, 1977. (Com-
puter Sciences)

Russell L. Gerber, M.S.,
St. Louis University, 1985. (Radiation
Physics)

William B. Harms, Sr., B.S.,
University of Missouri, 1979. (Radiation
Physics)

Henry K. Lee, M.D.,
Wayne State University, 1985.

Robert S. Malyapa, M.D.,
All India Institute of Medical Sciences,
1987; Ph.D., Hiroshima University, 1992.

John W. Matthews, D.Sc.,
Washington University, 1980. (Computer
Sciences) (See Institute for Biomedical
Computing.)

Daniel F. Mullen, D.D.S.,
University of Missouri, 1977. (Computer
Sciences)

William L. Straube, M.S.,
Washington University, 1992. (Radiation
Physics)

Marie E. Taylor, M.D.,
University of Washington, Seattle, 1982.

Instructor (Clinical)

Gary A. Ratkin, M.D.,
Washington University, 1967. (See
Department of Medicine.)

Research Associates

Ping Hou, Ph.D.,
University of Utah, 1993. (Radiation
Physics)

Assen S. Kirov, Ph.D.,
Sofia University, 1993. (Radiation
Physics)

Thomas Lakanen, M.E.M., M.B.A.,
Washington University, 1994. (Radiation
Physics)

Robert P. Vanderwaal, Ph.D.,
University of Illinois, 1993. (Cancer
Biology)

Mai Xu, M.D., Ph.D.,
China Medical University, 1992. (Cancer
Biology)

Xiafang Zhang, M.D.,
Shanghai Medical University, 1968.
(Cancer Biology)

Research Assistant

William D. Wright, B.S.,
University of California, 1976.
(Cancer Biology)

MARY CULVER DEPARTMENT OF SURGERY

The Department of Surgery includes the Divisions of General Surgery, Cardiothoracic Surgery, Pediatric Surgery, Plastic Surgery and Urologic Surgery. The formal instruction begins in the third year. For the duration of the 12-week rotation in the Department of Surgery, students are assigned clinical rotations in which they have the opportunity to participate in the care of surgical patients. Students attend daily patient rounds and outpatient clinics as well as scheduled and emergency surgical procedures. Seminars and teaching conferences are scheduled on a regular basis. In the fourth year, students may select a subinternship or a preceptorship elective in the Division of General Surgery. In addition, electives are available in pediatric surgery, transplant surgery, vascular surgery, cardiovascular and thoracic surgery, urologic surgery, and plastic and reconstructive surgery.

THIRD YEAR

During the 12-week surgery rotation in the third year, students work directly with residents and faculty on rotation in hospitals throughout the Medical Center, including Barnes Hospital, Jewish Hospital, St. Louis Regional Medical Center, John Cochran Veterans Administration Hospital, and St. Louis Children's Hospital. The student actively participates in patient care delivery to both hospitalized patients and to patients in the ambulatory care setting. Formal conferences consist of case presentations to the faculty, core lectures in surgery, ward rounds, and departmental and divisional rounds.

FOURTH YEAR

There are opportunities for fourth-year student rotations within each division in the Department of Surgery. The student is encouraged to actively participate in planning his or her fourth-year rotation within the department so that the resources and faculty expertise within the department can be maximally utilized by the student during the rotation. Generally, the minimum duration of a fourth-year rotation in the Department of Surgery is four weeks.

General Surgery Subinternship—Barnes Hospital

Each student will be assigned to the general surgery resident ward and will function as a member of the team, sharing most of the duties of an intern. The student will share night call under supervision of the first- and second-year residents in rotation with the two ward interns. In addition, part of the rotation may be taken in the Surgical Intensive Care Unit. The

purpose of this portion of the rotation is to familiarize the student with the care of the critically ill surgical patient. Rounds are made every morning with faculty members from the Department of Surgery and a senior surgical resident. Students are encouraged to participate actively in these rounds. They are also encouraged to read about the problems they encounter and to participate as integral members of the team providing care for the patients. *Dr. Wells, Dr. Andriole and Staff*

Jewish Hospital Subinternship

The senior rotation at Jewish Hospital is an extremely flexible program. Within the framework of providing a good background in and experience with surgical diseases, many approaches are allowable. A student may divide the rotation here choosing some time on a specialty or spending all of the rotation as a surgical subintern. *Dr. Philpott and Staff*

St. Louis Regional Medical Center Subinternship

Students work under the supervision of the chief resident in Surgery and are integral members of the surgical team. Ward rounds are made twice daily. Students are assigned new patients for complete history and physical examinations and are expected to formulate a plan of diagnosis and treatment. Students assist in the operating room on their patients as well as at the direction of the chief resident. Students attend the weekly teaching conference at 8:15 a.m. on Tuesdays and the Morbidity and Mortality Conference held on alternate weeks, and attend the General Surgery Conferences at Barnes Hospital as well. Night call is shared with a surgical assistant resident. *Dr. Monafio*

General Surgery Clerkship, Rural Practice

Students work under the supervision of two general surgeons involved in rural practice at the Keokuk Area Hospital, Keokuk, Iowa. Students function under a preceptorship arrangement and are involved in the diagnosis and management of a large variety of patients with general surgery conditions. Patients are followed from their initial office visit through outpatient diagnostic procedures and on to hospital admission for operation. Students are an integral part of the practice of the two general surgeons. Housing is provided across the street from the hospital and food maintenance is covered by the hospital. Keokuk is located approximately three and one-half hours north of St. Louis and is accessible by car. *Drs. Sirospour and Kinateder*

Preceptorships in General Surgery

The student works with a senior general surgeon within the Division of General Surgery. Student involvement in all aspects of clinical surgery is accomplished by student attendance in the outpatient office, preoperative patient evaluation, in-hospital patient management, and postoperative outpatient follow-up after discharge in conjunction with the

senior general surgeon. The student may plan an individual preceptorship program with a surgeon specializing in an area of particular interest to the student. *Dr. Andriole and Staff*

Transplantation Surgery Elective

The care of transplantation patients requires the integration of multiple diverse medical and surgical disciplines. This elective clerkship in organ transplantation encompasses preoperative cadaveric and living related donor evaluation for adult and pediatric recipients of kidney, liver and pancreatic grafts as well as associated operative procedures in patients with end organ failure. Emphasis is placed on postoperative care, multimodality immunosuppression, management of allograft rejection and organ retrieval and preservation. Basic hepatic, pancreatic and renal physiology, fluid and electrolyte balance, operative techniques and transplantation immunology are stressed. Management of the complications of diabetes, portal hypertension and infectious diseases are a part of the complete management of these patients. This course is designed to offer the student an overview of the field of organ transplantation. The student functions as an integral part of the transplant team and assumes appropriate responsibilities under supervision. A vigorous and varied clinical schedule should be anticipated. An interview is recommended prior to selecting this elective. *Dr. Howard and Staff*

Vascular Surgery Elective

The senior elective in Vascular Surgery offers the medical student the opportunity to become an integral member of the vascular surgery team, comprising three junior level surgery residents, three senior level surgery residents, and six attending surgeons. The student actively participates in the preoperative and postoperative care of patients with a variety of complex medical and vascular problems. The student is actively involved in the operating room for assigned cases and participates in daily teaching rounds as well as two weekly conferences with the attending surgeons. *Dr. Sicard and Staff*

Pediatric Surgery Elective

The student will fully participate as a member of the house staff team in all aspects of pediatric surgical patient care, including preoperative evaluation, surgery and postoperative care. Daily rounds are made with the resident staff and the attending staff. Participation in general surgery pediatric clinics, emergency room care and weekly teaching conferences (pediatric surgery, pathology and radiology) are encouraged. Students will have the opportunity to undertake clinical investigations, if elective time permits. *Dr. Foglia and Staff*

Plastic and Reconstructive Surgery Elective

The period on plastic surgery may be spent either as a clinical clerk or conducting a basic laboratory project. During the elective, the student can rotate on the six different clinical services or concentrate on a single service. The student will assume an active role in the plastic surgery service and will participate in the total management of a wide variety of surgical problems. The research clerkship can be conducted in the Plastic Surgery laboratory in association with any of our attending staff. A project will be designed with the student prior to his or her rotation on Plastic Surgery so that all the material and methods will be available at the beginning of the rotation. Research projects are ongoing in the following areas: (1) nerve repair and regeneration; (2) wound healing; (3) growth factors; (4) breast implants; (5) head and neck reconstruction; (6) craniofacial deformities; (7) microvascular research; (8) and soft tissue transplantation. *Dr. Weeks and Staff*

Urology Elective

A six-week clinical clerkship in Pediatric and/or Adult Urology will offer the interested student experience with a spectrum of problems in clinical urology. The student will learn the basic diagnostic procedures and management of surgical and nonsurgical aspects of patient care on the private and ward services under the supervision of the attending staff and house officers. Clinical conferences are held four days per week and pyelogram conferences are held daily. *Dr. Catalona and Staff*

Cardiothoracic Surgery Elective

During the senior elective in Cardiothoracic Surgery, students have the choice of spending the entire rotation in adult cardiac surgery, adult non-cardiac thoracic surgery, or in pediatric cardiac surgery. Alternatively, the rotation can be divided into any combination of the above three sub-rotations. While on the Cardiothoracic Surgery Service, students will round daily with the cardiothoracic surgery house staff, participate in operative procedures of their choice, and attend weekly Cardiothoracic Surgery Conferences, as well as the combined Cardiology and Cardiothoracic Surgery Cardiac Catheterization Conference. Students are also encouraged to spend time with the cardiothoracic anesthesia team and the perfusion staff. Active participation in postoperative care in the Cardiovascular Intensive Care Unit and step-down unit is also encouraged. *Dr. Cox, Dr. Rosenbloom and Staff*

Minimally Invasive Surgery Clinical Elective

An elective rotation in minimally invasive surgery is being offered by the Division of General Surgery. The coordinator for the rotation is Nathaniel J. Soper, M.D., a member of the Hepatobiliary Pancreatic (HPB) Section of the General Surgery Division. Surgeons in this section of the Division of General

Surgery regularly perform the following procedures laparoscopically: cholecystectomy, common bile duct exploration, staging of intra abdominal malignant disease, gastric fundoplication, inguinal hernia repair and gastroenterostomy. The medical student electing this rotation will participate in patient care, assist and observe in a wide range of laparoscopic procedures and participate in teaching rounds and conferences. During this rotation, the student also will have the opportunity to observe and participate in minimally invasive surgical procedures performed by surgeons in other specialties within the Department of Surgery. *Drs. Norton, Doberty and Brunt (Endocrine/Oncology), Dr. Fleschman (Colorectal Surgery), and Drs. Clayman and McDougall (Urologic Surgery)*

In addition, the fourth year medical student may spend four to eight weeks performing applied research under the auspices of the Washington University Institute for Minimally Invasive Surgery. Ongoing projects include: research in the physiology of pneumoperitoneum, evaluation of new surgical procedures in animal models, assessment of laparoscopic instrumentation, and outcome research of clinical operations. Dr. Nathaniel Soper can be contacted directly (phone 314-362-6900) to discuss both the research and clinical components of this elective in more detail. *Dr. Soper*

Surgical Intensive Care Unit (SICU) Elective

In this elective, the student will serve as a regular active member of the SICU Service. The student will be involved with the comprehensive critical management of all SICU patients. The student's activities will be focused in the Surgical Intensive Care Unit and in the Burn/Trauma Intensive Care Unit. Practical experience will include resuscitation and shock management, hemodynamic monitoring (including the placement of invasive catheters), management of mechanical ventilators, nutritional support, management of surgical infections, wound management, and discussion of ethical issues in critical care. The student will participate in regular rounds, conferences and other activities of the service. The student will take in-house night call every other night during the week only (weekends excluded). At the completion of this rotation, the student should have a comprehensive understanding of the systems approach to critical care management and will be adequately

prepared to manage basic, commonly occurring critical care emergencies. *Dr. Buchman*

Graham/Trauma Elective

The student will function as a subintern on the Evarts A. Graham Service. This service, which includes the Trauma Service, is a busy inpatient service. The student will be involved with the comprehensive management of emergency and trauma patients. The student will be involved in patient care in the Emergency Department, the Operating Room, the Intensive Care Units, and on the general surgery inpatient ward service. Practical experience will be obtained in the initial evaluation and resuscitation of traumatized patients and other emergency care patients. The student will also have ample opportunity to participate in operative care. The experience will include regular participation in the outpatient clinics. The student will participate in regular rounds, conferences, and other activities of the service, including regular in-house call. At the conclusion of the rotation, the student will have a systematic approach to the management of the traumatized or otherwise critically ill surgical patient and will be able to manage most routine problems in perioperative surgical care. *Dr. Buchman*

General Surgery Subinternship—John Cochran Veterans Administration Medical Center

Each student will be assigned to the Washington University General Surgery Service at the VA Medical Center and will function as a member of the Surgery team, sharing most of the duties of an intern. The student will share night call under the supervision of second and third year surgery residents. The VA Medical Center is unique in that residents rotating through this hospital are PGY-2 or greater. Therefore, the opportunity to participate in the functioning of the surgical team should be enhanced. The students will be assigned new patients for complete history and physical examinations and are expected to formulate a plan of diagnosis and treatment. Students will assist in the operating room on their patients, under the direction of the chief resident. Students will be expected to attend teaching conferences and the Multi-Disciplinary Tumor Conference. They also will attend departmental Grand Rounds and the General Surgery Conference at Barnes Hospital. *Dr. Kraybill*

Faculty

***Bixby Professor of Surgery,
Chairman, Department of
Surgery***

Samuel A. Wells, Jr., M.D.,
Emory University, 1961.

DIVISION OF CARDIOTHORACIC SURGERY

***Evarts A. Graham Professor of
Surgery and Head of Division***

James L. Cox, M.D.,
University of Tennessee, 1967.

***John M. Shoenberg Professor of
Cardiovascular Surgery***

Nicholas T. Kouchoukos, M.D.,
Washington University, 1961.

Professors Emeriti

Thomas B. Ferguson, Sr., M.D.,
Duke University, 1947.

Charles L. Roper, M.D.,
University of Colorado, 1953.

Professors

John P. Boineau, M.D.,
Duke University, 1959.

Joel D. Cooper, M.D.,
Harvard College, 1964.

Michael K. Pasque, M.D.,
University of Oklahoma, 1978.

G. Alexander Patterson, M.D.,
Queen's University, 1974.

Associate Professor

T. Bruce Ferguson, Jr., M.D.,
Washington University, 1979.

**Associate Professor
(Clinical)**

Martin Bergmann, M.D.,
Washington University, 1945.

Assistant Professors

Bill B. Daily, Jr., M.D., Ph.D.,
Washington University, 1985.

Charles B. Huddleston, M.D.,
Vanderbilt University, 1978.

Michael Rosenbloom, M.D.,
New York University, 1981.

R. Sudhir Sundareshan, M.D.,
University of Ottawa, 1983.

Thoralf M. Sundt III, M.D.,
The Johns Hopkins University,
1984.

**Research Assistant
Professor**

Richard B. Schuessler, Ph.D.,
Clemson University, 1977.

Instructor

Christina C. Pasque, M.D.,
University of California, Los
Angeles, 1980.

**DIVISION OF
GENERAL SURGERY****Head of Division**

Samuel A. Wells, Jr., M.D.,
Emory University, 1961.

Professors Emeriti

Walter F. Ballinger, M.D.,
University of Pennsylvania, 1948.

Eugene M. Bricker, M.D.,
Washington University, 1934.

Professors

Charles B. Anderson, M.D.,
Yale University, 1962.

Timothy G. Buchman, Ph.D.,
University of Chicago, 1978; M.D.,
1980.

M. Wayne Flye, M.D.,
University of North Carolina, 1967;
Ph.D., Duke University, 1980. (See
Department of Molecular Microbi-
ology.)

Thalachallour Mohanakumar,
Ph.D., Duke University, 1974. (See
Departments of Medicine and
Pathology.)

William W. Monafo, Jr., M.D.,
Tufts University, 1957.

Jeffrey A. Norton, M.D.,
State University of New York, 1973.

**Harry Edison Professor
of Surgery**

Gordon W. Philpott, M.D.,
Washington University, 1961.

David W. Scharp, M.D.,
Washington University, 1970.

Gregorio A. Sicard, M.D.,
University of Puerto Rico, 1972.

Steven M. Strasberg, M.D.,
University of Toronto, 1963.

Associate Professors

Paul J. Goodfellow, Ph.D.,
Queens University, 1985.

P. Robert C. Harvey, M.D.,
University of Toronto, 1981; Ph.D.,
University of Western Ontario,
1977.

Ira J. Kodner, M.D.,
Washington University, 1967.

Nathaniel J. Soper, M.D.,
University of Iowa, 1980.

**Associate Professors
Emeriti (Clinical)**

Richard V. Bradley, M.D.,
Washington University, 1952.

Leo A. Sachar, M.D.,
Washington University, 1940.

Richard G. Sisson, M.D.,
Yale University, 1946.

Willard B. Walker, M.D.,
Washington University, 1946.

**Associate Professors
(Clinical)**

Kenneth J. Bennett, M.D.,
Tulane University, 1965.

William D. Shieber, M.D.,
Washington University, 1953.

Assistant Professors

Brent T. Allen, M.D.,
Washington University, 1979.

Dorothy A. Andriole, M.D.,
New York University, 1980.

Elisa H. Birnbaum, M.D.,
University of Illinois, 1985.

L. Michael Brunt, M.D.,
The Johns Hopkins University, 1980.

Mark P. Callery, M.D.,
Albany Medical College, 1985.

Gerard M. Doherty,
Yale University, 1986.

Jeffrey A. Drebin, M.D., Ph.D.,
Harvard University, 1987.

James W. Fleshman, Jr., M.D.,
Washington University, 1980.

Todd K. Howard, M.D.,
University of Cincinnati, 1981.

Jeffrey A. Lowell, M.D.,
Yale University, 1985.

Jeffrey F. Moley, M.D.,
Columbia University, 1980.

Diane M. Radford, M.B.Ch.B.,
University of Glasgow, 1981; M.D.,
1991.

Jeffrey M. Reilly, M.D.,
Dartmouth University, 1985.

Brian G. Rubin, M.D.,
University of Vermont, 1984.

Robert W. Thompson, M.D.,
University of Michigan, 1983.

Kangla Tsung, Ph.D.,
State University of New York at
Stony Brook, 1990.

Eric D. Whitman, M.D.,
Pennsylvania State University, 1985.

**Research Assistant
Professor Emeritus**

Harry W. Margraf, Ph.D.,
Polytechnicum Milan, 1943; Sc.D.,
Washington University, 1971.

**Research Assistant
Professors**

Judith M. Connett, Ph.D.,
Washington University, 1979.

Phillip Gambel, Ph.D.,
Pennsylvania State University, 1980.

**Assistant Professors
(Clinical)**

Kenneth J. Arnold, M.D.,
Washington University, 1968.

Jerome F. Levy, M.D.,
Washington University, 1958.

Stanley L. London, M.D.,
Washington University, 1949.
Jerry R. Meyers, M.D.,
Washington University, 1966.
Shale M. Rifkin, M.D.,
Washington University, 1948.
Andrew D. Spencer, M.D.,
Indiana University, 1954.

Instructors

D. Brent Kerns, M.D.,
University of Texas, Southwestern,
1987.
Terry C. Lairmore, M.D.,
Vanderbilt University, 1988.
Errington C. Thompson, M.D.,
University of Texas, Southwestern,
1987.

Research Instructor

Yael G. Alevy, Ph.D.,
Albert Einstein College of Medicine,
1975.

