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Washington University School of Medicine bulletin, 1997-1998

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SCHOOL *of* MEDICINE
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CONTENTS

CALENDAR 1997-98

1997

JUNE

10, 11 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 1.

16 **Monday** Academic year begins for the third- and fourth-year classes.

20 **Friday** Deadline for registration and initial payment of tuition for the third- and fourth-year classes.

JULY

4 **Friday** Independence Day observance.

AUGUST

13 **Wednesday** Orientation, matriculation and initial payment of tuition for the first-year class.

18 **Monday** Academic year begins for the first- and second-year classes.

22 **Friday** Deadline for registration and initial payment of tuition for the second-year class.

26, 27 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 2.

SEPTEMBER

1 **Monday** Labor Day observance.

OCTOBER

14, 15 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 1.

NOVEMBER

27 **Thursday** Thanksgiving Day observance.

28 **Friday** Holiday for first-, second-, third-, and fourth-year classes.

DECEMBER

5 **Friday** Deadline for payment of the balance of tuition for the third- and fourth-year classes.

20 **Saturday** Winter recess begins at 1 p.m. for all classes.

1998

JANUARY

5 **Monday** Winter recess ends at 8 a.m. for all classes.

9 **Friday** Deadline for payment of the balance of tuition for the first- and second-year classes.

19 **Monday** Martin Luther King, Jr. Day observance.

FEBRUARY

6 **Friday** Danforth Symposium.

MARCH

3, 4 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 2.

29 **Sunday** Spring recess begins for the first- and second-year classes.

APRIL

3 **Friday** Spring recess begins at 8 a.m. for the third- and fourth-year classes.

6 **Monday** Classes resume for all classes.

MAY

2 **Saturday** Distinguished Student Scholarship/Distinguished Alumni Scholarship Interviews.

3 **Sunday** Academic year ends at 5 p.m. for graduating students.

15 **Friday** Commencement.

Academic year ends at 5 p.m. for the second-year class.

25 **Monday** Memorial Day Holiday observance.

29 **Friday** Academic year ends at 5 p.m. for the first-year class.

31 **Sunday** Academic year ends at 5 p.m. for the third-year class.

JUNE

9, 10 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 1.

SCHEDULE OF CLERKSHIP AND ELECTIVE INTERVALS

Weeks	*Dates*
1-4	June 16, 1997 - July 13, 1997
5-8	July 14, 1997 - August 10, 1997
9-12	August 11, 1997 - September 7, 1997
13-16	September 8, 1997 - October 5, 1997
17-20	October 6, 1997 - November 2, 1997
21-24	November 3, 1997 - November 30, 1997
25-28	December 1, 1997 - January 11, 1998
29-32	January 12, 1998 - February 8, 1998
33-36	February 9, 1998 - March 8, 1998
37-40	March 9, 1998 - April 5, 1998
41-44	April 6, 1998 - May 3, 1998
45-48	May 4, 1998 - May 31, 1998

Final examinations for clinical clerkships are administered at the end of each clerkship. Exact date, time and location are announced by the course master.

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 health care.

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 106-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 health care 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 health care 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 health care 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

Grants and contracts totaling more than $200 million supported faculty research efforts at the School of Medicine. Substantial additional research support was provided directly to faculty investigators by the Howard Hughes Medical Institute and through gifts and grants made to the Barnes-Jewish Hospital Foundation. Gifts and grants from private sources, including alumni, individuals, foundations, corporations and other organizations, totaled $48.9 million from more than 5,200 entities.

The School of Medicine received $162.4 million from the National Institutes of Health in grants, making it the third largest recipient of NIH dollars among the 124 U.S. medical schools in fiscal year 1996.

That money came in 573 separate grants, 498 of which were designated as research grants. Funds supporting training came in 33 additional grants, and 36 grants were for fellowships. NIH research grants supported the investigations of at least 588 full-time faculty members.

Johns Hopkins University	$203,906,513
University of California, San Francisco	$179,584,502
Washington University	**$162,392,651**
Yale University	$159,244,664
University of Pennsylvania	$148,991,761

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 and brain functions.
- Among the first to give patients insulin for diabetes.
- The now-common practice of taking aspirin to help prevent heart attacks.
- Pioneering research into excitotoxic amino acids and brain injury.
- Studies showing that a simple blood test can effectively diagnose prostate cancer in its early stages.
- A new surgical procedure in which heavily damaged portions of emphysema patients' lungs are removed, dramatically improving lung function.
- A cure for hepatitis B, in cases diagnosed early.
- 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.

Ongoing research includes:

- The Human Genome Project, one of the biggest scientific undertakings in history, to decipher the genetic messages locked away in each of the body's cells.
- Investigations into nerve transplants, including the world's first nerve transplant using nerve tissue from a cadaver donor.
- 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.
- The Center for the Study of Nervous System Injury's investigations into possibilities for preventing and reversing stroke-related brain injury caused by the release of an excess of neurotransmitters, especially glutamate.
- Basic investigations, clinical trials and educational outreach at the Alzheimer's Disease Research Center.
- Studies of the effectiveness of exercise in reversing physical frailty in the elderly.
- Investigations by the School's AIDS Clinical Trials Unit (ACTU), where medical scientists evaluate the effectiveness of drugs to treat AIDS and educate physicians in the region about how to care for AIDS patients.
- Studies of the pathology of pediatric diseases in the School's Department of Pediatrics, designated a Child Health Research Center of Excellence by NIH.
- 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, which 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.

• Development of a genetic test that accurately identifies patients who have inherited a certain thyroid cancer. Those who test positive can have the gland removed before cancer develops and spreads.

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, 12 current faculty members have been elected to the National Academy of Sciences. Fifteen Nobel laureates have been associated with the School of Medicine. During 1996-97, 99 members of the faculty held individual or career development awards: 52 from the National Institutes of Health, one from the American Academy of Neurology, seven from the American Cancer Society, one from the American Diabetes Foundation, one from the American Federation for Aging Research, Inc., 18 from the American Heart Association, two from the American Lung Association, one from the American Association for Thoracic Surgery, one from the Berlex Foundation, four from The Burroughs Wellcome Fund, one from the Council for Tobacco Research-U.S.A., Inc., one from the Dermatology Foundation, one from the Foundation for Anesthesia Education and Research, two from the Leukemia Society, one from the Pediatric Scientist Development Program, one from the Pew Charitable Trusts, one from the Reproductive Scientist Development Program, one from Research to Prevent Blindness, and two from the National Alliance for Research on Schizophrenia and Depression. The School of Medicine has 22 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 1996-97, the School employed 1,257 full-time, salaried faculty members in its 18 preclinical and clinical departments. The clinical departments are further strengthened by 1,016 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 hospitals in the Washington University Medical Center.

STUDENTS

The School of Medicine attracts a student body of exceptional quality. The 1996 Entering Class of 122 students was selected from a pool of 6,500 applicants. The School is a national institution with 43 states and 21 countries represented in the current enrollment.

In 1997, the School conferred the M.D. degree upon 103 individuals. In addition, seven students received the M.A./M.D. degrees and 16 students graduated with the M.D. and the Ph.D. degrees. Graduating students who participated in the 1997 National Residency Matching Program matched in programs recognized for high quality and selectivity. Beginning on page 201, 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 576 medical students. Programs also are conducted for 631 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 462 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 230-acre Washington University Medical Center, spread over portions of 12 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 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-Jewish Hospital, St. Louis Children's Hospital, Barnard Hospital and Central Institute for the Deaf, and is affiliated with BJC Health System. Integral units of the Medical Center include the world-famous Mallinckrodt Institute of Radiology and the Institute for Biomedical Computing.

Unprecedented growth has occurred at the Medical Center over the past 10 years. At the School of Medicine alone during the past three years, more than $200 million has been expended on renovation and new construction. Capital improvements have added 360,000 square feet of space to the medical school during this same period. A final stage calls for 60,000 additional square feet of space to be created. In the most recent fiscal year, more than $40 million of capital improvements were made at the School.

Medical Center-wide expansion includes the Eric P. Newman Education Center; the CSRB North Tower

Research Addition; the East McDonnell Sciences Building; the Bernard Becker Medical Library; the Mallinckrodt Institute of Radiology Imaging Research Facility, East Building; the 4480 Clayton Avenue Building; and a new 1,500-car parking garage.

The new 45,160-gross-square-foot Eric P. Newman Education Center, completed in December 1995, accommodates non-degree professional education for the Medical Center. The new education center provides auditoriums, classrooms, meeting space and lecture halls to support and enhance a comprehensive education program. The new 136,977-gross-square-foot, seven-story East McDonnell Sciences Building is a maximum-barrier research facility to accommodate higher brain function research and transgenic studies. The completion of the medical school library in the fall of 1989, a $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, the structure provides state-of-the-art information management.

The 10-story Clinical Sciences Research Building (CSRB) North Tower Research Addition, 201,349 gross square feet, consolidates all medical school specialized research into one structure. The top three floors of the addition house wet lab research space. The 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, provided space for the creation of an Imaging Center that houses four major MRI (Magnetic Resonance Imaging) units. The 4480 Clayton Avenue Building houses administration offices for the School of Medicine and the Department of Surgery. The new 494,500-gross-square-foot, 1,500-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.

In addition, major renovation to existing buildings continues, with emphasis on research facilities. Renovations totalling $32 million recently have been completed. The 31,000-gross-square-foot Health Key Beacon Medical Building at 4488 Forest Park, completed in 1993, provides private practice space to accommodate mental health, physical therapy, lab, X-ray and administrative support on its lower level. Pediatrics and Allergy are located on the main level, with Internal Medicine and OB/GYN located on the upper level. The 96,650-gross-square-foot, five-story, former Dental School Building has been renovated to accommodate the Departments of Psychiatry, Neurology, Genetics, Pathology and Internal Medicine. This renovation, completed in 1995, 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. The 46,400-gross-square-foot McMillan Building renovation project, completed in 1995, includes five complete floors of general labs, offices, corridors and central mechanical and electrical system improvements. The renovation provided new offices and research labs for Neurology, Neurological Surgery and Ophthalmology, as well as a new eye clinic for Barnes-Jewish Hospital. The 294,302-gross-square-foot 4444 Forest Park renovation project, completed in 1995, includes various office and research facility renovations. The building houses administrative offices of 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. 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.

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, as well as 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 has centered, have been renovated extensively. 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, computer installation and other components of the Mallinckrodt Institute of Radiology. The East Building also houses several administrative office suites.

A network of pedestrian bridges provides the ability to move freely among the major facilities, enhancing the interaction of all Medical Center institutions and benefiting research and patient care.

Other facilities owned or operated by Washington University include:

McMillan Hospital. McMillan 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-Jewish 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. 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. The West Building contains offices and research laboratories for the Departments of Pathology and Internal Medicine.

David P. Wohl, Jr. Memorial Hospital (10 floors). Wohl Hospital, 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, contiguous with companion facilities in the adjacent Barnard Hospital.

David P. Wohl, Jr. Memorial-Washington University Outpatient Clinics. The clinics are administered by Barnes-Jewish Hospital and handle over 100,000 outpatient visits per year. Five floors of the building are devoted to the clinics and five floors are devoted to research facilities for several departments of the School of Medicine. This building is owned by the School of Medicine, with Barnes-Jewish 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 interschool 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. The Institute creates opportunities for collaboration 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 five components: the Health Sciences Library, the Archives and Rare Books Collections, the Media/Computer Center, the Medical School Computing and Networking Services, and the Library Software 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 over 2,300 current subscriptions.

Its Archives and Rare Book Division includes almost 22,000 volumes and such outstanding collections as the Bernard Becker Collection in Ophthalmology, the CID-Max Goldstein Collection in Speech and Hearing, and the Paracelsus Collection of the St. Louis Medical Society. The archives of the Medical Center contain 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.

Information Services offers reference service six days and five evenings per week. Staff is available to answer a wide range of questions pertaining to biomedical and general information. Staff may be contacted by telephone (362-7085), by electronic mail (reference@medicine.wustl.edu) or at the Information Services desk on Level 1 of the Library. Information Services also offers specialized training in using EUCLID, information management software and genetic databases such as GENBANK. Special sessions can be tailored to a particular group's needs and may be held on-site in laboratories, offices or auditoriums.

The Media/Computer Center houses more than 2,500 audiovisual titles and computer programs, a network of advanced personal computer workstations with access to the Internet and other resources, and a large computer education classroom equipped with networked computers and large screen projectors. The Media/Computer Center is one of the organizations pioneering the use of high capacity networks and digital imaging technology in the

medical curriculum. The center also supports peripheral computer laboratories to other educational sites within the Medical Center. Facilities are integrated with other information sources through the campus-wide network.

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 Media/Computer Center.

The library pioneered the development of the BACS library system. Its database includes the book or journal holdings of medical school and hospital libraries in the St. Louis area. The Library also supports EUCLID, an information system that includes five biomedical databases and 30 full-text core medical journals. Databases include MEDLINE, Current Contents, and PsycInfo. Full-text titles include *Journal of the American Medical Association, New England Journal of Medicine, Annals of Internal Medicine, Journal of Clinical Investigation, Science, Circulation* and *Lancet*.

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.

Information about library services and programs is available on the library's WWW site: http://medschool.wustl.edu/library.

Library hours and telephone numbers are:

Monday-Thursday	7:30 a.m. - midnight
Friday	7:30 a.m. - 10 p.m.
Saturday	8:30 a.m. - 6 p.m.
Sunday	12 p.m. - midnight

Circulation	362-7080
Reference	362-7085
Interlibrary Loan	362-2780
Media/Computer Center	362-2793
Archives & Rare Books	362-4236
Help Desk	362-7798

Washington University Medical Center

Washington University 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 $3.5 billion on the St. Louis area, including employment, taxes, purchasing, construction projects and the reverberation of that activity through the community. With more than 15,000 employees, the Medical Center has the largest private payroll in the City of St. Louis and the second-largest in the metropolitan area.

Hospitals/Affiliates

Washington University School of Medicine has a rich, 106-year history of success in research, education and patient care. Its faculty pioneered bedside teaching and led in the transformation of empirical knowledge into scientific medicine. From the earliest days, there has been an understanding that "investigation and practice are one in spirit, method and object."

Barnes-Jewish Hospital, a 1,737-bed teaching and research facility, is the largest hospital in the Medical Center. It provides clinical experience for medical students for all clinical departments except Pediatrics. The medical staff is composed exclusively of members of the faculty of the School of Medicine.

Barnes-Jewish Hospital is the result of a merger between Barnes Hospital and The Jewish Hospital of St. Louis. By combining the strengths and traditions of these two national leaders in health care, Barnes-Jewish created a single center of medical excellence with a nationally renowned medical staff. The combined organization has a premier reputation in patient care, medical education, research and community service. By combining their resources and areas of expertise, high-quality care is maintained while allowing for greater efficiencies and the elimination of duplication of services.

St. Louis Children's Hospital is one of the top pediatric health centers in the country. It provides a full range of health services for children and their families throughout its 200-mile service area and beyond. The hospital's broad spectrum of pediatric specialty services includes newborn medicine and the world's largest pediatric lung transplant program.

Children's also provides an extensive complement of community outreach services, including pediatric urgent care centers, specialized home care services, pediatric mobile intensive care units, clinical affiliations with regional hospitals and physicians, patient and parent support groups, education programs for parents and children, and

a free parent information phone line and physician referral service staffed by registered nurses.

Barnes-Jewish and St. Louis Children's hospitals are members of *BJC Health System,* a regional health care system in Missouri and southern Illinois. BJC, in partnership with its physicians, provides a full continuum of care through hospitals, long-term care facilities, outpatient and urgent care centers, medical office buildings, air and ground transportation, home health services and a wide variety of managed care programs. BJC is affiliated with Washington University through Barnes-Jewish Hospital and St. Louis Children's Hospital.

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

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.

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

- Metropolitan St. Louis Psychiatric Center: 125 beds
- Veterans Administration Medical Center: 559 beds
- Shriners Hospital for Children: 80 beds
- Christian Hospitals Northeast and Northwest: 698 beds
- Missouri Baptist Medical Center: 494 beds
- St. Louis Regional Medical Center

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.

While the School of Medicine curriculum has been constantly under review and is continually evolving, the Medical Education 2000 project was selected to provide a temporal target for completing this initiative by the year 2000. Consequently, the reevaluation and reformulation that has developed over the last year is represented in various phases among the departmental chapters and the Study of Medicine chapter. Discrepancies may be noted, with the most recent information represented in the Study of Medicine chapter. Additional changes may occur without notice.

Table of Courses 1997-98

FIRST YEAR

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

Course No.	*Course Title*
M75 503	Cell and Organ Systems Biology
M05 501A	Human Anatomy and Development
M30 523	Immunology
M30 510	Medical Genetics
M30 526	Microbes and Pathogenesis
M75 512	Molecular Foundations of Medicine
M35 554	Neural Sciences
	Physicians, Patients and Society
M25 502	• Clinical Medicine I
M25 503	• Medicine and Human Values I
	Selectives
M04	• General Selectives
M04	• Medical Humanities

An elective is 15 clock hours in duration. Examples of elective offerings from last year include:

M04 500	Topics in Functional Imaging
M04 501	Anatomy Through the Eyes of the Radiologist
M04 5012	Retinal Transplantation in Retinitis Pigmentosa
M04 514	Cardiovascular Biophysics
M04 519	Case Problems in Biochemistry and Cell Biology
M04 526	New Diseases, New Pathogens
M04 533	Tropical Medicine
M04 534	Monocytes/Macrophages Progressive Kidney Disease
M04 536	Autonomic Mechanisms in Diseased States
M04 537	Cardiovascular Control Mechanism
M04 552	Genetics and Molecular Biology of Ion Channels
M04 561	Brain Blood Vessels
M04 5667	Microcirculation
M04 568	Monoclonal Antibodies in Diagnosis and Therapy
M04 582	Alzheimer's Disease
M04 584	Medical Aspects of Domestic Violence
M04 585	Ion Channels: Targets for Therapeutic Agents
M04 587A	Physician as Health Protector and Patient Advocate
M04 589	Topics in Viral Pathogenesis

SECOND YEAR

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

Course No.	*Course Title*
M25 611B	Cardiovascular Disease
M80 601	Clinical Epidemiology and Biostatistics
M25 614	Dermatology
M35 632	Diseases of the Nervous System
M55 660A	ENT
M25 615A	Endocrinology and Metabolism
M25 620A	Gastrointestinal and Liver Diseases/Nutrition
M25 625A	Hematology and Oncology
M25 605	Infectious Diseases
M45 635B	Obstetrics/Gynecology
M50 655A	Ophthalmology
M25 665	Pathology
M65 640	Pediatrics
	Physicians, Patients and Society
M25 602	• Clinical Medicine II
M25 603	• Medicine and Human Values II
M70 670A	Principles of Pharmacology
M85 676A	Diseases of the Nervous System: Psychiatry
M25 612B	Pulmonary Diseases
M25 613B	Renal and Genitourinary Diseases
M25 606	Rheumatology

THIRD YEAR

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

Course No.	*Course Title*	*Weeks*
	Ambulatory Clerkships:	
M25 714	• Emergency Medicine Clerkship	4
M26 712	• Family Practice Clerkship	4
M85 775	• Consultation/Liaison Psychiatry Clerkship	4
M95 790	Integrated Surgical Disciplines Clerkship	12
M25 710	Medicine Clerkship	12
M35 720	Neurology Clerkship	4
M85 770	Psychiatry Clerkship	4
	Women's and Children's Health Clerkships:	12
M65 760	• Pediatrics Clerkship	
M45 730	• Obstetrics/Gynecology Clerkship	

FOURTH YEAR

Elective (Fourth) Year is a 44-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 Medical Education. Students may participate in clinical electives of four 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. Clock hours for the year total 1,386 (36 weeks).

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

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 = third and fourth years).

The Office of the Associate Dean for Medical Education oversees the evaluation system, which is coordinated by Ms. Kelly Noll 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

Student advising occurs within two broad programs.

1. Clinical Advisers: The first-year students are assigned in small groups to selected 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 electives 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, 1997-98

FIRST YEAR

Cell and Organ Systems Biology
David Menton, Ph.D. 362-3593
Robert Wilkinson, Ph.D. 362-2300

Human Anatomy and Development
Glenn Conroy, Ph.D. 362-3397

Immunology
Andrey S. Shaw, M.D. 362-4614

Medical Genetics
S. Bruce Dowton, M.D. (Syd.) 362-7800
Jeffrey Gordon, M.D. 362-7243

Microbes and Pathogenesis
Julian Fleischman, Ph.D. 362-2759

Molecular Foundations of Medicine
Linda J. Pike, Ph.D. 362-9502

Neural Sciences
David Van Essen, Ph.D. 362-7043

Physicians, Patients and Society

Clinical Medicine I
Elliot Abbey, M.D. 362-2724

Medicine and Human Values
Stephen Lefrak, M.D. 454-7116

Selectives

General Selectives
Carl Rovainen, Ph.D. 362-2299

Medical Humanities
Stephen Lefrak, M.D. 454-7116

SECOND YEAR

Cardiovascular Disease
Dana Abendschein, Ph.D. 362-8925

Clinical Epidemiology and Biostatistics
Bradley A. Evanoff, M.D. 454-8350
Jay F. Piccirillo, M.D. 362-7504

Dermatology
Howard G. Welgus, M.D. 454-8290

Diseases of the Nervous System
Alan Pearlman, M.D. 362-6947

ENT
Joel Goebel, M.D. 747-0553

Endocrinology and Metabolism
William Clutter, M.D. 362-8067

Gastrointestinal and Liver Diseases/ Nutrition
Ray Clouse, M.D. 362-5035

Hematology and Oncology
Scot Hickman, M.D. 289-6308

Infectious Diseases
Gerald Medoff, M.D. 362-4413
Lawrence Gelb, M.D. 289-6433

Obstetrics/Gynecology
Andrea Stephens, M.D. 454-7889

Ophthalmology
Carla Siegfried, M.D. 362-5722

Pathology
Erika C. Crouch, M.D. 454-8462

Pediatrics
Jean P. Molleston, M.D. 454-6173

Physicians, Patients and Society

Clinical Medicine II
Elliot Abbey, M.D. 362-2724

Medicine and Human Values
Stephen Lefrak, M.D. 454-7116

Principles of Pharmacology
Douglas Covey, Ph.D. 362-1726

Diseases of the Nervous System: Psychiatry
Laura J. Bierut, M.D. 362-3492

Pulmonary Diseases
Michael Lippmann, M.D. 289-6306

Renal and Genitourinary Diseases
Stanley Misler, M.D. 454-7771

Rheumatology
Leslie Kahl, M.D. 362-7481

THIRD YEAR

Ambulatory Clerkships
Steven M. Mondeschein, M.D. 454-8800

Emergency Medicine Clerkship
Carolyn Haase, M.D. 362-9200

Family Practice Clerkship
Steven M. Mondeschein, M.D. 454-8800

Consultation/Liaison Psychiatry Clerkship
Kevin Black, M.D. 747-2013

Integrated Surgical Disciplines Clerkship
Dorothy Andriole, M.D. 362-8029

Medicine Clerkship
Alison Whelan, M.D. 362-8050

Neurology Clerkship
Alan Pearlman, M.D. 362-3296

Psychiatry Clerkship
Kevin Black, M.D. 747-2013

Women's and Children's Health Clerkships:

Pediatrics Clerkship
Angela Sharkey, M.D. 454-6299
Kathleen McGann, M.D. 454-6299

Obstetrics/Gynecology Clerkship
Andrea Stephens, M.D. 454-7889

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, The Johns Hopkins University, the University of Pennsylvania and Washington University to develop physician-scientists. The program as currently organized provides for a year of research to be performed between the third and fourth years of medical school and is similar in this regard to the Howard Hughes research fellowship for medical students. Students interested in academic internal medicine as a career path are encouraged to apply. Research can be performed at any of the four participating institutions within the Departments of Medicine and is supported by a generous stipend provided by the Lucille P. Markey Charitable Trust. Following the research year, students will complete their medical school training and have the opportunity to continue their clinical training at the internal medicine training program at one of the four schools. Students are highly encouraged to have completed their medicine clerkships prior to or concomitant with the application deadline. Those interested in the program can obtain additional information and application forms from the local coordinator (Dr. Andrew Chan, 362-9012, e-mail: chan@im.wustl.edu). Application deadline is typically January 31 with selection of students occurring by mid-February. Students travel to the four institutions to select their basic science or clinical research mentors in March. Start date for this one-year program is 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 takes an average of seven years to complete, 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 $14,500 per year), health coverage, disability and life insurances, 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, and 3) 15 months of clinical training based on a 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 in June or at the beginning of the medical school year. Students are encouraged to begin the program in June 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 medical and selected graduate 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, fifth and possibly sixth 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; and
5) Carry out a one-semester teaching assistantship.

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 non-graded tutorial for M.D./Ph.D. students facilitates their transition into the clinical phase of training. The intensive clinical training 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 contacting:

Medical Scientist Training Program
Washington University School of Medicine
660 S. Euclid Avenue, Campus Box 8226
St. Louis, Missouri 63110 -1093
(800) 852-4625
e-mail: mstp@medicine.wustl.edu

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 contacting:

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

APPLYING FOR ADMISSION

For updated information, check our Admissions home page at
http://medschool.wustl.edu/admissions
on the Internet's World Wide Web.

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; and
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

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 1998 first-year class must submit their AMCAS application so that it is postmarked no later than November 15, 1997. 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. To check on the status of your application, see our Medical School Application Checklist on the Internet at:
http://medschool.wustl.edu/admissions/atrace.html
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, MO 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@msnotes.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 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, 1998, 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; or 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, 1998, 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 19 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 1997, selected applicants for admission to the School's 1998 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 1998-99 scholarship recipients will be made during the week following the on-campus interviews on Saturday, May 2, 1998.