Instructors (Clinical)

Jerry L. Beguelin, M.D.,
Washington University, 1962.
John B. Buettner, M.D.,
Washington University, 1967.
Steven W. Cooley, M.D.,
Louisiana State University, 1977.
Mitchell B. Cordover, M.D.,
University of Arizona, 1982.
Gary L. Gambill, M.D.,
University of Oregon, 1974.
Ronald J. Gaskin, M.D.,
Washington University, 1970.
Joseph H. Gatewood, M.D.,
The University of Chicago, 1970.
Jay W. Haines, M.D.,
Chicago Medical School, 1974.
Thomas C. Hill, M.D.,
Washington University, 1972.
Elizabeth Hilliker, M.D.,
Washington University, 1970.
John D. Hirsch, M.D.,
Washington University, 1973.
Ronald Kinatader, M.D.,
University of Missouri, 1966.
Robert J. Kingsbury, M.D.,
University of Michigan, 1960.
David P. Krajcovic, M.D.,
Washington University, 1969.
G. Lynn Krause, Jr., M.D.,
University of Pennsylvania, 1954.
Eric H. Lindenblad, M.D.,
University of Missouri, 1981.

Alan M. Londe, M.D.,
Washington University, 1961.
Mark A. Ludwig, M.D.,
The University of Chicago, 1976.
Hubert S. Mickel, M.D.,
Harvard University, 1962.
Julian C. Mosley, Jr., M.D.,
Washington University, 1972.
George A. Oliver, M.D.,
Washington University, 1952.
Charles L. Parks, M.D.,
Washington University, 1969.
Jon Peterson, M.D.,
University of Southern California,
1978.
Frank O. Richards, M.D.,
Howard University, 1947.
Donald C. Sauer, M.D.,
Washington University, 1960.
Philip J. Schmitt, M.D.,
Washington University, 1979.
Marlys E. Schuh, M.D.,
Washington University, 1979.
David Siroospour, M.D.,
Shiraz University, 1967.
Calvin B. Terrell, M.D.,
Washington University, 1977.
Jeffrey E. Zuke, M.D.,
University of Missouri, 1979.

DIVISION OF HUMAN MOLECULAR GENETICS

Professor

Helen Donis-Keller, Ph.D.,
Harvard University, 1979.

Research Associate Professor

William G. Dilley, Ph.D.,
University of California, 1970.

DIVISION OF PEDIATRIC SURGERY

Head of Division

Robert P. Foglia, M.D.,
Georgetown University, 1974.

Professor

Jessie L. Ternberg, Ph.D.,
University of Texas, 1950; M.D.,
Washington University, 1953; Sc.D.
(hon.), Grinnell College, 1972. (See
Department of Pediatrics.)

Associate Professor

Jacob C. Langer, M.D.,
University of Toronto, 1980.

Assistant Professors

Michael A. Skinner, M.D.,
Rush University, 1984.
Andrea L. Winthrop, M.D.,
Queen's University, 1981.

DIVISION OF PLASTIC AND RECONSTRUCTIVE SURGERY

Head of Division

Paul M. Weeks, M.D.,
University of North Carolina, 1958.
(See Irene Walter Johnson Institute
of Rehabilitation.)

Professor Emeritus

Minot P. Fryer, M.D.,
The Johns Hopkins University,
1940; D.S.C., Brown University,
1972.

Professors

Susan E. Mackinnon, M.D.,
Queen's University, 1975.
Jeffrey L. Marsh, M.D.,
The Johns Hopkins University, 1970.
(See Department of Pediatrics.)
V. Leroy Young, M.D.,
University of Kentucky, 1970.

Associate Professors

Donald V. Huebener, D.D.S.,
Washington University, 1969.
Roger K. Khouri, M.D.,
American University, 1981.

Assistant Professors

Mark E. Beehner, D.D.S.,
Loyola University, 1979; M.D.,
St. Louis University, 1990.
Christine A. Feely, Ph.D.,
Washington University, 1984.
Thomas J. Francel, M.D.,
University of Cincinnati, 1982.
Philip E. Higgs, M.D.,
University of Florida, 1974.
George J. Hruza, M.D.,
New York University, 1982. (See
Department of Medicine.)

Timothy R. Jones, M.D.,
University of Oklahoma, 1983.

Bruce A. Kraemer, M.D.,
Washington University, 1979.

Michael W. Vannier, M.D.,
University of Kentucky, 1979. (See
Department of Radiology.)

Peter D. Witt, M.D.,
Case Western Reserve University,
1983.

Assistant Professors (Clinical)

Joseph W. Eades, M.D.,
Washington University, 1960.

Andrew K. Kim, D.M.D.,
Washington University, 1987.

Richard J. Nissen, D.D.S.,
University of Iowa, 1988.

Patricia A. Parsons, D.D.S.,
Washington University, 1957.

Homa Youn Sedighi, D.D.S.,
Washington University, 1987.

Instructors

Marlene B. Salas-Provence, Ph.D.,
University of Illinois, 1990.

Mary K. Seaton, B.S.,
University of Missouri, 1977.

Instructors (Clinical)

David A. Caplin, M.D.,
University of Cincinnati, 1975.

H. Groves Cooke, D.D.S.,
Washington University, 1971.

Thomas J. Veraldi, D.M.D.,
Washington University, 1979.

Bruce I. White, M.D.,
Washington University, 1964.

Robert A. Young, M.D.,
Ohio State University, 1978.

Research Associate Professor

Mary P. Watkins, M.S.,
Boston University, 1974.

Research Assistant Professors

Gary E. Christensen, D.Sc.,
Washington University, 1994.

Christine B. Novak, M.S.,
University of Toronto, 1992.

DIVISION OF UROLOGIC SURGERY

Head of Division

William J. Catalona, M.D.,
Yale University, 1968.

Professors

Ralph V. Clayman, M.D.,
University of California, San Diego,
1973. (See Department of Radiol-
ogy.)

Charles B. Manley, Jr., M.D.,
University of Missouri, 1958. (See
Department of Pediatrics.)

Professor (Clinical)

Robert K. Royce, M.D.,
Washington University, 1942.

Associate Professor

Gerald L. Andriole, Jr., M.D.,
Jefferson Medical College, 1978.

Research Associate Professor

Timothy L. Ratliff, Ph.D.,
University of Arkansas, 1977. (See
Department of Pathology.)

Associate Emeritus Professor (Clinical)

M. Richard Carlin, M.D.,
Yale University, 1947.

Associate Professor (Clinical)

William T. Bowles, M.D.,
Stanford University, 1955.

Assistant Professors

Joseph W. Basler, M.D.,
University of Missouri, 1984.

Douglas E. Coplen, M.D.,
Indiana University, 1985.

M'Liss A. Hudson, M.D.,
University of Texas, 1982.

Carl G. Klutke, M.D.,
University of Michigan, 1983.

Elsbeth M. McDougall, M.D.,
University of Calgary, 1979.

Assistant Emeritus Professor (Clinical)

Franz U. Steinberg, M.D.,
University of Berne, 1938. (See
Department of Medicine.)

Assistant Professors (Clinical)

Lawrence M. Aronberg, M.D.,
Washington University, 1936.

James G. Bucy, M.D.,
Northwestern University, 1962.

Richard P. Parsons, M.D.,
Washington University, 1958.

Instructors

Arnold D. Bullock, M.D.,
The Johns Hopkins University,
1987.

John W. Colberg, M.D.,
Washington University, 1985.

Robert S. Figenshau, M.D.,
University of Minnesota, 1987.

David W. Keetch, M.D.,
University of Utah, 1987.

John F. McCarthy, M.D.,
Georgetown University, 1989.

Charles H. Nicolai, M.D.,
Washington University, 1946.

Research Instructor

Deborah S. Smith, Ph.D.,
Washington University, 1989.

Instructors (Clinical)

Saul Klein, M.D.,
Syracuse University, 1959.

Neal Neuman, M.D.,
St. Louis University, 1971.

Jeffrey A. Parres, M.D.,
University of Missouri, 1987.

Enrique P. Perinetti, M.D.,
National University of Cuyo, 1968.

Courtney Shands III, M.D.,
Vanderbilt University, 1982.

Herbert Sunshine, M.D.,
Washington University, 1954.

Ralph J. Torrence, M.D.,
Georgetown University, 1980.

TEACHING AND RESEARCH DIVISIONS

DIVISION OF BIOSTATISTICS

The Division of Biostatistics is a medical school-wide facility that engages in teaching, research, and biostatistical consultation activities. An elementary course, Introduction to Biostatistics and Epidemiology, given to second-year medical students, affords a basis for understanding quantitative assessment in biology and medicine, and prepares the student for critical evaluation of reports in the medical literature. Interested students may pursue more intensive studies through electives offered by the Division. At the initiative of other departments, the Division also offers additional short courses in biostatistics. The Division participates actively in both pre- and postdoctoral training. In addition to the core research program of the Division, its research activities include collaborative projects with various departments of the School. Biostatistical consultation represents a major activity of the Division, providing expertise in both theoretical and applied areas.

First Year

Introduction to Biostatistics and Epidemiology

This introduction to the principles and methods of biostatistics emphasizes the concepts of statistical methodology and the appropriate design of clinical research projects as being essential to the proper application and interpretation of statistical methods and to a critical evaluation of the medical literature. Elementary statistical techniques illustrating the use of statistical principles in experimental and clinical research are discussed. Clinical summaries often precede the biostatistical lectures, highlighting the relevance of certain statistical principles. Small group discussions are also organized on prechosen topics to better prepare the students in evaluating published medical reports. *Drs. Schechtman and Spitznagel*

Electives

Biostatistics for Research Workers

This course is designed for those researchers who want to expand their knowledge of practical methods in statistics. It is oriented toward statistical and epidemiological concepts, applications, practical hints, and a hands-on approach to data, rather than theory or derivation of formulas. Heavy use is made of SAS/PC (a statistical analysis package for the PC computer, which is required for this course) for in-class examples and homework problems. The course begins with a basic overview of common statistical techniques, including: simpler, classical methods (e.g., t-test, chi-square, correlation); multivariate methods (regression, logistic models, ANOVA, survival analysis); and study design. These plus other selected topics (e.g., reliability, factor analysis, survey

and sampling, research design) are then covered in greater detail in additional modules. Many faculty from different departments and backgrounds provide the instruction. *Dr. Province and Staff*

Genetic Epidemiology: A Research Elective

After being introduced to current approaches in Genetic Epidemiology, interested students are supervised on research projects dealing with methodological developments as well as analysis of real data. Topics to be covered include: resolution of cultural and biological inheritance, with emphasis on multivariate associations and temporal trends; detection of major gene effects, with emphasis on pleiotropy and genetic heterogeneity; and linkage analysis and gene mapping. Pre- and postdoctoral students in genetic epidemiology are required to take this course. *Dr. Rao and Staff*

Research

Research activities of the Division span a wide range of topics dealing with a number of disorders of considerable public health importance, providing research opportunities at both theoretical and applied levels. Several research projects involve close interaction and collaboration with a number of research groups at the Medical Center. The present core research program of the Division deals with genetic epidemiology, especially as it relates to cardiovascular disease. A number of theoretical and applied problems are addressed, including: nature-nurture resolution and identification of the genetic basis of risk factors such as lipids, lipoproteins, apolipoproteins, obesity, blood pressure, sex hormones, and glucose tolerance; exploration of temporal trends in the degree of genetic and environmental effects; and multivariate associations among multiple risk factors. Timely theoretical issues are also addressed, such as the sampling of families through patients, and statistical properties of methods of data analysis. Present collaborative research projects include: a coordinating center for a multisite NIA/NCNR cooperative study to reduce frailty and injuries in the elderly (FICSIT), a coordinating center for a multicenter family and genetic study of heart disease (FHS), a coordinating center for a multicenter study to assess the genetic basis of response to exercise training (HERITAGE), a coordinating center for a trial in ocular hypertensives (OHTS); studies in psychiatric epidemiology; studies of the epidemiology of falls, hip fracture, and osteoporosis; studies of Alzheimer's disease; a SCOR project involving several laboratory and clinical research protocols on ischemic heart disease; three epidemiological research projects developing methods for increasing public awareness and utilization of measures which are known to decrease the likelihood of developing heart disease, and for encouraging behaviors which will improve prognosis following a heart attack; and epidemiological genetics and family studies of mental disorders, including schizophrenia and alcoholism.

Biostatistical Consultation

The Division provides consultation in a wide range of areas including the statistical design of experiments and clinical trials, protocol development, data base management, analysis of data, and interpretation of results. Some of the areas of special strength and

expertise include cardiovascular biostatistics, computing, and statistical packages. The Division is well equipped to provide assistance at the stage of preparing grant applications, including careful discussions of study design, sample size calculations, randomization schemes, computer resources, and data analysis.

Faculty

Professor and Director

Dabeeru C. Rao, Ph.D.,
Indian Statistical Institute, 1971.
(See Departments of Psychiatry and Genetics.)

Professor Emeritus

Reimut Wette, D.Sc.,
University of Heidelberg, 1955.

Professors

J. Philip Miller, A.B.,
Washington University, 1965.

John P. Rice, Ph.D.,
Washington University, 1975. (See Department of Psychiatry.)

Stanley Sawyer, Ph.D.,
California Institute of Technology, 1964. (Also Faculty of Arts and Sciences)

Edward L. Spitznagel, Jr., Ph.D.,
The University of Chicago, 1965.
(Also Faculty of Arts and Sciences)

Associate Professors

Mae Gordon, Ph.D.,
University of Wisconsin, 1978.
(See Department of Ophthalmology and Visual Sciences.)

Michael A. Province, Ph.D.,
Washington University, 1987.

Kenneth B. Schechtman, Ph.D.,
Washington University, 1978. (See Department of Medicine.)

Assistant Professor Emeritus

Barbara B. Hixon, B.S.,
University of Illinois, 1941.

Assistant Professors

Zhaohai Li, Ph.D.,
Columbia University, 1989.

Curtis A. Parvin, Ph.D.,
University of Minnesota, 1980. (See Departments of Pathology and Medicine.)

Research Assistant Professors

Ingrid B. Borecki, Ph.D.,
University of Hawaii, 1981.

Treva K. Rice, Ph.D.,
University of Colorado, 1987.

Research Instructors

Cynthia L. Arfken, Ph.D.,
Yale University, 1985.

Alexandre L. Todorov, Ph.D.,
Louisiana State University, 1992.

INSTITUTE FOR BIOMEDICAL COMPUTING

The Institute for Biomedical Computing is an inter-school organization which spans computing research activities at both the School of Medicine and the School of Engineering and Applied Science. The Institute consists of research laboratory components which have close ties with several departments in the School of Engineering as well as with most departments in the School of Medicine. The Institute now includes the Biomedical Computer Laboratory (BCL), the Center for Molecular Design (CMD), and the Center for Computational Biology (CCB).

The BCL emphasizes the development of computer hardware and software systems for use in the solution of research problems in biomedicine. Several systems have seen a progression from exploratory pilot studies, through major development projects, to public availability through commercial distribution. In general, BCL focuses on biomedical research applications which require solutions employing approaches to digital computing not available from commercial vendors or through other computing facilities at Washington University. Such applications often require the integration of comput-

ers with digital-communication networks for data and information sharing with local and national collaborators as well as to provide access to specialized computational and image display resources. The BCL sustains an active role in the development, support and extension of these networks, as well as computational and display technologies, especially on the medical campus.

The Center for Molecular Design (CMD) provides a core facility with research in the development and application of theoretical chemistry and biophysics to problems at the molecular level. A long-term association among Institute components, Computer Science, and Pharmacology in the area of molecular recognition and drug design provides the base for industrial collaboration and strong interactions with other departments at Washington University.

The Center for Computational Biology focuses on databases of biological information and analysis of metabolic systems. The research involves algorithm development, database design, and database analysis with a particular emphasis on biochemical and neuromuscular structure and function. The center is also involved in technology development and informatics support for genome mapping and sequencing.

The overall purpose of the Institute for Biomedical Computing is to foster the development and application of advanced computing and engineering technologies to problems in biomedical science. In addition to its activities in collaborative research, the Institute serves as a focal point for interdisciplinary teaching and student research in areas not yet included in conventional curricula.

Research Opportunities

Research activities of the Institute for Biomedical Computing span a wide range from basic biological science and clinical research to topics in biomedical engineering, signal processing, genome mapping, drug design, and databases. Many research projects of the Institute involve collaboration with researchers in the basic science and clinical departments of the School of Medicine, or in the Departments of Computer Science and Electrical Engineering of the School of Engineering and Applied Science. Additional collaborations take place through the interdepartmental program in Biomedical Engineering.

Current emphasis in the core research program of the Biomedical Computer Laboratory is on quantitative biomedical imaging, which includes: modeling of biological phenomena as image sources; transduction processes; instrumentation characteristics; data analysis strategies for extraction of information from images; algorithms for image reconstruction and analysis; display and visualization; and high-performance computing using multiple-instruction stream multiple-data stream (MIMD) and single-instruction stream multiple-data stream (SIMD) parallel processors.

Major collaborative projects in BCL include research in: (1) the development of algorithms for positron-emission tomography systems; (2) the development of image-analysis methods for sequencing as well as physical and SSRP mapping of DNA; (3) the development of algorithms for computational light-microscopic optical sectioning and confocal fluorescent microscopy; (4) the application of advanced image analysis methods to electron-microscopic autoradiography; (5) the non-invasive delineation of pharmacology, blood flow, and metabolism in the brain; (6) the pathogenesis, treatment and sequelae of ischemic heart disease; (7) shape modeling and image segmentation; (8) digital-communication networks; and (9) radiation-treatment planning. *Drs. Thomas and Rosenberger*

Research opportunities in CMD center on algorithm development in molecular modeling, simulations and structure-based *de novo* drug design, data analysis and presentation of molecular comparisons, interpretation of NMR experimental data, three-dimensional quantitative structure-activity relationships, and predictions of protein tertiary structure. *Drs. Marshall, Beusen, Huston and Nikiforovich*

Research in the CCB focuses on databases of biological information, and analysis of metabolic systems. Research involves algorithm development, database design, and database analysis with a particular emphasis on biochemical and neuromuscular structure and function. The center is also involved in technology development and informatics support for genome mapping and sequencing. *Drs. States, Kazic and Zuker*

Faculty

Associate Professor and Director of the Institute for Biomedical Computing, and Director of Biomedical Engineering

David J. States, M.D., Ph.D., Harvard University, 1983. (See Department of Genetics and Department of Biochemistry and Molecular Biophysics.) (Also School of Engineering and Applied Science)

Professor and Associate Director, and Director of BCL

Lewis J. Thomas, Jr., M.D., Washington University, 1975. (See Department of Anesthesiology and Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science)

Professor and Director of Center for Molecular Design

Garland R. Marshall, Ph.D., Rockefeller University, 1966. (See Department of Molecular Biology and Pharmacology.)

Associate Professor and Associate Director of BCL

Frederick U. Rosenberger, D.Sc., New York University 1969. (Also School of Engineering and Applied Science)

Professor Emeritus

Harold W. Shipton, C.Eng., Shrewsbury Technical College, 1949. (Also School of Engineering and Applied Science)

Professors

R. Martin Arthur, Ph.D., University of Pennsylvania, 1968. (Also School of Engineering and Applied Science)

Jerome R. Cox, Jr., Sc.D., Massachusetts Institute of Technology, 1954. (See Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science)

Seymour V. Pollack, M.S., Brooklyn Polytechnic Institute, 1960. (Also School of Engineering and Applied Science)

James A. Purdy, Ph.D., University of Texas, 1971. (See Radiation Physics.)

Donald L. Snyder, Ph.D., Massachusetts Institute of Technology, 1966. (Also School of Engineering and Applied Science)

Research Professor

Charles H. Anderson, Ph.D., Harvard University, 1962. (See Department of Anatomy and Neurobiology.)

Gregory V. Nikiforovich, Ph.D.,
Byelorussian University, 1972.

Associate Professors

G. James Blaine III, D.Sc.,
Washington University, 1974 (See
Department of Radiology.) (Also
School of Engineering and Applied
Science)

Mark E. Frisse, M.D.,
Washington University, 1978. (See
Department of Medicine, and
Library and Biomedical Communi-
cation Center.) (Also School of
Engineering and Applied Science.)

Michael I. Miller, Ph.D.,
The Johns Hopkins University,
1983. (Also School of Engineering
and Applied Science)

Michael Zuker, Ph.D.,
Massachusetts Institute of
Technology, 1974.

Research Associate Professors

Jack R. Engsborg, Ph.D.,
University of Iowa, 1985. (See
Department of Neurosurgery.)

Lyndon S. Hibbard, Ph.D.,
Michigan State University, 1977.
(See Department of Neurology and
Neurological Surgery.)

Assistant Professors

Denise D. Beusen, Ph.D.,
Washington University, 1985. (See
Department of Molecular Biology
and Pharmacology.)

Jose A. Concello, Ph.D.,
Dartmouth College, 1991.

Michael G. Kahn, M.D.,
University of California, San Diego,
1979. (See Department of Medi-
cine.)

James G. McNally, Ph.D.,
The University of Chicago, 1983.
(See Department of Cell Biology
and Physiology.) (Also Faculty of
Arts and Sciences)

John M. Ollinger, D.Sc.,
Washington University, 1986.

Joseph M. Smith, M.D.,
Harvard Medical School, 1987. (See
Department of Medicine.)

Instructor

Toni M. Kazic, Ph.D.,
University of Pennsylvania, 1984.

Senior Research Associates

William M. Hart, Jr., M.D., Ph.D.,
University of Maryland, 1970. (See
Department of Ophthalmology and
Visual Sciences.)

James G. Miller, Ph.D.,
Washington University, 1969. (See
Department of Medicine.) (Also
Faculty of Arts and Sciences)

Research Associates

Pankaj Agarwal, Ph.D.,
New York University, 1993.

Kenneth W. Clark, M.S.,
St. Louis University, 1967.

Stanislov G. Galaktionov, Ph.D.,
Byelorussian University, 1964.

Gerald C. Johns, B.S.,
Washington University, 1966.

Guennadi P. Klimov, Ph.D.,
Moscow State University, 1970.

David R. Lewis, Ph.D.,
Oxford University, 1994.

John W. Matthews, D.Sc.,
Washington University, 1980. (See
Department of Radiology.)

Joanne Markham, M.S.,
Washington University, 1973. (See
Department of Medicine.)

David G. Politte, M.S.,
Washington University, 1983.

Ilya Vakser, Ph.D.,
Moscow State University, 1989.

Research Associate (Visiting)

Stuart M. Green, Ph.D.,
Imperial College, 1993.

Research Assistants

H. Dieter Ambos, C.E.E.,
Washington University, 1973. (See
Department of Medicine.)

David R. Maffitt, M.S.,
Washington University, 1989.

HEALTH KEY MEDICAL GROUP

Health Key Medical Group is a primary care group practice providing comprehensive health services to more than 100,000 people in the St. Louis area. Previously established in 1969 as The Medical Care Group of St. Louis, Health Key's relationship with the School of Medicine has been as a teaching and research unit serving within a medical school environment. Today, the group provides care in pediatrics, internal medicine, allergy, and obstetrics/gynecology in a separate facility on the campus of the School of Medicine, as well as in five other locations throughout the metropolitan area.

The practice is a site for optional programs for advanced residents in general internal medicine and general pediatrics. An elective is available for fourth-year medical students in Internal Medicine and Pediatrics. The Health Key Pediatric Division actively participates in the COPE program of the Department of Pediatrics.

Health Key also is a source of data for various clinical and health services research. The practice is staffed by physicians in private practice who are members of the faculty of the School of Medicine in the Departments of Internal Medicine, Pediatrics, and Obstetrics and Gynecology.

Staff

- Susan R. Adams, M.D.**,
University of Virginia, 1992. (See Department of Medicine.)
- William S. Adams, M.D.**,
University of Virginia, 1992. (See Department of Pediatrics.)
- Patricia J. Amato, M.D.**,
Medical College of Ohio, 1982. (See Department of Pediatrics.)
- Scott J. Anderson, Ph.D.**,
Duke University, 1981; M.D., 1982. (See Department of Medicine.)
- John K. Appelbaum, M.D.**,
Washington University, 1984. (See Department of Obstetrics and Gynecology.)
- Bonnie J. Aust, M.D.**,
University of Texas, 1979. (See Department of Pediatrics.)
- Joyce E. Boehmer, M.D.**,
University of Missouri, 1979. (See Department of Medicine.)
- Kathleen S. Bruns, M.D.**,
St. Louis University, 1981. (See Department of Medicine.)
- Tattamangalam P. Chandrika, M.D.**,
Calicut Medical College, 1973. (See Department of Pediatrics.)
- Tammy S. Chi, M.D.**,
University of California, Los Angeles, 1990. (See Department of Pediatrics.)
- Kathleen M. Cizek, M.D.**,
The University of Chicago, 1990. (See Department of Medicine.)
- Darryl S. Cohen, D.O.**,
Texas College of Osteopathic Medicine, 1981. (See Department of Pediatrics.)
- James M. Corry, M.D.**,
Washington University, 1974. (See Department of Pediatrics.)
- Janet M. Cranshaw, M.D.**,
Washington University, 1988. (See Department of Pediatrics.)
- John C. Davis, M.D.**,
University of Michigan, 1980. (See Department of Pediatrics.)
- Nancy Z. Delaney, M.D.**,
Brown University, 1980. (See Department of Medicine.)
- Karen M. Diehl, P.N.P.**,
Washington University, 1978.
- Thomas D. Doerr, M.D.**,
The University of Chicago, 1983. (See Department of Medicine.)
- Irl J. Don, M.D.**,
Washington University, 1972. (See Department of Medicine.)
- Charles H. Dougherty, M.D.**,
University of Rochester School of Medicine, 1973. (See Department of Pediatrics.)
- Jay S. Epstein, M.D.**,
Emory University, 1983. (See Department of Pediatrics.)
- Renee D. Ewing, M.D.**,
Southern Illinois University, 1984. (See Department of Obstetrics & Gynecology.)
- Michael J. Fedak, M.D.**,
University of Missouri, 1982. (See Department of Medicine.)
- Edward B. Fliesher, M.D.**,
St. Louis University, 1978. (See Department of Pediatrics.)
- John P. Galgani, Jr., M.D.**,
St. Louis University, 1982. (See Department of Pediatrics.)
- Sally S. Hader, C.N.M.**,
St. Louis University, 1976.
- David E. Hartenbach, M.D.**,
University of Missouri, 1987. (See Department of Pediatrics.)
- Kathleen M. Hogan, M.D.**,
University of Missouri, 1989. (See Department of Obstetrics and Gynecology.)
- William L. Johnson, M.D.**,
University of Missouri, 1981. (See Department of Pediatrics.)
- Angela M. Kennedy, P.N.P.**,
University of California, 1987.
- A. Donna King, L.C.S.W., B.C.D.**,
Washington University, 1966.
- John H. Kissel, M.D.**,
Harvard University, 1971. (See Department of Medicine.)
- Shirley M. Knight, M.D.**,
Washington University, 1980. (See Department of Pediatrics.)
- Katherine L. Komendowski, M.D.**,
Uniformed Services University, 1984. (See Department of Pediatrics.)
- Richard L. Lazaroff, M.D.**,
St. Louis University, 1978. (See Department of Pediatrics.)
- Charline Ledgerwood, C.N.M.**,
University of Illinois, 1977.
- Margaret L. Lewis, P.N.P.**,
Washington University, 1978.
- Gerald M. Mahon, M.D.**,
University of Texas, Dallas 1983. (See Department of Medicine.)
- Jerald Maslanko, M.D.**,
Emory University, 1975. (See Department of Medicine.)
- Marjorie Maxwell, R.D., C.D.E.**,
University of Missouri, 1971.
- Katherine F. Phelps, P.N.P.**,
Washington University, 1983.
- Nancy Quigley, P.N.P.**,
Washington University, 1970.
- Catherine R. Remus, M.D.**,
Rush Medical College, 1983. (See Department of Pediatrics.)
- John H. Rice, M.D.**,
University of Missouri, 1980. (See Department of Medicine.)
- Carol A. Robinson, M.D.**,
University of Missouri, 1985. (See Department of Pediatrics and Department of Medicine.)
- Isabel L. Rosenbloom, M.D.**,
University of Maryland, 1984. (See Department of Pediatrics.)
- Caroline Rowlands, M.D.**,
Washington University, 1991. (See Department of Pediatrics.)
- Joseph Schachter, M.D.**,
Indiana University, 1979. (See Department of Pediatrics.)
- Margaret A. Schmandt, M.D.**,
St. Louis University, 1987. (See Department of Pediatrics.)
- Lisa D. Schrock, M.D.**,
University of Missouri, 1990. (See Department of Pediatrics.)
- J. Howard Shane III, M.D.**,
University of Texas, Galveston, 1992. (See Internal Medicine.)
- Paul S. Simons, M.D.**,
Washington University, 1967. (See Department of Pediatrics.)
- Elizabeth A. Tracy, M.D.**,
Medical College of Wisconsin, 1986. (See Department of Medicine.)
- Stanley G. Vriezelaar, M.D.**,
University of Iowa, 1981. (See Department of Medicine.)
- Nancy J. Williams, M.D.**,
University of Kansas, 1987. (See Department of Medicine.)
- Patricia B. Wolff, M.D.**,
University of Minnesota, 1972. (See Department of Pediatrics.)

GRADUATE PROGRAMS

DIVISION OF BIOLOGY AND BIOMEDICAL SCIENCES

The Division of Biology and Biomedical Sciences, organized in 1973, is a consortium of university departments which together provide interdisciplinary training for Ph.D. students. This unique organization was formed because of the realization that research and training in modern biology transcend the limits of departmental structure. The faculty consists of members of seven preclinical departments in the School of Medicine—Anatomy and Neurobiology, Biochemistry and Molecular Biophysics, Cell Biology and Physiology, Genetics, Molecular Microbiology, Pathology, and Molecular Biology and Pharmacology; ten clinical departments—Anesthesiology, Medicine, Neurology and Neurological Surgery, Obstetrics and Gynecology, Ophthalmology and Visual Sciences, Otolaryngology, Pediatrics, Psychiatry, Radiology and Surgery; the Department of Biology, and the Department of Chemistry in the School of Arts and Sciences. More than 300 faculty are affiliated with one or more of 11 broad training programs: Biochemistry; Bioorganic Chemistry; Developmental Biology; Evolutionary and Population Biology; Immunology; Molecular Biophysics; Molecular Cell Biology; Molecular Genetics; Molecular Microbiology and Microbial Pathogenesis; Neurosciences; and Plant Biology. Faculty in these programs take responsibility for all Divisional activities, including recruiting, admissions, advising, research training, and in addition many Divisional courses and seminars are offered by the participating faculty.

Currently almost 450 graduate students are enrolled in the Division, including 142 students pursuing both the Ph.D. and the M.D. through the Medical Scientist Training Program (see page 18). Requirements for the Ph.D. in each Divisional Program are highly flexible. They include a series of courses tailored to a student's background and interests, qualifying examinations usually taken during the second year, execution of laboratory research, and defense of a dissertation generated through original scientific investigation. Although students enter the Division through an affiliation with one of the 11 programs, it is possible for a student to transfer to another program as interests evolve. During the first year, advisers are appointed to assist students in selecting courses and seminars as well as to help them in choosing three laboratory rotations in which they will spend several months becoming acquainted with a particular area of scientific research. At the end of the first year, it is expected that each student will choose a research adviser.

Applications for admission to the Ph.D. programs of the Division are due January 1 for matriculation the following Fall. Admission is based on demonstrated ability, future promise, and the number of

positions currently available. Applicants should have completed undergraduate training in biology, chemistry, or physics at a high level of scholastic achievement; such training should include courses in biology, genetics, chemistry (including analytical, organic, and physical for some programs), physics, and calculus. In exceptional cases, deficiencies in basic requirements may be made up by appropriate course selection during the first year of study. It is required that each applicant take the aptitude test of the Graduate Record Examination (GRE). The advanced GRE subject test is highly recommended. Additional information and application for admission to the Ph.D. programs may be obtained by writing to the Director of Admissions, Washington University School of Medicine, 660 South Euclid Ave., Campus Box 8226, St. Louis, Missouri 63110-1093. Students who wish to pursue both the Ph.D. and M.D. degrees must apply to the Medical Scientist Training Program (see page 18).

Students admitted to the graduate programs are guaranteed full stipend and tuition support contingent upon satisfactory performance. The stipend for the 1995-96 academic year will be \$14,000 annually. Tuition remission is provided to all students and life, disability and health insurance is also provided. This provides coverage by the Medical Center Student Health Service. The Division provides support for its Ph.D. students from several sources, including federally funded training grants provided by the National Institutes of Health.

It is expected that each student in a Ph.D. training program will devote full time to that endeavor. The Division will not accept students for part-time study, nor will it enroll students interested in a Master's degree.

The following graduate courses are offered by the Division of Biology and Biomedical Sciences, and they are available both to Ph.D. and M.D. students who meet the prerequisites for the appropriate course. Those courses particularly relevant to a given department are cross-listed under the department in this Bulletin. Faculty members in charge of courses and their departmental affiliations are shown at the end of each course description.

Bio 501. Human Anatomy

Study of the human body primarily by dissection; extensive use of X-rays and CT scans. Emphasis on functional and clinical aspects of anatomy. Prerequisite, graduate or medical student status and permission of instructor. Credit 6 units. Same as Anthropology 501. *Conroy (Anatomy and Neurobiology), Phillips-Conroy, Cheverud*

Bio 5011. Ethics and Research Science

Exploration of ethical issues research scientists confront on a daily basis. Topics will include, but are not limited to: student-mentor relationships, allegations of fraud, collaborators rights and responsibilities, conflicts of interest and confidentiality, ethics

and the genome initiative, oversight role of institutions. Case study and scenario presentations will provide focus for discussions. Prerequisite, open to undergraduate, graduate, postdoctoral and medical students engaged in research. Six two-hour sessions. Credit 1 unit. *Donis-Keller (Surgery/Genetics/Psychiatry)*, *Steinbach (Anatomy)*

Bio 502. General Physiology

This course applies the fundamental physiological mechanisms of cell biology to the functions of the major organ systems of the body, namely, the cardiovascular, renal, respiratory, gastrointestinal, and endocrine systems. The course is intended primarily for first year medical students. The physiology and microscopic anatomy courses are closely coordinated within the same schedule. Prerequisite, Bio 5061 or the equivalent. Credit 6 units. *Wilkinson, Staff (Cell Biology and Physiology)*, *Menton, Staff (Anatomy and Neurobiology)*

Bio 5051. Foundations of Immunology

Designed for graduate students as an in-depth introduction to immunology. Topics: antibody structure and genetics, B cell recognition, T cell receptor, major histocompatibility complex, T cell recognition, regulation of the immune response, immune mediators, humoral and cellular effector mechanisms. Discussion group will meet once a week on Thursday from 1:00-2:00 p.m. Prerequisite, Introductory Biochemistry and/or Genetics helpful. Permission of instructor. Credit 4 units. *Thomas (Pathology, Molecular Microbiology)*, *Allen (Pathology)*

Bio 5061. Cell Biology

A course covering fundamental aspects of cell organization and physiology. The goal is to develop an understanding of cellular structure and fundamental cellular processes such as transport, secretion, motility, recognition, and cell/matrix interactions. Prerequisite, graduate standing in Arts and Sciences or in the medical school. Credit 3 units. *Mecham (Cell Biology and Physiology)*

Bio 5062. Central Questions in Cell Biology

Fundamental and "cutting-edge" research in the following areas: cell-cell interactions, biogenesis of organelles, cytoskeleton, cell physiology, cell differentiation. For each section, introductory lectures are accompanied by discussions of experimental techniques and evaluations of the strategies employed in recent original papers. Prerequisites, 3 units in Biochemistry, Bio 5063, or permission of instructor. Two hours each week alternating between lectures and discussions. Credit 3 units. *Linder (Cell Biology and Physiology)*

Bio 5063. Molecular Cell Biology

This course is one of the three courses in the core curriculum for the graduate programs in Cell and

Molecular Biology. As such, it provides a background of fundamental information on the molecular basis of cell structure and function. In addition, the course concentrates on the current status of research on these questions. Broad areas covered in this course include membranes, signal transduction, cell motility, cell-cell interactions, and extracellular matrix. The format includes both lectures and discussion sections. Original articles from the research literature will be discussed in detail in the sections. Several take-home exams will be given. Credit 3 units. *S. Wentz (Cell Biology and Physiology)*

Bio 5064. Introduction to Modern Techniques of Electron Microscopy

A practical course for those students who anticipate using electron microscopy (EM) in their research. Lectures and demonstrations compare and contrast the various methods of sample preparation and specimen viewing currently in use, emphasizing the pros and cons of each. Students learn to evaluate works in the EM literature critically and to design meaningful EM experiments. Lab exposure includes overseeing freeze-etch techniques and individual time working with an electron microscope. Three hours of lecture/lab one day per week. Credit 3 units. *Heuser (Cell Biology and Physiology)*

Bio 5065. Cell Biology of the Stress Response

Both prokaryotic and eukaryotic cells have evolved strategies to cope with potentially lethal stresses. Current knowledge of these stress responses will be discussed including the repair of damaged DNA, cell-cycle check-point pathways, scavenging free radicals, and alteration of gene expression to resist further exposure to stress. Prerequisite, Protein chemistry, nucleic acid chemistry. Two hours lecture and one hour journal club per week, with students presenting assigned paper(s). Credit 3 units. *Roti Roti (Radiology, Cell Biology and Physiology)*

Bio 507. Pharmacology

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular, neuropharmacology. Credit 4 units. Prerequisite, Bio 451, 502 and permission of instructor. Credit contingent upon completion of Bio 508 in Spring semester. *Covey (Molecular Biology and Pharmacology)*, *Staff*

Bio 5071. Bioorganic Chemistry I. Fundamentals of Molecular Interactions and Chemical Catalysis

Basic principles of physical organic chemistry from the biological perspective. Molecular interactions including H-bonding and hydrophobic forces, and introduction to methods of assessment. Kinetics and mechanisms of catalysis. Prerequisites, two semesters of organic chemistry; one semester of physical chemistry recommended. *Gokel, Covey (Molecular Biology and Pharmacology)*

Bio 508. Pharmacology

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular, neuropharmacology. Continuation of Bio 507. Credit 4 units. *Covey (Molecular Biology and Pharmacology) and Staff*

Bio 5083. Principles of Protein Chemistry

This course is designed to provide a background on the fundamentals of protein chemistry, stressing both the theoretical and practical aspects of the subject matter. Topics to be covered include: peptide synthesis protein purification and sequencing, enzyme kinetics, protein structure/function and an introduction to X-ray crystallography, NMR and electron microscopy. Prerequisite, General Biochemistry. Three hours lecture/week. Credit 3 units. *Pike/Ponder (Biochemistry and Molecular Biophysics), Grant (Molecular Biology and Pharmacology)*

Bio 5091. Molecular Biology and Pharmacology Journal Club

This course will teach the fundamentals of organization and oral presentation of scientific information. Presentations will be of recent articles from the literature relating to modern molecular biology and pharmacology as well as original research by the students. Students will be evaluated on clarity and effectiveness of presentations. Advisers for the course will be Drs. Ornitz and Russell but participation by all members of the Department (staff, students and fellows) is encouraged. Credit 1 unit. *Ornitz and Russell (Molecular Biology and Pharmacology)*

Bio 512. Selected Topics in Developmental Biology

Course title for Spring 95: "Advanced Drosophila Developmental Genetics" faculty lectures and student presentations, supplemented by extensive readings from current literature. One or two 2-hour presentations per student. Prerequisite, permission of instructor. May not be offered every year. Credit 2 units. *Cheney (Genetics)*