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.;

Grace E. Bergner, M.D.; Eugene M. Bricker, M.D.; Justin J. Cordonnier, M.D.; Robert C. Drews, M.D.; Ronald G. Evens, M.D.; I.J. Flance, M.D.; Bernard T. Garfinkel, 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.; Allan E. Kolker, M.D.; Nicholas T. Kouchoukos, M.D.; Virgil Loeb, M.D.; Gerald Medoff, M.D.; J. Neal Middelkamp, M.D.; Benjamin Milder, M.D.; Barbara S. Monsees, M.D.; Carl V. Moore, M.D.; Robert C. Packman, M.D.; Charles W. Parker, M.D.; Gordon W. Philpott, 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 1997-98 Distinguished Alumni Scholarships honor Samuel B. Guze, M.D.; William M. Landau, M.D.; Barry A. Siegel, M.D.; and Steven L. Teitelbaum, M.D.

Third-Year Class Transfer Program

Each year, 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 L.C.M.E.-accredited 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 the 1998 third-year class are available on August 1, 1997. The application deadline is March 30, 1998. Those applicants selected for interview will be invited to visit the Medical Center. Applicants will be notified of the decision of the Committee on Admissions by April 15, 1998. Inquiries should be directed to:

Third-Year Class Transfer Program
Washington University School of Medicine
660 S. 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 1997-98 academic year are listed below. Students who enter in 1997 will benefit from a tuition stabilization plan, which provides that their annual tuition of $28,800 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 $37,217. Allowances for entertainment, travel, clothing and other miscellaneous items must be added to this estimate.

Tuition (includes Student Health Service and Microscope Lending Plan)	$28,800
Books, supplies and instruments	1,406
Housing and food	7,011

Student Health Service

The Student Health Service provides comprehensive health care, 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, 1998. 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 on page 27.

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 School of Medicine 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 what was formerly 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. Chandeysson Scholarship Fund. Created in memory of Dr. Chandeysson by his daughter, Carol M. Chandeysson, 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 1956 Scholarship Fund. Established in 1996 by members of the class of 1956 in honor of their 40th reunion.

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.

Class of 1970 Scholarship Fund. Established in 1996 by members of the class of 1970 in honor of their 25th reunion.

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.

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.

Stanley C. Jones Scholarship Fund. Established in 1995 under the will of H. Roberta Jones as a memorial to her husband.

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. Lehmann 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 the 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 (MSTP).

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. The scholarship awards $5,000 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 Rosália Chipelo 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.

Philpott Family Scholarship Fund. Established in 1995 by the Philpott family to provide support for medical students with financial need and excellent academic achievement.

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 Stuebrk 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.

Tuholske-Jonas-Tuholske 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. The scholarship awards $5,000 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 and Com-mittee on Student Financial Aid, and is 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.

Class of 1947 Loan Fund. Established in 1996 by members of the class of 1947 in honor of their 50th reunion.

Jess K. Goldberg Memorial Loan Fund by Ophelia H. Kooden and Violet G. Sachs. Created in 1970 to provide zero-interest 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; and

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 preclinical and clinical portion of their M.D. education; and

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 preclinical 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 chair. The term of the chair will be four years.

Meeting Frequency

CAES meetings must occur in a timely manner after final examinations or reexaminations (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 reexamination. A meeting of the Committee also may 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 course master prior to the examination and to be evaluated by the Student Health Service. In the event the student cannot reach the relevant course master, the student should contact the Associate Dean for Student Affairs.

C) In order to continue their studies at 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 Individualized Study Program (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 Section 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 reexamination 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 reexamination 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 reexamination. If the reexamination 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 reexaminations, if a reexamination has not already been taken, in the courses for which Failed/Incomplete grades have

been recorded. Such reexaminations will generally occur during the last week of the interacademic year break. If such a reexamination is failed, the student may be required to enter an ISP or be dismissed from enrollment in the School.

D) The Associate Dean for Student Affairs may also request that the CAES review performance of a student who has demonstrated poor academic performance in two or more courses at interval evaluations conducted throughout the course when such performance has been reported to the Associate Dean. In such instances, the CAES may recommend a course of action.

If Fail/Incomplete grades have been recorded for more than two courses or a single reexamination, 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 reexamination, according to the schedule listed under B, immediately below:

1. A student for whom a Fail/Incomplete grade has been recorded in a single complete yearlong course in the second-year curriculum OR

2. A student for whom a Fail/Incomplete grade has been recorded in one or two block-long courses.

B) Reexaminations in complete courses in Pathology or Clinical Medicine generally will be offered during the last week of the inter-academic year break, prior to entry into the third year. Reexaminations for students who have failed one or two block-long courses generally will be offered at a time determined by the course master and the Associate Dean for Student Affairs.

Students who fail a reexamination 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 reexamination may be offered. If the reexamination 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 yearlong courses, OR

2. Three or more block-long courses, OR

3. One complete yearlong course and two block-long courses.

4. A student for whom the Registrar has recorded a Fail/Incomplete grade in any reexamination.

D) At review by CAES for students referred to above Section C, the committee may decide to permit the student to take reexaminations, if a re-examination has not already been taken, in the courses for which Fail/Incomplete grades have been recorded. Such reexaminations will generally occur during the last week of the inter-academic year break. The CAES may allow the student to defer beginning the clinical rotations so that reexaminations 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 reexamination, CAES may require that a student enter an ISP or that enrollment in the School of Medicine be terminated. In the event that CAES decides not simply to permit reexamination, the CAES may require that the student enter an ISP 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 completed successfully.

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 reexamination 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 reexamination or re-taking the course. If the course is failed a third time, enrollment in the School 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. Any student who fails to achieve a passing grade (defined as greater than or equal to 10th percentile as reported by the NBME) on two or more subject (shelf) examinations conducted as part of the evaluation of clerkships will be referred to CAES for review and proposal for 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 (ISP)

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 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 generally will 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/Incomplete grade is recorded for a student after entry into an ISP (including in a complete course or a section of Pathophysiology), a reexamination schedule will be determined by CAES. If a Fail/Incomplete grade is recorded for the reexamination of a single course for which two previous final examinations have been failed, enrollment in the School will be terminated. If a Fail/Incomplete grade is recorded for the reexamination 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 also may 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. In such a matter the following procedure applies:

A) The Chancellor or his designate may impose an involuntary leave of absence when there is evidence that a student has committed an offense under these rules or the University's Judicial Code and there is evidence that the continued presence of the student on the University campus or as a participant in a clinical rotation poses a substantial threat to himself or herself, to patients or to the rights of others to continue their normal University function and activities.

B) Imposition of the involuntary leave of absence may result in denial of access to the campus, prohibition of class attendance and/or prohibition of participation in clinical rotations.

C) If an involuntary leave of absence is imposed, the suspending authority shall prepare a written notice

of the imposition and shall have the notice mailed certified or personally presented to the student. The written notice shall include a brief statement of the reasons therefor, and a brief statement of the procedures provided for resolving cases of involuntary leave of absence under these rules.

D) The student shall be given an opportunity to appear personally before the suspending authority within five business days from the date of service of the notice of imposition of the involuntary leave of absence. If the student asks to appear personally before the suspending authority, only the following issues shall be considered:
1) Whether the suspending authority's information concerning the student's conduct is reliable; and
2) Whether under all the circumstances, there is a reasonable basis for believing that the continued presence of the student on campus or in clinical rotations poses a substantial threat to the student, to patients or to the rights of others to engage in their normal University functions and activities.

E) Within one week of the date of imposition of the involuntary leave of absence, the suspending authority shall either file a statement of charges against the student with the University Judicial Board, and shall have the statement or charges served, by mail or personal service, upon the student and the Dean of the school or college or director of the program in which the student is enrolled or initiate prodeedings under these rules to convene a Disciplinary Committee.

F) A temporary suspension shall end when 1) rescinded by the suspending authority, or 2) upon the failure of the suspending authority to promptly file a statement of charges with the University Judicial Board or a Disciplinary Committee, or 3) when the case is heard and decided by the University Judicial Board, or the Disciplinary Committee.

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 60 days or more leave of absence, the grace period for loan repayment during a leave of absence may be 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.

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 also must 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 Academic Review. A quorum of this committee shall consist of five members.

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

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

Within 20 days of the date of an Appeals Committee's decision or referral back to CAES, 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.

Research Integrity Policy

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 M.D. 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 described below).

Policy on Student Status and Benefits During Research Years or Leave of Absence

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 School of Medicine (WUSM).

The benefit is provided to WUSM 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 School of Medicine. 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 School of Medicine, 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. 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 Deans listed under Section 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 recommending to the Dean dismissal from enrollment in the school, where four out of five votes will be required. The recommendation of the Disciplinary Committee will be forwarded to the Dean, who will decide upon the disciplinary action to be taken.

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.

N) In the event that the student wishes to appeal the decision of the Dean dismissing the student from enrollment in the School, such an appeal should be directed to the Provost of the University according to the University Judicial Code. The decision of the Provost 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: USMLE Step 1, generally taken in June or September following the second-year curriculum, tests knowledge in the basic sciences; USMLE Step 2, generally taken in March or September prior to graduation, tests proficiency in clinical sciences; and USMLE Step 3, 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.

STUDENT LIFE

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 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. A convenient, modern highway system and a simple city plan allow easy access to all parts of the city and its many activities. A 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 west are the elegant homes and multifamily dwellings of Clayton. Those who come to St. Louis to be associated with the University find apartments that range in price from $400-$650 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. The effects of the St. Louis renaissance are easily seen 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.

The *Hot Docs*, now in its 15th year of existence, is a fully instrumented big band jazz ensemble. The 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. *Code Blue* is an improvisational combo jazz group. The repertoire of *Code Blue* includes compositions by Charles Mingus and Horace Silver, among others. The band primarily plays instrumental jazz, although a fine vocalist often is added for another dimension to the sound experience. The members of *Code Blue* are physicians, scientists and attorneys.

Celebrating its 22nd year in 1997, 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. On campus, Edison Theatre offers the very

highest quality in national and international programs in theater, dance and music each season.

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 Laumeier Sculpture Park, which displays 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 members hold positions on the Washington University faculty and make the extensive research facilities available to students.

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 more than a century, it has hosted one of the oldest traditions in baseball — the St. Louis Cardinals. Dizzy Dean and the Gas House Gang, Stan Musial, Lou Brock, and Ozzie Smith 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 in the Kiel Center, an 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 welcomed the NFL Rams to town in the fall of 1995, bringing professional football back to the city.

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.

Many major corporations are located here, as are a variety of retail, transportation and banking organizations. Among the top firms in town are Anheuser-Busch, The Brown Group, McDonnell Douglas, Monsanto, Pet and Ralston Purina — all founded in St. Louis. Many support services have grown up around these corporate headquarters — including 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 — made up of the School of Medicine and several teaching hospitals. Illustrative of the productive ties between university and community, the Monsanto company supports fellowships for M.D./Ph.D. students at the School of Medicine and contracts 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 also have 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 also is 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 Students, 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.

Fourth-Year Class Officers

President
Amy Sullivan

MER Representative
Paul House

Social Chairs
Dawn Ebach
Dan Drake
Chris Gerst

Third-Year Class Officers

President
Maria Dans

MER Representative
Maureen Farrell

Social Chairs
Jennifer Smith
Karen Woolf

Second-Year Class Officers

President
Erik Wallace

MER Representative
Michael Kappelman

Social Chairs
Clare Pipkin
Mike Peelle
Geoff Uy

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, Medical Education Rep (MER), 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. MER Rep: The MER Rep shall represent the class at all meetings of the MER and Curriculum Evaluation Committee and serve as a liaison between students and faculty on curricular matters. The MER 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 MER 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.

E. Representative to the Graduate Professional Council (GPC): There shall be a Representative with a two-year term chosen every year from the First-Year class to represent the School of Medicine at GPC meetings. The Representative shall inform the GPC of issues affecting the School of Medicine, learn about issues affecting other schools, discuss and find solutions to problems affecting the whole graduate and professional student population, and plan and advertise social activities that foster communication between all graduate and professional students. The Rep shall be the liaison to the other programs within the School of Medicine. In addition, the Rep shall serve on the Professional and Graduate Student Coordinating Committee (PROGRADS).

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, **the Representative to the Graduate Professional Council**, and the University's Official 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 School of Medicine 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 School of Medicine or by other organizations, so long as such authority is consistent with the purposes stated in Article I.
   8. Posting agenda of all meetings for public reference.
   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 summary brief of the activities undertaken during their term.
   12. The Student Government shall meet regularly and at intervals of no more than six weeks.
   13. The MER 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 MER. The responsibility for the brief can be distributed among the MER 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 School of Medicine 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 and Amendments

A. In 1993 this Constitution was ratified by a 2/3 majority of a quorum of one-half of the student body pursuing a medical degree.

B. This Constitution can be amended by either a 2/3 majority of a quorum of one-half of the students in their first, second, and third years, or by a unanimous vote of the elected members of the Medical Student Government.

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 at 6926 Millbrook Blvd., Campus Box 1059, St. Louis, MO 63130 or (314) 935-5092.

The Spencer T. Olin Residence Hall (314-362-3230), located at 4550 Scott Ave. 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 1997-98 are:

School Year: Late August-May (Nine Months)	
Two-room suite	$3,439.00
Single room	$2,590.00
Double room	$1,747.00
Large single	$3,104.00

Summer 1997 for Three Months	
Two-room suite	$1,069.00
Single room	$781.00
Double room	$535.00
Large single	$963.00

Summer 1997: Weekly Rates for Student Visitor	
Two-room suite	$100.00
Single room	$90.00
Double room	$81.00

Daily Rates for Visitors	
Two-room suite (furnished)	$44.00
Single room	$33.50
Single room (prospective student)	$30.00

Security

Security at the School of Medicine is the responsibility of Protective Services. Uniformed security personnel are on duty 24 hours a day, seven days a week to provide for personal safety, reduce the opportunity for theft and to educate on crime awareness and prevention. Radio-dispatched Protective Services personnel respond immediately to calls to 362-HELP (4357).

The Medical School has an expanding access control program that makes campus facilities easily accessible after hours and on weekends. Faculty, staff and students are issued a photo identification badge that identifies the wearer as a member of the medical school community. The badge also has a magnetic strip that activates the computerized door lock entrances to the School's buildings. These entrances have two-way intercoms for direct communication with Protective Services' radio dispatcher, as do direct-ring telephones located outside campus buildings.

Each year the School publishes "Crime Awareness and Campus Security." This document outlines the many services and programs provided by Protective Services and includes the School's annual security report. It is distributed to faculty, staff and students. Individual copies are available on request by writing to Washington University School of Medicine, Protective Services Department, 660 S. Euclid Ave. - #8207, St. Louis, MO 63110, or by calling (314) 362-2698.

Parking

Parking is available on various surface lots and garages owned by the School of Medicine. The surface lots are located near a variety of sites within the Medical Center. Although surface parking space is limited, parking is generally available in the new 1,500-space employee/student garage located at the corner of Clayton and Taylor avenues. Shuttle service is available for transportation from one site to another in accordance with specific shuttle schedules. If additional information is needed, please contact Transportation Services at (314) 362-6824. If you are interested in carpooling or vanpooling, please contact our Rideshare Coordinator at 747-0706.

Check Cashing

Personal checks may be cashed at the Cashier's Office (Room 107, first floor McDonnell Sciences Building). Hours 9 a.m. to 4 p.m., Monday through Friday. Limit for personal checks is $100 per check or a total of $100 per day. Limit for Washington University checks is $200 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 and second floors of the McDonnell Sciences Building and on the first floor of Olin Residence Hall. Please check these frequently.

Lockers

Student lockers with combination padlocks are located on the second floor of McDonnell Sciences Building. Locker assignments are made by the Registrar's Office for a nominal fee to cover the cost of the padlock.

Mail

First-class student mail sent to the School of Medicine will be put in student mailboxes. This will most probably serve as a temporary mailing address and be used only until students are settled in St. Louis. It is important that mail addressed and sent to the School of Medicine include both student status and year, as follows:

Jane Doe - Medical Student - WUSM I
Washington University School of Medicine
660 S. Euclid Ave., Box 8077
St. Louis, MO 63110

Student Health Service

The Student Health Service is located on the third floor of the Old Children's Hospital Annex, room 3910. 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 health care and care for urgent illness. Emergency care is available at the emergency department of Barnes-Jewish Hospital.

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 Student 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 Hilltop 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 total 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 a $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 School of Medicine 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 health care 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 health care 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 health care workers to patients, such as invasive surgical procedures in which trauma to a health care 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.

Student Organizations

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 Asian-Pacific American Medical Students Association (APAMSA), the Medical Student Section of the American Medical Association (AMA-MSS), the Missouri State Medical Association (MSMA), the Organization of Student Representatives (OSR) in the Association of American Medical Colleges (AAMC) and the Student Organized Community Clinic (SOCC) 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 funds for travel and other expenses on an annual basis.

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. The societies promote a collegial environment for the medical school's diverse faculty and student body.

AMA-MSS

Washington University has an active chapter of the American Medical Association Medical Student Section. WUSM 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 the "Dinner with a Doctor" program and community-oriented activities such as Organ Donor Awareness.

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.

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.

APAMSA

The Asian-Pacific American Medical Students Association was founded to address issues and needs specific to Asian-Pacific American medical students. To that end, it serves as a support group for students, fosters student-faculty interaction and promotes cultural awareness, as well as providing a framework for community service programs.

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.

SNMA

The Student National Medical Association (SNMA) is the oldest and largest medical student organization focused around the needs and concerns of African-American, 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.

Student Organized Community Clinic (SOCC)
A student/faculty clinic organized by students to service the indigent.

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 Barnes-Jewish and Children's hospitals, the School of Medicine and Mallinckrodt Institute of Radiology. The purpose of the organization is to provide friendship and social support among its 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 $20 and information about membership and applications can be obtained by calling Malissa Ungacta (454-3872) or Michelle Turner (862-1279).

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 CoMoTion project serves as a clearinghouse for students to participate in a series of St. Louis 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. The Domestic Violence Action (DVA) group has introduced domestic violence issues into the medical school curriculum. These students also organize yearly symposiums on domestic violence for health care workers from the community.

HIV Partnership Program
Students provide additional support for patients in the community living with HIV.

Student Publications
Students organize and spearhead several important publications at the School of Medicine. *Hippocrene*, an arts and literary magazine, draws contributions of prose, poetry, photography and drawings from students and faculty. *Auscultations*, the quarterly student-run newsletter, keeps students informed about school policy and curricular changes, and provides a forum for students to editorialize about these and other issues. The *Dis-Orientation Guide* is produced annually as a student-to-student guide to the curriculum and the city.

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 voluntary 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

Student research is an important part of the educational program. Fellowships in basic science or

clinical areas will be awarded each year to selected students who undertake research projects under the direction of faculty members. 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.

Most students take the opportunity for research during the summer after their first year of classes, but incoming students to the school also are eligible. Students with academic encumbrances are not eligible. All research must be carried out at the School of Medicine. Students will be awarded a fellowship and 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 at a special AOA lecture.

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 women in the graduating class who have demonstrated outstanding leadership in service to or advancement of women in the community. The 1997 recipient: Karen Marie Dahl.

Morris Alex, M.D. Prize. Awarded each year to that medical student who is outstanding among his or her peers in the second-year Introduction to Clinical Medicine course. The 1997 recipient: Nancy Shaochia Chen.

Alpha Omega Alpha Book Prize. Awarded to a member of the graduating class with outstanding performance for the entire medical course. The 1997 recipient: Charles Todd Vedder.

American College of Physicians Kenneth M. Ludmerer Book Award. Presented 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 1997 recipient: Anjala Vaishampayan.

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 1997 recipients: Michelle Lynn Hermiston and Andrea Kay Stonecipher.

American College of Physicians Clerkship 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 1997 recipient: Amy Elizabeth Bane.

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 1997 recipients: Jennifer Lynn DeLamielleure, Karen Manheimer Hart, Michelle L. Hermiston, Michele Lili Jones, Jennifer Elise Thomure, Amy Lauren Weed and Susan Helen Yang.

American Medical Women's Association Janet M. Glasgow Memorial Award. Presented to a woman who graduates first in her class. The 1997 recipient: Jennifer Sue Temel.

Alexander Berg Prize. Awarded to the student presenting the best results in research in molecular microbiology. The 1997 recipients: Karen Marie Dahl and Jennifer Ann DeLaney.

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 1997 recipients: Karen Marie Dahl and Jennifer Ann DeLaney.

Dr. Richard Brookings and Robert Carter Medical School Prizes. Provided for medical students through a bequest of Robert S. Brookings. The 1997 Dr. Richard S. Brookings recipients: Denise Debra Dewald, Jennifer Sue Gold, Geoffrey Allen Kerchner, and Jennifer Lanier Payne; the 1997 Robert Carter recipients: Amanda Fishback Cashen, Adam Christopher Eaton, Michele Lili Jones, Griffith Liang, and Rashmi Mehrotra.

Dr. Harvey Butcher Prize in General Surgery. Awarded in memory of Dr. Harvey Butcher to the member of the graduating class who shows the greatest promise for a career in the field of general surgery. The 1997 recipient: Julie Robin Fuchs.

Kebar S. Chouke Prize in Anatomy. Awarded at the end of the first year to a medical student who has demonstrated superior scholarship in anatomy. The 1997 recipient: Amanda Fishback Cashen.

Ciba-Geigy Award for Community Service. Recognizes a second-year student who has performed laudable extracurricular activity within the community. The 1997 recipient: Neal Kumar Sikka.

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 1997 recipient: Albert Kim.

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 1997 recipients: Albert Kim and David Christopher Miller.

Antoinette Frances Dames Award in Cell Biology and Physiology. Awarded annually to a member of the first-year class who has demonstrated superior scholarship in these fields. The 1997 recipient: Xinna Kong.

Elisabeth L. Demonchaux Prize in Pediatrics. Established in 1985, the prize is awarded to a graduating student who has done outstanding work in pediatrics. The 1997 recipient: Sharon Gail Meltzer.

Distinguished Minority Student Scholarship Prize. Provided by African-American 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 1997 recipients: Esi Marie Morgan and Ericka Vanessa Hayes.

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 1997 recipient: Charles Todd Vedder.

Dr. William Ellis Award. Established in 1990 by Dr. Ellis and awarded to a senior student in recognition of meritorious research in ophthalmology. The 1997 recipient: Susan Helen Yang.

The Endocrine Society Medical Student Achievement Award. Recognizing a graduating medical student who has shown special achievement and interest in the general field of endocrinology. The 1997 recipient: Steven Jason Lawrence.

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.

Family Health Foundation of Missouri Scholarship Award. Presented in recognition of academic achievement of a graduating medical student entering the specialty of family practice. The 1997 recipient: Tracie Ann Martin.

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 1997 recipients: Amanda Fishback Cashen and Amy Lauren Weed.

Alfred Goldman Book Prize in Diseases of the Chest. Created in 1972 as an annual award to be given to a student selected by the faculty who has done outstanding clinical work or research in diseases of the chest or pulmonary physiology. The 1997 recipient: Meral Omurtag.

Max and Evelyn Grand Prize. Established in 1985 by Dr. M. Gilbert Grand, the prize is awarded to a student in the fourth-year class for excellence in ophthalmic research or clinical ophthalmology. The 1997 recipient: Susan Helen Yang.

R. R. Hannas Award for Excellence in Emergency Medicine. Offered annually by the Missouri Chapter of the American College of Emergency Physicians. The 1997 recipient: Theodore Martin Willmore.

Dr. John E. Kirk Scholastic Award. Established in 1975 and awarded to a graduating student of high scholastic standing. The 1997 recipient: Jennifer Sue Temel.

Louis and Dorothy Kovitz Senior Prize in Surgery. Senior award in surgery recognizing a member of the fourth-year class who has shown the most outstanding ability, zeal and interest in surgical problems. The 1997 recipient: Charles Kyung Chul Lee.

Lange Medical Publications Book Award. Given to one graduating senior and one undergraduate for high scholastic standing. The 1997 recipients: Travis Wade Hanson and Melanie Everitt-Watson.

I. Wallace Leibner 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 1997 recipient: Dana Ann Kumar.

Irwin Levy Prize in Neurology and Neurological Surgery. 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 clerkships. The 1997 recipient: Howard Colman.

Oliver H. Lowry Prize in Pharmacology. Awarded to a second-year medical student for academic excellence in pharmacology. The 1997 recipient: Heather Lynn McGuire.

Howard A. McCordock Book Prize in Pathology. Awarded at the end of the second year to a member of that class for general excellence in pathology. The 1997 recipient: Laxmeesh Mike Nayak.

McGraw-Hill Book Prizes. Awarded annually to a medical student for outstanding achievement in the first-year curriculum. The 1997 recipients: Albert Kim and David Christopher Miller.

Edward Massie Prize for Excellence in Cardiology. Awarded to the member of the graduating class who has done the most outstanding clinical or basic research work in the field of cardiovascular disease. The 1997 recipient: Joshua Avram Socolow.

Medical Center Alumni Scholarship Fund Prize. Given annually to a student who has shown excellence in his or her work during the preceding year. The 1997 recipient: Laxmeesh Mike Nayak.

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 fourth-year class who has excelled in the study of surgery. No individual is eligible for both prizes. The 1997 recipients: Jennifer Sue Temel and Paul Matthew Lamberti.

Merck Manual Awards. Given to three graduating medical students for scholastic achievement in medical studies. The 1997 recipients: Howard Colman, Michele Lili Jones, and Jennifer Elise Thomure.

Missouri State Medical Association Award. Presented annually to an honor graduate of the senior class. The 1997 recipients: Karen Manheimer Hart, Michelle L. Hermiston and Amy Lauren Weed.

Dr. Helen E. Nash 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 prize is given in honor of Dr. Helen Nash, a pediatrician noted in the St. Louis community for her commitment to excellence, tireless advocacy on behalf of children and endless enthusiasm for the field of medicine. The 1997 recipient: Elias Dagnew.

The Needleman Award. Established by his family in 1989 to honor Dr. Needleman, who was Chairman of the Department of Pharmacology from 1976-1989. This award is given to a member of the graduating class for outstanding research in pharmacology. The 1997 recipient: Peter Frosio Nichol.

James L. O'Leary Neuroscience Prize. Awarded annually to students who demonstrate the best accomplishments in the neuroscience course. The 1997 recipient: David Christopher Miller.

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.

Roy Peterson Award in Anatomy. Awarded for outstanding performance in the Gross Anatomy course in recognition of Dr. Peterson's many contributions as a teacher in the School of Medicine. The 1997 recipient: Albert Kim.

The Richard and Mildred Poletsky Education Fund. Established in 1995 by the family of Mr. Richard Poletsky, an alumnus of Washington University. A prize is awarded annually to a professional student in the health sciences whose interest is in research on dementia and care of demented patients. The 1997 recipient: William Goldman, M.D.

Dr. Philip Rosenblatt Award in Pathology. Given to a medical student for distinguished performance during an elective in pathology or laboratory medicine. The 1997 recipient: Adrienne Kathryn Harper.

St. Louis Pediatric Society Senior Prize. Presented to the senior student showing the greatest promise in clinical pediatrics. The 1997 recipient: Gregory Harron Gorman.

David F. Silbert Outstanding Teaching Assistant Award. Established in memory of Dr. David Silbert. Awarded to a teaching assistant in a medical school course in recognition of his/her commitment to teaching. The 1997 recipient: Gabriel Enrique Soto.

John R. Smith Memorial Fund Award. Created in 1982, it is awarded to a medical student who has done meritorious clinical and/or research work in the Division of Cardiovascular Disease within the Department of Medicine.

Dr. Margaret G. Smith Award. Given to a woman medical student for outstanding achievement in the first two years of medical school. The 1997 recipient: Heather Lynn McGuire.

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 1997 recipient: Fiona Elizabeth Gallahue.

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 1997 recipient: Julie Ann Mai.

Jessie L. Ternberg Award. Presented to a woman graduating from the School of Medicine who best exemplifies Dr. Ternberg's indomitable spirit of determination, perseverance and dedication to her patients. The 1997 recipient: Cristina Ferrone.

Washington University American Heart Association Medical Student Research Fellowship Prize. Given for outstanding performance in the American Heart Association Medical Student Research Fellowship Program.

Washington University Internal Medicine Club Research Award. Awarded to the member of the graduating class who has done the most significant research in any area of internal medicine. The 1997 recipient: Bruce Jonathan Darrow.

Washington University Summer Research Fellowship Prize. The award recognizes a student for meritorious research in the Summer Research Fellowship Program at Washington University School of Medicine. The 1997 recipient: Patrick Yue.

Samson F. Wennerman Prize in Surgery. Donated by his wife, Zelda E. Wennerman, and awarded annually to the fourth-year student who has demonstrated promise in surgery. The 1997 recipient: Jennifer Lynn DeLamielleure.

Park J. White, M.D. 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 1997 recipient: Irene Hong McAtee.

Hugh M. Wilson Award in Radiology. Given annually to a graduating medical student in recognition of outstanding work in radiology-related subjects, either clinical or basic science. The 1997 recipient: Jennifer Elise Thomure.

The Wynder Prize in Preventive Medicine. Established in 1994, it is awarded to senior medical students who have done the best research in preventive medicine. The 1997 recipients: Karen Marie Dahl and Jennifer Ann DeLaney.

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 1997 recipient: Louis Kuchnir.

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 staff 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.

William M. Landau Lectureship. This lectureship was established in 1995 by friends, family and colleagues of Dr. Landau.

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 Orthopaedic 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.

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 Chair of the Department of Medicine at Washington University.

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 and graduate medical education, and his commitment to patient care.

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 Orthopaedic 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.

Earl E. and Wilma Shephard Orthopaedics/ Otolaryngology Memorial Lecture. Established in 1994 through a bequest by Dr. and Mrs. Shephard.

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

Donald C. Shreffler Genetic Lectureship. Established in 1995 by Mrs. Donald C. Shreffler as a memorial to her husband.

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.

Arthur W. Stickle Lectureship in Pediatric Ophthalmology. Established by Arthur and Emily Stickle in 1995 with their generous gift in recognition of Dr. Stickle's medical training in the Department of Ophthalmology and Visual Sciences and his special professional contribution to the field of pediatric ophthalmology.

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."

Leonard J. Tolmach Lectureship. Established in 1995, this lectureship was endowed by friends and

colleagues to honor the legacy of Dr. Tolmach. The lecture theme is radiation biology in clinical radiation oncology.

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 for our students. 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 Residency Match Office 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-1 residencies selected in the most recent residency matching (1997) are identified in the Register of Students beginning on page 201.

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. Copher 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 orthopaedic 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 to:

1. Provide high quality educational activities for alumni and faculty of Washington University School of Medicine and other physicians locally, regionally, nationally and, on occasion, internationally.

2. Encourage lifelong learning by a variety of educational methods appropriate to the learners' needs.

3. 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. Provide a forum where academic and practicing physicians can jointly explore solutions to health care problems.

5. Translate the results of research and the habits of critical assessment of new data to the needs of practicing physicians.
6. Embark on newer areas of CME such as remedial education, electronic education, distance learning and self-study.

Each year more than 60 symposia and more than 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 60 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 staff 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

The Alumni Association assists students in a variety of ways. The Association makes a substantial financial commitment each year to support 16 Distinguished Alumni Scholars. Entering students are welcomed to the School at an event sponsored by the Association, which 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 Academic Societies also benefit from support by WUMCAA. These provide opportunities for faculty and student interaction in a collegial environment

In addition, the Association provides financial support to a number of student-initiated community service activities, including a variety of health education programs in public schools clinics.

Many students and residents meet alumni informally during the admissions process. The Office of Medical Alumni and Development Programs coordinates an alumni resource bank which arranges more formal contacts between alumni and students. Alumni volunteers host students who wish to spend time with a practicing physician, provide information to help students choose a specialty, assist with summer employment opportunities for first-year students, and provide overnight lodging to fourth-year students going on residency interviews.

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 departments, 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, neural sciences, is taught in the second semester. Gross anatomy is largely a laboratory course, and lectures deal with anatomical principles and 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 sciences 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

M35 554 NEURAL SCIENCES

Instructors: *Jeff Lichtman, M.D., Ph.D.*, 362-2504; *W.Thomas Thach, M.D.*, 362-3538; *David Van Essen, Ph.D.*, 362-7043

The Neural Sciences 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 includes 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 emphasizes the core body of important facts and principles presented in lectures and laboratories. Limited space is available for non-medical students with instructor's permission. Non-medical students should register under the cross listed number L41 (Bio) 554 (SPRING ONLY).

M05 501 GROSS ANATOMY

Instructor: *Glenn Conroy, Ph.D.*, 362-3397

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. Cross listed with L41 (Bio) 501.

M05 502 MICROSCOPIC ANATOMY

Instructor: *David Menton, Ph.D.*, 362-3593

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, preparations of fresh tissues and electron micrographs. A microscope will be provided for each student. Limited space is available for non-medical students with instructor's permission.

M04 536 AUTONOMIC MECHANISMS IN DISEASED STATES

Instructor: *Arthur Loewy, Ph.D.*, 362-3930

The purpose of this elective is to discuss several topics related to autonomic dysfunction. Each student will present a paper dealing with new scientific ideas regarding the physiology of the autonomic nervous system. The focus of the discussion will be to address how particular disease processes may affect function of normal tissues. The topics covered will include sexual dysfunction, neurogenic inflammation, neural-immune interactions and selected autonomic nervous system diseases.

M04 536A MICROSURGERY OF THE AUTONOMIC NERVOUS SYSTEM

Instructor: *Arthur Loewy, Ph.D.*, 362-3930

The purpose of this course is to develop microsurgical skills. Particular components of the autonomic nervous system will be dissected and injections of various neuronal markers will be made. Attendance of two days per week will be necessary and prior contact with Dr. Loewy should be made.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

M04 552 GENETICS AND MOLECULAR BIOLOGY OF ION CHANNELS

Instructor: *Lawrence B. Salkoff, Ph.D.*, 362-3644

How molecular genetic techniques and theory help understand the structure, function and distribution of ion channels which are critical for the electrical properties of excitable nerve and muscle cells.

FOURTH YEAR

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.

L41 (Bio) 5404 MOLECULAR NEUROBIOLOGY
L41 (Bio) 5562 PRINCIPLES OF NEURAL DEVELOPMENT
L41 (Bio) 5571 CELLULAR NEUROBIOLOGY
L41 (Bio) 5641 COMPUTATIONAL NEUROSCIENCE
L41 (Bio) 5651 NEURAL SYSTEMS
L41 (Bio) 567 ADVANCED TUTORIALS IN NEURAL SCIENCE
L41 (Bio) 590 RESEARCH OPPORTUNITIES

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.

M05 810 ADVANCED DISSECTION

Instructors: *Staff*, 362-3397

Different regions of the body will be dissected in detail. A period of four weeks should be allowed for each region: head and neck, thorax and abdomen and superior and inferior limbs. Surgical approaches, cross-sections, X-rays and CT scans can be studied. Valid start weeks for four-week blocks are: Weeks 29, 33, 37 and 41.

M05 820 TEACHING ASSISTANT IN HUMAN ANATOMY

Instructor: *Glenn Conroy, Ph.D.*, 362-3397

Offers the student the opportunity to review human anatomy by assisting Anatomy faculty in teaching first-year medical students in the Anatomy laboratory. Valid start weeks for four-week blocks are: Weeks 13, 17 and 21.

Research (M05 900)

Cross listed with L41 (Bio) 590

Charles H. Anderson, Ph.D., 362-1799
Computational models of neural systems and image analysis.

Nancy L. Baenziger, Ph.D., 362-2817
Up and down regulation of receptor systems for multifunctional mediators bradykinin and histamine in neuronal, vascular and connective tissue cells.

Richard Bischoff, Ph.D., 362-3548
Development and regeneration of skeletal muscle.

Paul Bridgman, Ph.D., 362-3449
Cell biology of the developing nervous system.

Andreas Burkhalter, Ph.D., 362-4068
Development and synaptic organization of cortical circuits.

Harold Burton, Ph.D., 362-3556
Functional organization of somatic sensory cortex.

James M. Cheverud, Ph.D., 362-4188
Evolutionary quantitative genetics, genetics of growth and morphology.

Glenn C. Conroy, Ph.D., 362-3397
Comparative primate anatomy and human evolution.

David I. Gottlieb, Ph.D., 362-2758
Gene regulation in the developing brain.

James E. Krause, Ph.D., 362-3416
Functions and regulation of tachykinin neuropeptides and their receptors.

Jeff W. Lichtman, M.D., Ph.D., 362-2504
The mechanisms underlying the formation, maintenance and elimination of synaptic connections.

Arthur D. Loewy, Ph.D., 362-3930
Neural basis of fight-or-flight response.

David N. Menton, Ph.D., 362-3593
Structure and function of the mammalian integument.

Michael L. Nonet, Ph.D., 747-1176
Molecular genetic analysis of synaptic development and function in the nematode *C. elegans.*

Karen L. O'Malley, Ph.D., 362-7087
Molecular biology of dopaminergic systems.

Jane Phillips-Conroy, Ph.D., 362-3396
Behavior, morphology and biology of living primate populations.

Joseph L. Price, Ph.D., 362-3587
Structure and organization of the prefrontal cortex and limb forebrain, and the neuropathology of Alzheimer's disease.

Yi Rao, Ph.D., 362-9388
Molecular mechanism of neural development in Xenopus embryos.

Lawrence B. Salkoff, Ph.D., 362-3644
Genetics and molecular biology of ion channels.

Joshua R. Sanes, Ph.D., 362-2507
Molecular basis of synapse formation.

Lawrence H. Snyder, M.D., Ph.D., 747-3530
Computational and cognitive issues in parietal control of eye and arm movement.

Paul H. Taghert, Ph.D., 362-3641
Molecular genetic analysis of neuropeptide transmitters.

W. Thomas Thach, M.D., 362-3538
Neural control of posture, movement and motor learning.

David C. Van Essen, Ph.D., 362-7043
Organization and function of visual cortex in primates.

Mark B. Willard, Ph.D., 362-3462
The transport of macromolecules and viruses in neurons.

Rachel O. Wong, Ph.D., 362-4941
Development of connections in the mammalian retina.

Faculty

EDISON PROFESSOR OF NEUROBIOLOGY AND HEAD OF DEPARTMENT

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

Professor Emeritus

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.

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

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

Tae Sung Park, M.D., Yonsei University, 1971. (See Departments of Neurology and Neurological Surgery and Department of Pediatrics.)

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

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

Marcus E. Raichle, M.D., University of Washington, 1964. (See Departments of Neurology and 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.

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.)

W. Thomas Thach Jr., M.D., Harvard University, 1964. (See Departments of Biochemistry and Molecular Biophysics, Neurology, Program in Biological and Biomedical Engineering, and Program in Physical Therapy.)

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.)

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

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)

M. Rosario Hernandez, D.D.S., University of Chile, 1973.

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.

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.)

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

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

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 Program in Occupational Therapy.)

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

Jonathan W. Mink, M.D., Ph.D., Washington University, 1989. (See Departments of Neurology and Neurological Surgery.)

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 H. Snyder, M.D., Ph.D., University of Rochester, 1992.

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

Min Zhuo, Ph.D., University of Iowa, 1992. (See Department of Anesthesiology.)

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 injured 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 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 provides experience in the clinical evaluation and management 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.

This clerkship introduces all of the basic aspects of anesthetic practice including preoperative assessment, intraoperative anesthetic administration, placement and interpretation of invasive and non-invasive physiologic monitoring, airway management and regional anesthetic administration. Students taking this clerkship work one-on-one with attending anesthesiologists and are an integral part of the anesthetic care team. By the end of the clerkship the student should be able to provide (under supervision) anesthesia for an uncomplicated surgical procedure. This rotation offers a unique opportunity for the student to work directly with attending physicians and to acquire fundamental skills (airway management, invasive monitoring, regional anesthesia) applicable to all aspects of acute medicine.

Students who have taken the anesthesia clerkship in the third year may elect to repeat this rotation in the fourth year. These students will be exposed to more complicated cases and techniques and will be given increased responsibility for perioperative patient management. Students who have taken the clerkship in the third year may also elect to take an elective in the subspecialty areas of Cardiothoracic Anesthesiology or Anesthesia for Neurosurgery. Students taking these electives will be exposed to surgical cases of increased complexity requiring specialized invasive monitoring and anesthetic techniques.

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. Students learn techniques of mechanical ventilation, hemodynamic monitoring, resuscitation and vasoactive drug treatment while managing all aspects of patients assigned to their care.

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 Joe Henry 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, M.D.; Charles M. Crowder, M.D., Ph.D.; Alex S. Evers, M.D.; Narasimhan Gautam, Ph.D.; Richard Hotchkiss, M.D.; Christopher Lingle, Ph.D.; Joseph Steinbach, Ph.D.; or Min Zhuo, Ph.D.

FOURTH YEAR
Electives

M10 805 ANESTHESIOLOGY

Instructor: *David Murray, M.D.*, 454-6215

This clinical elective is designed to familiarize the student with basic aspects of anesthesiology practice. The primary teaching method is patient care in an instructional setting (one-on-one). The student will learn the basics of preoperative

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evaluation of surgical patients, preanesthetic medication, intraoperative patient management and intraoperative monitoring. The student will be taught perioperative fluid and electrolyte therapy, airway management skills, the placement and interpretation of invasive monitoring devices and regional anesthetic techniques. The student will be an integral part of the anesthesia care team and will participate actively in the anesthetic management of surgical patients. The rotation will also include practical management of some common emergencies using a clinical simulator. By the end of the rotation, we expect that the student will independently (under supervision) provide anesthesia for uncomplicated surgical procedures. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M10 811 CARDIOTHORACIC ANESTHESIOLOGY

Instructor: *Demetrios Lappas, M.D., Ph.D.,* 362-6584

Clinical elective for fourth-year students interested in perioperative monitoring and management of cardiac and thoracic surgical patients. The students will be an integral part of the cardiothoracic anesthesia team and share responsibility for preoperative assessment of patients and anesthesia, hemodynamic and respiratory management of surgical patients with complex circulatory, pulmonary coagulation and other medical problems. In addition, students are expected to gain facility with tracheal intubation, invasive line placement and cardiovascular monitoring, transesophageal echocardiography and interpretation of hemodynamic data, including TEE findings and pressure waveform analysis. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M10 812 PEDIATRIC ANESTHESIA

Instructors: *Gary Hirshberg, M.D.,* 454-6215; *Alice Edler, M.D.,* 454-2296

The student will learn about differences between adults and children in relation to anatomy (airway), physiology and pharmacology as they pertain to anesthesia. By the end of the elective, students will be able to manage a routine pediatric anesthetic, including pre-anesthetic assessments and postoperative pain management, and will be able to perform tracheal intubation in anesthetized children. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M10 820 CRITICAL CARE

Instructor: *Walter Boyle, M.D.,* 362-8543

This clinical elective is designed to familiarize the student with the management of the critically ill surgical patient. The student will function as an integral part of the surgical intensive care unit team, which consists of an attending physician, fellows and surgical and anesthesia house staff. Each student will carry out diagnostic and treatment plans in surgical patients with acute problems requiring intensive care management. A variety of patients from various surgical services is well represented. Practical experience will be gained in the placement and interpretation of cardiovascular monitors, the use of mechanical ventilation, the management of fluids and electrolytes, the recognition and management of sepsis and septic shock, and the diagnosis and treatment of renal failure. The student will actively participate in daily teaching rounds with members of the intensive care unit team. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M10 821 PAIN MANAGEMENT

Instructor: *Robert A. Swarm, M.D.,* 362-8820

Severe, uncontrolled pain is an all-too-often consequence of acute or chronic illness. Pain management students will be involved in the multidisciplinary management of acute and chronic pain, and master the treatment guidelines with which greater than 90 percent of cancer patients' pain can be successfully managed. This rotation is centered at Barnes-Jewish Hospital, but students may also be involved with patient care at St. Louis Children's Hospital. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M10 822 ANESTHESIA FOR NEUROSURGERY

Instructors: *René Tempelhoff, M.D.; Mary Ann Cheng, M.D.; M.Angele Theard, M.D.; Michael Crowder, M.D., Ph.D.* (all: 362-5604)

Application of principles of cerebral physiology. Airway management = direct and fiber-optic-guided intubation. Management of complicated neurosurgical patients, including electrophysiologic monitoring and hemodynamic monitoring (arterial line, central venous access and pulmonary artery catheter). Optional participation in ongoing clinical research protocols (six-week rotations). Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M10 823 OBSTETRICAL ANESTHESIA

Instructor: *Mark Norris, M.D.,* 362-5110

Students will gain an in-depth experience in obstetrical anesthesia. They will learn how the physiologic changes of pregnancy alter anesthetic management. Students will develop an understanding of labor pain and the methods available for its relief. They will participate in the provision of pain relief to laboring women. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Faculty

HENRY ELIOT MALLINCKRODT PROFESSOR AND HEAD OF DEPARTMENT

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

Professors Emeriti

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

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.

Christopher J. Lingle, Ph.D., University of Oregon, 1979. (See Department of Anatomy and Neurobiology.)

Mark C. Norris, M.D., Jefferson Medical College, 1980. (See Department of Obstetrics and Gynecology.)

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

Peter Rock, M.D., The Johns Hopkins University, 1978. (See Department of Medicine.)

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

Associate Professor Emeritus

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

Associate Professors

Walter A. Boyle III, M.D., University of California, San Francisco, 1977.

Narasimhan Gautam, Ph.D., University of Bombay, 1983. (See Department of Genetics.)

Gary E. Hirshberg, M.D., Hannemann Medical College, 1972.

Barbel Holtmann, M.D., University of Missouri, 1968.

Richard S. Hotchkiss, M.D., University of Virginia, 1976.

James J. Jenkins, M.D., University of North Carolina, 1970.

Terri G. Monk, M.D., University of Nebraska, 1977.

David J. Murray, M.D., University of Saskatchewan, 1978.

Carl H. Nielsen, M.D., Copenhagen Medical School, 1979.

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.

G. Ram Volotzky, M.D., Sackler School of Medicine, 1979.

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.

Jennifer W. Cole, M.D., Washington University, 1984.

Michael Crowder, M.D., Ph.D., Washington University, 1989.

George Despotis, M.D., St. Louis University, 1985.

Edwin Dunteman, M.D., University of Illinois, 1989.

Charles W. Hogue, M.D., University of Illinois, 1986.

Michael E. Leavell, M.D., University of Kansas, 1984.

Barry P. Markovitz, M.D., University of Pennsylvania, 1983. (See Department of Pediatrics.)

Scott A. McClure, M.D., St. Louis University, 1989.

Christopher D. Newell, M.D., Washington University, 1990.

Mitchell R. Platin, M.D., Northwestern University, 1987.

Charles G. Pond, M.D., St. Louis University, 1980.

Debra D. Pulley, M.D., St. Louis University, 1987.

James M. Shear, M.D., University of Missouri, 1981.

Iris Soliman, M.B.B.Ch., Cairo University, 1977.

Richard Stern, M.D., Washington University, 1985.

Trevor Sutton, M.D., University of California, San Francisco, 1990.

Robert A. Swarm, M.D., Washington University, 1983.

Kalvin L. White, D.O., Oklahoma State University, 1990.

Brett D. Wolff, M.D., Washington University, 1991.

Patricia Young-Beyer, M.D., University of California, San Diego, 1981.

Min Zhuo, Ph.D., University of Iowa, 1992.

Assistant Professors (Clinical)

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

Frederick E. Youngblood, M.D., Medical College of Georgia, 1968.

Instructors

Hussein Y. Abukhudair, M.D., Faculty of Medicine, 1980.

Sharma Anshuman, M.D., All India Institute of Medical Sciences, New Delhi, India, 1990.

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.

Mary Ann Cheng, M.D., University of Michigan, 1980.

Ursula Class, M.D., University of Tübingen, 1982.

Michael T. Connor, M.D., Wayne State University, 1974. (See Department of Pediatrics.)

Friedrich C. Dalman, M.D., Ph.D., University of Michigan, 1992.

Hiroko Dalman, M.D., University of Michigan, 1992.

Mark H. Davis, M.D., UMDNJ, Robert Wood Johnson Medical School, 1990.

Catherine M. Dunn, M.D., University of Missouri, 1982.

Alice A. Edler, M.D., St. Louis University, 1977.

Steven T. Fogel, M.D., University of Missouri, 1976.

Barry A. Graff, M.D., St. Louis University, 1976.

Matthew Barry Jones, M.D., UMDNJ, Robert Wood Johnson Medical School, 1987.

Stephanie Jones, M.D., Washington University, 1992.

Shahrdad Khodamoradi, M.D., Washington University, 1990.

Joseph Kras, M.D., D.D.S., Hahnemann University, 1991.

Catherine P. Krucylak, M.D., UMDNJ, New Jersey Medical School, 1986.

Theodore N. Marks, Ph.D., M.D., Case Western Reserve University, 1992.

John D. McAllister, M.D., University of Manitoba, 1980.

Amrik S. Narula, M.B.B.S., H.P. Medical College, 1972.

Joan M. Niehoff, M.D., University of Missouri, Kansas City, 1982.

Deborah Ott, M.D., Washington University, 1991.

Joseph Rater, M.D., University of Iowa, 1990.

Cindy M. Regan, M.D., University of Iowa, 1988.

Elaine V. Riegle, M.D., University of Iowa, 1967.

Frank E. Robbins, M.D., Washington University, 1977.

Thomas Saak, M.D., University of Missouri, 1992.

Steven Saltzman, M.D., University of Connecticut, 1991.

Charles R. Schrock, M.D., University of Missouri, Columbia, 1991.

Hind Shabany-Bashiti, M.B.B.Ch., Ain Shams University, 1971.

Raghu TerKonda, M.D., University of Missouri, 1987.

M. Angele Theard, M.D., University of Illinois, 1989.

Vesna Todorovic, M.D., Ph.D., University of Belgrade, 1985.

Silvestre A. Tomeldan, M.D., Far Eastern University, 1970.

Jean P. Waddle, M.D., St. Louis University, 1991.

Lawrence S. Waldbaum, M.D., Washington University, 1973.

Karen L. Weiss, M.D., Boston University, 1980.

A. Andrew Zimmerman, M.D., University of Missouri, Kansas City, 1987.

DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOPHYSICS

The department participates in Medical School teaching in the first year as well as offering several specialized courses in the major fields of biochemistry and biophysics. Students in the School of Medicine or those in the Graduate School of Arts and Sciences may enroll in these courses and 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 and nucleic acids; enzymology, metabolic regulation, molecular biology of gene expression and protein biosynthesis, lipid metabolism, signal transduction, and the dynamics of cytoskeletal structures.