Bio 5122. Cell-Matrix Interactions

Current research in extracellular matrix biology with an emphasis on cell-matrix interactions. Specific topics include structure and composition of ECM, receptors for ECM and cell-matrix interactions in development, inflammation and disease. Prerequisite, Basic Biochemistry/Cell Biology. Credit 3 units. *Mecham (Cell Biology and Physiology)*

Bio 5124. Cell Biology Journal Club

Discussion of key papers on all aspects of cell biology. Emphasis on recent papers that have addressed fundamental questions relevant to cell biology. Credit 1 unit contingent upon regular attendance and one presentation. *Mercer (Cell Biology and Physiology)*

Bio 5125. Student-Run Cell Biology Journal Club

Participants (students) present summaries of current research published in various journals in the field of cell biology. A large component of this journal club includes coaching in oral presentation. Students receive one credit for regular participation and for making one presentation. Credit 1 unit. *Stahl (Cell Biology and Physiology)*

Bio 5126. Developmental Biology Journal Club

Participants (students, faculty and postdoctorates) present summaries of current research published in various journals in the field of developmental biology. Credit 1 unit, contingent on one presentation per semester. *McNally (Biology)*

Bio 5127. Pathobiology Journal Club

Participants (students, faculty and postdoctorates) present summaries of current research published in various journals in the general fields of cell and developmental biology. A large component of this journal club includes coaching in oral presentation. Students receive 1 credit for one presentation during the semester. *J. Baenziger (Pathology)*

Bio 5128. Extracellular Matrix and Cell Matrix Interactions Journal Club

This journal club covers a broad range of topics related to extracellular matrix, including the fields of biochemistry, molecular biology, cell biology, and developmental biology. Speakers give a brief background to introduce the topic and then focus on one to two papers from the current literature. Presentations are given by faculty, students, and postdoctorates. Students receive one credit for regular participation and for making one presentation. *Parks (Cell Biology and Physiology/Medicine)*

Bio 5132. Cell Motility and Cytoskeleton Journal Club

Weekly presentations of recent literature and research, with each participant presenting once per semester. Opportunity for students to discuss the context, implications and future directions for research. Prerequisite, Bio 5063 or undergraduate course in cell biology. Credit 1 unit. *Elson, Staff (Cell Biology and Physiology, Biochemistry and Molecular Biophysics, Genetics)*

Bio 5135. Molecular Basis of Disease

This course will consider the status of current research investigating the molecular basis of a number (eight-12) of diseases related to the cytoskeleton. The format will be a seminar style, with students reading, presenting and discussing current research literature under the guidance of the faculty. The faculty will also help the student become familiar with resources for learning about the medical aspects of these diseases, to provide a context for understanding the research. Prerequisite, Bio 5063 or

equivalent course in Cell Biology plus some background in Molecular Biology. Graduate status or permission of instructor. Credit 2 hours. *Cooper (Cell Biology and Physiology)*

Bio 5136. Topics in Herpes Virology and Neurovirology

Participants present summaries of current research published in various journals predominantly in the field of herpes virology but occasionally HIV. A large component of this journal club includes coaching in oral presentation. Prerequisite, graduate standing. Credit 1 unit contingent upon regular attendance and one presentation. *Leib (Ophthalmology/Molecular Microbiology)*, *Pepose (Ophthalmology/Pathology)*

Bio 5171. Medical Immunology

An introduction to basic concepts in immunology and immunopathology. Lectures focus on antigen-antibody interactions, immunoglobulin structure and genetics, cellular basis of the immune response and immune regulation, T cell effector mechanisms, the inflammatory response, complement, positive and negative roles of hypersensitivity, and immune deficiency. Prerequisite, some background in biochemistry and genetics helpful. Offered during the first half of the second medical semester. Credit 2 or 3 units (3 if lab is taken). *Unanue, Schreiber (Pathology)*, *Atkinson, Lob (Medicine, Molecular Microbiology)*

Bio 5191. Pathobiology of Human Disease States

Two or three human disease states will be discussed in detail. Topics will include background clinical and epidemiological information, followed by a detailed examination of the molecular and cellular events that underlie the disease state. Examples of pertinent topics might include malaria, cystic fibrosis, sickle cell anemia, diabetes, or lupus. Prerequisite, must be a Markey pathway student. Credit 2 units. *Broze (Cell Biology and Physiology, Medicine)*

Bio 5221. Molecular Basis of Microbial Pathogenesis

Primarily for graduate and MSTP students, this seminar course involves discussion of current research of pathogenic microorganisms and their virulence determinants. Emphasis on model systems that demonstrate the cellular and molecular basis of host-pathogen interactions. Prerequisite, advanced elective course "Molecular Microbiology and Pathogenesis" or permission of instructor. One and one-half class hours a week. Credit 2 units. *D. Sibley (Molecular Microbiology)*

Bio 5225. Proteins Journal Club

A weekly journal club of recent literature and research in the fields of protein structure and function. Presentations are given by graduate students, postdoctoral fellows, and the faculty. Presentation of controversial topics and results are

encouraged. Credit 1 unit contingent upon regular attendance and one presentation. Prerequisite, graduate standing. *L. Kurz (Biochemistry and Molecular Biophysics)*

Bio 5235. Genetics Journal Club

Participants present research reports from current literature in human genetics and related fields. One of the aims is to provide guidance in oral presentation. Prerequisite, graduate standing. Credit 1 unit contingent upon regular attendance and one presentation. *Gerhard (Genetics/Psychiatry)*

Bio 5261. Molecular Mechanisms of Disease

Lectures and student presentations covering a wide range of topics on clinical immunology including inflammation, microbial immunity, immunodeficiencies, immunopharmacology, neuroimmunology, autoimmunity, and lymphoid malignancies. Prerequisite, Cell Biology or Foundation of Immunology. Credit 2 units. *Virgin (Pathology)*

Bio 5272. Advanced Topics in Molecular Immunology

This course uses a journal club format to discuss contemporary issues in the cell and molecular biology of the immune system. Discussions focus on the use of current approaches to analyze the cellular and molecular basis of immunity. Topics include mechanisms of antigenic specificity, diversity, cell communication, differentiation, activation, and effector activity. Prerequisite, Bio 5051 or permission of instructor. Credit 2 units. *Murphy (Pathology)*, *Staff (Immunology)*

Bio 5281. Developmental Genetics

Genetics of developmental events including sex determination, pattern formation, cell fate, and regulation of tissue-specific genes. Emphasis will be placed on the use of genetics to investigate these phenomena in organisms such as yeast, *Volvox*, *C. elegans*, *Drosophila* and mouse. Prerequisite, Bio 301 or equivalent Genetics courses and permission of instructor. Credit 3 units. *Staff (Genetics)*

Bio 5288. Special Topics in Molecular Genetics

The course will cover one topic each semester and include subjects such as gene expression in mammalian species, genetic switches, and human genetics. Papers regarding the subject will be discussed in depth. Prerequisite: graduate level core courses for molecular genetics including nucleic acids (Bio 548) and Molecular Cell Biology (Bio 5063). 2 hours per week, 2 units credit. *Staff (Biochemistry and Molecular Biophysics)*

Bio 531. Advanced Biochemistry

Designed primarily for medical students; study of major control systems of metabolic processes. Begins with a treatment of protein structure and enzyme

kinetics. Basic metabolic pathways are presented as a basis for the discussion of their regulation by hormone receptors and their signal transduction mechanisms, the role of kinases in metabolic regulation, lipoproteins and the regulation of lipid metabolism, control of cellular proliferation, oncogenes. Coordinated with other first semester medical school courses (Cell Biology and Molecular Genetics) to provide an integrated first semester curriculum in the basic sciences for medicine. Prerequisite, graduate standing in Medicine, or permission of instructor in Arts and Sciences. Credit 3 units. *Cistola, Silbert, Frieden, Pike, Frazier (Biochemistry and Molecular Biophysics), Schlesinger (Cell Biology and Physiology)*

Bio 5312. Macromolecular interactions

This course will cover equilibria, kinetics and mechanisms of macromolecular interactions from a quantitative perspective. Thermodynamics, multiple binding equilibria (binding polynomials), linkage phenomena, cooperativity, allostery, macromolecular assembly, analysis of binding isotherms, enzyme catalysis and mechanism, steady-state and pre-steady state kinetics, kinetic simulation and isotope effects. Prerequisite: Physical Chemistry, Biochemistry, Calculus, and Organic Chemistry. Two class hours per week, 3 units credit. *Lohman (Biochemistry and Molecular Biophysics)*

Bio 5315. Macromolecular Structure

A required course for the programs in Biochemistry and in Molecular Biophysics. This course introduces the student to protein and nucleic acid structure and structure determination, including X-ray crystallography, NMR, optical spectroscopies, and transport. Prerequisite, undergraduate course in Physical Chemistry. Credit 3 units. *Cistola (Biochemistry and Molecular Biophysics)*

Bio 5323. Signal Transduction Journal Club

Journal club with both faculty and student presentations in the area of signal transduction. Prerequisite, none. Credit 1 unit. *Frazier/Pike (Biochemistry and Molecular Biophysics)*

Bio 5342. Macrophage Biology

This special topics course will examine aspects of cell and molecular biology of the macrophage: endocytosis, phagocytosis, adhesion, motility, signal transduction, antigen processing, lysosomes, intracellular parasitism. Prerequisite: Molecular Cell Biology (Bio 5063) or Foundations in Immunology (Bio 5051). Offered in alternate years. Two hours a week, 2 units credit. *Steinberg (Cell Biology and Physiology)*

Bio 5346. Physical DNA Mapping

Same as Computer Science 534

Bio 5352. Developmental Biology

Current literature and present information available on a variety of model systems being used to study developmental biology. Focus on molecular approaches, but based in classical concepts. Prerequisite, Molecular Cell Biology (5063) and Nucleic Acids (548). Credit 3 units. *McNally (Biology), Kirk, Miller, Duncan (Biology), Cheney (Genetics)*

Bio 5355. Statistical Thermodynamics of Macromolecular Interactions

Basic principles of statistical mechanics and thermodynamics. Detailed treatment of ligand binding and linkage properties of biological macromolecules. Prerequisite, undergraduate level Physical Chemistry. Credit 3 units. *E. Di Cera, T. Lohman (Biochemistry and Molecular Biophysics)*

Bio 536. Physical Chemistry of Macromolecules

Application of physical chemistry to proteins, nucleic acids, and other natural and synthetic polymers. Polymer chains statistics, thermodynamics and statistical mechanics of macromolecular solutions, conformational transitions and molecular interpretation of light scattering, viscosity, sedimentation, diffusion and circular dichroism experiments. Prerequisite, two semesters of Physical Chemistry or permission of the instructor. Credit 3 units. Same as Chem 577, offered every other year. *Holtzer (Chemistry)*

Bio 5381. Mechanisms of Protein Targeting and Intercompartmental Transport

Recent advances regarding the molecular mechanisms responsible for targeting and intercompartmental transport to and between specific organelles, such as the endoplasmic reticulum, golgi apparatus, lysosomes, mitochondria, and nucleus. Particular emphasis on the development and use of cell-free systems that faithfully reconstitute key protein targeting and transport events. Material consists primarily of original research articles presented by students. Prerequisite, Molecular Biology (may not be taken concurrently.) Credit 1 unit. *Blumer, Stahl (Cell Biology and Physiology)*

Bio 5382. Membranes as Mediators

This course is an advanced analysis of current approaches to the study of membranes' mediated processes including membrane structure (both lipid and protein components), the biosynthesis of membrane components, the structure and function of receptors, signal transduction elements such as G proteins, kinases and phosphatases, and the roles of protooncogenes in cellular signaling processes. Prerequisites, Bio 548, Bio 5063 and Bio 5083. Credit 3 units. *Frazier, Rotwein (Biochemistry and Molecular Biophysics)*

Bio 5391. Molecular Virology

General concepts of basic virology and the molecular mechanisms of viral replication; a review of the molecular biology of the major classes of viruses with an in-depth analysis of a prototype of each class. Emphasis on animal viruses, and medical virology, but plant and insect viruses also discussed. Prerequisite, Nucleic Acids. Credit 3 units. *Olivo (Medicine/Molecular Microbiology)*

Bio 5392. Molecular Microbiology and Pathogenesis

First half focuses on prokaryotic physiology and genetics, with special attention to recent discoveries in gene regulation and protein processing. Second half devoted to microorganisms that cause disease, with emphasis on the molecular interactions between pathogen and host. Prerequisite, first-semester core curriculum for programs in Cell and Molecular Biology. Credit 3 units. *Goldman (Molecular Microbiology)*

Bio 5393. Molecular Virology Journal Club

Journal club with a minimum of one student presentation with faculty critique. Credit 1 unit. *Majors (Biochemistry and Molecular Biophysics)*

Bio 5404. Molecular Neurobiology

This course examines the strategies that have been employed to discover how molecules—especially proteins and nucleic acids—conspire in the elaboration, maintenance, and function of the cells of the nervous system. The three weekly sessions will comprise two lectures and one session in which students will present critiques of research papers. Prerequisites, basic courses in Neurobiology, Biochemistry and, preferably, Physical Chemistry. Credit 4 units. *Willard (Anatomy and Neurobiology)*

Bio 5406. RNA Structure and Metabolism

This seminar course will include topics on any aspect of RNA structure and metabolism in prokaryotic or eukaryotic cells. Each student will select a topic for critical presentation which will cover published papers, but the emphasis will be on the topic; i.e., it should be more than a journal club review. The discussion should cover the main questions and how some have been answered and possible approaches to solving the unanswered ones. Papers assigned in Bio 548 can be used but not exclusively. Topics will change from year to year. One two-hour meeting per week. Credit 1 unit. *Kennell (Molecular Microbiology)*

Bio 5415. Mechanisms of Gene Regulation Journal Club

A weekly journal club that explores the molecular and genetic mechanisms that control gene expression in prokaryotes and eukaryotes. Transcription, RNA processing, translations, signal transduction, changes in chromatin structure, and epigenetic phenomena

are some relevant areas. The format is designed to develop students' classroom teaching skills. Credit 1 unit, contingent on regular attendance and one presentation per semester. *Pikaard, Landick (Biology)*

Bio 5416. Molecular Microbiology and Pathogenesis Journal Club

Presentations by students, postdoctoral fellows, and faculty on a broad range of topics of current interest, including the fields of molecular mechanisms of pathogenesis, biochemistry, molecular biology, cell biology, developmental biology, and immunology. Speakers usually give a brief background to introduce the topic and then focus on one or two papers from the current literature. Participants are expected to attend all the sessions. Credit requires attendance at all sessions and one or two presentations during year. Credit 1 unit. *Hultgren (Molecular Microbiology)*

Bio 5417. Hematology/Oncology Journal Club

This journal club covers a broad range of topics of current interest, including the fields of biochemistry, molecular biology, cell biology, developmental biology and immunology. Speakers usually give a brief background to introduce the topic and then focus on one or two papers from the current literature. Presentations are given by graduate students, postdoctorate fellows and the faculty. Each attendee presents two to three times per year. Participants are expected to attend all the sessions. This journal club was founded in 1966. Credit 1 unit. *Majerus, S. Kornfeld (Medicine, Biochemistry and Molecular Biophysics)*

Bio 5418. Molecular Oncology/Hematopoiesis Journal Club

This journal club covers current papers in molecular oncology, hematopoietic differentiation, stem cell biology, and gene therapy. Presentations will be given by faculty and students and will be discussed critically. Credit 1 unit. *Ley (Medicine and Genetics), Korsmeyer (Medicine and Pathology)*

Bio 5443. Nucleic Acids and Nucleic Acid Protein Interactions Journal Club

The biochemistry of nucleic acids and nucleic acid-protein interactions. Focus is on the functional and structural properties of these molecules, addressed through basic biochemical and quantitative approaches. Credit 1 unit. *Hall (Biochemistry and Molecular Biophysics)*

Bio 5456. Advanced Crystallography

The advanced course in protein crystallography will address all aspects of modern protein crystallography including fundamentals of crystallography, the derivation of the structure factor and electron density equation, symmetry and space groups, direct methods, isomorphous replacement, molecular replacement, data collection, and crystal growing

theory and techniques. Prerequisites, undergraduate physical chemistry and Biol 5315 Macromolecular Structure. Two class hours per week. Credit 2 units. *Waksman (Biochemistry and Molecular Biophysics)*

Bio 5461. Molecular Recognition

The physical basis of recognition is the focus with modeling of interactions between macromolecules of biological interest such as G-protein coupled receptors and ligands such as drugs and hormones. Approaches to structure-based design of novel ligands as well as development of active site hypotheses when the three-dimension structure of the receptor is unknown will be developed. Emphasis will be placed on pharmacophore determination, receptor site modeling, three-dimensional quantitative structure-activity relationships, neural networks, and de novo design. Applications will be taken from biological systems of therapeutic interest such as inhibition of proteases (HIV protease, thrombin, collagenase), homology modeling of enzyme targets such as convertases, and design of minor groove ligands for DNA. Each student should expect to complete a project applying one of the computational methods discussed. Prerequisite, Physical Chemistry, basic Biological Chemistry. Minimum 5 students. Credit 3 units. *Marshall (Molecular Biology and Pharmacology)*

Bio 5462. Principles of Molecular Recognition II

The physical basis of molecular recognition as exemplified in ligand binding to macromolecules, protein folding, macromolecular assemblies, and other biological systems examined from several viewpoints. Applications of quantum chemistry, molecular mechanics and conformational analysis (molecular dynamics, systematic search, and Monte Carlo) will be discussed. Molecular modeling and computer graphics techniques demonstrated and applied to typical problems. Success stories in computer-aided drug design and new developments in quantitative three-dimensional structure-activity relationships reviewed. A lab project will be part of the course. Prerequisite, Physical Chemistry, Basic Biological Chemistry. Minimum 5 students. Credit 3 units. *Marshall (Molecular Biology and Pharmacology)*

Bio 548. Nucleic Acids and Protein Biosynthesis

Fundamental aspects of structure, biosynthesis, and function of nucleic acids and the biosynthesis of proteins. Emphasis on mechanisms involved in the biosynthetic processes and the regulation thereof. Prerequisites, Bio 337, 449, or equivalent or permission of instructor. Credit 3 units. *Majors (Genetics)*

Bio 5491. Advanced Genetics

Fundamental aspects of organismal genetics with emphasis on experimental studies that have contributed to the molecular analysis of complex biological

problems. Examples drawn from bacteria, yeast, nematodes, fruit flies and mammalian systems. Prerequisite, graduate standing or permission of instructor. Credit 3 units. *Schedl, Johnston (Genetics), Staff*

Bio 5498. Advanced Genetics: An Introduction to Genomic Analysis

Formal lectures will serve to highlight the role that genomic analysis currently plays in all areas of genetics. A series of lectures and demonstrations will introduce the students to many of the techniques presently used in genomic analysis. Prerequisite, Nucleic Acids (Bio 548) or permission of coursemaster. One hour lecture and two hours laboratory demonstration/lecture each week. Credit 3 units. *Goodfellow (Genetics and Surgery), Schlessinger (Molecular Microbiology)*

Bio 550. Medical Genetics

Topics covered include population and quantitative genetics, clinical cytogenetics, biochemical genetics and metabolic defects. Lectures, clinics and small group discussions. Credit 2 units. Prerequisite, an introductory genetics course, and permission of the instructor. *Hansen (Genetics)*

Bio 5502. Molecular Aspects of Vision

Seminar on useful research strategies used to elucidate the molecular basis of light detection including the biochemical, biophysical and electrophysiological events. Discussions of the molecular basis of inherited ocular cancer, color blindness and retinitis pigmentosa included. Not taught every year. Prerequisite, 3 units of Biochemistry. Credit 1 unit. *Petrash (Ophthalmology and Visual Sciences)*

Bio 5503. Molecular Pathobiology of Visual Disorders

The fundamental basis, diagnosis and management of diseases affecting the visual system, with emphasis on genetic and immunologic factors. Each topic addressed in two sessions; the first covers the fundamental etiology, the second is led by a clinician-scientist experienced in diagnosis and management of affected patients. Credit 3 units. *Petrash (Ophthalmology and Visual Sciences)*