FIRST YEAR

M15 502 MOLECULAR FOUNDATIONS OF MEDICINE

Instructor: *Linda Pike, Ph.D.*, 362-9502

This course is designed primarily for medical students and will cover fundamental aspects of biochemistry and cell biology. The course begins with a treatment of protein structure and the function of proteins in the cytoskeleton and cell motility. The principles of enzyme kinetics and regulation are then discussed and basic pathways for the synthesis and metabolism of carbohydrates and lipids are introduced. This leads in to a discussion of membrane structure and the function cellular organelles in biological processes including energy production, protein degradation and protein trafficking. Specials topics workshops presented by physicians serve to link the basic science to the clinic. Non-medical students should register under L41 (Bio) 5319.

FOURTH YEAR

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.

L41 (BIO) 5312	MACROMOLECULAR INTERACTIONS
L41 (BIO) 5325	PROTEIN STRUCTURE AND FUNCTION
L41 (BIO) 5384	ADVANCED CELL BIOLOGY/ BIOCHEMISTRY OF MEMBRANES
L41 (BIO) 5456	ADVANCED CRYSTALLOGRAPHY
L41 (BIO) 5461	MOLECULAR RECOGNITION
L41 (BIO) 5464	COMPUTATIONAL BIOCHEMISTRY
L41 (BIO) 548	NUCLEIC ACID AND PROTEIN BIOSYNTHESIS

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

Research (M15 900)

Cross listed with L41 (Bio) 590

Gary K.Ackers, Ph.D., 362-0260
Biophysical chemistry of regulatory interactions in proteins and nucleic acids.

Wayne M. Barnes, Ph.D., 362-3351
Plant and DNA polymerase genetic engineering; DNA technology improvement.

Peter M.J. Burgers, Ph.D., 362-3872
Molecular biology of yeast chromosomal DNA replication and DNA repair.

David P. Cistola, M.D., Ph.D., 362-4382
Multidimensional NMR studies of lipid carrier proteins in normal and disease states.

Enrico Di Cera, M.D., 362-4185
Molecular recognition. Structure-function studies of clotting proteases.

Elliot L. Elson, Ph.D., 362-3346
Cellular mechanics and cytoskeletal structure and function.

William A. Frazier, Ph.D., 362-3348
The role of the extracellular matrix protein thrombospondin in angiogenesis.

Carl Frieden, Ph.D., 362-3344
Protein folding. Properties of actin and actin-binding proteins. Relationship of enzyme structure to function. Protein-protein interactions.

Kathleen Hall, Ph.D., 362-4196
RNA structure/function; RNA:protein interactions; NMR spectroscopy.

Jo Holt, Ph.D., 362-4406
Kinetics and thermodynamics of ligand binding in hemeproteins; FTIR spectroscopy.

Rosalind H. Kornfeld, Ph.D., 362-8835
Structure of membrane carbohydrates.

Linda C. Kurz, Ph.D., 362-3401
Direct observation of enzymatic catalytic strategies.

Angel Lee, M.D., Ph.D., 362-4466
Structure and function studies on receptor tyrosine kinase; elucidation of their signal transduction mechanisms; integration of molecular biological and molecular modeling approaches.

Timothy M. Lohman, Ph.D., 362-4393
Biophysical chemistry of proteins, nucleic acids and their mechanisms of interaction; helicases, helix destabilizing proteins; polyelectrolyte properties of proteins and nucleic acids.

John E. Majors, Ph.D., 362-1135
Control of eukaryotic gene expression.

F. Scott Mathews, Ph.D., 362-1080
X-ray crystallographic studies of proteins and enzymes.

Linda J. Pike, Ph.D., 362-9502
Caveolae and signal transduction.

Jay Ponder, Ph.D., 362-4195
Computational modeling of protein structure and energetics; protein engineering.

Gabriel Waksman, Ph.D., 362-4562
X-ray crystallographic studies of proteins involved in signal transduction and DNA replication.

Mark Wardell, Ph.D., 747-0725
Structure, function and pathology of proteins associated with atherosclerosis.

Faculty

ALUMNI ENDOWED PROFESSOR OF BIOCHEMISTRY AND MOLECULAR BIOPHYSICS AND INTERIM HEAD OF DEPARTMENT

Carl Frieden, Ph.D., University of Wisconsin, 1955.

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.

Professors

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

Peter M.J. Burgers, Ph.D., State University of Leiden, 1977.

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.)

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.)

J. Evan Sadler, M.D., Ph.D., Duke University, 1978; M.D., 1979. (See Department of Medicine.)

Robert E. Thach, Ph.D., Harvard University, 1964. (See Departments of Anatomy and Neurobiology, Neurology, Program in Biological and Biomedical Engineering, and Program in Physical Therapy.)

Associate Professor Emeritus

William F. Holmes, Ph.D., University of Pennsylvania, 1960. (See Biomedical Computer Laboratory.)

Associate Professors

Wayne M. Barnes, Ph.D., University of Wisconsin, 1974.

Oscar P. Chilson, Ph.D., Florida State University, 1963. (See Department of Cell Biology and Physiology.)

Enrico Di Cera, M.D., Universitá Cattolica, 1985.

Gregory I. Goldberg, Ph.D., Weizmann Institute of Science, 1977. (See Departments of Medicine and Molecular Microbiology.)

David I. Gottlieb, Ph.D., Washington University, 1971. (See Department of Anatomy and Neurobiology.)

Kathleen B. Hall, Ph.D., University of California, Berkeley, 1984.

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 for 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, M.D., Ph.D., Boston University, 1985.

Steven M. Cohn, M.D., Ph.D., Washington University, 1985. (See Department of Medicine.)

Alan Daugherty, Ph.D., University of Bath, Britain, 1981. (See Department of Medicine.)

Lucian V. Del Priore, M.D., University of Rochester, 1982; Ph.D., Cornell University, 1984. (See Department of Ophthalmology and Visual Sciences.)

Chih-Lin Hsieh, Ph.D., University of Texas, 1987. (See Department of Obstetrics and Gynecology.)

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. (See Department of Medicine.)

Douglas M. Tollefsen, M.D., Ph.D., Washington University, 1977. (See Department of Medicine.)

Gabriel Waksman, Ph.D., University of Paris, 1982.

Mark Wardell, Ph.D., Christchurch School of Medicine, University of Otago, 1986.

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 Technology, 1990.

Research Instructors

Jenny Buzan, Ph.D., Washington University, 1984.

Judy Fee, Ph.D., University of California, Berkeley, 1973.

Yingwen Huang, Ph.D., Southern Illinois University, 1991.

James J. Toner Jr., Ph.D., St. Louis University, 1973.

DEPARTMENT OF CELL BIOLOGY AND PHYSIOLOGY

The department offers instruction to medical and graduate students. A Cell and Organ Systems Physiology course in 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

M75 503 CELL AND ORGAN SYSTEMS BIOLOGY

Instructor: *Robert Wilkinson, Ph.D.*, 362-2300

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. Limited space is available for non-medical students with instructor's permission. Non-medical students should register under the cross listed number L41 (Bio) 502.

M04 5015 PROBLEMS IN RESPIRATORY PHYSIOLOGY

Instructor: *Carl Rovainen, Ph.D.*, 362-2299

This elective complements the core curriculum on respiration in the first year Physiology course for those students who like to learn by problem-solving, for instance, as in undergraduate physics. Some (but not all) students say that the way they really learned respiration was by solving problems. Qualitative and quantitative problem sets in respiratory physiology will be assigned to teams of students who will solve them in class with advice from the instructor and then present the basic concepts and answers to the group as a whole. The instructor will give a mini-lecture on the theme of each session and will moderate the discussion.

This elective early in the semester will provide both a head start and greater depth of understanding for the core learning objectives in the regular course in respiratory physiology.

M04 519 CASE PROBLEMS IN BIOCHEMISTRY AND CELL BIOLOGY

Instructors: *Tom Steinberg, M.D.*, 362-9218; *Sam Stanley, M.D.*, 362-1070; *Ellen Li, M.D., Ph.D.*, 362-1072; *Gregory Longmore, M.D.*, 362-8834

One or a few clinical cases will be used as a springboard for delving into, and making the connections between, the basic science and clinical aspects of medicine. Approach will be somewhat "problem-oriented." (Also listed in Department of Medicine.)

M04 534 MONOCYTES/MACROPHAGES PROGRESSIVE KIDNEY DISEASE

Instructor: *Jerry Morrissey, Ph.D.*, 454-7464

Infiltration of the kidney by monocytes which differentiate into tissue macrophages is a primary factor initiating or secondary factor exacerbating many kidney diseases. In this elective, we will explore the molecular events that cause monocytes to be activated by, attracted to and subsequently invade the diseased kidney. The events from transcription factor activation to tissue fibrosis are similar to those occurring during arteriosclerosis. Animal models to study the pathophysiology of kidney disease will be discussed along with the histologic examination of the kidneys at various stages in the development of end-stage renal disease. For those students interested, visits to the renal clinic with attending physicians will be arranged. Reversibility, cures and preventions/amelioration of kidney disease will be discussed. (Also listed in Department of Medicine.)

M04 537 CARDIOVASCULAR CONTROL MECHANISMS

Instructors: *Jeff Gidday, Ph.D.*, 454-2817; *Dana Abendschein, Ph.D.*, 362-8925

A demonstration of various aspects of cardiovascular physiology in an anesthetized pig. Topics covered will include differences between left and right ventricular pressures, arterial pulse wave velocity, respiratory heart rate reflex, carotid sinus reflex, effects of drugs such as nitrates and alpha- and beta receptor agonists on the heart and circulation and effects of vagal stimulation on cardiopulmonary dynamics. Students interested in observing the surgical preparation of the pig are encouraged to come to the laboratory one hour before the scheduled start of the demonstration. Some simulations on computer-based models may be attempted.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

M04 561 BRAIN BLOOD VESSELS

Instructors: *Tom Woolsey, M.D.,* 326-3600; *Carl Rovainen, Ph.D.,* 362-2299

This course considers the structure, development, transport mechanisms, flow regulation and disease of cerebral blood vessels. During the first session, students will select topics and papers for presentation from a diverse menu. Three general themes will be 1) the architecture of cerebral vessels and regulation of cerebral blood flow during neural activity with a demonstration of brain circulation in the rat model, 2) the blood-brain barrier, and 3) brain angiogenesis. For the final session, students will select a particular disease, research a clinical case and present it to the rest of the group.

MO4 5667 MICROCIRCULATION

Instructor: *Jeff Gidday, Ph.D.,* 454-2817

The homeostatic functions of the microcirculation include the active regulation of metabolic substrate delivery and waste product removal and a multifaceted response to injury and disease. This elective is an introduction to the normal and abnormal cell biology and physiology of the arterioles, capillaries and venules that comprise the microcirculation. Six sessions will be organized around conceptual presentations and laboratory demonstrations by the instructor and two-part, topic presentations by students following independent library research that focus on basic physiology and clinically relevant pathophysiology. Basic research topics might include: regulation of tissue blood flow and vascular tone, propagated vasodilation, hemodynamics and rheology of erythrocytes and leukocytes, cell biology of the endothelium, electromechanical coupling, control of capillary permeability and angiogenesis. Typically covered disease entities involving the microcirculation include: stroke and myocardial ischemia, diabetes, inflammation, tumor angiogenesis, retinopathy of prematurity and pulmonary edema, as well as adaptive responses such as to exercise and high altitude. (Also listed in Department of Neurological Surgery.)

M04 585 ION CHANNELS: TARGETS FOR THERAPEUTIC AGENTS

Instructor: *Colin Nichols, Ph.D.,* 362-6630

Ion channels are present in all cells and direct intracellular events by controlling the membrane potential. Many widely used clinical drugs act by altering the behavior of ion channels. In this course, we will discuss the mode of action of such drugs, particularly two classes of drugs that act on potassium channels. The sulfonylure drugs (e.g., glibenclamide or glucotrol) act to reduce potassium channel activity and cause insulin secretion in diabetics. A broad class of drugs known as potassium channel openers (PCOs) are now becoming available. PCOs have been, or are likely to be, used as antihypertensives, antihypoglycemic agents, bronchiodilators, and even as hair growth stimulants (minoxidil). We will consider research on the action of these drugs at the biophysical and physiological level. The format of the course will be an informal group discussion of original papers with brief presentations by the participants. The group discussion will be led by the course master, with assistance from other faculty and postdoctoral fellows.

FOURTH YEAR

Electives

Descriptions of the following courses may be found under the Division of Biology and Biomedical Sciences.

L41 (BIO) 5062 CENTRAL QUESTIONS IN CELL BIOLOGY

L41 (BIO) 5068 FUNDAMENTALS OF MOLECULAR CELL BIOLOGY

L41 (BIO) 5122 CELL-MATRIX INTERACTION

L41 (BIO) 5132 CELL MOTILITY AND CYTOSKELETON JOURNAL CLUB

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.

Research (M75 900)

Cross listed with L41 (Bio) 590

Dana Abendschein, Ph.D., 362-8925

Responses of arteries to acute injury and coagulation mediators of arterial remodeling after injury.

Kendall Blumer, Ph.D., 362-1668

Mechanism and regulation of signal transduction and growth control in yeast.

John Cooper, M.D., Ph.D., 362-3964

The role of actin polymerization and actin-binding proteins in cell motility.

Phyllis I. Hanson, M.D., Ph.D.

Stimulated release of neurotransmitter from synaptic vesicles is the fundamental process underlying intercellular communications in the nervous system. My interests are in building a molecular understanding of how this release is accomplished and regulated. Biochemical, biophysical, and cell biological techniques will be used to study protein-protein and protein-membrane interactions involved in synaptic membrane trafficking. This work will ultimately shed light on molecular mechanisms that underlie synaptic function and its plasticity.

David A. Harris, M.D., Ph.D., 362-4690
Cell biology of prion proteins. Pathogenesis of transmissible spongiform encephalopathies.

John E. Heuser, M.D., 362-6948
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.

James Huettner, Ph.D., 362-6628
Excitatory amino acid receptors and synaptic transmission in the central nervous system.

Maurine Linder, Ph.D., 362-6040
Signal transduction via GTP binding regulatory proteins: G-protein function in the secretory pathway. Biology and enzymology of protein palmitoylation.

Robert Mecham, Ph.D., 362-2254
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.

Robert Mercer, Ph.D., 362-6924
Structure and function of cation transport proteins. Molecular biology of the Na, K-ATPase. Polarized sorting of membrane proteins in cultured epithelial cells.

Mike Mueckler, Ph.D., 362-4160
Molecular biology of mammalian glucose transporters. Gene structure, biosynthesis and regulation. Expression of transfected cDNA in foreign cells. Mechanism of insertion of proteins into the rough endoplasmic reticulum membrane.

Colin Nichols, Ph.D., 362-6630
Roles and regulation of ion channels in the heart and nervous system. Cloning and expression of ion channels in vertebrate and invertebrate systems.

Alan L. Pearlman, M.D., 362-6947
Early development of the mammalian cerebral cortex, with emphasis on the molecular and cellular mechanisms that guide migrating neurons and axonal growth cones to their proper location. To study these mechanisms, we determine the distribution of potential molecular guidance cues in the developing cortex, then perturb their function experimentally in an organotypic slice preparation maintained in culture for several days.

Helen Piwnica-Worms, Ph.D., 362-6812
Regulation of the eukaryotic cell cycle.

Carl M. Rovainen, Ph.D., 362-2299
Brain blood vessels. *In vivo* videomicroscopy of flowing RBC and fluorescent markers in arterioles and venules through cranial windows in anesthetized rodents. Computer-assisted image analysis. Micro-neurosurgery. Development of brain blood vessels. Models for ministrokes and local cerebral edema. Long-term remodeling of arterioles and recovery of blood flow.

Paul Schlesinger, M.D., 362-2223
Molecular mechanisms and regulation of acidification and ion transport by intracellular vesicles.

Philip Stahl, Ph.D., 362-6950
Endocytosis and phagocytosis in macrophages. *In vitro* reconstitution of transport and membrane fusion events. Role of GTP binding protein (Gαβg, Rab and ARF) in protein trafficking.

Susan Wente, Ph.D., 362-2713
Structural and functional analysis of nuclear pore complexes in nucleocytoplasmic trafficking.

Robert S. Wilkinson, Ph.D., 362-2300
Cellular physiology and nerve-muscle synapses, especially the regulation of synaptic strength and the role of innervation in determining cell properties.

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.

Albert Roos, M.D.,
University of Groningen, Netherlands, 1940.

Professors

Jacques U. Baenziger, M.D., Ph.D., Washington University, 1975. (See Department of Pathology.)

David C. Beebe, Ph.D.,
University of Virginia, 1974.
(See Department of Ophthalmology and Visual Sciences.)

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.)

Roberto Civitelli, M.D., University of Siena, Italy, 1980. (See Department of Medicine.)

F. Sessions Cole, M.D., Yale University, 1973. (See Department of Pediatrics.)

John A. Cooper, M.D., The Johns Hopkins University, 1982; Ph.D., 1983.

Jerome R. Cox Jr., Sc.D., Massachusetts Institute of Technology, 1954. (Biomedical Engineering) (See Biomedical Computer Laboratory.) (Also School of Engineering and Applied Science)

William A. Frazier III, Ph.D., Washington University, 1973. (See Department of Biochemistry and Molecular Biophysics.)

Stephen L. Gluck, M.D., University of California, Los Angeles, 1977. (See Department of Medicine.)

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.)

Mike Max Mueckler, Ph.D., University of Wisconsin, Madison, 1982.

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 Simchowitz, 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 Departments of Neurology and Neurological Surgery.)

Associate Professors

Dana R. Abendschein, Ph.D., Purdue University, 1978. (See Department of Medicine.)

Eric C. Beyer, Ph.D., University of California, San Diego, 1981; M.D., 1982. (See Department of Medicine.)

Kendall J. Blumer, Ph.D., Duke University, 1986.

Douglas C. Dean, Ph.D., University of Kansas, 1984. (See Department of Medicine.)

Marc R. Hammerman, M.D., Washington University, 1972. (See Department of Medicine.)

David A. Harris, M.D., Ph.D., Columbia University, 1983.

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 Medicine.)

Colin G. Nichols, Ph.D., University of Leeds, 1985.

William C. Parks, Ph.D., Medical College of Wisconsin, 1982. (See Department of Medicine.)

Helen M. Piwnica-Worms, Ph.D., Duke University, 1984.

Paul A. Schlesinger, M.D., The University of Chicago, 1970; Ph.D., 1973.

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.)

Steven M. Strasberg, M.D., University of Toronto, 1963. (See Department of Surgery.)

Robert S. Wilkinson, Ph.D., University of Texas, Austin, 1974.

Assistant Professors

John C. Edwards, Ph.D., The University of Chicago, 1983; M.D., 1985. (See Department of Medicine.)

Jeffrey M. 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.)

Phyllis I. Hanson, M.D., Ph.D., Stanford University, 1993.

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.)

Jeffrey Minor, Ph.D., California Institute of Technology, 1991. (See Department of Anatomy.)

Jeremiah J. Morrissey, Ph.D., St. Louis University, 1974.

Anthony Muslin, M.D., Harvard University, 1984. (See Department of Medicine.)

Robert W. Thompson, M.D., University of Michigan, 1983. (See Department of Surgery.)

Steven J. Weintraub, M.D., Medical College of Virginia, 1985. (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.

Koong-Nah Chung, Ph.D., Washington University, 1986.

Maria I. Colombo, Ph.D.,
Juan Augustin Maza, 1986.

Crislyn D'Souza-Schorey, Ph.D.,
University of Texas, 1992.

Anatoly Grishin, Ph.D.,
Leningrad State University, 1985.

Christopher Hardy, Ph.D.,
Columbia University, 1991.

Richard C. Hresko, Ph.D.,
University of Virginia, 1986.

Sylvain Lehmann, M.D.,
Strasbourg School of Medicine,
1991.

Anatoli Lopatin, Ph.D.,
Research Center of Molecular
Diagnostics, 1990.

Dorothy Schafer, Ph.D.,
University of Michigan, 1983.

Ling Wei, M.D.,
Bejing Capital Institute of
Medicine, 1977.

Instructor

Shirley A. Sahrmann, 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 School of Medicine.

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

M30 510A MOLECULAR AND MEDICAL GENETICS

Instructors: *S. Bruce Dowton, M.D., (Syd.)* 362-7800; *Jeffrey Gordon, M.D.*, 362-7243

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. This course is cross listed with number L41 (Bio) 550.

FOURTH YEAR

Electives

For complete descriptions, see Division of Biology and Biomedical Sciences.

L41 (BIO 5011) ETHICS AND RESEARCH SCIENCE

L41 (BIO) 512 SELECTED TOPICS IN DEVELOPMENTAL BIOLOGY

L41 (BIO) 548 NUCLEIC ACIDS AND PROTEIN BIOSYNTHESIS

L41 (BIO) 5491 ADVANCED GENETICS

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

Research (M65 900)

Cross listed with L41 (Bio 590)

Clarissa M. Cheney, Ph.D., 362-2694
Cellular mechanisms of pattern formation in early Drosophila development.

Sean Eddy, Ph.D., 362-7666
Computational biology: RNA and protein structure prediction; genome analysis of *Caenorhabditis elegans.*

Daniela S. Gerhard, Ph.D., 362-2736
Identification of genes by positional cloning causing cervical cancer and Multiple Endocrine neoplasia type 1. Determination of predisposition genes for major affective disorders.

Warren Gish, Ph.D., 286-1826
Research and development of automated systems for gene prediction, identification, and annotation. Emphasis is on combing biological knowledge with the use of rapid search methods and information theory.

Ted Hansen, Ph.D., 362-2716
Molecular immunology of antigen presentation. Intracellular antigen processing, peptide binding to MHC molecules and presentation to immune T cells.

Stephen L. Johnson, Ph.D., 362-0362
Growth control and morphogenesis in vertebrate development. Focus on genes and mechanisms affecting proportionate fin growth, fin regeneration, and pigment stripe patterning in zebrafish.

Mark Johnston, Ph.D., 362-2735
Transcriptional control mechanisms in eukaryotic cells; glucose regulation of gene expression in yeast; and mechanisms of signal transduction.

Tim Schedl, Ph.D., 362-6162
Germ cell development in the model organism *Caenorabditis elegans.* The major focuses are: control of the decision to proliferate or enter the meiotic pathway; control and coordination of meiotic prophase progression and gametogenesis; and control of meiotic maturation and ovulation.

James Skeath, Ph.D., 362-7075
Genetics and cell biology of neural development; evolution of the nervous system; genetic control of animal behavior; biological pattern formation.

Robert H. Waterston, M.D., Ph.D., 362-2657
Muscle development and function in the nematode *Caenorhabditis elegans*; genome analysis and large scale DNA sequencing.

Richard K. Wilson, Ph.D., 286-1804
Genome research; large scale DNA sequence analysis of genomes and expressed genes (cDNAs) from H. sapiens, Mouse, *C. elegans*, C. briggsae, A. thaliana and S. cerevisiae; development of novel technology for large scale DNA sequence analysis and genetic analysis.

Faculty

JAMES S. MCDONNELL PROFESSOR OF GENETICS AND HEAD OF DEPARTMENT

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

Professors

Douglas E. Berg, Ph.D., University of Washington, 1969. (See Department of Molecular Microbiology.)

David D. Chaplin, M.D., Ph.D., Washington University, 1980. (See Departments of Medicine and 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)

H. Mark Johnston, Ph.D., University of California, Berkeley, 1980.

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.)

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

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)

Richard D. Todd, Ph.D., University of Texas, Dallas, 1977; M.D., University of Texas, San Antonio, 1981. (See Department of Psychiatry.)

Associate Professors

James P. Crane, M.D., Indiana University, 1970. (See Department of Obstetrics and Gynecology and Department of 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 J. Goodfellow, Ph.D., Queens University, 1985. (See Department of Surgery.)

Andrew C. Heath, Ph.D., University of Oxford, 1983. (See Department of Psychiatry.)

J. Mark Petrash, Ph.D., University of Texas, Galveston, 1981. (See Department of Ophthalmology and Visual Sciences.)

Tim B. Schedl, Ph.D., University of Wisconsin, 1984.

David J. States, M.D., Ph.D., Harvard University, 1983. (See Institute for Biomedical Computing.)

Brian K. Suarez, Ph.D., University of California, Los Angeles, 1974. (See Department of Psychiatry.)

Michael S. Zuker, Ph.D., Massachusetts Institute of Technology, 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.)

Sean R. Eddy, Ph.D., University of Colorado, Boulder, 1991. (See Institute for Biomedical Computing.)

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.)

Warren R. Gish, Ph.D., University of California, Berkeley, 1988. (See Institute for Biomedical Computing.)

David H. Gutmann, Ph.D., The University of Michigan, 1984; M.D., 1986. (See Department of Neurology.)

Stephen L. Johnson, Ph.D., University of Washington, 1991.

Pui-Yan Kwok, Ph.D., The University of Chicago, 1985; M.D., 1987. (See Department of Medicine.)

John D. McPherson, Ph.D., Queen's University at Kingston, 1989.

Peter S. Rotwein, M.D., Albert Einstein College of Medicine, 1975. (See Department of Medicine.)

Mark S. Sands, Ph.D., State University of New York, Stony Brook, 1990. (See Department of Medicine.)

Steven B. Scholnick, Ph.D., Cornell University, 1982.

James B. Skeath, Ph.D., University of Wisconsin, 1993.

Michael S. Watson, Ph.D., University of Alabama, 1981. (See Department of Pediatrics.)

Research Assistant Professors

Daniela S. Gerhard, Ph.D., Cornell University, 1982.

Elaine Mardis, Ph.D., University of Oklahoma, 1989.

John G. Spieth, Ph.D., University of Washington, 1978.

Research Scientist

Ladeana Hillier, M.S., Northwestern University, 1988.

Research Instructors

Sabire Ozcan, Ph.D., Heinrich Heine University, 1989.

Jeffrey P. Woessner, Ph.D., Duke University, 1986.

JOHN MILLIKEN DEPARTMENT OF MEDICINE

The general medicine teaching services of the department at Barnes-Jewish Hospital and the Veterans Administration Medical Center (St. Louis) under the following directors:

Barnes-Jewish Hospital, *Dr. Schonfeld* (Chairman, Department of Medicine)
House Staff Training Program, *Drs. Goodenberger and Wren*
Veterans Administration Medical Center, *Dr. Chase*

In addition, for the purposes of both teaching and research, the Department of Medicine is divided into specialty divisions and sections at Barnes-Jewish Hospital under the following directors:

Allergy and Clinical Immunology Diseases, *Dr. Chaplin*
Bone Marrow Transplantation and Stem Cell Biology, *Dr. DiPersio*
Bone and Mineral Diseases, *Dr. Avioli*
Cardiovascular Diseases, *Dr. Cain*
Center for Health Behavior Research, *Dr. Fisher*
Dermatology, *Drs. Welgus, Eisen*
Emergency Medicine, *Drs. Lewis, Zwemer*
Endocrinology, Diabetes and Metabolism, *Drs. Cryer, Avioli*
Gastroenterology, *Dr. Stenson*
General Medical Sciences, *Dr. Littenberg*
Geriatrics and Gerontology, *Dr. Holloszy*
Hematology, *Drs. S. Kornfeld, Majerus*
Infectious Diseases, *Drs. E. Brown, Powderly*
Laboratory Medicine, *Dr. Miletich*
Lipid Research, *Dr. Schonfeld*
Medical Oncology, *Dr. DiPersio*
Molecular Oncology, *Dr. Korsmeyer*
Pulmonary and Critical Care Medicine, *Dr. Holtzman*
Renal Diseases, *Drs. Hammerman, Hruska*
Rheumatology, *Dr. Yokoyama*

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 three four-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

M25 510 CLINICAL MEDICINE I

Instructor: *Elliot Abbey, M.D.*, 362-2724

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 one-on-one sessions. Preparation for and attendance at clinicopathological conferences expands the clinical vocabulary and basic knowledge base.

M04 514 CARDIOVASCULAR BIOPHYSICS

Instructor: *Sándor J. Kovács, Ph.D., M.D.*, 454-7660

This elective is intended for students with a background in the physical sciences: physics, mathematics, engineering, computer sciences and comparable fields. Topics covered vary according to the interest of the staff and the clinical spectrum encountered during the course of the elective. Included are quantitative cardiovascular physiology and pathophysiology, nonlinear dynamics and its application to physiology, biophysics, ultrasonics, biomechanics and biomedical engineering. The focus of the elective is the application of quantitative mathematical and engineering principles to solve real problems encountered in clinical practice. Participation in weekly seminars and familiarity with selected topics of current research is included.

M04 519 CASE PROBLEMS IN BIOCHEMISTRY AND CELL BIOLOGY

Instructors: *Tom Steinberg, M.D.*, 362-9218; *Sam Stanley, M.D.*, 362-1070; *Ellen Li, M.D., Ph.D.*, 362-1072; *Gregory Longmore, M.D.*, 362-8834

One or a few clinical cases will be used as a springboard for delving into and making the connections between the basic science and clinical aspects of medicine. Approach will be somewhat "problem-oriented." (Also listed in Department of Cell Biology and Physiology.)

M04 533 TROPICAL MEDICINE

Instructor: *Daniel Goldberg, M.D.*, 362-9210

Washington University School of Medicine has several faculty members who are actively researching diseases specific to developing countries. This elective is designed to bring these individuals together, in an informal discussion forum with students, to highlight the problems particular to geographical medicine. The elective will cover issues including eradication, prevention and treatment, immunology and vaccine development, as well as description of the different disease syndromes themselves. (Also listed in Department of Molecular Microbiology.)

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

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 that 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.

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. Pathophysiology courses are identified by "PP" between course number and name.

M25 605 PP INFECTIOUS DISEASES

Instructors: *Gerald Medoff, M.D.; Lawrence Gelb, M.D.* (both: 362-4413)

The infectious diseases course emphasizes both organism-specific and organ-specific approaches to disease caused by microbes. The course aims to expand upon the material presented in the first year concerning bacteria, viruses, fungi and parasites and their involvement in causation of human disease. Educational methods include lecture and clinical case discussions in small groups.

M25 606 PP RHEUMATOLOGY

Instructor: *Leslie Kahl, M.D.*, 362-7481

The rheumatology pathophysiology course begins with an overview of the structure, function and physiology of the normal joint. The pathophysiology of both localized joint disorders such as osteoarthritis and infectious arthritis are presented, along with systemic inflammatory disorders including rheumatoid arthritis, lupus and vasculitis. Diagnosis, pharmacologic management and rehabilitation of these conditions are included. In small group sessions, students interview patients and observe the characteristic physical findings of these disorders.

M25 611A PP CARDIOLOGY

Instructor: *Dana Abendschein, Ph.D.*, 362-8925

The purpose of this course is to consider the mechanisms and manifestations of acquired and congenital cardiovascular disorders. Lectures and group discussions are provided which emphasize the major manifestations of cardiac pathophysiology.

M25 612A PP PULMONARY

Instructor: *Michael Lippmann, M.D.*, 289-6306

The objectives of the pulmonary pathophysiology course include review of normal pulmonary physiology as related to specific pulmonary disease states. The focus of the course will largely be upon presentations in lectures concerning pathophysiologic principles of abnormal lung structure and function. In addition, case study problems will be discussed.

M25 615 PP METABOLISM ENDOCRINOLOGY

Instructor: *William Clutter, M.D.*, 362-8067

This course aims to develop understanding of the pathophysiology, clinical manifestations and diagnosis of common endocrine disorders. History, physical examination and interpretation of diagnostic laboratory tests are emphasized. Basic principles of treatment of endocrine disorders also are discussed. Students are expected to apply their knowledge in clinical case discussions.

M25 620 PP GASTROENTEROLOGY

Instructor: *Ray E. Clouse, M.D.*, 362-5035

This course discusses the pathophysiologic mechanisms related to the diseases of the gastrointestinal tract including esophagus, stomach, small and large intestines, liver, gall bladder and pancreas. The emphasis is on changes that occur in normal physiology, biochemistry anatomy, immunology and cell biology that result in human gastroenterologic diseases. Lectures are supplemented by group seminars that include clinical case presentations.

M25 626 PP HEMATOLOGY

Instructor: *Scot Hickman, M.D.*, 289-6308

The hematology pathophysiology course exposes students to common hematologic disorders and hematologic malignancies. The course utilizes lectures, clinical case discussions and practical sessions involving microscopy.

M25 628 PP NUTRITION

Instructor: *William Stenson, M.D.*, 362-8940

A basic knowledge of macronutrients (carbohydrates, proteins and fats), factors influencing protein and caloric requirements, dietary recommendations, vitamin and mineral disorders, nutritional issues in infancy and childhood and obesity will be presented in this lecture course.

M25 652 CLINICAL MEDICINE II

Instructors: *Elliot Abbey, M.D.*, 362-2724; *Dorothy Andriole, M.D.*, 362-8212; *Joel Goebel, M.D.*, 362-7532; *Carla Siegfried, M.D.*, 362-5722

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 documention 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 is 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. Students will attend those CPCs presented in the problem-solving format. Sessions with clinical subjects and integration of the whole in case development problems completes the format. During the second year, there will be brief introductory sessions in Pediatrics, Otolaryngology and Ophthalmology provided by members of the faculty of those departments.

THIRD YEAR

M25 710 MEDICINE CLERKSHIP

Instructor: *Alison Whelan, M.D.,* 362-8050

The Medicine clerkship provides supervised study of patients in both inpatient and ambulatory settings. For the inpatient rotations, students are assigned as clinical clerks to patients admitted to the general medical teaching services of Barnes-Jewish Hospital and Veterans Administration Medical Center. For the outpatient rotations, students rotate through the ambulatory general medicine clinics at Barnes-Jewish Hospital and a community-based internal medicine practice. Teaching is provided by the Chief of Service, Attending Physicians, House Officers, consultants, Chief Residents and regularly scheduled conferences. Formal instruction is given in medical therapeutics and laboratory medicine during the clerkship.

Clinical Pathological Conference

The clinical course, laboratory and radiologic studies, and pathological findings of a patient are discussed using a problem-solving format at a weekly conference by members of the Departments of Medicine, Pathology and Radiology.
Dr. Goodenberger, chief residents and medical staff; Dr. Debner and pathology staff

FOURTH YEAR
Electives

M25 801 HONORS MEDICINE — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructor: *Tom DeFer, M.D.,* 454-7106

M25 807 HONORS MEDICINE — VETERANS ADMINISTRATION MEDICAL CENTER

Instructor: *Lewis R. Chase, M.D.,* 289-7030

Subinternship in Medicine offers practical experience in the care of patients. Subinterns are an integral part of the house staff team, working under the supervision of a resident and attending physician. Their responsibilities for patients assigned to them are similar to those of interns, although state law requires that orders must be countersigned by a licensed physician. Subinterns take night call every fifth night with their team and participate in the teaching conferences of the Department of Medicine. Patients are followed by the same house staff team throughout acute hospitalization including wards and intensive care units. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 805 RHEUMATOLOGY

Instructor: *Richard Brasington Jr., M.D.,* 362-7479

Students will be intimately involved in the diagnostic workup and management of patients with rheumatic illnesses including autoimmune diseases such as systemic lupus erythematosus and rheumatoid arthritis, and inflammatory disorders such as vasculitis (polyarteritis, Wegener's, temporal arteritis) and spondyloarthropathies (ankylosing spondylitis, Reiter's syndrome). In addition, students will learn about common afflictions such as osteoarthritis and gout, as well as regional musculoskeletal problems and synovial fluid analysis. By working closely with a faculty member, fellows and medical residents, students become integral and active members of the rheumatology service that provides inpatient consultations and staffs outpatient clinics at Barnes-Jewish Hospital and Veterans Administration Medical Center. In addition, an emphasis is placed on the physical examination of joints and the musculoskeletal system. Students also may view the division's slide collection of clinical findings and will be exposed to the primary literature. Students attend rheumatology conferences, held twice weekly to supplement the rich clinical exposure. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 808 GENERAL INTERNAL MEDICINE — KEOKUK, IOWA

Instructors: *Milton F. Austin, M.D.; Wilson Davis, M.D.; Thomas Hakes, M.D.* (all: 319-524-6274)

This course is a clerkship in General Internal Medicine in a small community without medical subspecialists (Keokuk, Iowa). Emphasis during this preceptorship will be on the practice of internal medicine as both a primary care and consultative specialty. In addition to ambulatory office-based care, students will participate in practice in which general internists perform endoscopy, pacemaker insertion, exercise studies, echocardiography and intensive care with ventilator management. Consultations are rendered to family practitioners and general surgeons. In an environment without resident physicians, students assume a large amount of responsibility for the ongoing care of patients in all settings and have the opportunity to do various procedures. Extensive resources are available, including online medical search facilities, and

housing and food are provided without charge. No pets allowed. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 809 HYPERBARIC MEDICINE

Instructors: *John Davidson, M.D., and staff,* 453-0930

The specialty of hyperbaric medicine centers on the use of oxygen under increased atmospheres of pressure for the treatment of many disparate diseases and clinical problems. This elective allows a student to have an acquaintance with this technology, which has a definite role in a wide range of differing specialities including emergency medicine, otolaryngology, plastic and reconstructive surgery, military medicine, rheumatology, dermatology, oral surgery, radiation oncology, internal medicine, neurology and psychiatry, to name a few.

Because students going into these specialities do not need to learn about hyperbaric medicine in depth, but nevertheless would benefit by some exposure to it, we can arrange a mini-elective of one to two weeks duration. This "exposure elective" can be tailored to a student's special field of interest just as we attempt to do in the usual four- to six-week program. Please call Dr. John D. Davidson for more information. Valid start dates for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 810 GERIATRIC MEDICINE

Instructor: *David Carr, M.D.*, 286-2700

Clinical geriatrics is available to one third or fourth-year student in four-week rotations throughout the year. Students will make rounds at a skilled nursing facility and an outpatient assessment clinic for the elderly. Attendance at scheduled research and clinical conferences and formal teaching rounds in geriatric medicine are required. Valid start weeks for four-week blocks are: Weeks, 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 811 CLINICAL INTERNAL MEDICINE

Instructors: *Mark Thoelke, M.D., and staff,* 454-7106

This course allows the student to work one-on-one with the attending physician on a patient care team. The student acts as the intern under the direct supervision of the attending physician. Daily responsibilities include admission history and physicals, daily notes and discharge summaries on assigned patients. He/she also will have the opportunity to perform indicated procedures on all patients on this service. Students will attend teaching rounds with the assigned attending and participate in Department of Medicine conferences. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 812 PRIMARY CARE MEDICINE

Instructor: *Pam Moore, M.D.,* 454-7106

During this rotation, the student will gain confidence in the ability to deliver first-contact as well as ongoing care to ambulatory adult patients of all ages. The student 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 osteoporosis clinic, dermatology and geriatrics, as well as the medical continuity clinic and the walk-in clinic. The student will have the opportunity to gain experience in other areas of interest (e.g., nutrition, home care). No night or weekend duty. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 813 EMERGENCY MEDICINE

Instructor: *Frank Zwemer, M.D.,* 454-7905/7900

The senior student will function as a member of the ED staff, evaluating and treating all patients presenting to the ED. Emphasis is on Internal Medicine patients, with a significant number of minor Surgery and Gynecology cases. Flexibility is encouraged in scheduling of approximately 45 hours/week. ED and hospital conference attendance is required. A presentation or paper will be assigned. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 814 CLINICAL EMERGENCY HOSPITAL — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructor: *Carolyn Haase, M.D.,* 362-8971

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 eight hours, and students will rotate between day, evening and night shifts, including weekend shifts, in order to gain maximum exposure to all types of emergencies. A core content of lectures will be provided including an intubation lab, rhythm strip interpretation lab and a procedure lab. Students desiring a letter of recommendation from our division chief, Dr. Larry Lewis, must take the WUMS IV Emergency Medicine rotation. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 819 CARDIOLOGY CONSULT SERVICE — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructors: *Michael W. Rich, M.D.; Robert E. Kleiger, M.D.; and Ronald Krone, M.D.* (all: 454-7085)

Students will receive intensive training in clinical electrocardiography (ECG) and a broad exposure to consultative cardiology, including ischemic heart disease, coronary care, arrhythmias, congestive heart failure and preoperative and postoperative care. Emphasis will be placed on noninvasive techniques for evaluating cardiac disease, including echocardiography, exercise stress testing and long-term ECG (Holter) recordings. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 821 INPATIENT CARDIOLOGY

Instructors: *Craig Reiss, M.D.; Benico Barzilai, M.D.; Alan Braverman, M.D.; Keith Mankowitz, M.D.; Paul Robiolio, M.D.; John Nash, M.D.* (all: 362-1292)

Students will participate as members of the Barnes-Jewish Cardiology Consultative Team at Washington University. The team is composed of faculty members, fellows, residents and nurse specialists that see a large population of cardiac patients and follow them through all aspects of their in-hospital care. Emphasis will be placed on physical examination and the interpretation of modern cardiac diagnostic tests in clinical decision making. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 823 CLINICAL CARDIOLOGY — VETERANS ADMINISTRATION MEDICAL CENTER

Instructor: *Wade Martin, M.D.,* 289-6329

The major purpose of this elective in clinical cardiology at the Veterans Administration Medical Center will be to improve primary care skills in the diagnosis and treatment of cardiovascular disease varying over a wide spectrum of etiologies and severities. The emphasis will be on improving basic cardiovascular history and physical examination skills, interpreting electrocardiograms and evaluating inpatients and outpatients with cardiovascular illnesses. Students also will have the opportunity to participate in echocardiographic reading sessions, stress testing evaluations and studies performed in the cardiac catheterization and exercise physiology laboratories, but a major objective of the rotation will be to enhance the ability to evaluate patients in a primary care setting using relatively low technology approaches that do not require subspecialty consultation. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 824 SUBINTERNSHIP IN CARDIAC INTENSIVE CARE UNIT

Instructors: *Paul Eisenberg, M.D.; Kenneth Winters, M.D.* (both: 362-7278)

Selected highly motivated students may participate in a subinternship 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 the 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 professors' rounds format. Valid start weeks for four-week blocks are: Weeks 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 825 CARDIAC ARRHYTHMIAS AND ELECTROPHYSIOLOGY

Instructor: *Bruce D. Lindsey, M.D.,* 362-1045

This elective provides the student with exposure and teaching in the diagnosis and treatment of complex cardiac rhythm disturbances. Specifically, the student is expected to work up hospitalized patients and outpatients referred for evaluation and treatment of complex or life-threatening rhythm disturbances, unexplained syncope or sudden death syndrome. Rounds are made daily on hospitalized patients, and exposure is offered to intracardiac, electrophysiologic studies. This elective also provides an intensive opportunity to learn clinical electrocardiography and the systematic use of conventional and new anti-arrhythmic drugs. Finally, since patients with chronic, complex rhythm disturbances frequently have various forms of organic heart disease, a broad-based exposure to general cardiology is also part of this elective. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 830 DERMATOLOGY

Instructors: *Dermatology staff,* 362-8180

The aim of this elective is to provide a guide for students so that they are able to appreciate Dermatology within the broader perspectives of Medicine and Biology. Stress will be placed on the dermatologic variations encountered in a normal physical examination of the skin, the identification of common skin diseases, dermatologic clues to systemic disease, as well as those dermatologic conditions that are life threatening. The student will participate in outpatient care in Barnes-Jewish Hospital and affiliated clinics. Students will attend all clinical teaching rounds and conferences in addition to the basic science and cutaneous histopathology conferences. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 831 PEDIATRIC DERMATOLOGY
Instructor: *Susan Mallory, M.D.,* 454-2714

This clinical rotation will be available to students interested in dermatology, pediatrics, or both. Students will follow the dermatology rotation (M25 830) with an emphasis on pediatric dermatology, including attending pediatric dermatology clinics and seeing consults. Enthusiastic students will have an opportunity to write up a case report if they wish. Students can take either this elective or M25 830 — not both. Valid start weeks for four-week blocks are: Weeks 17, 21, 25, 29, 33 and 37.

M25 835 CLINICAL GASTROENTEROLOGY
Instructors: *Ray E. Clouse, M.D.; Gary Zuckerman, D.O.* (both: 362-5673)

The GI elective is integrated into a very active consultation and endoscopy service at Barnes-Jewish Hospital. Students will participate in the evaluation of patients with a spectrum of digestive and liver diseases; make daily patient rounds with the faculty and fellows; have responsibility for patients on whom consultations have been requested; observe biopsy, endoscopic and intubation techniques; and participate in outpatient clinic and GI conferences. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 844 HEMATOLOGY AND HEMOSTASIS
Instructors: *Philip Majerus, M.D.; Stuart Kornfeld, M.D.* (both: 362-8801); *Morey Blinder, M.D.* 362-8808

Activities planned include workup of patients at Barnes-Jewish Hospital under the supervision of the hematology fellow and his or her staff consultant, attendance at clinical rounds three hours weekly, participation in outpatient clinics and experience in various procedures, especially blood and bone marrow morphology and in interpretation of coagulation tests. Weekly student rounds with a senior staff person. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 847 BONE AND MINERAL DISEASES
Instructors: *Louis Avioli, M.D.; Michael Whyte, M.D.; Roberto Civitelli, M.D.; Roberto Pacifici, M.D.* (all: 454-7765)

The course is designed to acquaint the student with the clinical, radiological and pathological manifestations of skeletal disorders and to expose him/her to current concepts of therapy. The student will see patients at Barnes-Jewish and Children's hospitals and Shriners Hospital for Children.

Acquired and developmental bone diseases will be studied in context of derangements of mineral homeostasis with emphasis on vitamin D and peptide hormone metabolism. The role of the bone biopsy and more recent noninvasive methods for measuring bone mass in the diagnosis and management of skeletal diseases also will be stressed. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 850 HEMATOLOGY AND ONCOLOGY IV
Instructors: *Scot Hickman, M.D.; Michelle Schultz, M.D.* (both: 289-6308)

The student will have major inpatient and outpatient exposure to the management of the following: non-small cell and small cell lung cancer, carcinoma of the colon, prostate cancer, lymphoma and leukemia. A wide variety of more esoteric tumors and hematological pathology may be encountered. In addition to diagnosis, staging and management, general oncological topics such as pain management, hypercalcemia of malignancy and malignant effusions will be discussed. The weekly schedule includes morphology sessions, multidisciplinary conferences and tutorial sessions with the student alone, which will require prior literature review. Valid start weeks for four-week blocks to be announced.

M25 855 CLINICAL INFECTIOUS DISEASES
Instructor: *William G. Powderly, M.D.,* 362-4413

This elective is a study of patients with infectious diseases. It is designed to teach students the 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-Jewish Hospital under the supervision of a faculty member who rounds with them every day. They work closely with medical residents and infectious disease fellows, follow their own patients and play an important role in their management. Students are expected to read the literature about their patients and participate in clinical conferences. They also attend teaching rounds, conferences and lectures in infectious diseases. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 867 MEDICAL INTENSIVE CARE
Instructor: *Daniel Schuster, M.D.,* 362-3776

This elective is offered as an opportunity to gain additional experience in acute, primary care medicine. It is an advanced course in patient care involving complex medical problems. Responsibilities involve working up new patients with the MICU team, case presentations and attendance at conferences. Conferences consist of attending rounds Monday through Saturday, radiology rounds Monday through Saturday, pulmonary conference and medical grand rounds on Thursday and critical care conference once each month. Call schedule is every third night. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 870 ENDOCRINOLOGY, DIABETES AND METABOLISM

Instructors: *Philip Cryer, M.D., and staff,* 362-7617

Students taking this elective see patients with endocrine and metabolic diseases in the Outpatient Consultation office and inpatients at Barnes-Jewish Hospital and the General Clinical Research Center. They will present these cases at formal rounds conducted at Barnes-Jewish Hospital. They also will participate in informal rounds with the Division and at divisional seminars. Extensive interaction with patients with diabetes and a diabetes education program are included, as is involvement with patients with thyroid, pituitary, adrenal, gonad and metabolic bone disease, as well as lipid disorders. Ample opportunities will be provided for discussions of patient problems with the members of the division. Valid start weeks for four-week blocks are: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 872 ONCOLOGY I — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructor: *Matthew Arquette, M.D.,* 362-5268

Students will gain experience in the initial treatment of newly diagnosed malignancies and the outpatient management of oncology patients. Participation in multidisciplinary tumor conferences will stress a combined-modality approach to management, incorporating chemotherapy, radiotherapy and surgery. Students will see patients with a variety of malignancies, including tumors of the lung, breast, colon, lymphoma and myeloma. Management of hypercalcemia and other paraneoplastic syndromes, as well as cancer pain management, will be covered. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 875 EXERCISE IN HEALTH MAINTENANCE AND TREATMENT OF CAD AND DIABETES

Instructors: *John Holloszy, M.D.; Ali Ebsani, M.D.; Wendy Kohrt, Ph.D.; Robert Spina, Ph.D.* (all: 362-3506)

This elective covers exercise testing, including exercise electrocardiography, exercise echocardiography, measurement of O_2 uptake capacity, noninvasive cardiac output measurement, radionuclide studies during exercise, body composition determination and evaluation of the degree of physical frailty in the elderly. Also addressed is exercise training, used to reverse physical frailty in elderly people in danger of losing their independence and in the treatment of hypertension, obesity, osteoporosis and diabetes. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 876 EXERCISE PHYSIOLOGY

Instructor: *Ali A. Ebsani, M.D.,* 362-2392

Includes performing and interpretation of exercise testing, measurement of oxygen uptake and cardiac output. Students will participate in the management of patients undergoing exercise training. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 880 PULMONARY MEDICINE — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructors: *Dan Schuller, M.D., and staff,* 424-0899 (beeper)

Students will acquire skills in the evaluation and management of patients with pulmonary diseases, interpretation of pulmonary function tests, outpatient pulmonary medicine clinic, attend regular pulmonary and critical care medicine conferences and, if desired, pursue a circumscribed clinical research project. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 882 PULMONARY MEDICINE — VETERANS ADMINISTRATION MEDICAL CENTER

Instructor: *Carlos Daughaday, M.D.,* 289-6306

Students will participate in all clinical activities of the Pulmonary Division with particular emphasis on the inpatient and outpatient evaluation and management of common respiratory disorders such as chronic obstructive lung disease, lung cancer and tuberculosis. Students will become proficient in preoperative evaluations, indications for fiberoptic bronchoscopy, pulmonary function and chest radiograph interpretation, and ventilator management. Major activities include daily teaching rounds on inpatients in the medical intensive care unit, consultation rounds and twice weekly outpatient clinics limited to evaluation of new patients. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 883 TRANSFUSION MEDICINE

Instructor: *Lawrence T. Goodnough, M.D.,* 362-1546

This elective is designed to introduce the student to the clinical aspects of blood banking and interventional hematology. The four-week elective will consist of regular didactic sessions with senior staff, teaching conferences, participation in daily clinical rounds and exposure to developing programs. The student will develop clinical skills in areas related to transfusion practice, blood conservation and evaluation of transfusion reactions. Complex hematologic diseases such as the coagulopathies and diseases that require apheresis will serve to instruct in current clinical practice along with future indications for application of interventional hematology, such as photopheresis and peripheral stem cell harvest for marrow transplantation. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 884 BONE MARROW TRANSPLANTATION AND STEM CELL BIOLOGY

Instructor: *John F. DiPersio, M.D., Ph.D.*, 362-9339

Intense four-week clinical rotation exposing interested fourth-year medical students to the clinical world of bone marrow transplantation and to the basic science of hematopoiesis and stem cell biology. Students will be primarily responsible for the care of autologous and allogeneic BMT recipients. In addition they will be exposed to methods of stem cell harvest, cryopreservation and immunoplenotyping. This rotation plans to provide motivated students with an ideal mix of clinical medicine and basic science. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 885 OCCUPATIONAL/ENVIRONMENTAL MEDICINE

Instructor: *Bradley Evanoff, M.D.*, 454-8350

This elective is designed to introduce students to both the clinical treatment and the prevention of work-related injuries and illnesses. Clinical activities will include the diagnosis and treatment of workers with illnesses due to chemical exposure and repetitive motion, as well as acute injuries. Preventive activities will include worksite visits and intervention projects, as well as involvement with worksite health promotion and policy making. Specific activities are flexible depending on the students' interests. Students also are urged to contact Dr. Evanoff if they wish to participate in research projects concerning the epidemiology of work-related diseases. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 886 CLINICAL RESPIRATORY ELECTIVE

Instructor: *Stephen Lefrak, M.D.*, 362-6044

An opportunity to study and care for patients with severe obstructive lung disease and other diseases of the chest. An excellent clinic to study pathophysiology and clinical treatment both surgical and medical for classical diseases of the chest. Valid start weeks for four-week blocks are: Weeks 13, 17, 21, 25, 29, 33, 37 and 41.