Bio 5522. Memory

A seminar exploring experimental and theoretical approaches to understanding the biological basis of memory. Participants will read and discuss original literature with the goal of deciding what are (and are not) useful avenues into this poorly understood phenomenon. Not taught every year. Prerequisite, permission of instructor. 3 units. *Lichtman (Anatomy and Neurobiology)*

Bio 554. Neural Sciences

An integrated course dealing with structure, function and development of the nervous system. The course will be offered in the spring of the first year medical school calendar. Prerequisite, Bio 3411 or Bio 501 and Bio 5651 and approval of the instructor. Credit 5 units. *Van Essen, Lichtman, Thach (Anatomy and Neurobiology)*

Bio 5553. Developmental Neurobiology Journal Club

A weekly journal club to review important recent publications in developmental neurobiology. Emphasis on cellular and molecular mechanisms in development, in both vertebrate and invertebrate systems. Prerequisite, one year of graduate study in Division of Biology and Biomedical Sciences or equivalent. Credit 1 unit. *Taghert (Anatomy and Neurobiology), Pearlman (Cell Biology and Physiology)*

Bio 5562. Principles of Neural Development

An introduction to the development of the nervous system. Prerequisite, graduate status or permission of instructors. Credit 4 units. *Taghert, Sanes, Lichtman (Anatomy and Neurobiology)*

Bio 5571. Cellular Neurobiology

A survey of the basic principles of nerve cell structure and function, including quantitative analysis of voltage and chemically gated ion channels, synaptic transmission and sensory transduction. Lectures and conferences supplemented with reading of classic and contemporary papers. Prerequisite, matriculation in the Division of Biology & Biomedical Sciences or in the medical school, advanced undergraduate standing, or permission of instructor. 4 hours a week, 4 units credit. *Lukasiewicz (Anatomy, Neurobiology, Ophthalmology and Visual Sciences)*

Bio 5581. Physiological Basis of Acoustic Communication

Lectures and seminars in hearing and acoustic signals of animals, from invertebrates to humans. Structural and functional adaptation for processing the signals for communication and echolocation are considered. Prerequisite, Bio 3411 or Bio 3421, or a course comparable to Physiological Psychology. One two-hour class a week. Offered in the fall semester of odd numbered years. Credit 2 units. *Suga (Biology)*

Bio 5601. Topics in Cognitive Neuroscience

How the brain organizes behavior, emphasizing higher functions such as perception, language and attention. Aim is a useful integration of information from neurobiological approaches (e.g., single unit recording, lesion-behavior experiments) and information-processing approaches (e.g., cognitive psychological models, connectionist models). Prerequisite, Psych 340 or 441. Credit 3 units. Same as Psychology 4411. *Petersen (Neurology)*

Bio 5641. Computational Neuroscience

This course will review methods for applying basic principles of computation and information processing to neurobiological systems, with an emphasis on the primate visual system. It will be of use to those interested in building models of the brain, and should be helpful in the design of physiological and psychological experiments. Prerequisites, Calculus and Elementary Statistics. Some knowledge of Neurobiology would be useful, but it is not essential. Credit 1 unit. *Anderson (Anatomy and Neurobiology)*

Bio 5651. Neural Systems

Introduction to the structure and function of the major systems within the central nervous system. Selected topics are chosen to provide an overview of the brain with emphasis on major general concepts. Laboratories and readings of the primary literature are an integral part of this course. Prerequisite, matriculation as a graduate or medical student, or advanced undergraduate standing with satisfactory performance in Bio 3411, Bio 3421, and permission of instructor. Three hours of lecture, 1 1/2 hours of discussion and 4 hours of laboratory a week. Credit 4 units. *Staff (Anatomy and Neurobiology)*

Bio 5662. Biological Applications of Optical Microscopy

Introduction to the light microscope as a tool for innovative research in cell biology and neuroscience. Topics include optical microscope theory, electronic image acquisition and analysis, fluorescent probes for intracellular ions such as calcium and confocal microscopy. Seminar format with faculty and student participation. Prerequisites, graduate or medical student standing or permission of course director. One and one-half class hours per week. Credit 2 units. *Goldberg (Biochemistry and Molecular Biophysics)*

Bio 567. Advanced Tutorials in Neural Sciences

Directed readings and discussions for graduate students on selected topics in advanced neuroscience. Topics and specific instructors to be listed at registration. Each tutorial will last for six weeks. Two-class hours a week for six weeks for 1 credit. Credit 1-3 units, depending on how many sessions taken. Offered in both fall and spring semesters. Open to all students interested in the neurosciences program. Prerequisite: consent of instructor for non-neurosciences students. *Lichtman (Anatomy and Neurobiology), Staff (Neurosciences Program)*

Bio 5681. Pathogenesis of Neurologic Diseases

This course will offer an in-depth description of recent scientific advances relevant to the causes of neurological disease. Lectures will be followed by discussions involving preclinical and clinical faculty members whose research is relevant to the disease being considered. The course will meet two hours per week for 15 weeks in alternate years. Credit 2 units. *Snider (Neurology)*

Bio 572. Seminar in Plant Biology

A weekly discussion of modern research in plant biology including topics in molecular genetics, development, biochemistry, physiology, population dynamics and plant-pathogen interactions. Research seminars by local and outside speakers will be intermixed with journal club presentations in alternating weeks. Credit will be contingent on one journal club presentation per semester, regular attendance and active participation in group discussions. Credit 1 unit. *Kunkel, Richards (Biology)*

Bio 575. Advanced Studies in Plant Systematics

Seminars in specific topics with main emphasis in economic botany. Other topics include anatomy, chemotaxonomy, cytology, ecotaxonomy, embryology, nomenclature, palynology, phytogeography and bibliography. Prerequisite, Bio 308 or equivalent. One seminar alternate weeks. Credit 1 unit a semester. *Lewis (Biology)*

Bio 580. Seminar in Population Biology

This weekly seminar, covering different topics each semester, should be taken by graduate students in the program. Prerequisite, graduate standing or either Bio 301 or 302; and Bio 419. Credit variable, 2 or 3 units. *Staff (Biology)*

Bio 581. Seminar in Techniques in Field Biology

Planning and presentation of techniques in selected areas of population biology. Prerequisite, permission of the instructor. Credit 3 units. *Sexton (Biology)*

Bio 582. Theoretical Population Genetics

A rigorous introduction to the theoretical basis of population genetics and evolutionary mechanisms. Quantitative genetics, population structure, and molecular evolution will be investigated first, followed by an examination of how selection, population structure and ecological factors interact in determining the evolutionary fate of a population. Will be taught every four years. Prerequisite: Bio 301, Math 118 and either 217 or 320. Credit 3 units. *Templeton (Biology)*

Bio 585. Seminar in Floristic Taxonomy

A survey of angiosperm families, their morphology, cytology, anatomy, palynology, chemistry, and evolution. Prerequisite, Bio 308 or equivalent. Credit 1 unit. *Richardson (Biology)*

Bio 590. Research.

Credit to be arranged. *Staff (Biology)*

Bio 591. Seminar in Biology and Biomedical Sciences

These summaries cover the recent literature in various areas not included in other courses, or in more depth than other courses. Credit to be arranged. *Staff*

Bio 5915. Teaching Practice in Biology and Biomedical Sciences

Students serve as teaching assistants for undergraduate and graduate level courses. Faculty-supervised activities include lecture presentation; leading discussion and problem-solving sessions; laboratory instruction. Prerequisite, restricted to graduate students in the Division of Biology and Biomedical Sciences. Credit 1 unit. *Landick (Biology)*

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences.

PROGRAM IN BIOLOGICAL AND BIOMEDICAL ENGINEERING

Biological engineering is a multidisciplinary science bringing expertise in computing, electronics, materials, mechanics and other fields of engineering to bear on problems of biological and medical importance. The quantitative approaches of engineering and the applied sciences are increasingly needed in the biological sciences.

Biological and biomedical engineers are playing critical roles in renovating our nation's healthcare system by developing new tools and strategies to make the delivery of healthcare both better and more cost effective. They are also playing a critical role in improving the environment by optimizing the interactions between human activities and our biological environment. Analytical approaches and quantitative methodology are essential to understanding the complex systems encountered in medicine and biology. Ecosystems and the human body are intricate and well-engineered systems; their maintenance and repair present many engineering challenges.

Biological engineering has been a focus of activity for almost 40 years in both the School of Engineering and Applied Sciences and the School of Medicine at Washington University in St. Louis. Contributions of the University include several novel imaging technologies for biology and medicine; positron emission tomography, confocal optical microscopy, and advanced ultrasound, and extensions to magnetic resonance and X-ray tomography. The University has played a leading role in applying high-speed communications systems to transmit medical information and link physicians at remote sites together. Washington University is recognized worldwide for its work in mapping and sequencing the human genome and for mapping of the human brain.

Biological engineering is an extremely diverse field encompassing the activities of faculty at Washington University in departments ranging from physics to cardiology, as well as all of the engineer-

ing departments. Recognizing the strength and diversity of existing programs, biological engineering involves faculty from several departments in the School of Engineering and Applied Science, the College of Arts and Sciences, the School of Medicine, and the Institute for Biomedical Computing.

Modern biological engineering is emerging as a new discipline grounded in the tremendous advances that have been made in biology, genetics, and medicine over the past three decades. The biotechnology revolution has created a host of powerful new tools with applications ranging from forensics and the neurosciences to agriculture. Biological engineering brings quantitative analysis and rational design approaches to these new technologies so that they can be reliably used and extended.

The goals of the graduate Program in Biological Engineering at Washington University are to continue the University's innovative and nationally recognized research programs and to train a new generation of leaders capable of acting independently, directing novel applications of engineering science in biomedicine, and addressing current problems in biological and biomedical research. This is a new vision of biological engineering as a field and this new formulation defines a role for which Washington University is ideally suited.

The degree programs in biological and biomedical engineering are administered through the School of Engineering and Applied Science. For full program descriptions, see the School of Engineering Graduate Catalog.

Biomedical Engineering course offerings:

- BMed 500. Independent Research
- BMed 502. Mathematical Methods in Biophysics
- BMed 547. Biological Mass and Momentum Transfer
- BMed 559. Introduction to Biomechanics
- BMed 560. Biomechanics
- BMed 582A. Instrumentation
- BMed 583. Models of Sensory Communication
- BMed 585. Ion Selective Channels in Cell Membranes
- BMed 599. Master's Research
- BMed 600. Doctoral Research
- BMed 651. Science of Synthetic and Biological Polymers
- BMed 693. Special Topics in Biomedical Engineering

For additional related courses, see Biomedical Computer Laboratory in this Bulletin and the Bulletin of the School of Engineering and Applied Science.

FACULTY

Professor Emeritus

Harold W. Shipton

Professors

R. Martin Arthur
Jerome R. Cox, Jr.
Phillip L. Gould
E. Mark Haacke
Stephen M. Highstein
John L. Kardos
Jeffery Lichtman
Garland R. Marshall
James G. Miller
Michael I. Miller
Tom R. Miller
Robert E. Morley
Michael K. Pasque
William F. Pickard
James A. Purdy
Marcus E. Raichle
Donald L. Snyder
Salvatore P. Sutura

Curt Theis

Michael W. Vannier

George I. Zahalak

Research Professors

Charles H. Anderson
Norbert S. Mason
Gregory V. Nikiforovich

Associate Professors

G. James Blaine III
Stuart B. Boxerman
Ron K. Cytron
Mark E. Frisse
Daniel R. Furhmann
Will D. Gillett
Stanley Misler
William D. Richard
Frederick U. Rosenberger
David J. States
Lewis J. Thomas, Jr.
Samuel A. Wickline
Richard K. Wilson
Michael S. Zuker

Research Associate Professor

Lyndon S. Hibbard

Assistant Professors

Philip V. Bayly
Denise D. Beusen
José-Angel Conchello
Duffy Cutler
Julius M. Guccione
Michael G. Kahn
Sandor J. Kovacs
DeBiao Li
Weili Lin
James G. McNally
John M. Ollinger

Research Assistant Professor

Norbert S. Mason

Instructor

Toni M. Kazic

HEALTH ADMINISTRATION PROGRAM

The Philosophy

The faculty of the Health Administration Program of Washington University believes that administrative personnel in health organizations require not only a solid foundation in management but also an understanding of those aspects of finance, regulation, and planning unique to the healthcare field. Additionally, since its inception in 1946, the program has acted on the premise that health administration students would benefit from exposure to the environment in which they ultimately will be involved. To this end the program has maintained an organizational structure consisting of a core faculty located within the School of Medicine, augmented by faculty from other schools and departments within the University, as well as affiliated institutions and agencies. This multidisciplinary approach enables the student to acquire not only specific management skills but an understanding of the many complexities unique to the healthcare sector.

Curriculum and Sequence of Study

Required courses constitute 62 percent of the course sequence for the Master of Health Administration degree, offering vital exposure to the generic knowledge in the health administration area. In addition to the elective courses available within the Health Administration Program (HAP), students may take up to 15 semester hours of graduate work in other units of Washington University. The HAP student's faculty adviser must approve the selection of courses in the student's individual curriculum. The student's previous academic work, employment experience, and ultimate performance goals enter into the individual's personalized curriculum.

As a means of furthering interdisciplinary study, up to 15 semester hours of HAP courses are open to interested graduate students from other areas of Washington University. There is also a joint M.H.A.-J.D. degree between the Health Administration Program and the school of Law, a joint M.H.A.-M.B.A. degree between the Health Administration and the graduate School of Business Administration, and a joint M.H.A.-M.I.M. degree between the Health Administration Program and the School of Technology and Information Management. Two new joint degrees are offered between the Health Administration Program and the George Warren Brown School of Social Work (M.H.A.-M.S.W.) and with the School of Arts and Sciences in Human Resource Management (M.H.A.-M.A.) through University College.

The sequence of study requires two years, each consisting of a fall and spring semester. Upon completion of the four semesters, or a total of 60 units, the student will receive a master of health administration (M.H.A.) degree conferred by Washington University. The statute of limitations is five years from the date of matriculation to complete

all requirements for the M.H.A. degree. Contingent upon graduation the student has the option of pursuing a 12-month postgraduate administrative fellowship. A certificate will be awarded by Washington University School of Medicine and the affiliated fellowship organization upon completion of the fellowship.

Administrative Fellowship

The 12-month optional postgraduate administrative fellowship will be served in a hospital, health agency, or health organization which has been recommended and approved by the full-time faculty. This option is available only to those persons who have the M.H.A. degree conferred upon them by Washington University. The purpose of the fellowship is to provide the graduate with an opportunity to observe and practice those concepts and principles learned during the didactic on-campus exposure. The administrative fellowship is strongly recommended, as this postgraduate clinical exposure is deemed necessary for adequate professional career preparation. The fellowship is completed under the direction of a well-qualified and experienced healthcare administrator who is given an annual adjunct faculty appointment at Washington University School of Medicine.

The full-time faculty maintains close liaison with the administrative fellow and the preceptor. An educational plan which outlines the fellow's resident's activities for the coming year must be filed by the preceptor. The preceptor also sends two evaluation reports to the Director of HAP and shares the responsibility for recommending awarding of the certificate by Washington University School of Medicine and the fellowship site organization.

Within available resources an on-campus faculty member visits the site to meet with the preceptor and resident. HAP also sponsors an annual preceptor's conference at Washington University. Interaction of these site and campus visits enables joint review of the resident's progress, as well as evaluation and refinement of the administrative fellowship experience.

Admission Requirements

Washington University's Health Administration Program is committed to nondiscriminatory practices in selection of applicants regarding race, sex, age, religion, or national origin. The faculty and staff are affirmatively committed to recruiting, enrolling, and educating students from minority groups who have the potential for graduate study.

A minimum of a bachelor's degree from an accredited university or college acceptable to Washington University School of Medicine is required, as is completion of the Graduate Record Examination (Aptitude Test) or the Graduate Management Aptitude Test. No specific undergraduate major field of study is required for admission into the program; however, at least one semester of accounting is required and introductory courses in

economics, statistics (or their equivalents), and mathematics through college algebra are very strongly recommended.

Tuition per semester	\$8,500
Books and supplies (per semester)	550
Application fee (nonrefundable)	30

"B" Electives Health Administration

During the 1990s, the American healthcare system is undergoing dynamic change as never seen before in the 20th century. This change is a social mandate from the American people demanding the direct involvement of the federal government in designing, organizing and financing the delivery of patient care.

The goal of this six-week elective is to expose the senior medical student to the history of healthcare

organization in the United States with focus on the evolving National Healthcare System under President Clinton's administration. It will also explore the impact of new National Health Policy upon medical practice, medical education and medical research.

The elective will be conducted by senior faculty using a seminar approach drawing upon a background textbook, monographs, timely topical articles and current research publications to focus the weekly discussions.

The medical student will also have the opportunity to participate in Health Administration Program classes in economics, finance, human resource management, health law, management information systems and case studies. This will be arranged according to individual interest and schedules.

Faculty

Professor and Director

James O. Hepner, Ph.D.,
University of Iowa, 1964.

Associate Professor and Deputy Director

Stuart B. Boxerman, D.Sc.,
Washington University, 1970.

Associate Professor and Associate Director/Research

Robert S. Woodward, Ph.D.,
Washington University, 1972.

Associate Professors (Adjunct)

Ted Bowen, M.H.A.,
Washington University, 1951.

James D. Harvey, M.H.A.,
Washington University, 1952.

David H. Hitt, M.H.A.,
University of Minnesota, 1952.

Wayne M. Lerner, D.P.H.,
University of Michigan, 1988.

Assistant Professor

Ronald E. Gribbins, Ph.D.,
University of Wisconsin, 1975.

Assistant Professors (Adjunct)

Frank S. Groner, LL.D.,
East Texas Baptist College, 1946.

Boone Powell, Sr., LL.D.,
Baylor University, 1958.

Mary R. Rocklage, M.H.A.,
St. Louis University, 1963.

Instructors

Linda B. Cottler, Ph.D.,
Washington University, 1987.

Dennis L. Lambert, Ph.D.,
Washington University, 1994.

Instructors (Adjunct)

Richard M. Abell, M.H.A.,
Washington University, 1972.

Lee A. Bernstein, M.H.A.,
Washington University, 1980.

Edgar V. Borgenhammar, Ph.D.,
University of California, Berkeley, 1972.

Frederick L. Brown, M.H.A.,
George Washington University, 1966.

L. Gerald Bryant, M.H.A.,
Washington University, 1968.

Keith W. Curtis, Ph.D.,
University of Oklahoma, 1973.

Stephen Dorn, M.H.A.,
St. Louis University, 1958.

John T. Farrell, M.H.A.,
St. Louis University, 1973.

Max D. Francis, M.H.A.,
Washington University, 1966.

Phillip H. Goodwin, M.H.A.,
Washington University, 1968.

Dennis A. Hall, M.H.A.,
Washington University, 1973.

M. James Henderson, M.H.A.,
Washington University, 1975.

Robert A. Hille, M.A.,
Baylor University, 1969.

Charlotte Lehmann, M.H.A.,
Washington University, 1979.

Michael T. McGovern, M.H.A.,
Ohio State University, 1982.

John P. McGuire, M.H.A.,
Washington University, 1985.

Garry A. Maness, M.H.A.,
Memphis State University, 1977.

Larry L. Mathis, M.H.A.,
Washington University, 1972.

Joseph J. Neidenbach, M.H.A.,
Washington University, 1974.

Glenn E. Potter, M.H.A.,
Washington University, 1972.

Boone Powell, Jr., M.A.,
University of California, 1960.

Joseph H. Powell, M.H.A.,
University of Minnesota, 1955.

E. Wynn Presson, M.H.A.,
Washington University, 1965.

Stephen C. Reynolds, M.H.A.,
Washington University, 1972.

Mark A. Wallace, M.H.A.,
Washington University, 1978.