M25 890 CLINICAL NEPHROLOGY

Instructors: *Director and staff*, 362-8231

Students assist in both the inpatient and outpatient areas, to diagnose and treat patients with acute and chronic renal failure, glomerulonephritis, electrolyte disorders and renal transplants. Students spend one full week in the outpatient setting, rotating through the General Renal Clinics, Renal Stone Clinic, Transplant Clinic and Peritoneal Dialysis Clinic. Five half-days during this week are reserved for assigned reading. The other three weeks, the student is a full member of the Inpatient Renal Consult Service, diagnosing and treating patients with acute and chronic renal disease and electrolyte disorders. Students will learn electrolyte management, drug dosing, dialysis procedures and complications, kidney biopsy reading, and the management of acute and chronic renal failure. Students attend daily teaching rounds, Renal Grand Rounds and Clinical Case Conference. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 891 CLINICAL NEPHROLOGY — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructor: *Jay Seltzer, M.D.*, 454-7771

Students will be provided an opportunity to evaluate patients on the renal consultant service. These will include patients with renal diseases and fluid and electrolyte disorders. They also will encounter patients with end stage renal failure receiving dialytic therapy or transplantation. They will participate in daily clinical nephrology rounds and in all of the combined rounds of the Renal Division. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 893 ALLERGY AND CLINICAL IMMUNOLOGY

Instructor: *H. James Wedner, M.D.*, 362-9049

Students will participate in the allergy consult service at Barnes-Jewish Hospital, North and South Campus. The student will serve as the primary allergy consult for inpatient and Emergency Room and present each patient to the allergy fellows on call and the attending physician. They will attend the Adult Allergy Clinic, the Pediatric Allergy Clinic and the Asthma Center at Barnes-Jewish West County Hospital. Conferences on selected topics in Allergy and Clinical Immunology will be held with the attending staff two to three afternoons a week. Valid start dates for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 894 HEPATOLOGY

Instructor: *Marion Peters, M.D.*, 747-1124

Outpatient and inpatient management and diagnosis of acute and chronic liver disease as well as liver transplantation. Valid start dates for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M80 810 AMBULATORY CARE MEDICINE

Instructor: *Robert Packman, M.D.*, 367-3113

Students will have a half-day clinic in Neurology, Ophthalmology and ENT. The student may spend one or two half days in Gynecology, Pediatrics and/or Medicine for a total of seven half days. The instructors will be Dr. McAlister in Gynecology, Dr. Mark Wallace in ENT, Dr. Levitt in Medicine, Dr. Pearlman in Neurology, Dr. Carla Siegfried in Ophthalmology and Drs. McGann and Sharkey in Pediatrics. The instructors or departmental course masters will meet with a pair of students or all four

of them together once weekly.

It is our perception that students will be exposed to a variety of outpatient problems, from minor to major chronic illness, interspersed with acute problems. This course will be pitched at a practical not theoretical level. The instructor will stress the importance of proper differential diagnosis, judicious use of diagnostic tests, proper use of medications, medication interactions, proper communication with other physicians, proper communication with patient and family, proper instructions to patients regarding their illness, proper emotional support to the patient and the patient's family, all of this delivered in a cost-effective setting. Ethical management will be stressed.

In the sessions with the course master, the students will discuss patients in which there are difficulties or complexities in identifying problems and proper work-up. Issues of cost, ethics, interpersonal relationships, delivery of care in the managed care environment, and other practical matters will be discussed. It is our intention to make the course instructive from the practical point of view and to make it fun for the student as well. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M25 900)

Dana R. Abendschein, Ph.D., 362-8925

Research in this basic science laboratory is focused on responses of the arterial wall to injury and on mediators of coagulation that may contribute to acute rethrombosis after coronary fibrinolysis and accelerated restenosis after coronary angioplasty. Current studies are designed to define the time after vessel injury that the luminal surface remains procoagulant, to define the molecular expression of determinants of procoagulant activity associated with the site of injury and their changes with time, and to determine whether agents that inhibit the activity of procoagulant moieties can alter vascular remodeling, leading to decreased acute thrombosis and subsequent restenosis in animal models of vascular injury. Students will be expected to observe procedures in experimental animals, to participate in assays of procoagulant moieties and vascular wall proteins, and to attend weekly laboratory meetings.

David H. Alpers, M.D., 362-8940

Cell biology of polarized small intestinal epithelium, synthesis and secretion of intestinal proteins, and 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 (i.e., surfactant-like particle and receptor-mediated endocytosis). Methods include cDNA cloning and sequencing, cell fractionation, cDNA transfection, and protein synthesis and secretion.

John P. Atkinson, M.D., 362-8391

A research elective is offered in studies related to clinical, biochemical and molecular aspects of complement receptors and complement regulatory proteins. Current focus is on defining active sites and characterizing recently identified microbiologic connections.

Louis V. Avioli, M.D.; Roberto Civitelli, M.D.; Roberto Pacifici, M.D. (all: 454-7765)

Bone cell differentiation, growth and metabolism in tissue culture cell-cell communication in bone via intercellular junctions and soluble factors, with emphasis on cytokines and their regulation by hormones and local factors.

Joseph J. Billadello, M.D., 362-8914

Our research interests are in the broad area of regulation of gene expression. We are currently working with two paradigms. The creatine kinase gene family serves as an example of a gene family that is regulated during myogenesis. We have elucidated cis-acting sequence elements within the cytoplasmic M and B creatine kinase genes that confer developmental regulation to linked marker genes in transfected myoblasts in culture. The plasminogen activator inhibitor 1 (PAI-1) gene serves as a model of a gene that is regulated by growth factors. We have identified cis-acting sequence elements within the PAI-1 gene that confer TGF-B responsiveness to linked marker genes. We are currently identifying trans-acting factors that regulate expression of the M and B creatine kinase and plasminogen activator inhibitor 1 gene in transfected cells in culture.

Eric J. Brown, M.D., 362-2125

Investigations into the molecular mechanisms for regulation of the function of phagocytic cells.

Michael E. Cain, M.D., 362-1508

Delineation of mechanisms responsible for clinical arrhythmias, improved identification of patients at risk for developing sudden cardiac death, evaluation of new antiarrhythmic agents, evaluation of new antitachycardia pacing devices, signal-averaged ECGs and catheter ablation of arrhythmias.

David Chaplin, M.D., Ph.D., 362-9047

Developmental regulation of peripheral lymphoid organ structure and definition of the natural functions of acute proinflammatory cytokines *in vivo*.

Philip E. Cryer, M.D., 362-7617

Studies of the physiology and pathophysiology of metabolic regulation in normal humans and patients with diabetes mellitus with a focus on hypoglycemia.

Arthur Z. Eisen, M.D., 362-8180

Proteolytic degradation of the extracellular matrix. Behavior of fibroblasts in a collagen lattice (skin equivalent).

Paul R. Eisenberg, M.D., 362-7278
Research opportunities are available to study the role of the coagulation and fibrinolytic system and complications of coronary and peripheral atherosclerotic vascular disease. The student will be involved in basic laboratory projects involving studies of interactions of the coagulation fibrinolytic system in arterial injury. The student will be exposed to techniques involved in studying coagulation and 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. Students will be expected to participate in laboratory and clinical research projects and attend weekly laboratory meetings.

Bradley Evanoff, M.D., 454-8350
Occupational Medicine Epidemiology Research. My research involves the use of epidemiology methods to characterize associations between diseases and work-related exposures. I also am doing studies that evaluate the detection and treatment of work-related musculoskeletal diseases. During an elective in Occupational Medicine Epidemiology Research, students will learn how to use epidemiologic methods to investigate disease processes by working on a mutually agreed-on topic of interest related to occupational diseases. Other activities can include worksite visits and intervention projects, as well as involvement with worksite health promotion and policy making. Elective length is variable depending on individual circumstances.

Stephen Gluck, M.D., 362-8762 or 362-8232
Our laboratory is studying the molecular biology and biochemistry of the vacuolar proton pump, an enzyme that acidifies endosomes and lysosomes, and that is responsible for renal acid excretion and osteoclast bone dissolution. Students will have the opportunity to participate in basic research or clinical research related to renal acidification or bone disease. Techniques currently in use in the lab include cDNA and genomic cloning and sequencing, gene transfection, transgenic mice, protein purification, monoclonal and polyclonal antibody production and other methods in biochemistry and molecular biology.

Gregory I. Goldberg, Ph.D., 362-8172
Role of secreted extracellular matrix metalloproteases in tissue remodeling. Structure and function of the metalloproteases.

Richard W. Gross, M.D., Ph.D., 362-2690
Lipid Mediators of Signal Transduction in the Cardiovascular System. Characterization of regulatory mechanisms responsible for the liberation of lipid second messengers during cellular activation.

Marc R. Hammerman, M.D., 362-8233
Studies characterizing synthesis of polypeptide growth factors in renal tissue and the role(s) of polypeptide growth factors in renal development, growth and physiology.

Jay W. Heinecke, M.D., 362-6923
The overall goal of our research is to understand the role of oxidative reactions executed by activated phagocytes in the pathogenesis of vascular disease. Novel lipid and protein oxidation products generated by phagocytes *in vitro* have been isolated and their structures determined using NMR and mass spectrometry. To establish the physiological relevance of such reactions, we have used gas chromatography-mass spectrometry to demonstrate that these products are present in human atherosclerotic lesions.

John O. Holloszy, M.D., 362-3506
The research in our laboratory deals with the roles of exercise in the prevention and reversal of abdominal obesity, insulin resistance and diabetes. Much of our research is directed to elucidation of the mechanisms by which exercise activates glucose transport and enhances insulin sensitivity in muscle. Our current research is focused on the signaling pathways by which exercise activates glucose transport and enhances insulin sensitivity in muscle.

Keith A. Hruska, M.D., 454-7771
Cellular mechanisms of bone remodeling and proximal tubular function. The student will participate in studies analyzing signal transduction by calcitropic hormones, the role of load-regulated ion channels and the mechanism of matrix/integrin mediated regulation.

Saulo Klahr, M.D., 454-7107
Mechanisms involved in the progression of renal disease. This section will provide the student with an understanding of the methodology used to assess renal function and different maneuvers utilized to prevent the progression of renal disease in experimental animal models. Research projects include: 1) effects of urinary tract obstruction on renal function and metabolism, 2) factors that are responsible for the progression of renal disease in experimental animals, and 3) questioning how obstruction of the urinary tract leads to progressive renal disease.

Saulo Klahr, M.D., 454-7107
The Renal Division offers a research elective of three to six months duration with emphasis on the pathophysiological consequences of ureteral obstruction and the mechanisms of progression of chronic renal disease. Techniques of molecular biology, radioimmunoassay, tissue culture, radioisotopic labeling and separation of lipids and proteins, and the production of animal models of renal disease will be emphasized.

George S. Kobayashi, Ph.D., 362-2998
Biochemical studies on the control of cellular differentiation of the medically important systemic mycotic agents, in particular *Histoplasma capsulatum*, are being carried out in the division. In the conversion of the unicellular (yeast-like) to multicellular (mold) and reverse systems, the changes caused by environmental stimuli can be followed and the relationships between induction, the biochemical change and morphological differentiation can be established. The opportunity to participate in studies of this phenomenon are available by an arrangement as an elective for one student for a period of 18 weeks.

Rosalind H. Kornfeld, Ph.D.; Stuart A. Kornfeld, M.D., 362-8803
1) Biochemistry of mammalian cell surfaces;
2) Synthesis, processing and sorting of glycoproteins, including lysosomal enzymes.

Sándor J. Kovács, Ph.D., M.D., 454-7660
The Cardiovascular Biophysics Laboratory (CBL) at Barnes-Jewish Hospital North Campus was established in 1992 in recognition of the multidisciplinary nature of research in biomedicine and the rapid growth and development of new medical noninvasive imaging technologies. The overall goal of the laboratory is to further understand how the heart and circulatory system work in physical and mathematical terms and to apply that understanding in the clinical arena. Problems under consideration include: systolic and diastolic function of the heart, nonlinear dynamics of ventricular function, atrial and ventricular interaction, vascular physiology and the analysis of heart sounds. One consequence of this type of inquiry is the maximum extraction of physiological information from signals or images, which may be routinely recorded, but not analyzed in sufficient detail. This elective is intended for students with a background in math, physics, engineering, etc.

Sándor J. Kovács, Ph.D., M.D., 454-7660
For students with math, physics, and engineering background. Cardiovascular biophysics research elective concentrates on physiologic modeling and comparison of model predictions to *in vivo* human data. Ability to solve ordinary differential equations and familiarity with numerical methods at the level of "Numerical Recipes" is required. *Minimum of 8 weeks of elective time.*

Anthony Kulczycki Jr., M.D., 362-9042
Dietary antigens in infant colic, milk-induced colitis and "autoimmune" diseases. Allergens that cause chronic hives. NOD mice, which spontaneously develope Type I diabetes, infants with colic, nursing mothers with colicky infants and chronic urticana patients are being challenged with suspected antigens to identify etiologic agents.

Pui-Yan Kwok, M.D., Ph.D., 362-8236
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.

Jack Ladenson, Ph.D., 362-3186
Development and use of monoclonal antibodies to cardiac proteins.

Lawrence M. Lewis, M.D., 362-4362
This elective, Emergency Medicine Research, 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 currently 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.

Angel López-Candales, M.D., 454-7665
The vascular endothelium forms a highly selective permeability barrier between the elements of blood and the artery wall. Integrity of this structure maintains the physiological balance of growth-related, contracting and relaxing factors that ultimately determine the developmental response of this tissue. However, the evolution and relative contribution of tissue growth factors and the developmental process of aortic vascular tissue has not been defined. Furthermore, the molecular events that modulate the transition from normal physiological adaptive responses to pathological atherosclerotic transformation remains unknown. We propose to evaluate the interplay of these cytokines at different stages of normal maturation in the presence and absence of altered cholesterol metabolism, using both exogenous and endogenous hypercholesterolemic models to define the vascular profile in terms of cellular organization, extracellular matrix expression and the molecular signals that characterize the evolution of this process.

Preliminary findings in our laboratory have demonstrated, using homology-based polymerase chain reaction strategy, that cholesterol feeding results in the specific induction of certain cytokines. Furthermore, we also noted two distinct patterns of TGF beta production in normal New Zealand white rabbit aortic tissue that correlate with both the aortic age and anatomical location. These findings in the normal rabbit represent the first documented evidence of molecular regulation during normal aortic development and might be critical in the understanding of vascular physiology and how tissue responds during early atherosclerotic injury.

We intend to determine the phenotypic and proliferative profile of aortic vascular components. Specifically, we shall identify predominant cell elements, extracellular matrix molecules and growth factors that characterize the vascular architecture during normal development and its transition during early atherosclerosis. These findings might prove crucial for the identification of the molecular pathways accessible for gene therapy in intravascular sites to modulate vascular responses during endothelial injury.

Douglas Lublin, M.D., Ph.D., 362-8849
Lipid modifications of proteins, including glycophospholipid anchors and acylation, and their role in the structure and function of membrane proteins.

Philip W. Majerus, M.D., 362-8801
Biochemistry of platelets, regulation of lipid metabolism in tissue culture and mechanism of platelet thrombus formation.

Jeffrey D. Milbrandt, M.D., Ph.D., 362-4650
We are interested in a subset of genes, termed immediate-early genes, that are rapidly activated by a variety of extracellular stimuli including exposure to growth factors, membrane depolarization such as occurs during neuronal activity, or physiologic stress such as seizure, nerve injury, hypotension or exposure to endotoxin. Many of these genes, including those we have identified (NGFI-A, NGFI-B, NGFI-C), encode transcription factors which presumably guide the cellular responses to environmental change. Understanding the biological function of these proteins within the context of the nervous system is now being pursued via mutagenesis experiments and by determining their expression patterns in fetal and adult rats, both before and after stress or injury. The phenotype of transgenic mice containing either loss-of-function mutations of these genes or inappropriately high expression of these proteins is now being examined.

Joseph P. Miletich, M.D., Ph.D., 362-3110
Of all the proteins involved in blood coagulation, factor X is most centrally positioned for regulation. More than a dozen other plasma proteins can interact with factor X to effect its activation, local concentration, activity or inhibition. We are systematically studying the regions of the factor X molecule that mediate these interactions using a variety of traditional and novel cellular and molecular biological approaches, with particular emphasis on expression of recombinant proteins. The long-term goal is a better understanding of how coagulation is normally regulated and what goes wrong when clots form that block blood flow.

Steven Miller, M.D., 362-8232
Growth factors in renal pathology. Current studies examine the role of different growth factors in the pathogenesis of renal diseases, including acute and chronic renal failure. Investigations are underway utilizing growth factors as therapeutic agents for the treatment of renal disorders in animal models and patients.

Stanley Misler, M.D., Ph.D., 454-7719
Stimulus-secretion coupling in endocrine cells (B-islet cells and adrenal chromaffin cells) is examined using single cell assays of secretion (capacitance measurements, amperometery).

Hector D. Molina, M.D., 747-0339
A research elective is offered in studies related to the role of complement receptors in the development of humoral immunity using a mouse model deficient in complement receptors 1 and 2.

Aubrey Morrison, M.D., 362-2597
Regulation at a transcriptional and translational level of the cyclooxygenase gene(s) by the lymphokines IL-1 and TNF. Interactions of cyclooxygenase products with nitric oxide system in renal cells.

Jeremiah Morrissey, Ph.D., 454-7464
The role of monocytes/macrophages in the progress of renal disease. The function of lymphohemopoeitic cells in the normal kidney and in the pathophysiology of renal disease will be examined. Transcription factor activation, chemoattractants, adhesion molecules, glomerular/tubulointerstitial fibrosis and reversibility of these processes will be determined.

Jeremiah Morrissey, Ph.D., 454-7464
Experimental maneuvers that blunt the progression of kidney disease appear to blunt transcription factor NF-kappa B activation. New protein factors which bind to gene promoters containing NF-kappa B sites are induced by the maneuvers. These factors will be cloned using the yeast one and two hybrid systems and characterized with respect to minimizing and/or reversing kidney disease progression.

Paul D. Olivo, M.D., Ph.D., 362-5718
Our laboratory studies DNA replication in Herpes viruses, particularly Herpes simplex virus (HSV). We have overexpressed the essential HSV replication gene in a variety of heterologous systems, and we are studying the role of the products of each of these genes in the replication process by using both genetic and biochemical methodologies.

Richard E. Ostlund, M.D., 362-8690
The regulation of plasma and body cholesterol levels is studied in patients with atherosclerosis and hyperlipidemia. Whole-body cholesterol metabolism and lipoprotein receptor structure, function and modification is investigated.

Curtis A. Parvin, Ph.D., 362-8849
The analytical techniques and theoretical concepts underlying the field of medical decision analysis are investigated. Critical review of the literature is combined with microcomputer application of the techniques to medical problems of interest.

Alan Permutt, M.D., 362-8680
Studies of genetic susceptibility to diabetes in man and experimental animal models through use of recombinant DNA techniques. Families with multiple diabetic members are being characterized clinically, and diabetes genes are being mapped. Collaborative genetic studies are underway in the United States, Israel and Japan. Islet cDNA genes are being cloned and sequenced to define genes involved in insulin secretion. Mutations in genes are being defined with hereditary disorders of insulin secretion.

Marion Peters, M.D., 747-1124
Human cellular and molecular immunology: Immunoregulation and ontogeny of intestinal B and T cells; Immunoglobulin gene usage in normal intestine, inflammatory bowel disease and mice with IBD and gene knockouts.

Steven M. Pogwizd, M.D., 362-8909
Our research interests are in electrophysiological mechanisms underlying sudden cardiac death in the setting of congestive heart failure. Ongoing studies in several experimental animal models of congestive heart failure utilize clinically based diagnostic tools such as echocardiography, cardiac catheterization, Holter monitoring of the electrocardiogram and programmed electrical stimulation, along with detailed electrophysiological analysis involving recordings from more than 230 sites in the intact heart (cardiac mapping) performed *in vivo* or *in vitro*. Students will be involved in studies to delineate the contribution of reentrant and nonreentrant mechanisms to arrhythmogenesis in the failing heart and their modulation by alpha- and beta-adrenergic stimulation.

Jeffrey N. Rottman, M.D., 454-7450
Cardiac fatty acid binding protein (CFABP) is an extraordinarily abundant protein in the heart that binds avidly, as its name would suggest, to fatty acids, which are this tissue's most important metabolic substrate. This protein also is found in some other tissues, especially skeletal muscle, but at far lower relative abundance than in the heart. It is closely related to a variety of other "fatty acid binding proteins" found in liver, intestine, brain, etc.

The function of all of these fatty acid binding proteins is still not certain; reasonable hypotheses are that they fill an important transport function and/or protect the cell from fatty acids which could otherwise be toxic. In any case, the study of the homologous genes has been very productive from the standpoint of understanding tissue-specific gene regulation and illuminating cell biologic processes in the host cell type. Our lab has cloned the genomic sequence for the cardiac fatty acid binding protein, and we are studying its expression and regulation.

The other project in our lab involving the regulation of matrix enzymes in the heart is of more direct clinical relevance. More than half of the cells in the heart are non-contractile; these cells produce and remodel the interstitial matrix, the scaffolding to which the contractile elements attach. In conditions of volume overload or ischemia, the matrix is remodeled and the heart dilates, impairing the hemodynamic function of the remaining tissue and forming the substrate for lethal arrhythmias.

Clinical efforts to modify the remodeling process by decreasing hemodynamic load have resulted in decreased morbidity and mortality after myocardial infarction.

We are interested in studying cardiac matrix remodeling on a biochemical and molecular biological level. We are systematically characterizing the matrix metalloproteinases present in the heart and their regulation by cytokine and paracrine mechanisms.

Peter Rotwein, M.D., 362-2703
Molecular biology of growth hormone action, regulation of gene expression of members of the insulin-like growth factor family of peptides and growth factor action during cellular differentiation and development.

Samuel A. Santoro, M.D., Ph.D., 362-8849
Research is aimed at defining the molecular mechanisms of cell-cell and cell-substrate adhesion. Investigations are centered on the structure, function and regulation of adhesion receptor molecules in platelet function, development and malignancy.

Gustav Schonfeld, M.D., 362-7038
1) Molecular genetics and pathophysiology of low LDL syndromes, 2) role of ethanol in artherosclerosis, and 3) regulation of apolipoprotein metabolism using cell biology and molecular techniques.

Daniel P. Schuster, M.D., 362-3776
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, mathematical modeling and pulmonary physiology. Specific projects involving questions relevant to pulmonary edema, gas exchange and lung metabolism will be assigned according to students' individual interests. Students with any expertise in bioengineering or computer science are especially invited to apply.

Jo Louise Seltzer, Ph.D., 362-8180
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, as well as signal transduction mediated by various drugs and agents.

Clay F. Semenkovich, M.D., 362-4454
Biochemistry and molecular biology of enzymes involved in fatty acid metabolism, specifically, lipoprotein lipase and fatty acid synthase, regulation of gene expression in human skeletal muscle by exercise, characterization of RNA-binding proteins involved in mRNA stability and the role of fatty acids and triglycerides in atherogenesis.

Eduardo Slatopolsky, M.D., 362-7208
These studies investigate the interrelationships between vitamin D metabolites and parathyroid metabolism. Research projects include pathogenesis of secondary hyperparathyroidism. Characterization of receptors for 1,25-$(OH)_2$D3. The role of phosphorus on the synthesis and secretion of PTH. In addition, the role of the calcium receptor in the regulation of PTH secretion in uremia. New analogs of vitamin D and their effects on the vitamin D receptor are also being currently investigated.

Samuel L. Stanley Jr., M.D., 362-1071
This laboratory studies the protozoan parasite *Entamoeba histolytica*, the cause of amebic dysentery and amebic liver abscess. Work in the laboratory has focused on developing models to better understand the immunopathogenesis of amebic infection and the design and evaluation of recombinant-antigen-based vaccines to stimulate mucosal and parenteral immune responses against the parasite.

Thomas H. Steinberg, M.D., 362-9218
We study cell-cell communication between macrophages and other cells. In addition, we study the rapidly expanding class of receptors for extracellular ATP and their role in macrophage function. Methods include fluorescence video microscopy.

Douglas M. Tollefsen, M.D., Ph.D., 362-8830
Biochemical studies of the interactions of plasma protease inhibitors with coagulation proteases. The student will become acquainted with standard biochemical techniques, such as column chromatography, absorption spectroscopy and radioisotope methods. Minimum of 12 weeks required.

John Turk, M.D., Ph.D., 362-8190
Low molecular weight autocoids such as arachidonic acid and its metabolites, platelet activating factor, anandamide and a variety of other substances involved in signal transduction pathways in mammalian cells. Experience is offered in analysis and measurement of such substances by mass spectrometry and examination of their role in signaling events such as glucose-induced insulin secretion.

Herbert Virgin, M.D., Ph.D., 362-9223
We work on issues at the interface of virology and immunology by analyzing aspects of viral immunity, viral pathogenesis and viral genetics which contribute to virulence and disease. We focus on latency and pathogenesis of herpes viruses.

H. James Wedner, M.D., 362-9049
Psychosocial aspects of asthma. Students will participate in ongoing studies of the delivery of asthma care to inner-city children and adults.

H. James Wedner, M.D., 362-9049
Biology of pollen and fungal allergens. Our laboratory has been characterizing the important allergenic proteins from molds and pollen. The allergens are identified using skin test sensitive individuals and the proteins are isolated and characterized by a combination of physiochemical and molecular biological techniques. These studies should lead to better forms of allergy immunotherapy. Students will participate in the isolation, characterization and modification of major allergens from a number of molds including *Epicoccum nigrum* and several pollens including those from white oak and *Parthenium hysterophoros*, a newly recognized weed allergen.

Howard G. Welgus, M.D., 454-8290
Extracellular matrix turnover by metalloproteinases. The matrix metalloproteinases are a gene family of enzymes that control the turnover of connective tissues. Our research involves study of the structure, gene regulation and catalytic activity of several of these metalloenzymes. Particular emphasis is given to the role of these enzymes in wound healing and in the pathogenesis of pulmonary emphysema. We also study the production of specific inhibitors (TIMPs) released by cells to control the activity of the metalloproteinases.

Samuel A. Wickline, M.D., 454-8097
Both clinical and basic research programs are offered in the area of cardiovascular bioengineering in association with the new Institute for Biological and Medical Engineering at Washington University. The Institute sponsors a graduate program in Biomedical Engineering, which is conducted as a joint venture between the Medical School and the School of Engineering and Applied Science. Advanced imaging projects are available in: 1) cardiovascular magnetic resonance (Dr. Christine Lorenz, Director of Center for Cardiovascular Magnetic Resonance, 454-7459); 2) ultrasonics/physical acoustics (Dr. Samuel A. Wickline, Co-Director of Cardiovascular Division and Director of Medical Ultrasonics Laboratory, 454-8635); and 3) cardiovascular biophysics (Dr. Sándor J. Kovács, Director of Cardiovascular Biophysics Laboratory, 454-8097). These laboratories feature quantitative approaches to determine the structure, organization and function of cardiovascular tissues with direct clinical applications in magnetic resonance imaging and echocardiography. The program in magnetic resonance imaging comprises assessment of cardiac function, flow, perfusion, angiography, and mathematical modeling of stress-strain relationships. The ultrasound and acoustics program comprises ultrasonic tissue characterization of the structure and composition of heart and vascular tissues that reflect

fundamental physical properties of materials. The cardiovascular biophysics program is concerned with development of noninvasive techniques useful for mathematic modeling of heart function. In each venue, clinical correlation and case studies are presented and clinical research with direct patient contact is stressed.

Bulent Zaim, M.D., 454-7450
Research projects include application of signal processing techniques to arrhythmias; evaluation of nonpharmacologic therapies for atrial fibrillation.

Faculty

ADOLPHUS BUSCH PROFESSOR AND CHAIRMAN OF DEPARTMENT

Gustav Schonfeld, M.D., Washington University, 1960.

Professors Emeriti

Elmer B. Brown, M.D., Washington University, 1950.

Hugh Chaplin Jr., M.D., Columbia University, 1947. (See Department of Pathology.)

William H. Daughaday, M.D., Harvard University, 1943.

M. Kenton King, M.D., Vanderbilt University, 1951.

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.

John P. Atkinson, M.D., University of Kansas, 1969. (See Department of Molecular Microbiology.)

Sydney M. and Stella H. Shoenberg Professor

Louis V. Avioli, M.D., Yale University, 1957. (See Department of Orthopaedic Surgery.)

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.)

Distinguished University Professor of Medicine

George J. Broze Jr., M.D., Washington University, 1972.

Tobias and Hortense Lewin Professor of Cardiovascular Diseases

Michael E. Cain, M.D., George Washington University, 1975.

David D. Chaplin, M.D., Ph.D., Washington University, 1980. (Howard Hughes Medical Institute Associate Investigator) (See Departments of Molecular Microbiology and Genetics.)

Lewis R. Chase, M.D., Harvard University, 1964. (Chief, Washington University Medical Services, VA Medical Center)

Ray E. Clouse, M.D., Indiana University, 1976.

Irene E. and Michael M. Karl Professor of Endocrinology and Metabolism

Philip E. Cryer, M.D., Northwestern University, 1965. (Clinical Research Center)

William H. Danforth, M.D., Harvard University, 1951. (See Administration.)

James A. Delmez, M.D., University of Rochester, 1973.

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.)

Lawrence T. Goodnough, M.D., University of Pennsylvania, 1975. (See Department of Pathology.)

Jeffrey I. Gordon, M.D., The University of Chicago, 1973. (See Department of Molecular Biology and Pharmacology.)

Gregory A. Grant, Ph.D., University of Wisconsin, 1975. (Dermatology) (See Department of Molecular Biology and Pharmacology.)

Richard W. Gross, M.D., New York University, 1976; Ph.D., Washington University, 1982. (See Department of Molecular 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 Department of Molecular Biology and Pharmacology.)

John E. and Adaline Simon Professor of Medicine

Saulo Klahr, M.D., Universidad Nacional de Colombia, 1959.

Robert E. Kleiger, M.D., Harvard University, 1960.

Samuel Klein, M.D., Temple University, 1979.

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, M.D., University of Illinois, 1976. (Howard Hughes Medical Institute Investigator in Medicine) (See Department of Molecular Microbiology.)

Ronald Krone, M.D., The University of Chicago, 1966. (John E. Simon Scholar in Medicine)

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.) (Barnes-Jewish Hospital)

Philip A. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Radiology.)

Kenneth Ludmerer, M.D., The Johns Hopkins University, 1973.

Philip W. Majerus, M.D., Washington University, 1961. (See Department of Biochemistry and Molecular Biophysics.)

Susan B. Mallory, M.D., University of Texas, Galveston, 1974. (Dermatology) (See Department of Pediatrics.)

Robert P. Mecham, Ph.D., Boston University, 1976. (See Department of Cell Biology and Physiology.)

Senior Advisor to the Chair

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.

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 Rock, M.D., The Johns Hopkins University, 1978. (See Department of Anesthesiology.)

J. Evan Sadler, Ph.D., Duke University, 1978; M.D., 1979. (Howard Hughes Medical Institute Associate Investigator in Medicine) (See Department of Biochemistry and Molecular Biophysics.)

Shabbir H. Safdar, M.D., Nishtar Medical College, 1961.

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.)

Daniel P. Schuster, M.D., Yale University, 1976.

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.)

Louis Simchowitz, 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.)

H. James Wedner, M.D., Cornell University, 1967.

Gary J. Weil, M.D., Harvard University, 1975. (See Department of Molecular Microbiology.)

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.

Samuel A. Wickline, M.D., University of Hawaii, 1980. (Also Department of Physics)

Wayne M. Yokoyama, M.D., University of Hawaii, 1978.

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. Gieselman, M.D., Washington University, 1947.

Paul O. Hagemann, M.D., Washington University, 1934.

Norman P. Knowlton, M.D., Harvard University, 1945.

Marvin E. Levin, M.D., Washington University, 1951.

Virgil Loeb, M.D., Washington University, 1944.

Morris D. Marcus, M.D., Washington University, 1934. (Dermatology)

Ernest T. Rouse Jr., M.D., Washington University, 1943.

Llewellyn Sale Jr., M.D., Washington University, 1940.

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, 1952.

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.

Joseph Levitt, M.D., Washington University, 1949.

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)

Benjamin Schwartz, M.D., Ph.D., Albert Einstein College of Medicine, 1972.

Burton A. Shatz, M.D., Washington University, 1943.

Alvin S. Wenneker, M.D., Washington University, 1953.

Professor (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)

Steven R. Bergmann, Ph.D., Hahnemann Medical College, 1977; M.D., Washington University, 1985. (Medical Physiology)

Bernard B. Davis, M.D., University of Pittsburgh, 1961.

Associate Professors

Dana R. Abendschein, Ph.D., Purdue University, 1978. (See Department of Cell Biology and Physiology.)

Benico Barzilai, M.D., University of Illinois, 1978.

Joseph Billadello, M.D., Georgetown University, 1978.

Stanley J. Birge Jr., M.D., Washington University, 1963.

Richard D. Brasington, M.D., Duke University, 1980.

Roberto Civitelli, M.D., Siena University, 1980. (See Department of Orthopaedic Surgery.)

William E. Clutter, M.D., Ohio State University, 1975. (Clinical Research Center)

Carlos C. Daughaday, M.D., Washington University, 1971. (Clinical Academic)

Douglas C. Dean, Ph.D., University of Kansas, 1982. (See Department of Cell Biology and Physiology.)

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 Institute for Biomedical Computing.)

Lawrence D. Gelb, M.D., Harvard University, 1967. (See Department of Molecular Microbiology.)

Stephen J. Giddings, Ph.D., Dartmouth College, 1973; M.D., University of Rochester, 1976.

Anne C. Goldberg, M.D., University of Maryland, 1977.

Daniel E. Goldberg, M.D., Ph.D., Washington University, 1985. (Howard Hughes Medical Institute Assistant Investigator) (See Department of Molecular Microbiology.)

Daniel M. Goodenberger, M.D., Duke University, 1974.

Samuel B. Guze, M.D., Washington University, 1945. (See Department of Psychiatry.)

Daniel L. Hamilos, M.D., Northwestern University, 1979.

Jay W. Heinecke, M.D., Washington University, 1981.

Scot G. Hickman, M.D., Washington University, 1970.

Leslie E. Kahl, M.D., Albany Medical College, 1978.

Daniel P. Kelly, M.D., University of Illinois, 1982.

Joseph L. Kenzora, M.D., University of New Mexico, 1975.

Sándor J. Kovács, Ph.D., California Institute of Technology, 1977; M.D., University of Miami, 1979. (Also Department of Physics)

Anthony Kulczycki Jr., M.D., Harvard University, 1970. (See Department of Molecular Microbiology.)

Marc S. Levin, M.D., Columbia University, 1981.

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.)

Steven B. Miller, M.D., University of Missouri, Kansas City, 1983.

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. (See Department of Radiology.)

William C. Parks, Ph.D., Medical College of Wisconsin, 1982.

Curtis A. Parvin, Ph.D., University of Minnesota, 1980. (Clinical, Computer Science) (See Department of Pathology and Division of Biostatistics.)

Marion G. Peters, M.B., B.S., Melbourne University, 1972. (See Department of Molecular Microbiology.)

William G. Powderly, M.B., B.Ch., B.A.O., National University of Ireland, 1979.

Michael W. Rich, M.D., University of Illinois, 1979.

Marcos Rothstein, M.D., University of Zulia, 1974.

Deborah C. Rubin, M.D., Albert Einstein College of Medicine, 1981.

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.)

Clay Semenkovich, M.D., Washington University, 1981. (See Department of Cell Biology and Physiology.)

Steven Shapiro, M.D., The University of Chicago, 1983.

Deborah Shure, M.D., Albert Einstein University, 1973.

Samuel L. Stanley Jr., M.D., Harvard University, 1980. (See Department of Molecular Microbiology.)

Thomas H. Steinberg, M.D., New York University, 1978. (See Department of Cell Biology and Physiology.)

Gregory A. Storch, M.D., New York University, 1973. (See Departments of Molecular Microbiology and Pediatrics.)

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.

David Windus, M.D., Creighton University, 1978.

Jeffrey Wong, M.D., University of Utah, 1985.

Robert S. Woodward, Ph.D., Washington University, 1972.

Gary R. Zuckerman, D.O., Kansas City College of Osteopathic Medicine, 1963.

Research Associate Professor Emeritus

Norma Fletcher, Ph.D., University of Copenhagen, 1965.

Research Associate Professors

H. Dieter Ambos, C.E.E., Washington University, 1973. (See Institute for 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 Biochemistry and Molecular Biophysics.)

Debra L. Haire-Joshu, Ph.D., St. Louis University, 1988.

Fong Fu Hsu, Ph.D., University of Utah, 1986.

Osami Kanagawa, M.D., Okayama University, 1974; Ph.D., 1978. (See Department of Pathology.)

Wendy M. Kohrt, Ph.D., Arizona State University, 1986.

Bruce W. Patterson, Ph.D., University of Illinois, 1980.

Kenneth B. Schechtman, Ph.D., Washington University, 1978. (See Division of Biostatistics and Institute for Biomedical Computing.)

Jo Louise Seltzer, Ph.D., Washington University, 1969. (Dermatology)

Robert J. Spina, Ph.D., University of Pittsburgh, 1987.

Associate Professors Emeriti (Clinical)

Janina M. Brajtburg, Ph.D., University of Lodz, 1968.
Mary L. Parker, M.D., Washington University, 1953.
James C. Sisk, M.D., Washington University, 1946. (Dermatology)

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.
Dane M. Chapman, Ph.D., Brigham Young University, 1985; M.D., University of Michigan, 1985.
John S. Daniels, M.D., University of Arkansas, 1974.
Arnold Dankner, M.D., Washington University, 1947.
Rand E. Dankner, M.D., Baylor College of Medicine, 1978.
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, 1970.
George J. Hruza, M.D., New York University, 1982. (Dermatology) (See Departments of Surgery and Otolaryngology.)
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.
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.
Matthew J. Orland, M.D., University of Miami, 1979.
Deborah L. Parks, M.D., University of Louisville, 1982.
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.
Scott R. Sale, M.D., St. Louis University, 1976.
Robert Saltman, M.D., Washington University, 1980.
Bernard L. Shore, M.D., Washington University, 1977.
Robert B. Shuman, M.D., University of Missouri, 1981.
Donald A. Skor, M.D., Rush University, 1978.
Ross B. Sommer, M.D., Cornell University, 1949.
Paul M. Stein, M.D., St. Louis University, 1971.
Kongsak Tanphaichitr, M.D., Siraraj Hospital Medical School, 1970.
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)
Leonard B. Weinstock, M.D. University of Rochester, 1981.
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.
Marc D. Smith, Ph.D., St. Louis University, 1979.

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.
Amir Arsham Amini, Ph.D., University of Michigan, 1990.
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.
Mitchell D. Botney, M.D., Ohio State University, 1984.
Gregory W. Botteron, M.D., University of Kansas, 1989.
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.

Cary A. Caldwell, M.D., University of Pittsburgh, 1989.

David B. Carr, M.D., University of Missouri, 1985.

Mario Castro, M.D., University of Missouri, Kansas City, 1988.

Lilibeth M. Cayabyab-Loe, M.D., University of Missouri, 1990.

Andrew C. Chan, M.D., Ph.D., Washington University, 1986. (Howard Hughes Medical Institute Assistant Investigator)

Mary F. Chan, M.D., University of Alabama, 1986.

Douglas M. Char, M.D., University of Hawaii, 1989.

Steven M. Cohn, M.D., Ph.D., Washington University, 1985.

Lynn A. Cornelius, M.D., University of Missouri, 1980. (Dermatology)

Daniel W. Coyne, M.D., Case Western Reserve University, 1983.

Samuel E. Dagogo-Jack, M.D., University of Ibadan, 1978.

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Instructors

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Lauraine E. Davidson, M.D., Cornell University, 1981.

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Brian K. Dieckgraefe, Ph.D., Washington University, 1987; M.D., 1988.

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Stanley L. Hazen, M.D., Ph.D., Washington University, 1992.

Luciann Hruza, M.D., Boston University, 1988.

David A. Katzman, M.D., St. Louis University, 1991.

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Michael H. Koval, Ph.D., The Johns Hopkins University, 1990.

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Edward B. Morgan, M.D., St. Louis University, 1970.

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Gabrielle Reed, Ph.D., Salve Regina University, 1995.

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Marvin Sasson, M.D., New York University, 1993.

Mark Scheperle, M.D., University of Missouri, Kansas City, 1989.

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Instructors Emeriti (Clinical)

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John M. Cary, M.D., St. Louis University, 1958.
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Royal J. Eaton, M.D., University of Missouri, 1964.
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James H. Epstein, M.D., Washington University, 1969.
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David Feldman, M.D., Washington University, 1943.
Bruce T. 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.
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Andrew Gold, M.D., University of Iowa, 1989.
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Ronald K. Grady, M.D., Washington University, 1966.
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Patricia Quinley, M.D., University of Illinois, 1989.

William R. Reilly, M.D., University of Illinois, 1980.

John H. Rice, M.D., University of Missouri, 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., Harvard University, 1978. (Dermatology)

Robert J. Scheff, M.D., Washington University, 1974.

Alvin K. Schergen, M.D., St. Louis University, 1980.

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.

William S. Schwab, M.D., Ph.D., Washington University, 1990.

Jeremy M. Segal, M.B.B.C.H., University of Witwatersrand, 1991.

Kenneth E. Shafer, M.D., St. Louis University, 1979.

Atul S. Shah, M.B., B.S., Medical College of India, 1980.

Bharat J. Shah, M.D., Guiarat University, 1978.

J. Howard Shane III, M.D., University of Texas, 1992.

John B. Shapleigh II, M.D., Washington University, 1946.

Randy Silverstein, M.D., University of Missouri, 1982.

Carol M. Simmons, M.D., Washington University, 1979.

Raymond Smith, M.D., University of Virginia, 1984.

Allen D. Soffer, M.D., University of Missouri, 1983.

Hani Charles Soudah, M.D., University of Hamburg, 1988.

Erik Stabell, M.D., Rush University, 1983.

James Stokes, M.D., University of Missouri, 1984.

Steven Storfer, M.D., Medical University of South Carolina, 1986.

William K. Sullivan, M.D., University of Missouri, 1974.

Arnold S. Tepper, M.D., University of Missouri, 1970.

Wanda T. Terrell, M.D., Washington University, 1979. (See Health Key Beacon.)

Mark Thoelke, M.D., Ph.D., University of Illinois, Urbana, 1990.

William M. Thomson, M.D., The Johns Hopkins University, 1973.

Erik P. Thyssen, M.D., University of Copenhagen, 1984.

Sharon F. Tiefenbrunn, M.D., Washington University, 1975. (Dermatology)

Garry S. Tobin, M.D., Washington University, 1985.

Elizabeth A. Tracy, M.D., Medical College of Wisconsin, 1986. (See Health Key Beacon.)

Cynthia Troiano, D.O., Chicago College of Osteopathic Medicine, 1986.

Jenny S. Tseng, M.D., Northwestern University, 1992.

David J. Tucker, M.D., St. Louis University, 1981.

Jose Vasquez, M.D., Ponce School of Medicine, Puerto Rico, 1991.

Stanley G. Vriezelaar, M.D., University of Iowa, 1981.

David Wallace, M.D., St. Louis University, 1984.

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.

James R. Wiant, M.D., Jefferson Medical College, 1959.

Deborah Wienski, M.D., Tufts University, 1983.

Nancy J. Williams, M.D., University of Kansas, 1987. (See Health Key Beacon.)

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.

Instructor (Adjunct)

John Hall, M.D., University of Illinois, Chicago, 1979.

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 cell fate, differentiation and metabolism, 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

M70 670 PHARMACOLOGY

Instructor: *Douglas Covey, Ph.D.*, 362-1726

The purpose of this course is to develop an understanding of the general principles of pharmacology that are applicable to current and future drugs. Pharmacology draws heavily on biochemistry, physiology and microbiology for an understanding of drug interaction, drug metabolism and selective toxicity. The mechanisms of actions of drugs used to treat a variety of pathological conditions, from systemic infection and neoplasia to the regulation of cardiovascular and neurological function, are discussed. Students who have not completed the first year of the medical school curriculum must have permission from the course master to enroll in this course. This will change due to revision of medical school curriculum. A new course is to be planned.

FOURTH YEAR

Electives

Description of the following course is shown in the Division of Biology and Biomedical Sciences.

L41 (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.

Research (M70 900)

Cross listed with L41 (Bio) 590

Irving Boime, Ph.D., 362-2556
Regulated expression of the human placental and pituitary glycoprotein hormone genes.

Ross L. Cagan, Ph.D., 362-7796
Cell fate specification and programmed cell death in the developing *Drosophila* retina.

Douglas F. Covey, Ph.D., 362-1726
Medicinal chemistry of ion channel ligands and enzyme inhibitors.

George W. Gokel, Ph.D., 362-9297
Novel synthetic organic compounds for use as model systems for biological processes.

Jeffrey I. Gordon, M.D., 362-7243
Gut development; gut epithelial biology; protein N-myristoylation.

Gregory A. Grant, Ph.D., 362-3367
Interaction of polypeptide inhibitors with acetylcholine receptors and mechanism of allosteric regulation in enzymes.

Eugene M. Johnson Jr., Ph.D., 362-3926
Biology of neurotrophic factors and mechanisms of neuronal programmed cell death.

Kerry Kornfeld, M.D., Ph.D., 747-1480
Signal transduction during development.

Garland R. Marshall, Ph.D., 362-1567
Molecular recognition, computer-aided drug design, antivirals, peptidomimetics and protein structure prediction.

Jeanne M. Nerbonne, Ph.D., 362-2564
Regulation of membrane excitability; structure, function and regulation of voltage-dependent ion channels.

David M. Ornitz, Ph.D., M.D., 362-3908
Mechanisms of fibroblast growth factor signaling in development. Genes involved in inner ear development.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

John H. Russell, Ph.D., 362-2558
Mechanisms of cell death in the regulation and function of lymphocyte response.

Dwight A. Towler, M.D., Ph.D., 362-9925
Transcriptional regulation of bone-specific genes by homeodomain proteins and polypeptide growth factors.

Faculty

ALUMNI PROFESSOR AND HEAD OF DEPARTMENT

Jeffrey I. Gordon, M.D., The University of Chicago, 1973. (See Department of Medicine.)

Distinguished University Professor

David M. Kipnis, M.D., University of Maryland, 1951. (See Department of Medicine.)

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.

Gregory A. Grant, Ph.D., University of Wisconsin, 1975. (See Department of Medicine.)

Richard W. Gross, M.D., New York University, 1976; Ph.D., Washington University, 1982. (See Department of Medicine.) (Also Department of Chemistry)

Eugene M. Johnson Jr., Ph.D., University of Maryland, 1970. (See Departments of Neurology and Neurological Surgery.)

Garland R. Marshall, Ph.D., Rockefeller University, 1966. (See Department of Biochemistry and Molecular Biophysics and Institute for Biomedical Computing.)

David B. McDougal Jr., M.D., The University of Chicago, 1947.

Aubrey R. Morrison (Burroughs Wellcome Clinical Pharmacology Scholar), M.B.,B.S., University of London, 1970. (See Department of Medicine.)

Arthur H. Neufeld, Ph.D., New York University, 1970. (See Department of Ophthalmology and Visual Sciences.)

John H. Russell, Ph.D., Washington University, 1974.

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)

Peter B. Corr, Ph.D., Georgetown University, 1975.

James A. Ferrendelli, M.D., University of Colorado, 1962.

Research Professor (Adjunct)

Philip Needleman, Ph.D., University of Maryland, 1964.

Associate Professors

Carolyn J. Anderson, Ph.D., Florida State University, 1990. (See Department of Radiology.)

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.)

Jeanne M. Nerbonne, Ph.D., Georgetown University, 1978.

David M. Ornitz, Ph.D., University of Washington, 1987; M.D., 1988.

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.)

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.

Michael Crowder, M.D., Ph.D., Washington University, 1989. (See Department of Anesthesiology.)

Per Falk, M.D., Ph.D., University of Gothenburg, 1986; Ph.D., 1991.

David M. Holtzman, M.D., Northwestern University, 1985. (See Department of Neurology.)

Raphael Kopan, Ph.D., The University of Chicago, 1989. (See Department of Medicine.)

Kerry Kornfeld, M.D., Ph.D., Stanford University, 1991.

Mark E. Lowe, Ph.D., University of Pennsylvania, 1977; M.D., University of Miami, 1984. (See Department of Pediatrics.)

Louis J. Muglia, Ph.D., The University of Chicago, 1986; M.D., 1988. (See Department of Pediatrics.)

Jean E. Schaffer, M.D., Harvard University, 1986. (See Department of Medicine.) (Cardiovascular Division)

Theodore C. Simon, Ph.D., George Washington University, 1990. (See Department of Pediatrics.)

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.)

Research Assistant Professors

Medha Gautam, Ph.D., Tata Institute of Fundamental Research, Bombay, India, 1985.

Jennifer K. Lodge, Ph.D., Washington University, 1988.

Assistant Professors (Adjunct)

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 of Molecular Microbiology also offers a number of advanced courses, primarily designed for graduate students, but open to medical students. Advanced elective research activities also are offered by faculty in the department.