Dan S. Wilford, M.H.A.,
Washington University, 1966.

Lecturers

Walter F. Ballinger, M.D.,
University of Pennsylvania, 1948.

Marlowe W. Erickson, Ph.D.,
University of Michigan, 1964.

Zachary B. Gerbarg, M.D.,
Albany Medical College, 1979.

Philip J. Karst, Ph.D.,
Washington University, 1972.

David H. LeMoine, M.A.,
University of Illinois, 1968.

Merlin E. Lickhalter, B.A.,
Massachusetts Institute of
Technology, 1957.

Miles W. Meyer, Ph.D.,
Washington University, 1984.

J. Stuart Showalter, J.D.,
Washington University, 1971.

Wes Sperr, B.A.,
Washington University, 1993.

Stuart D. Yoak, Ph.D.,
Washington University, 1985.

Lecturers (Adjunct)

Warren R. Betts, M.H.A.,
Virginia Commonwealth University,
1959.

David S. Ramsey, M.H.S.A.,
University of Michigan, 1962.

Donald B. Wagner, M.H.A.,
Baylor University, 1960.

HEALTH CARE SERVICES PROGRAM

The Health Care Services Program at Washington University responds to the growing need for interdisciplinary professionals with expertise in the planning, implementation, and evaluation of health service programs. Sponsored jointly by Washington University's School of Medicine, Department of Psychology, and University College, this 30-unit graduate degree program draws on the broad expertise of University faculty and research personnel. The curriculum examines organizational influences important to the development of innovative programs for individuals and families, stressing health education and the application of current research findings.

Admission to the Health Care Services program is open on a selective basis to qualified applicants with a baccalaureate degree in a science or health-related field from an accredited institution. Applicants should have completed training in one of the several professions involved in the healthcare environment. Others may be admitted whose training and goals are congruent with the purposes of the program and acceptable to the admissions committee. The Master of Health Science degree can be pursued on a part-time basis with most courses held during the late afternoon or evening hours to accommodate the working professional. Students may select electives from various departments and divisions of the University (health administration, social work, psychology, human resources management).

Faculty**Director, Health Care Services Program**

Debra L. Haire-Joshu, Ph.D., R.N.,
Research Assistant Professor in
Medicine, Center for Health
Behavior Research

Associate Director, Health Care Services Program

Cheryl A. Houston, M.S., R.D.,
Research Instructor in Medicine,
Center for Health Behavior
Research

Professor of Psychology

**Director, Center for Health
Behavior Research**

Edwin B. Fisher, Jr., Ph.D.

Associate Professors

Wendy Auslander, Ph.D., LCSW,
George Warren Brown School of
Social Work

Kenneth B. Schechtman, Ph.D.,
Biostatistics

Neil H. White, M.D.,
St. Louis Children's Hospital

Research Assistant Professor

Cynthia L. Arfken, Ph.D.,
Center for Health Behavior
Research and Division of Biostatistics

Research Instructors

Jeffrey Gavard, Ph.D.,
Center for Health Behavior
Research

Carol Stubblefield, M.S.N.,
Center for Health Behavior
Research and Jewish Hospital
College of Nursing and Allied
Health

Linda K. Sussman, Ph.D.,
Center for Health Behavior Research
and Research Associate Department of
Anthropology

Program Instructors

Joan Heins, M.A., R.D., C.D.E.,
Center for Health Behavior Research

Jan Munro, M.Ed.,
Center for Health Behavior Research

Instructors (Adjunct)

Carol Dyer, M.A.,
Psychology

Donna Jeffe, Ph.D.,
Center for Health Behavior Research

Donald Richert, Ph.D., R.Ph.,
Vice President of Student Affairs,
St. Louis College of Pharmacy

Ex Officio

Julio V. Santiago, M.D.,
Professor of Pediatrics

PROGRAM IN OCCUPATIONAL THERAPY

The Program in Occupational Therapy prepares individuals to practice, do research and teach in the field of occupational therapy, an applied social and biological science. Occupational therapy benefits persons of all ages whose ability to engage in life tasks is impaired by physical or mental disease, injury, birth defect or aging. Through a variety of intervention strategies, occupational therapy professionals help people develop skills and adapt to disabilities so that their lives become more productive and meaningful. Occupational therapists help individuals develop, regain or retain the skills they need to learn, play, earn a living and tend to their personal needs. A critical shortage of talented individuals exists in this rewarding, well-paid field.

Master of Science in Occupational Therapy Degree Program

The Professional Master of Science degree program prepares individuals to practice as professional occupational therapists and provides them with additional knowledge and skills needed to evaluate practice, engage in educational activities, and plan and execute specialty programs. Applicants must hold a bachelor's degree or be an approved participant in a Three-Two program, and have completed prerequisites from an accredited college or university.

Each candidate for a Master's degree must complete the professional curriculum, which consists of 80 hours of coursework and is usually accomplished in five semesters of academic study (two academic years and the intervening summer). The student must complete an assistantship and a master's

project during the five semester program. Six months of supervised clinical internship is required following course work.

Tuition (graduate), per semester	\$8,750
Fee, Clinical Internship	1,950

Post Professional Master of Science Degree Graduate Program

Advanced studies leading to a Master of Science degree are offered to practicing health professionals. The multidisciplinary faculty of the Program in Occupational Therapy mentors students as they learn specialized clinical skills and participate in ongoing clinical research in one of the three tracks: occupational health, geriatric rehabilitation, and pediatrics. The Occupational Health Track focuses on the relationship between the workplace and worker's health. The Geriatric Rehabilitation Track focuses on the development and evaluation of rehabilitation and health promotion programs for older adults and their caregivers. The Pediatric Track focuses on infant development with emphasis on neonatal assessment and/or intervention.

The program requires completion of 36 semester credits including a thesis. A part time evening format allows health practitioners to work and pursue graduate education simultaneously. The program can be completed in two and one-half years. All graduate work, including the thesis, must be completed within five years.

For further information, contact the Program in Occupational Therapy, Campus Box 8505, 4444 Forest Park Blvd., St. Louis, Missouri 63108. Phone: (314) 286-1600, TDD: (314) 286-1651, FAX: (314) 286-1601.

Faculty

Elias Michael Director and Assistant Professor

M. Carolyn Baum, Ph.D.,
Washington University, 1993.

Associate Director of Profes- sional Programs and Instructor

Catherine Rose, M.A.,
Washington University, 1992.

Associate Director of Profes- sional and Program Develop- ment and Instructor

Jayne B. Lux, M.S., CCC/SLP,
Pennsylvania State University, 1983.

Coordinator of Post Profes- sional Program and Instructor

Peggy Strecker Neufeld, M.A.,
OTR/C, New York University, 1976.

Coordinator of Fieldwork Education and Instructor

Karen Parker Davis, M.A.,
OTR/C, Webster University, 1983.

Coordinator of Public Informa- tion and Recruitment and Instructor

Claudia Hilton, M.B.A.,
University of Evansville, 1986.

Computer Systems Coordinator

Ibrahim Abusharbain, B.S.,
Southern Illinois University, 1989.

Professors

Susan E. Mackinnon, M.D.,
Queen's University, 1975.

John Gail Neely, M.D.,
University of Oklahoma, 1965.

Associate Professor

C. Robert Almli, Ph.D.,
Michigan State University, 1970.

Associate Research Professor

Mary P. Watkins, M.S., P.T.,
Boston University, 1974.

Assistant Professors

Judy Bachelder, Ph.D.,
University of Kansas, 1987.

Janet Duchek, Ph.D.,
University of South Carolina, 1982.

Dorothy F. Edwards, Ph.D.,
Washington University, 1980.

Christine A. Feely, Ph.D.,
Washington University, 1984.

Philip E. Higgs, M.D.,
University of Florida, 1974.

Luci Kohn, Ph.D.,
University of Wisconsin, 1989.

Jay F. Piccirillo, M.D.,
University of Vermont, 1985.

Assistant Professors (Adjunct)

Mary Evert, M.B.A.,
National University, 1979.

Leonard Matheson, Ph.D.,
University of Southern California,
1979.

Assistant Research Professor

Christine B. Novak, M.S., P.T.,
University of Toronto, 1992.

Instructors

Diane Barnes, B.S.,
University of Illinois, 1982.

Karen F. Barney, M.S.,
University of Wisconsin, 1982.

Christine Berg, M.S.,
Boston University, 1979.

Mary Bettlach, M.P.H., OTR/C,
St. Louis University, 1992.

Paula C. Bohr, Ph.D., OTR/C,
FAOTA, University of Oklahoma,
1993.

Frances J. Cohen, M.S., OTR/C,
Washington University, 1993.

Monica Perlmutter, M.A.,
Washington University, 1989.

Lecturers

Jeanenne Blaha, M.A., OTR/C,
Webster University, 1993.

Theresa Braford, B.S.,
Washington University, 1978.

Nancy Mohr, M.S.O.T.,
Washington University, 1989.

Susan Rhomberg, M.A.,
Washington University, 1991.

PROGRAM IN PHYSICAL THERAPY

The Program in Physical Therapy at the School of Medicine offers an intensive two and one-half year curriculum which leads to the degree of Master of Science in Physical Therapy. Applicants for admission must have completed: (1) a baccalaureate degree at an accredited college or university and (2) prerequisite courses in English, psychology, biology, mathematics, physics, chemistry and social sciences.

The study of human movement—both normal and abnormal—forms the core of the curriculum. Competence in clinical practice results from integrating information learned from courses in basic science, clinical science, and from applying this information to actual practice. Students develop the ability to assess, remedy, and prevent movement disorders for a wide variety of patient care problems. The goals of the curriculum are to prepare individuals

for the profession of physical therapy who (1) have attained the competencies of an entry-level, science based, general practitioner, (2) are prepared to accept their professional responsibilities, and (3) are committed to a lifelong career.

The Program seeks to prepare students for both the current and future practice of physical therapy. The faculty actively participates in clinical practice, research and curriculum development to enhance and influence the direction of the profession. Students are provided with an environment in which both clinical and academic faculty assist them to achieve their highest personal and professional potential.

Tuition per semester \$8,750

Further information may be secured by direct correspondence with the Program in Physical Therapy, Campus Box 8502, 4444 Forest Park Blvd., St. Louis, Missouri 63108.

Faculty

Assistant Professor and Director

Susan S. Deusinger, Ph.D.,
Washington University, 1987.

Associate Professor Emeritus

Beatrice F. Schulz, M.A.,
Washington University, 1955.

Assistant Professors Emeriti

Robert J. Hickok, M.H.A.,
Washington University, 1971. (See
Administration and Health Adminis-
tration Program.)

Lorraine F. Lake, Ph.D.,
Washington University, 1962.

Associate Professor

Shirley A. Sahrman, Ph.D.,
Washington University, 1973. (See
Departments of Neurology and
Neurological Surgery and Cell
Biology and Physiology.)

Associate Professor (Visiting)

Eugene Michels, M.A.,
University of Pennsylvania, 1967.

Assistant Professors

Marybeth Brown, Ph.D.,
University of Southern California,
1984.

Robert H. Deusinger, Ph.D.,
University of Iowa, 1981.

Scott D. Minor, Ph.D.,
University of Iowa, 1987.

Michael Mueller, Ph.D.,
Washington University, 1992.

David R. Sinacore, Ph.D.,
University of West Virginia, 1991.

Assistant Professor (Adjunct)

Anthony Delitto, Ph.D.,
Washington University, 1990.

Instructors

Gail W. Baudendistel, M.S.,
St. Louis University, 1977.

Tamara Burlis, M.H.S./P.T.,
Washington University, 1993.

Cheryl Caldwell, M.H.S./P.T.,
Washington University, 1989.

Ruth Clark, Ph.D.,
St. Louis University, 1988.

Suzanne M. Cornbleet, M.A.,
Washington University, 1987.

Jay Diamond, M.H.S./P.T.,
Washington University, 1989.

Kathleen Dixon, M.Ed.,
The Johns Hopkins University, 1969.

Patricia Kohne, M.H.S./P.T.,
Washington University, 1992.

Mary Kate McDonnell, M.H.S./
P.T., Washington University, 1985.

Barbara J. Norton, M.H.S./P.T.,
Washington University, 1984.

Marc H. Schieber, M.D., Ph.D.,
Washington University, 1982.

Jennifer S. Stith, Ph.D.,
Washington University, 1995.

Janet A. Tenhula, M.H.S./P.T.,
O.C.S., Washington University,
1986.

Linda Van Dillen, Ph.D.,
Washington University, 1995.

Nancy B. Woolsey, M.S.,
Washington University, 1979.

Lecturers

Dana Altermatt, M.B.A.,
University of Missouri, 1995.

Ethel Frese, M.H.S./P.T.,
Washington University, 1985.

Richard C. Lehman, M.D.,
University of Miami, 1980.

Sue Million, B.S.,
Washington University, 1982.

Susan Strecker, B.S.,
University of Kansas, 1980.

Instructors (Clinical)

Steve Allen	Diane Cordiero	Anne Huff
Cindy Alvino	Tammy Coughlin	Kathy Huxhold
Linda Anderson	Susan Crabtree	Ann Jampel
Dan Arnold	Kim Crosley	Mike Jennings
Linda Autz	Arlene Crouther	Elaine Jones
Karen Bachman	Cindy Dahl	Janice Jones
Jennifer Baker	Chris Haag Deans	Rutger Jongblotts
Pat Barbier	Cathy Dearing	Sandra Karcher
Barbara Barnett	Chris Delketny	Rachel Kath-Dvorak
Bob Barnhart	Steven Dickoff-Hoffman	Dan Kelley
Noemi Barroga	Jeff Dobbins	Kimberly Kerbel
Susan Barrows	Karen Donahue	Kathy Kilkenny-Febos
Stephanie Battelle	Deborah Donaldson	Pam Knickerbocker
Beth Battock	Cathy Drake	Sharon Knipp
Gail Baumer	Chris Easley	Keith Kocher
Sarah Baumgartner	John Eberhart	Julie Koesterer
Dana Beggs	Tony Egan	Kelly Koga
Carla Bennett	Marilyn Engmann	Nancy Krick
Marlys Bennett	Julie Fernando	Joy Krull
Renee Bennett	Jayne Fleck-Pool	John LaRocco
Susan Barr Black	Jean Fleming	Kaycie LaRock
Jocelyn Blaskey	Lynne (Merscher) Frank	Nick Laubenthal
Jeanne Boardman	Nancy Frasch	Linda Law
Philip Boeckmann	Lori Fuentes	Charles LeBlanc
Brenda Bolton	Trena Glenn	Kim LeBlanc
Karen Boudouris	Toni Goelz	Chris Leifield
Carl Brandow	Prem Gogia	Peter Leininger
Denise Brasseaux	Ira Gorman	Mary Liddy
Kathy Braun	Jennie Gregory	Judy Ligman
Sylvia Brothers	Philip Griess	Terri Lochmaier
Laura Brown	Linda Haar	Ray Lucci
Julie Bullock	Judy Hackmann	Adele Luxa
Sue Burton	Iola Haddock	Maureen Lynch
Pam Bustamante	Kris Hager	Dave Maaske
Marlene Cailteux	Theresa Hall	Gabrielle Mack
Susan Cannon	Cheryl Halverson	Marsha Mahne
Christine Canupp	Donabelle Hansen	Andy Marini
Margaret Carr	Cheryl Hardy-Gostin	Pamela Markland
Barbara W. Carroll	Cheri Hayes	Jeanne Martin
Steve Cassabaum	Jill Heitzman	Sue Mayer
Diana Chartrau	Mindy Hensley	Laura McBurnett
Mike Cibulka	Becky Herron	Chuck McDonnell
Sherry Clark	Julie Hilborn	Kevin McGowan
Carles Collins	Carol Jean Hood	Liane Meadors
	Rick Huelsing	Christine Meier

Shirley Meissner	Teresa Reiser	Sue Stevens
Lois Michaelis	Karen Remillard	Capt. Stephen Stoecker
Carol Miller	Diane Richter	JoAnna Strunk
Kim Miller	Belinda Ricks	Lynn Suiter
Mike Miller	Jackie Rinaldo	Linda Tackes
Sheri Miller	Julia Robinson	Neal Tanner
Margaret Molloy-Haughey	Paul Rockar	Janet Tenhula
Cheryl Moore	Donna Roettger	Susan Thessen
Gail Morikado	Scott Rose	Carla Thomas
Patty Morita-Nagai	Erica Rouvalis	Deb Thomas
Todd Munson	Cindy Ruich	Cynthia Trentman
Emily Murph	Mark Rutledge	Eileen Tufenkain
Christine Musgrove	Ron Ryan	Karen Uebelhor
Melody Nagel	Wendy Rzeppa	Michelle Unterberg
Kelly Nahlik	Gretchen Salsich-Varga	Ralph Utzman
Mary Ann Nedorost	Karen Sandstedt	Gary Van de Kamp
Mary Niemeyer	Cheryl Sazama	Karen Mees Vespa
Stacie Novak	Kathy Schmidt	Kathy Vitela
Ellen O'Bannon	Rene Schreier	Rich Wager
Dick Ondrey	Heidi Schulte	Tom Waggonner
Margie O'Shaughnessy	Peg Schultz	Mary Ann Walde
David Overby	Beth Schutz	Jane Warner
Mary Palaima	Alex Sciaky	Kathy Wcislo
Mary Patrick	Karen Scott	Cheryl Whitehurst
Shana Pearson	Joan Selby	Jessie Whitehurst
Wayne Petereit	Sue Serbinski	Chris Williams
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This program prepares postdoctoral fellows and a select group of predoctoral students for an active research career in psychiatric epidemiology. Students develop research skills, and learn basic epidemiological methods. They study the history and development of various psychiatric diagnostic systems, the history of psychiatric epidemiology, and they become familiar with the commonly used diagnostic interviews and questionnaires. They also become familiar with computer statistical packages and become competent in data analysis.

Advanced students may be given credit for similar courses taken elsewhere. Each student selects a mentor who is responsible for guiding him or her in

research activities. Students present research findings at scholarly meetings and in journal articles and learn to write grant proposals. They serve as constructive critics of the published and submitted work of other researchers and become sensitive to ethical issues in cross-sectional and longitudinal epidemiological research. Students' time is divided between formal courses and research apprenticeships, with the greater emphasis on the latter. Students participate in various stages of ongoing studies: instrument development, study design, interviewer training, sample selection, data collection and management, designing and carrying out data analysis, and literature reviews.

The degree of Master of Psychiatric Epidemiology (MPE) is typically earned in two years (five semesters, including one summer).

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C. Robert Cloninger (Psychiatry)

Dabeeru C. Rao (Biostatistics)

Theodore Reich (Psychiatry)

John P. Rice (Mathematics in Psychiatry and Biostatistics)

Edward L. Spitznagel, Jr. (Biostatistics)

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Andrew C. Heath (Psychology in Psychiatry)

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Elizabeth M. Smith (Social Work in Psychiatry)

Arlene Stiffman (Social Work)

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Carol S. North (Psychiatry)

George P. Vogler (Biostatistics)

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Mae Gordon (Ophthalmology and Visual Sciences)

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Gwendolyn G. Reich (Anthropology in Psychiatry)

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B.S., University of Wisconsin, '87
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

DuBois, Brian W.

San Diego, CA
B.A., University of California,
San Diego, '88
Internal Medicine - Preliminary
Jewish Hospital
St. Louis, MO
Anesthesiology
Massachusetts General Hospital
Boston, MA

Glickman, Jonathan

Scarsdale, NY
B.S., Yale University, '87
Pathology
Brigham and Women's Hospital
Boston, MA

Godambe, Sandip Ashok

Lisle, IL
B.A., Washington University, '87
Pediatrics
Children's Hospital
Boston, MA

Goodkin, Howard Parker

Sierra Madre, CA
B.S.E., University of
Pennsylvania, '85
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Heusel, Jonathan William

Lincoln, NE
B.S., University of Nebraska, '87
Laboratory Medicine
Barnes Hospital
St. Louis, MO

Hsu, Benjamin Li-ping

Gaithersburg, MD
B.A., Harvard College, '86
Internal Medicine - Preliminary
Jewish Hospital
St. Louis, MO

Jay, Patrick YinKan

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B.S., Stanford University, '87
Pediatrics
Children's Hospital
Boston, MA

Johnson, Donald Russell

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B.A., Ohio State University, '87
Internal Medicine - Preliminary
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Kolodney, Michael Spencer

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S.B., Massachusetts Institute of
Technology, '86
Internal Medicine - Preliminary
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Portales, NM
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University, '86
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Novack, Deborah Veis

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Pathology
Barnes Hospital
St. Louis, MO

Porter, Brenda Elaine

St. Louis, MO
B.S., Washington University, '87
Internal Medicine
Wilford Hall - USAF Medical Center
Lackland AFB
San Antonio, TX

Roberts, Charles W. Mortimer

Madison, WI
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Children's Hospital
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Rudnick, Caroline Marie

Mt. Clemens, MI
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Family Practice
St. John's Mercy
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Yale University
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Iowa City, IA

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St. Louis, MO

Kao, Janet Wen-Yun

Creve Coeur, MO
B.S., Duke University, '90
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Kaskowitz, Lawrence

St. Louis, MO
B.A., Washington University, '86
Radiology-DX
Barnes Hospital
St. Louis, MO

Kirchmann, Eric

Omaha, NE
B.A., Knox College, '91
Psychiatry
Duke University
Durham, NC

Kirkpatrick, Kraig

Lee's Summit, MO
B.S., Graceland College, '91
Radiology-DX
Barnes Hospital
St. Louis, MO

Kissela, Brett

Fond du Lac, WI
B.S., Marquette University, '91
Internal Medicine - Preliminary
Medical College of Wisconsin
Milwaukee, WI
Neurology
University of Michigan
Ann Arbor, MI

Koler, Mark

Parma, OH
B.S., University of Dayton, '91
General Surgery
Wilford Hall - USAF Medical Center
San Antonio, TX

Kraujalis, Michael J.

Carmel, IN
B.A., Northwestern University, '91
Internal Medicine
Barnes Hospital
St. Louis, MO

Kraus, Carl N.

St. Louis, MO
B.A., Washington University, '91
Internal Medicine
The University of Chicago
Chicago, IL

Krumholtz, Jason

Muttontown, NY
B.S., University of Michigan, '91
Surgery - Preliminary
Barnes Hospital
St. Louis, MO
Urology
Washington University
St. Louis, MO

La Starza, Mark

New Smyrna Bch, FL
B.S., University of Florida, '86
Internal Medicine
Barnes Hospital
St. Louis, MO

Lattibourdere, Rennae

Miramar, FL
B.S., University of Miami, '91
Pathology
The Johns Hopkins University
Baltimore, MD

Lawner, Brian

East Brunswick, NJ
B.A., Duke University, '91
Surgery - Preliminary
Barnes Hospital
St. Louis, MO
Otolaryngology
Washington University
St. Louis, MO

Lee, Wai

Kuala Lumpur, Malasia
B.S., University of Oregon, '90;
M.S., '91
Internal Medicine
Baylor College of Medicine
Houston, TX

Lehman, Jr., John

Belleville, IL
B.A., Washington University, '91
Internal Medicine
Barnes Hospital
St. Louis, MO

Liu, Kenneth

Arlington Heights, IL
B.S., University of Illinois, '89
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Lyons, William

Oceanside, CA
B.S., University of California,
Santa Barbara, '80;
M.S., University of California,
San Diego, '91
Internal Medicine
University of California - San
Francisco
San Francisco, CA

McCulley, Timothy

Dallas, TX
B.A., Pitzer College, '91
Transitional
University of Hawaii
Honolulu, HI
Ophthalmology
Stanford University
Stanford, CA

MacDonald, Nancy E.

Lynn, MA
B.A., College of the Holy Cross, '90
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

McKinley, Derrick

Boston, MA
B.S., Carnegie-Mellon University, '84
M.B.A., Xavier University, '91
Research

Mickevicius, Richard

Wind Lake, WI
B.S., Marquette University, '91
ER Medicine
Wayne State University/Detroit
Medical Center
Detroit, MI

Miller, David H.

Houston, TX
B.A., Washington University, '91
Transitional
Albert Einstein Medical Center
Philadelphia, PA
Radiology-DX
North Shore University Hospital
New York, NY

Miller, David P.

Rockford, IL
B.S., University of Illinois, '91
Pediatrics
Wright Patterson AFB
Dayton, OH

Muller, Nancy

St. Louis, MO
B.S., St. Louis University, '89
Pathology
University of Kentucky
Lexington, KY

Naylor, Michael

Pascoag, RI
B.S., Providence College, '91
Radiology-DX
Barnes Hospital
St. Louis, MO

Nguyen, Jamie

Santa Ana, CA
B.S., University of California,
Irvine, '91
Internal Medicine
University of California - Irvine
Irvine, CA

Oliak, David

Racine, WI
B.S., Northwestern University, '91
General Surgery
Harbor Hospital - UCLA
Torrance, CA

Oliver, Kari Ann Schmidt

Cedarburg, WI
B.S., Northeast Missouri State
University, '91
Obstetrics - Gynecology
St. Louis University
St. Louis, MO

Palmer, Christopher

Fort Wayne, IN
B.S., Purdue University, '91
Psychiatry
McLean Hospital
Belmont, MA

Perez, Nona

Bethesda, MD
B.S., Georgetown University, '91
ER Medicine
Rhode Island Hospital
Providence, RI

Pogue, Douglas

South Euclid, OH
B.A., Miami University, '90
Internal Medicine
University of Maryland
Baltimore, MD

Porter, Brent

Topeka, KS
B.A., University of Kansas, '91
Internal Medicine
Wilford Hall-USAF Medical Center
Lackland AFB

Primack, Jonathan David

Commack, NY
B.A., Washington University, '91
Internal Medicine - Preliminary
Lenox Hill Hospital
New York, NY
Ophthalmology
Mount Sinai School of Medicine
New York, NY

Raissi, Abdolreza

Edina, MN
B.A., Northwestern University, '90
Orthopaedic Surgery
Ohio State University
Columbus, OH

Rastorfer, Suzanne

Gladstone, MO
B.A., University of Kansas, '91
Pediatrics
Wayne State University/Detroit
Medical Center
Detroit, MI

Reynolds IV, John Moses

Nashville, TN
B.E., Vanderbilt University, '91
Orthopaedic Surgery
Alton Oschner Foundation
New Orleans, LA

Reznik, Scott

Oklahoma City, OK
B.A., Duke University, '91
General Surgery
Barnes Hospital
St. Louis, MO

Richardson, David

Fountain Valley, CA
B.A., Brigham Young
University, '91
Family Practice
Ventura County Medical Center
Ventura, CA

Robey, Thomas

Wauwatosa, WI
B.S., Duke University, '91
Surgery - Preliminary
University of Michigan Hospital
Ann Arbor, MI
Otolaryngology
University of Michigan
Ann Arbor, MI

Rogakos, John

Centerville, OH
B.S., University of Dayton, '90
Psychiatry
Barnes Hospital
St. Louis, MO

Roy, Soham

Lincoln, NE
B.A., Stanford University, '91
Otolaryngology
University of Miami
Miami, FL

Ruff, Joel

Cincinnati, OH
B.S., University of Cincinnati, '90
Pediatrics
Brooke Army Medical Center
San Antonio, TX

Salaris, Sheryl Lynn

West Lafayette, IN
B.S., Purdue University, '91
Psychiatry
Hospital of University of
Pennsylvania
Philadelphia, PA

Schein, Joel

Sunnyvale, CA
B.A., University of California,
San Diego, '91
Radiology-DX
University of Minnesota
Minneapolis, MN

Schendel, Timothy

Elk Grove, CA
B.A., California State University,
Sacramento, '91
Orthopaedic Surgery
Hahnemann University Hospital
Philadelphia, PA

Schulte, Douglas

West Des Moines, IA
B.S., University of Iowa, '91
Otolaryngology
Mayo Graduate School of Medicine
Rochester, MN

Sirinek, Matthew

Gladstone, MO
B.A., University of Michigan, '91
Internal Medicine
McGaw Medical Center
Chicago, IL

Smith, Andrew

Wilmington, DE
B.A., University of Virginia, '91
Family Practice
Floyd Medical Center
Rome, GA

St. Peter, Steven Lynn

Wichita, KS
B.A., University of Kansas, '89
Internal Medicine
Hospital of University of
Pennsylvania
Philadelphia, PA

Stacy, Gregory S.

Hillsborough, CA
B.A., University of California,
Berkeley, '91
Radiology-DX
The University of Chicago
Chicago, IL

Starr, Ann

Plattsburgh, NY
B.S., Tulane University, '91
Obstetrics - Gynecology
McGaw Medical Center
Chicago, IL

Strawhecker, Kristen

New Rochelle, NY
B.A., Washington University, '91
Pediatrics
University of Tennessee
Memphis, TN

Terry, Martha Sue

Columbia, MO
B.A., Williams College, '89
Family Practice
University Hospital & Clinic
Columbia, MO

Thornton, John D.

La Mesa, CA
B.A., Williams College, '91
Internal Medicine - Preliminary
University of Washington
Seattle, WA

Trump, Nichol Marie

St. Louis Park, MN
B.A., Washington University, '91
Pediatrics
Bethesda Naval Hospital
Bethesda, MD

Walter II, James Cleo

Tulsa, OK
B.S., Stanford University, '91
Orthopaedic Surgery
University of Texas - Southwestern

Wang, Po

Lenexa, KS
B.A., Washington University, '89
Psychiatry
Stanford University
Stanford, CA

Wu, Debbie

Douglasville, GA
B.A., Washington University, '91
Internal Medicine
University of Rochester/Strong
Memorial Medical Center
Rochester, NY

Young, Natawadee

Kaduna, Nigeria
B.A., Illinois Wesleyan
University, '91
Family Practice
University Hospital & Clinic
Columbia, MO

Zimmerman, Patrick

Salt Lake City, UT
B.A., University of Utah, '91
Family Practice
Merced Community Medical Center
Merced, CA

Zogakis, Theresa

Satellite Beach, FL
B.S., University of Florida, '91
Surgery - Preliminary
Barnes Hospital
St. Louis, MO

**Medical Scientist
Training Program
(M.D. and Ph.D.
Degrees)**

Ninth-Year Trainees

Glaser, Paul Edward

Euclid, OH
B.S., M.S., The University of
Chicago, '86

Eighth-Year Trainees

Chiara, David Carl

Redding, CA
B.S., University of California,
Davis, '84

Ho, Chris Meichung Wang

West Lafayette, IN
B.S., Purdue University, '87

Hug, Christopher

Cincinnati, OH
B.S., B.A., University of
Cincinnati, '87

Leonis, Michael Anthony

Las Vegas, NV
B.A., Washington University, '87

Silbert, Seth Cheng
Clayton, MO
B.S., Harvard University, '86

Tarle, Ivan
Novi Sad, Yugoslavia
B.S., California Institute of
Technology, '87

Seventh-Year Trainees

Beck, Anita Elizabeth
Troy, OH
B.S., Massachusetts Institute of
Technology, '88

Lee, Stephen Luming
Westerville, OH
B.A., Washington University, '88

Sachais, Bruce S.
Florham Park, NJ
B.A., Lehigh University, '88

Solaro, Christopher Ross
Mariemont, OH
B.S., Northwestern University, '88

Tykodi, Scott Simon
South Dartmouth, MA
B.A., Northwestern University, '88

Warszawsky, Ilka Ruth
West Bloomfield, MI
B.A., Brandeis University, '88

Sixth-Year Trainees

Alvarez, John David
Mechanicsburg, PA
B.S., Pennsylvania State
University, '89

Bullock, Eric Daniel
Ankeny, IA
B.S., University of Iowa, '89

Chu, Gerald Chen
Oswego, NY
B.A., Cornell University, '89

Colman, Howard
Irvin, CA
Sc.B., Brown University, '89

Colvin, Jennifer Susan
Towson, MD
A.B., Harvard University, '87

Dighe, Anand Shrikant
Bethesda, MD
B.S., Massachusetts Institute of
Technology, '89

Gallagher, Martin
Palos Park, IL
B.S., University of Notre Dame, '89

Greenlund, Andrew Christopher
Nevada, MO
B.S., Southern Methodist
University, '89

Greenlund, Laura Schwarze
Rochester, MN
B.S., University of Wisconsin, '89

Hermiston, Michelle E.
Durant, IA
B.S., University of Iowa, '88

Hodsdon, Michael Edwin
Bloomington, IN
B.S., Indiana University, '89

Kotzbauer, Paul Thomas
Cincinnati, OH
B.S., Northwestern University, '89

McCoy, Roderick Lawrence
Santa Monica, CA
B.S., Stanford University, '89

Mathews, Gregory Christopher
Berkeley Heights, NJ
B.S., Georgetown University, '89

Moscato, Lisa Mae
Medford, WI
B.S., University of Wisconsin, '89

Norris, Andrew William
Olathe, KS
B.S., Massachusetts Institute of
Technology, '89

Rogers-Rovira, Howard Wooding
Newbury, MA
B.S., Harvard University, '89

Wu, Justina Eng Hui
Westminster, CA
B.S., University of California,
Irvine, '89

York, Sally Jane
Hopewell, NJ
B.S., University of Iowa, '86

Fifth-Year Trainees

Ardelt, Agnieszka Anna
West Lafayette, IN
B.S., Purdue University, '89

Bhatnagar, Rajiv Sahai
Burlingame, CA
B.S., A.B., University of California,
Berkeley, '89

Bry, Lynn Virginia
Hilton Head Island, SC
B.A., Cornell University, '90

Chan, Iris Tanchi
Jamaica, NY
Sc.B., Brown University, '90

Cheng, Judy Mary
Hoffman Estates, IL
B.S., University of Michigan, '89

Culican, Susan Margaret
Frederick, MD
B.A., Washington University, '90

Darrow, Bruce Jonathan
White Plains, NY
B.S., Yale University, '90

Fogg, George Chee-Chiu
Littleton, CO
A.B., Cornell University, '90

Gubiose-Klug, Rose
Euclid, OH
B.S., Washington University, '90

Hsieh, Chyi-Song
Carbondale, IL
B.S., M.S., University of
Chicago, '90

Hug, Bruce Allen
Tinley Park, IL
B.S., University of Illinois '88

McCarter, James Philip
Northfield, IL
A.B., Princeton University, '89

Martin, Tod Andrew
Carbondale, IL
B.A., Vanderbilt University, '90

Nichol, Peter Frosio
Madison, WI
B.S., Macalester College, '89

Pinckard, James Keith
Tucson, AZ
B.S., University of Arizona, '90

Schreiber, Matthew A.
Cleveland Heights, OH
B.S., Case Western Reserve, '88

Seydel, Karl Boynton
Redwood City, CA
B.S., M.S., Stanford University, '89

Wolf, Matthew Joseph
Dunwoody, GA
B.A., Washington University, '90

Ying, Howard Shann-Cherng
Tampa, FL
B.S., The Johns Hopkins
University, '89

Fourth-Year Trainees

Benvensite, Ronald J.
Miami Beach, FL
B.S., University of Miami, '91

Cook, James Robert
Pittsburgh, PA
B.S., Pennsylvania State
University, '91

Crawford, Peter Alan
Berea, OH
B.S., Duke University, '91

Dang, Quoc D.
Wichita, KS
B.S., University of Tulsa, '91

Kaplan, Daniel Harry
Nashville, TN
B.S., Yale University, '91

Kulesza, Piotr
Warsaw, Poland
B.S., University of Alabama,
Birmingham, '91

Lee, Christopher W.

San Jose, CA
B.A., Harvard University, '90

Miller, David Thomas

Lexington, KY
B.S., University of Kentucky, '91

Miller, Timothy Matthew

St. Louis, MO
B.S., University of Virginia, '91

Pruett, John Robert

Haverford, PA
B.A., Princeton University, '90

Rodig, Scott Jefferson

Crozet, VA
B.A., University of Virginia, '90

Rogers, Amy Malecki

New Ulm, MN
B.A., Harvard University, '91

Sedlak, Thomas William

Cherry Hill, NJ
B.A., Case Western Reserve University, '91

Shindler, Kenneth Scott

Greenlawn, NY
B.S., Brown University, '91

Truong, Rosalie Minh

Los Angeles, CA
B.S., University of California, Davis, '90

Williams, Korwyn Lyle

Tuskegee, AL
B.S., University of North Carolina, Chapel Hill, '91

Third-Year Trainees

Buckman, ShaAvhree

Camp Springs, MD
A.B., Washington University, '92

Easton, Rachel

Springfield, MA
B.A., Washington and Lee University, '92

Frohnert, Paul

Frankfurt, A.M., Germany
B.S., Macalester College, '92

Garabedian, Emily

New York, NY
B.S., University of Michigan, '92

Grossman, William

Glencoe, MN
B.A., University of St. Thomas, '92

Guler, Mehmet

Ankara, Turkey
B.S., University of Illinois, '92

Ho, Albert

Boston, MA
B.S., California Institute of Technology, '92

Jacobson, Nils

Ann Arbor, MI
B.A., University of California, Berkeley, '92

Kundra, Robin

Atlanta, GA
B.S., University of Georgia, '92

Minning, Dena

Melbourne, FL
B.S., University of Florida, '92

Randolph, David

Gainesville, FL
B.S., University of Colorado, '90

Saulino, Evan

Marshfield, WI
B.A., University of California, San Diego, '92

Smith, Arnold

Rochester, MN
B.S., Mississippi State University, '92

Soto, Gabriel

Boston, MA
B.A., Wesleyan University, '92

Trask, Timothy

Philadelphia, PA
B.A., University of Pennsylvania, '91

Van Blerkom, Suzanne

Amherst, MA
B.A., University of Colorado, Boulder, '92

Verbsky, James

Madison, WI
B.S., University of Wisconsin, Madison, '92

Yu, Benjamin Diung-Yuen

Orinda, CA
B.S., University of North Carolina, Chapel Hill, '91

Second-Year Trainees

Barrera, Pamela

Alice, TX
B.A., Rice University, '93

Brown, Amy

Coon Rapids, MN
B.S., University of Wisconsin, Madison, '93

Chuang, Hubert

Louisville, KY
B.S., Yale University, '92

Clements, Mark

East Chicago, IN
B.S., Butler University, '93

Fisher, Daniel

Burlingame, CA
B.S., University of Washington, '91

Hill, Matthew

Urbana, IL
A.B., Washington University, '93

Nguyen, Quyen

Manoi, Vietnam
B.S., University of Southern California, '93

Payne, Aimee

Corvallis, OR
B.S., Stanford University, '93

Peterson, Daniel

Lincoln, NE
B.S., University of Nebraska, '93

Putch, Girish

Bhilai, India
B.A., Rice University, '91

Saifee, Owais

Karachi, Pakistan
B.S., Northwestern University, '93

Simpson, Joseph

Boston, MA
B.A., Harvard University, '92

Wang, Lawrence

Arlington, MA
B.S., Harvard University, '93

Zarrin, Amy

New York City, NY
B.S., Cornell University, '93

First-Year Trainees

Banerjee, Dolly

Williamson, IL
B.S., Washington University, '94

Banerjee, Ritu

Bergen, NJ
B.A., Swarthmore College, '94

Basu, Devraj

Davidson, TN
B.S., Brown University, '94

Bernstein, Michael Lyn

Woodbury, IA
B.A., The Johns Hopkins University, '94

Bhattacharyya, Timothy

Kane, IL
B.A., Northwestern University, '94

Bubeck-Wardenburg, Julianne

Will, IL
B.A., Washington University, '93

Dalcanto, Albert John

Cook, IL
B.A., Northwestern University, '94

Drake, Matthew Truman

Blue Earth, MN
B.A., Harvard University, '93

Erinjeri, Joseph Patrick

Oakland, MI
B.S., University of Michigan, Ann Arbor, '94

Farazi, Thalia Andrea

Nicosia, Cyprus
B.A., Brandeis University, '94

Hasbani, Josh Mayer

New Haven, CT
B.A., The Johns Hopkins University, '94

Henderson, Jeffrey Parker

Olmsted, MN
B.S., University of Wisconsin, Madison, '94

House, Paul Andrew

Muscataine, IA
B.S., University of Iowa, '94

Kim, Han Woong

Johnson, IN
B.S., Stanford University, '92

Lehman, David Henry

New York, NY
B.A., Wesleyan University, '92

Madden, John Crane

Middlesex, MA
B.S., Yale University, '94

Moosikasuwana, Josh

Bronx, NY
B.A., Columbia University, '94

Murata, Haruhiko

Clark, WA
B.A., Washington University, '94

Nagarajan, Rakesh

Henrico, VA
B.A., University of Virginia, '94

Ongur, Dost

Istanbul, Turkey
B.A., Oberlin College, '92

Presti, Rachel Margaret

King, WA
B.A., Scripps College, '94

Shankaran, Vijay

Cuyahoga, OH
B.A., Dartmouth College, '94

Wong, Wai Thong

Republic of Singapore
B.S., Mass Inst Of Technology, '94

M.A. and M.D. Degrees Trainees**Dagnew, Elias**

Dallas, TX
B.S., Dallas Baptist University, '92

Dahl, Karen Marie

Dunwoody, GA
B.S., Georgia Institute of Technology, '92

Eaton, Adam Christopher

St Charles, MO
B.S., University of Illinois, '92

Lee, Scott

Flossmoor, IL
A.B., Harvard University, '90

Liang, Griffith

Arlington Heights, IL
B.A., Northwestern University, '91

Liang, Jeff E.

Morton Grove, IL
B.A., Northwestern University, '91

Makram, Maurice Nabil

Parkesburg, PA
B.S., Brown University, '91

Preddie, Dean

Berrien Springs, MI
B.S., Andrews University, '93

Howard Hughes Medical Institute Research Scholars Program Trainees**Korenblat, Kevin M.**

St. Louis, MO
B.A., Cornell University, '91

Payne, Jennifer

Beckley, WV
B.S., Davidson College, '90

M.D. Degree Trainees**Fourth-Year Class****Buckner, Alyson**

Knoxville, TN
B.S., University of Tennessee, Knoxville, '91

Parker, Ian Chase

Brooklyn, NY
B.S., Cornell University, '87

Tantuwaya, Vrijesh

St. Louis, MO
B.A., Northwestern University, '90

Third-Year Class**Anderson, Eric Edward**

Lowell, IN
B.A., Wabash College, '92

Aronovitz, Joseph Arthur

Broomall, PA
B.A., Cornell University, '81; Ph.D., Harvard University, '86

Arvin, Kara Lynn

Loogootee, IN
B.S., University of Evansville, '88

Baghadady, Rose

Weston, MA
B.A., Wellesley College, '90

Bane, Robert Arlo

Leroy, IL
B.S., University of Illinois, '92

Barker, Thomas Edward

Kendallville, IN
B.A., Stanford University, '90

Bateman, Timothy Robert

Oroville, CA
B.S., Washington University, '92

Baxter, Jeffrey D.

Cleveland Hts, OH
B.A., University of Rochester, '91

Beahm, Pamela Hopkins

Boxford, MA
B.A., Cornell University, '90

Beall, Abby Elizabeth

Indianapolis, IN
B.A., Case Western Reserve University, '92

Bhayani, Sam Bipin

Bourbonnais, IL
B.A., Cornell University, '92

Bhusri, Priya

Holmdel, NJ
B.S., Stanford University, '91

Blum, Andrea Lynn

Cincinnati, OH
B.A., Washington University, '92

Boyer, Suzanne Audrey

Cincinnati, OH
B.S., Case Western Reserve University, '92

Brischetto, Brenda Joy

San Antonio, TX
B.A., Washington University, '91

Burgin, Heather Joy

Salem, OR
B.S., Oregon State University, '92

Capstack, Timothy M.

Mahwah, NJ
B.A., Rutgers University, '92

Carmichael, Craig Wayne

Pekin, IL
B.S., University of Illinois, '92

Chau, Yuen Michael

Sandy, UT
B.A., Princeton University, '92

Chen, Christopher Jean

Rockville, MD
B.S., The Johns Hopkins University, '92

Choi, Paul Daniel

Morton Grove, IL
B.S., Stanford University, '92

Clements, Lori Diane

Edwardsville, IL
B.S., Southern Illinois University, '92

Cooper, Joshua Morrey

St Louis, MO
B.A., Harvard University, '92

Cordes, Barry G.

St Louis, MO
B.S., University of Missouri, '92

Cranmer, Hilarie Hartel

Boston, MA
B.E., Hofstra University, '89;
M.S., University of Minnesota, '92

De Laney, Jennifer Ann

Indianapolis, IN
B.A., Georgetown University, '92

Ehsani, Hamid

Nairobi, Kenya
B.S., Stanford University, '91

Ellis, Byron Keith

Tuskegee, AL
B.S., University of Alabama,
Birmingham, '92

Englander, Stacey Ellen

Narberth, PA
B.A., University of Pennsylvania, '92

Ewbank, Penelope Ann

Franklin Grove, IL
B.S., Olivet Nazarene College, '92

Fink, Andrew James

Tampa, FL
B.A., University of Dallas, '92

Fonseca, Rosalia Chipelo

Naugatuck, CT
B.S., Yale University, '92

Forage, James Steven

Tucson, AZ
B.A., B.S., University of Arizona, '92

Frei, Pamela Ann W.

Milton, OH
B.S., University of Dayton, '92

Garretson, Ralph B.

Arlington, VA
B.A., Dartmouth College, '87

Gartner, Elaina Marie

Pleasant Ridge, MI
B.A., Washington University, '92

Gilbert, Scott Jeffrey

Falmouth, ME
B.A., University of Pennsylvania, '91

Goldberg, Kimberly Anne

Highland Park, IL
B.S., University of Illinois, '92

Hadsall, Jeffrey

Anaheim, CA
B.A., California State University,
Fullerton, '91

Handler, Richard J.

Neshanic Station, NJ
B.A., SUNY at Binghamton, '91

Harvey, Heather Dianne

Bloomington, IN
B.A., Miami University, '92

Haussler, Tanya Susan

Tucson, AZ
B.A., University of California, Santa
Cruz, '91

Hayne, Thomas Wesley

Orlando, FL
B.S., University of Central Florida,
'84; M.S., University of Miami, '92

Heidenreich, Kelly

Pittsburgh, PA
B.S., University of Notre Dame, '92

Hodges, Harlan Dru

U City, MO
B.S., Morehouse College, '92

Hsu, Raymond M.

Gaithersburg, MD
B.S., University of Maryland,
College Park, '92

Huang, James Ting-Chih

Louisville, KY
B.S., Washington University, '91

Huff, Carla Michelle

Indianapolis, IN
B.S., Duke University, '91

Hung, Irene Hwang

Prairie Village, KS
B.A., University of California,
Berkeley, '92

Jerng, Diane Yaping

Montville, NJ
B.A., University of Pennsylvania, '92

Karsan, Damla

Gulsum, Norway
B.A., Rice University, '92

Kim, Matthew Ian

Manchester, CT
B.A., Yale University, '90

Kindsvater, Steven Michael

Dodge City, KS
B.S., US Air Force Academy, '92

Klepps, Steven Jay

Great Falls, MT
B.A., Carroll College, '92

Kraft, Judith Ellen

Gaithersburg, MD
B.A., Cornell University, '92

La Starza, Mark

New Sunnyside Beach, FL
Ph.D., Washington University, '92;
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SUMMARY OF STUDENTS IN THE SCHOOL OF MEDICINE: 1994-95

Doctor of Medicine and Doctor of Philosophy Degrees

Graduating Class	20
Ninth-Year Trainees	1
Eighth-Year Trainees	6
Seventh-Year Trainees	6
Sixth-Year Trainees	19
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Graduating Class	27
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First-Year Class	17
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On January 7, 1987, the Executive Faculty acted to discontinue the Department of Preventive Medicine and Public Health. Programs and Faculty of the department are listed separately or have been assigned to other departments.

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C. Howe Eller, M.D., University of Colorado, 1930 (Public Health); Ph.D., Johns Hopkins University, 1934.

Robert E. Shank, M.D., Washington University, 1939. (See Department of Medicine.)

Danforth Professor of Preventive Medicine and Public Health

M. Kenton King, M.D., Vanderbilt University, 1951. (See Department of Medicine.)

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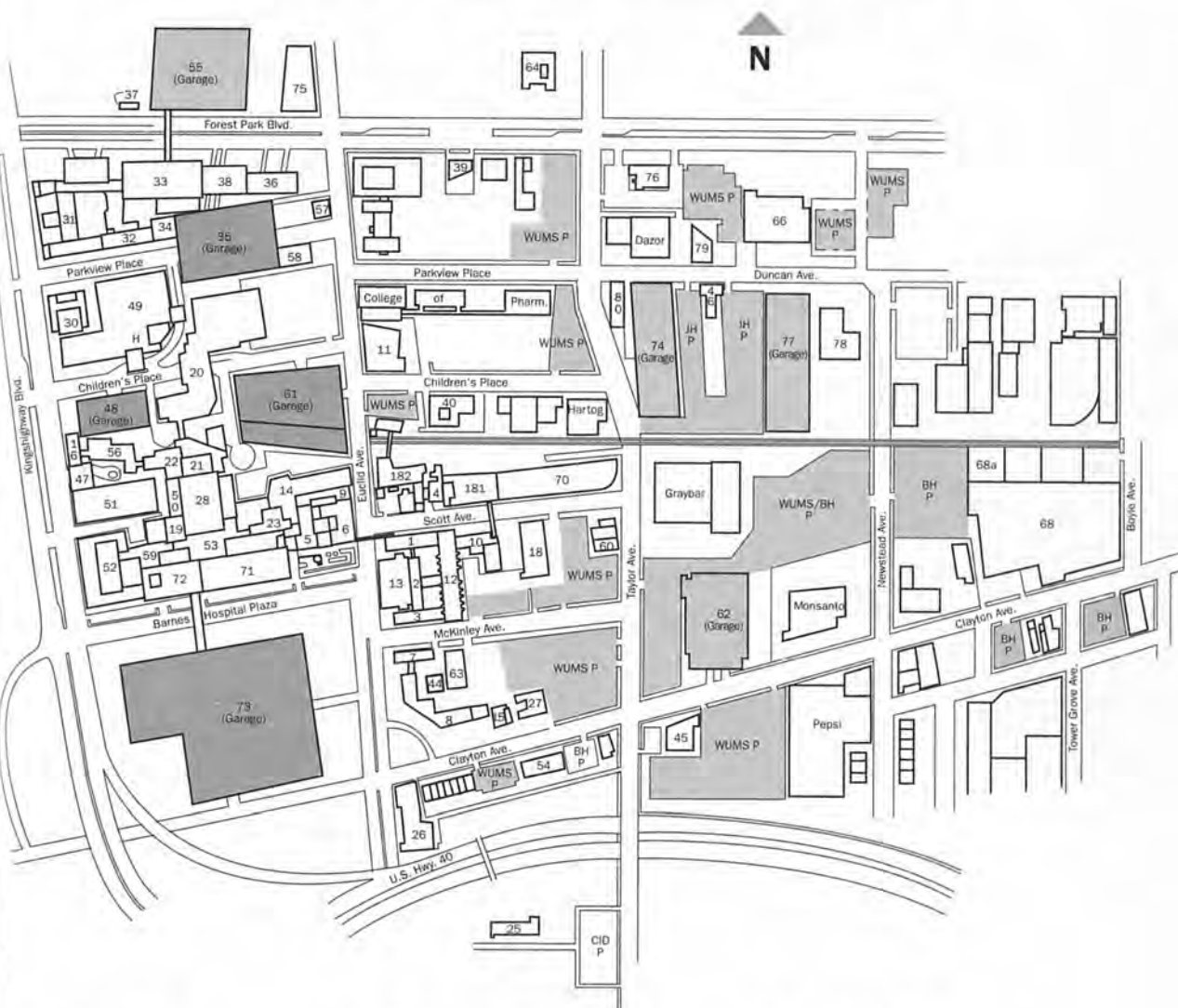
SCHOOLS OF WASHINGTON UNIVERSITY

All schools are located at One Brookings Drive
St. Louis Missouri 63130 except Medicine (660 South
Euclid Avenue 63110). A University-sponsored shuttle
bus travels between the Hilltop Campus and the
Medical Center every 20 minutes.

College of Arts and Sciences
Graduate School of Arts and Sciences
School of Engineering and Applied Sciences
School of Technology and Information
Management
School of Architecture
John M. Olin School of Business
School of Fine Arts
George Warren Brown School of Social Work
School of Law
School of Medicine
University College

The information that appears in this Bulletin was
compiled in the spring of 1995. It is current as of
April 1, 1995.

WASHINGTON UNIVERSITY MEDICAL CENTER



BARNES HOSPITAL

- 23 Peters Building
- 28 Barnes Service Building
- 52 Queeny Tower
- 53 Barnes
- 54 Barnes Lodge
- 59 Rand Johnson
- 68 Clayton Avenue Building
- 68a Employee Day Care Facility
- 71 East Pavilion
- 72 West Pavilion
- 73 Parking Garage
- 74 Parking Garage

JEWISH HOSPITAL

- 30 Shoenberg School of Nursing
- 31 Kingshighway Building
- 32 Steinberg Building
- 33 Shoenberg Pavilion
- 34 Yalem Research Building
- 35 Parking Garage
- 36 Central Medical Building
- 37 Shoenberg Research Building
- 38 Waldheim Ambulatory Care Facility
- 39 Day Care Center
- 46 Material Management/Purchasing
- 55 Parking Garage
- 57 225 S. Euclid
- 58 Power Plant
- 75 Ettrick Building

WASHINGTON UNIVERSITY MEDICAL CENTER

- 11 Eric P. Newman Education Center *

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

- 1 North Building
- 2 Cancer Research Building
- 3 South Building
- 4 Occupational Therapy Program
- 5 Maternity
- 6 McMillan
- 7 Biomedical Computing Laboratory
- 8 Shriner's
- 9 Irene Walter Johnson Rehabilitation
- 10 Olin Residence Hall
- 12 McDonnell Medical Sciences Building
- 13 Bernard Becker Medical Library
- 14 West Building
- 15 Health Administration Program
- 16 School of Nursing
- 17 Renard
- 18 East McDonnell S.R.F. *
- 19 Mallinckrodt Institute of Radiology
- 20 Clinical Sciences Research Building **
- 21 Wohl Clinic
- 22 Wohl Hospital
- 40 Storz Building
- 44 Plant Maintenance Storage Garage
- 45 4480 Clayton
- 56 Nurses Residence
- 60 Library Annex
- 61 Parking Garage
- 62 Parking Garage
- 63 Interim Sp. Res. Facility
- 64 4511 Forest Park Medical Center
- 66 4444 Forest Park
- 70 East Building
- 76 4488 Forest Park
- 79 4455 Duncan
- 80 4500 Parkway
- 181 Biotechnology Center
- 182 Euclid Power Plant

CHILDREN'S HOSPITAL

- 47 Spoehrer Children's Tower
- 48 Parking Garage
- 49 Children's Hospital
- 51 Children's Annex
- 77 Parking Garage
- 78 Child Development Center

CENTRAL INSTITUTE FOR THE DEAF

- 25 Clinic/Research Building
- 26 Central Institute for the Deaf
- 27 Residence Hall

BARNARD HOSPITAL

- 50 Barnard Hospital

SURFACE PARKING LOTS

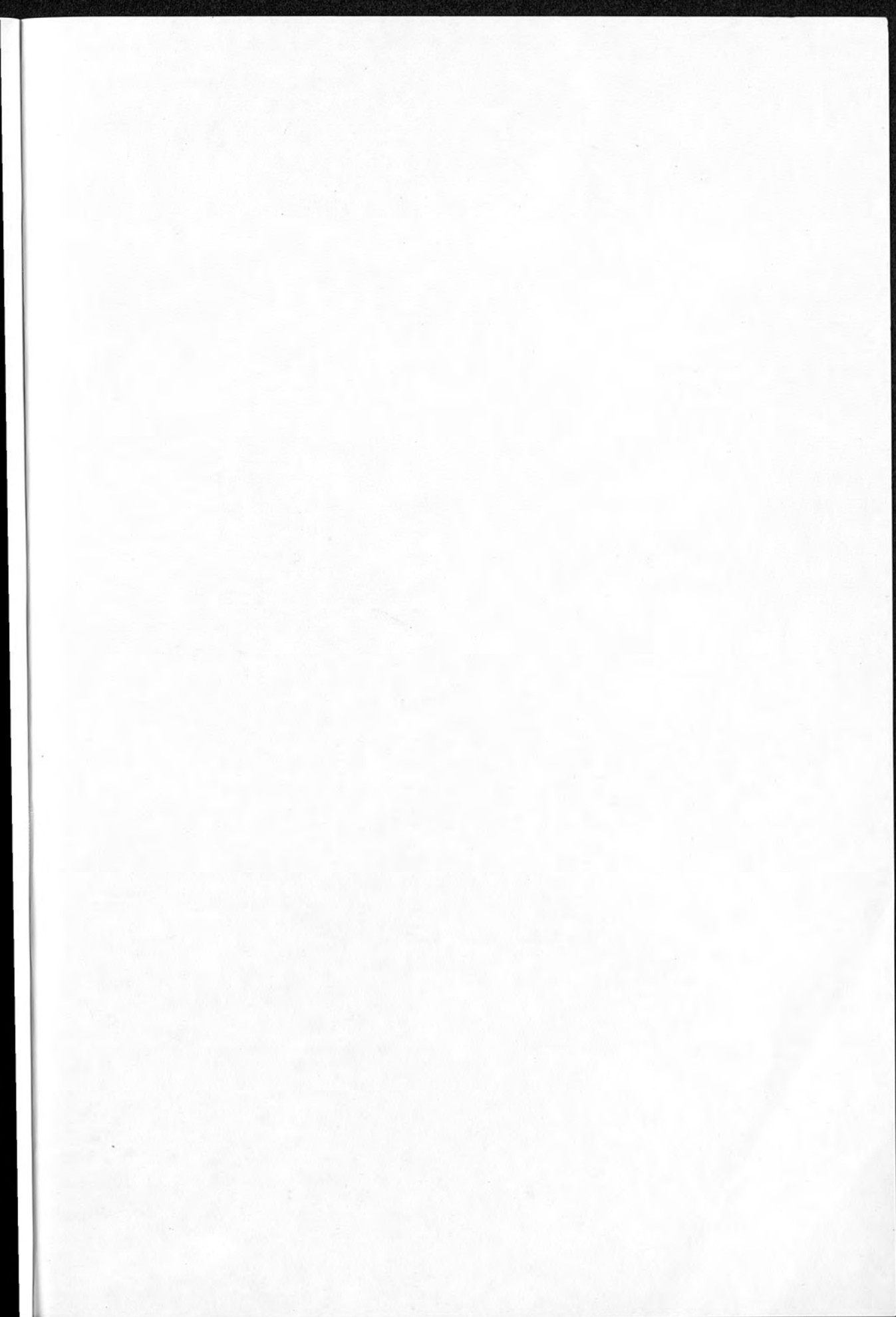
- BH P Barnes Hospital
- JH P Jewish Hospital
- CID P Central Institute
- WUMS P Medical School
- WUMS/BH P Medical School & Barnes
- H Heliport

* Under Construction

** Addition Under Construction

Public/Employee Reserved Parking

Employee Parking





Washington

WASHINGTON · UNIVERSITY · IN · ST · LOUIS

School of Medicine