FIRST YEAR

M30 501 MEDICAL MICROBIOLOGY

Instructor: *J. Fleischman, Ph.D.*, 362-2759

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 part of the course focuses on bacterial structure, physiology and genetics, including lectures on the mechanisms of antibiotic action and resistance. The second part of the course is centered around mechanisms of virulence, using bacteria as models to describe pathogen-host interactions in molecular detail. Additional sessions discuss the molecular biology and pathogenic importance of viruses, fungi, protozoa and helminths. A set of laboratory exercises introduces the student to basic microbiological techniques and principles of diagnostic bacteriology.

M04 526 NEW DISEASES, NEW PATHOGENS

Instructors: *Gregory Storch, M.D.*, 454-6079; *Lawrence Gelb, M.D.*, 289-6433; *Penny Shackelford, M.D.*, 454-6050; *Joseph St. Geme, M.D.*, 362-5401; *Jean Molleston, M.D.*, 454-6173

This elective will focus on the process by which new etiologic agents of disease have been discovered. Special attention will be paid to the logical processes by which a causative role is attributed to a newly discovered pathogen. Specific examples will probably include, but will not necessarily be limited to, legionnaire's disease, AIDS and other human T cell leukemia virus-associated disease, cat scratch disease, human parvovirus infection, hepatitis C, Lyme disease, human herpes virus 6, Ehrlichiosis, 4-corners hantavirus and *Helicobactor pylori*.

M04 533 TROPICAL MEDICINE

Instructor: *Daniel Goldberg, M.D., Ph.D.*, 362-1514

Washington University has several faculty members who are actively researching diseases specific to developing countries. This elective is designed to bring these individuals together, in an informal discussion forum with students, to highlight the problems particular to geographical medicine. The elective will cover issues including eradication, prevention and treatment, immunology and vaccine development, as well as description of the different disease syndromes themselves. (Also listed in Department of Medicine.)

M04 568 MONOCLONAL ANTIBODIES IN DIAGNOSIS AND THERAPY

Instructor: *Julian Fleischman, Ph.D.*, 362-2759

This elective will cover current applications of monoclonal antibody technology to the diagnosis and therapy of human disease. Topics will include the design of highly sensitive antibody-based diagnostic immunoassays, the creation of bispecific monoclonal antibodies to deliver toxins or cytotoxic cells to tumor cell targets, genetically engineered antibody molecules for the treatment of cancer, AIDS and autoimmune diseases, and the application of catalytic monoclonal antibodies in biomedical research and technology. The material in this course will be based on readings in the current literature plus informal discussions.

M04 589 TOPICS IN VIRAL PATHOGENESIS

Instructor: *Milton Schlesinger, Ph.D.*, 362-2762

This course is a "tutorial-style" program. Assigned papers will be discussed during one- to two-hour sessions for six to eight sessions (variable). A general review of molecular virology and virus-host cell interactions will be conducted. Topics include viral hepatitis, influenza, viruses and cancer.

FOURTH YEAR

Electives

At present, the primary enrollees in the following 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. Course descriptions are presented in the section on the Division of Biology and Biomedical Sciences.

L41 (BIO) 5217 SPECIAL TOPICS IN MICROBIAL PATHOGENESIS

L41 (BIO) 5392 MOLECULAR MICROBIOLOGY AND PATHOGENESIS

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

Research (M30 900)

Cross listed with L41 (Bio) 590

John P. Atkinson, M.D., 362-8391
Autoimmunity with an emphasis on the complement system and immune complex processing: clinical, genetic, biochemical and molecular analyses of complement receptors and regulatory proteins.

Douglas E. Berg, Ph.D., 362-2772
Helicobacter pylori: genome organization; detection of genes involved in colonization or disease. Molecular epidemiology of *H. pylori* and other pathogens.

Steven M. Beverley, Ph.D., 362-7059
Genetic analysis of virulence in protozoan parasite.

Eric Brown, M.D., 362-2125
Mechanisms and control of phagocytic function. Biochemistry and cellular physiology of IgG and complement receptors and adhesive integrins are studied in detail.

Michael Caparon, Ph.D., 362-1485
Molecular genetics and pathogenicity of the streptococci and other pathogenic gram positive bacteria.

David D. Chaplin, M.D., Ph.D., 362-9047
Structure, organization and gene content of the HLA complex. Transgenic approaches for defining actions of acute inflammatory cytokines *in vivo*.

Josephine Clark-Curtiss, Ph.D., 935-6869
Genetics and molecular biology of *Mycobacterium leprae, Mycobacterium tuberculosis* and *Mycobacterium avium*.

Julian B. Fleischman, Ph.D., 362-2759
Structure and biosynthesis of antibodies; production and applications of monoclonal antibodies.

M. Wayne Flye, M.D., Ph.D., 362-7145
Biochemical and gene regulation of local and systemic immune responses by the environment and cells of the liver with particular attention to the Kuppfer cell.

Daniel Goldberg, M.D., Ph.D., 362-1514
Biochemistry of malaria.

Greg Goldberg, Ph.D., 362-8180
Enzymology of connective tissue remodeling.

William Goldman, Ph.D., 362-2742
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.

Eduardo Groisman, Ph.D., 362-3692
Regulation of gene expression. Molecular biology of bacteria-host interactions. Evolutionary origins of virulence.

Henry Huang, Ph.D., 362-2755
Molecular biology of alphaviruses. Alphavirus gene expression vectors. Antiviral drug design.

Scott Hultgren, Ph.D., 362-6772
Molecular basis of microbial pathogenesis; organelle biogenesis in pathogens; structure-function of chaperones, ushers and adhesins.

David Kennell, Ph.D., 362-2751
Biochemistry and genetics of macromolecule regulation: mRNA metabolism and mechanism of processive enzyme reactions.

George Kobayashi, Ph.D., 362-1548
Development of therapy for intracellular fungal infections.

David Leib, Ph.D., 362-3826
Molecular biology and latency of herpes simplex virus.

Hsiu-San Lin, M.D., Ph.D., 362-7034
Differentiation and function of mononuclear phagocytes.

Paul Olivo, M.D., 362-5718
Transgenic cell lines for detection of viruses.

Marion Peters, M.B.B.S., 362-8940
Human cellular and molecular immunology: Immuno-regulation and ontogeny of intestinal B and T cells; Immuno-globulin gene usage in normal intestine, inflammatory bowel disease and mice with IBD from gene knockouts.

Lee Ratner, M.D., Ph.D., 362-8836
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 and pathogenicity.

Charles Rice, Ph.D., 362-2842
Molecular genetics of animal RNA viruses (alphaviruses and flaviviruses, in particular, hepatitis C virus): replication, packaging and virulence.

David Russell, Ph.D., 362-3693
Infection and survival strategies of the intracellular pathogens *Leishmania* and *Mycobacteria.*

Milton J. Schlesinger, Ph.D., 362-2762
Interactions between RNA animal viruses and their host cells. Emphasis on maturation and assembly of viral proteins.

Sondra Schlesinger, Ph.D., 362-2746
Structure and replication of enveloped RNA animal viruses.

David Schlessinger, Ph.D., 362-2744
Mapping of X chromosome, X-linked diseases; chromosome structure.

Robert Schreiber, Ph.D., 362-8747
Biochemistry and biology of cytokines and their receptors. Elucidation of the signal transduction mechanisms used by interferon-gamma and tumor necrosis factor. Definition of the physiologic roles of cytokines *in vivo.*

L. David Sibley, Ph.D., 362-8873
Cell and Molecular Biology of Invasion and Intracellular Survival by the Protozoan *Toxoplasma gondii.*

Joseph W. St. Geme, M.D., 362-5401
The molecular mechanism of nontypable *Haemophilus influenzae* pathogenicity. *H. influenzae* is an important cause of human respiratory tract diseases and a source of substantial morbidity. We are principally interested in characterizing the bacterial and host cell determinants of *H. influenzae* respiratory tract colonization, an essential step in the pathogenesis of disease. We anticipate that these studies will assist efforts to develop a strategy for preventing nontypable *Haemophilus* disease.

Samuel L. Stanley, M.D., 362-1070
We study the protozoan parasite *Entamoeba histolytica*, the cause of amebic dysentery and amebic liver abscess, focusing on developing models to better understand the pathogenesis of amebic infection, novel targets for anti-amebic drug design, and the design and evaluation of recombinant antigen-based vaccines to stimulate mucosal and parenteral immune responses against the parasite.

Gregory Storch, M.D., 454-6079
The student, in this elective, will participate in a research project involving the application of techniques of molecular biology, especially the polymerase chain reaction, to the diagnosis of the infectious diseases. Infectious agents currently under investigation include human cytomegalovirus, Epstein-Barr virus, VZV, HSV, human parvovirus B19, JC virus, Ehrlichia and toxoplasma.

Matthew L. Thomas, Ph.D., 362-8722
Study of protein tyrosine phosphatases and the regulation of cellular differentiation and activation.

Herbert Virgin, M.D., Ph.D., 362-9223
We work on issues at the interface of virology and immunology by analyzing aspects of immunity which control infection and aspects of viral structure/genetics which contribute to virulence and disease. We study the pathogenesis and latency of the dsDNA enveloped murine cytomegalovirus and gamma herpes virus 68.

Faculty

MARVIN A. BRENNECKE PROFESSOR OF MOLECULAR MICROBIOLOGY AND HEAD OF DEPARTMENT

Stephen M. Beverley, Ph.D., University of California, Berkeley, 1979.

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.)

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.) (Barnes-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 Department of Medicine.)

Charles M. Rice, Ph.D., California Institute of Technology, 1981.

David G. Russell, Ph.D., London University, 1982.

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.)

Michael G. Caparon, Ph.D., University of Iowa, 1985.

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.)

Daniel E. Goldberg, M.D., Ph.D., Washington University, 1985. (See Department of Medicine.)

William E. Goldman, Ph.D., University of North Carolina, 1980.

Eduardo A. Groisman, Ph.D., The University of Chicago, 1986.

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.)

Virginia L. Miller, Ph.D., Harvard University, 1985. (See Department of Pediatrics.)

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 Departments of Medicine and Pediatrics.)

Gary J. Weil, M.D., Harvard University, 1975. (See Department of Medicine.)

Research Associate Professors

Josephine E. Clark-Curtiss, Ph.D., Medical College of Georgia, 1974.

Deborah E. Dobson, Ph.D., University of California, Berkeley, 1981.

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.)

David A. Leib, Ph.D., University of Liverpool, 1986. (See Department of Ophthalmology and Visual Sciences.)

Frederik Lindberg, M.D., Ph.D., University of Umea, 1987. (See Department of Medicine.)

Marion G. Peters, M.B.B.S., Melbourne University, 1972. (See Department of Medicine.)

L. David Sibley, Ph.D., Louisiana State University, 1985.

Joseph W. St. Geme, M.D., Harvard University, 1984. (See Department of Pediatrics.)

Matthew L. Thomas, Ph.D., University of Utah, 1981. (See Department of Pathology.)

Herbert W. Virgin IV, M.D., Ph.D., Harvard University, 1985. (See Departments of Medicine and Pathology.)

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.)

Instructor

Linda G. Eissenberg, Ph.D., University of North Carolina, 1982.

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 Department 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 Diseases of the Nervous System in conjunction with the Departments of Pathology, Molecular Biology and Pharmacology, Medicine and Pediatrics. 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 four-week clerkship in Neurology introduces students to the clinical care of patients with diseases of the nervous system. Questions pertaining to neurosurgical treatment, neurorehabilitation and ethical issues in management also are addressed. In the fourth year, opportunities exist 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. Arnold, Bourgeois, Brunstrom, Connolly, Deuel, Dodge, Dodson, Mink, Neil, Noetzel, Prensky, Thurston, Yamada*

Division of Pediatric Neurosurgery: *Drs. Park, Kaufman*

Division of Rehabilitation: *Drs. Baum, Dromerick, Hanlon, Sahrmann, 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. Babcock, Behrens, Cross, Diringer, Dugan, Elliott, Goldberg, Gutmann, Holtzman, Hsu, Jacquin, Johnson, Kato, McDonald, Powers, Racke, Rothman, J. Snider, W. Snider, Trotter, Xu, Yamada, Yu*

Cerebrovascular Disease Section: *Dr. Hsu* (Director), *Drs. Diringer, Dromerick, Goldberg, Landau, J.H. Lee, J.M. Lee, Lowenkopf, Manno, Powers, J. Snider, Wittenborn*

Clinical Neurophysiology Section: *Drs. Miller and Yee* (Section Co-Directors)

EEG: Sleep and Evoked Potentials: *Dr. Miller* (Director), *Drs. Arnold, Bourgeois, Duntley, Prensky, Yamada*

EMG: *Dr. Yee* (Director), *Drs. Al-Lozi, Connolly, Lee, Lopate*

Dementia and Aging Section: *Dr. Morris* (Director), *Drs. Buckles, Coats, Cohen, Dugan, Holtzman, Hosto, Johnson, Koepke, LaBarge, Storandt, Wittenborn*

Epilepsy Section: *Drs. Arnold, Bourgeois, Dodson, Duntley, Goldring, Miller, Park, Rothman, Silbergeld, Yamada*

Functional Neuroanatomy Section: *Drs. Powers and Raichle* (Section Co-Directors), *Drs. Carl, Corbetta, Miezin, Perlmutter, Petersen, Shulman, Videen*

Movement Disorders Section: *Dr. Perlmutter* (Director), *Drs. Black, Landau, Mink, Racette, Thach*

Neurological Critical Care Section: *Dr. Diringer* (Director), *Drs. Deibert, Manno*

Neurodevelopment Section: *Dr. Pearlman* (Director), *Drs. Brunstrom, Deuel, 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, Ms. Florence, Drs. Lopate, W. Snider, Yee*

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*

FIRST YEAR

Neurological Surgery

MO4 5667 MICROCIRCULATION

Instructor: *Jeffrey Gidday, Ph.D.*, 454-2817

The homeostatic functions of the microcirculation include the active regulation of metabolic substrate delivery and waste product removal and a multifaceted response to injury and disease. This elective is an introduction to the normal and abnormal cell biology and physiology of the arterioles, capillaries and venules that comprise the microcirculation. Six sessions will be organized around conceptual presentations and laboratory demonstrations by the instructor and two-part topic presentations by students following independent library research that focus on basic physiology and clinically relevant pathophysiology. Basic research topics might include: regulation of tissue blood flow and vascular

tone, propagated vasodilation, hemodynamics and rheology of erythrocytes and leukocytes, cell biology of the endothelium, electromechanical coupling, control of capillary permeability and angiogenesis. Typically covered disease entities involving the microcirculation include: stroke and myocardial ischemia, diabetes, inflammation, tumor angiogenesis, retinopathy of prematurity and pulmonary edema, as well as adaptive responses such as to exercise and high altitude. (Also listed in Department of Cell Biology and Physiology.)

SECOND YEAR

Neurology

M25 632A DISEASES OF THE NERVOUS SYSTEM

Instructor: *Alan L. Pearlman, M.D.,* 362-6947

The goal of this course is to provide an introduction to diseases of the central and peripheral nervous systems, including their clinical manifestations, pathology, pathophysiology and pharmacotherapy. The course includes reading assignments, lectures, laboratories, conferences and clinical presentations.

THIRD YEAR

Neurology

M35 720 NEUROLOGY CLERKSHIP

Instructor: *Alan L. Pearlman, M.D.,* 362-3296

A full-time, four-week clerkship is provided on the neurology services at Barnes-Jewish Hospital South Campus. 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 and attend a series of lectures on neurosurgical problems.

Neurological Surgery

M40 730 NEUROLOGICAL SURGERY CLERKSHIP

Instructor: *Robert L. Grubb Jr., M.D.,* 362-3567

Up to two students may elect to obtain their neurology clerkship experience on the neurosurgery service or they can choose neurosurgery as part of the surgical specialty rotations. Third-year students participate with the residents and attendings on hospital rounds, evaluate patients in the neurosurgery outpatient department and participate in the neurosurgical operating room. The main objectives of the rotation include: 1) the evaluation of comatose or head-injured patients, 2) clinical presentation, diagnostic work-up and treatment of cervical and lumbar disc disease, and 3) evaluation and treatment of patients with hemorrhagic and ischemic stroke.

FOURTH YEAR

Electives

Neurology

M35 815 CONSULT NEUROLOGY

Instructor: *Alan L. Pearlman, M.D.,* 362-3296

The student will evaluate patients with neurological manifestations of medical, surgical and psychiatric diseases, and participate in their care, under the supervision of the consult resident and attending physician. The student also will attend weekly clinical conferences, including Neurology/Neurosurgery Grand Rounds. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M35 825 NEUROLOGY SUBINTERNSHIP — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructor: *Alan L. Pearlman, M.D.,* 362-3296

The student will share full primary physician responsibility with the first-year neurology resident, while the third-year neurology resident and attending physician provide supervision. Night call every fourth night, attending rounds six times per week, weekly clinical conferences and resident conferences. Valid start weeks for four-week blocks are: Weeks, 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M35 851 CLINICAL ASPECTS OF AGING AND DEMENTIA

Instructor: *John C. Morris, M.D.,* 454-5605

This elective focuses on the distinction of dementia from healthy aging and on the differential diagnosis of dementia, including Alzheimer's disease, Parkinson's disease, cerebrovascular disorders and affective disorders. The student will gain proficiency in interviewing techniques and in the neurologic examination of the geriatric patient, be introduced to neuropsychological, neuropathological, radiologic, and other biomedical procedures important in the diagnostic evaluation of the aged and consider clinical trials of experimental agents used in memory disorders and practical aspects of the management of the demented patient and his or her family. Valid start weeks for four-week blocks are: Weeks 9, 13, 33 and 37.

M35 860 PEDIATRIC NEUROLOGY

Instructor: *Steven M. Rothman, M.D.,* 454-6042

We offer two senior electives: 1) On our Inpatient Elective, the student participates as a full member of the neurology ward team and is directly responsible for a proportion of patients on the service under the direction of the senior pediatric neurology resident. The student may take night call every third or fourth night, during which time he or she is responsible for the medical care of the entire ward, as well as for emergency admissions under supervision of a pediatric resident. Formal teaching rounds with the

attending pediatric neurologist are held three times a week, and informal teaching rounds are held daily with the senior residents. 2) On our Outpatient Elective, the student will attend daily outpatient clinics, during which time he or she will be able to evaluate outpatient problems under faculty guidance. There are pediatric neurology clinics five days a week, in addition to teaching conferences. This elective allows students to see many new and return patients in a tutorial type of setting since patients are immediately reviewed with senior faculty. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M35 861 NEUROLOGY/NEUROSURGERY ICU

Instructor: *Michael N. Diringer, M.D.*, 362-2999

The student will be integrated into the Critical Care Team that provides care in the Neurology/Neurosurgery ICU. Diseases frequently encountered include intracerebral hemorrhage, head trauma, subarachnoid hemorrhage and stroke. The student will follow patients, participate in rounds and perform some procedures under supervision. Daily didactic sessions will be provided as conferences or lectures from the ICU attending. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M80 806 REHABILITATION — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructor: *Oksana Volshteyn, M.D.*, 454-7756

The student will serve as an extern and as a full-fledged member of the department's Medical Rehabilitation Team. Teaching and supervision are provided by five full-time physicians and senior resident physicians. The elective is designed to provide the student with a broad introduction to the field of Physical Medicine and Rehabilitation. It will be useful for students who are planning to specialize in general internal medicine, rheumatology, neurology, orthopaedics or any other field that will require experience in the evaluation and management of patients with physical disabilities. It also will be useful for students who are considering physical medicine and rehabilitation as a career choice. The students work on the 52-bed inpatient service and also see outpatients. The inpatient service will acquaint them with the management of patients with spinal cord lesions, head injuries, strokes, multiple sclerosis, neuropathies, arthritis, orthopaedic trauma, and amputated limbs. The outpatient service will provide them with experience in examining, assessing and treating patients with myofascial pain, musculoskeletal disorders, such as acute or chronic back and neck problems, and peripheral joint disease. It also will teach them how to deal with neuromuscular disorders in patients who are still ambulatory and whose function can be improved by rehabilitation. The students will gain experience in the prescription of rehabilitation programs and they will follow and observe their patients in physical therapy, occupational therapy, speech therapy or whatever treatment modality is applicable. Valid start weeks for four-week blocks are: Weeks 9, 13, 17, 21, 29, 33, 37 and 41.

Electives

Neurological Surgery

M40 805 NEUROSURGERY

Instructor: *Ralph Dacey Jr., M.D.*, 362-3571

The goal is to provide an overview of Neurological Surgery. Responsibilities will include patient workup, pre-, intra- and postoperative care, diagnostic procedures, daily resident and weekly grand rounds, neurosurgery clinic, and weekly combined Neurology and Neurosurgery, Neuropathology conferences. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M35 900)

Neurology

Dennis W. Choi, M.D., Ph.D., 362-9460

The cellular mechanisms underlying neuronal injury in neurological disease states. Our goal is to identify methods for blocking injury pathways that may prove to be clinically useful in treating brain or spinal cord damage in man.

David B. Clifford, M.D., 362-3296

Clinical treatment of neurologic manifestations of AIDS, including peripheral neuropathy, AIDS Dementia, cytomegalovirus encephalitis, and progressive multifocal leucoencephalography. Quantitative virologic correlations are a particular area of concentration with current studies.

Anne H. Cross, M.D., 362-3293

Understanding interactions of the immune system with the central nervous system as it relates to multiple sclerosis and other neuroimmunological disorders. Our goal is to understand how immune cells cross the blood-brain-barrier and initiate the cascade of events leading to lesions of multiple sclerosis, using the animal model, allergic encephalomyelitis.

Ruthmary K. Deuel, M.D., 454-6086

Research in developmental disorders of cognition: 1) functional neuroanatomic (fMRI) and neuropsychological study of dysgraphia, through the Imaging Research Center; and 2) Acquired Epileptic Aphasia and related disorders, in collaboration with Neuromuscular and Epilepsy services.

Mark P. Goldberg, M.D., 362-3258

Cellular mechanisms of hypoxic and traumatic neuronal injury. Focus on disturbances of calcium homeostasis using conventional and confocal videomicroscopy.

David H. Gutmann, M.D., Ph.D., 362-7149
Our laboratory is studying the molecular biology of central nervous system tumor suppressor genes. These genes include neurofibromatosis 1 (NF1), neurofibromatosis 2 (NF2) and tuberous sclerosis (TSC2). All three genes are expressed in central nervous system tissues and are essential for normal embryonic development. The central themes explored in our laboratory revolve around 1) determining how these tumor suppressor genes regulate cell growth, 2) determining the normal function of these gene products in cell differentiation and embryonic development, and 3) determining the relationship between the structure of these genes and their functions. These latter studies are aimed at determining how alternative exon splicing contributes to the generation of functional diversity. The object of all of our studies is an improved understanding of the molecular biology of these important disease genes with an eye towards improved diagnosis and treatment of these and other inherited cancer syndromes.

Alan L. Pearlman, M.D., 362-6947
Early development of the mammalian cerebral cortex, with emphasis on the molecular and cellular mechanisms that guide migrating neurons and axonal growth cones to their proper location. To study these mechanisms, we determine the distribution of potential molecular guidance cues in the developing cortex, then perturb their function experimentally in an organotypic slice preparation maintained in culture for several days.

Steven E. Petersen, Ph.D., 362-3319
This lab is interested in the functional localization of higher brain processes, particularly those processes related to language, memory and visual attention. Our main approach to these issues is the use of PET functional activation, but we also study task performance in normal and selected patient populations.

Marcus E. Raichle, M.D., 362-6907
In vivo brain hemodynamic and metabolic studies using positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) in normal humans and patients with select diseases. (See also Steven E. Petersen, Ph.D.)

William D. Snider, M.D., 362-7149
Work in my laboratory is directed at regulation of axon growth and branching in mammalian spinal cord. We have focused on the dorsal root afferent projection because this system is particularly amendable to experimental manipulation and because more is known about the molecular characteristics of DRG cells than any other neuron class. We are applying a variety of anatomical and molecular techniques to the study of DRG axon branching. Post-fixation staining with the lipid-soluble fluorescent tracers is employed to characterize the growth and branching of dorsal root axons during spinal cord development. Expression of neurotrophins and chemorepellant molecules by spinal cord neurons is being studied in relation to patterns of axon branching. Finally, we are characterizing dorsal root axon arborizations in transgenic mice in which neurotrophins and chemorepellant molecules are overexpressed in the spinal cord. Understanding the regulation of axon growth and branching in the spinal cord during development is the first step toward enhancing the regeneration of axons after spinal cord injury.

John L. Trotter, M.D., 362-3293
Immunology of multiple sclerosis and human lymphocyte studies focusing on myelin antigens. Clinical research relevant to the care of the MS patient.

Research (M40 900)

Neurological Surgery

Ralph G. Dacey Jr., M.D., 362-3571
Research on the cerebral microcirculation. Studies focus on an examination of heterogeneity and responsiveness of intracerebral arterioles and venules to responses affecting the endothelial and smooth muscle cells in the muscle wall. *In vitro* techniques for studying isolated perfused microvessels are used in the laboratory with image processing techniques.

Jeffrey M. Gidday, Ph.D., 454-2817
Dr. Gidday's research focuses on understanding the mechanisms underlying vascular dysfunction in the brain and retina under the conditions of ischemia, trauma and diabetes. A concurrent line of investigation involves elucidation of the unique adaptive mechanisms whereby tolerance to ischemia can be induced in CNS tissue by previous exposure to a sublethal hypoxic-ischemic challenge.

Robert L. Grubb Jr., M.D., 362-3567
Research on cerebral circulation and metabolism, utilizing short-lived cyclotron-produced isotopes of oxygen, carbon and nitrogen is performed in both animals and humans. In animals there are ongoing physiological experiments involving cerebral circulation and metabolism. Positron emission tomography is used to measure cerebral circulation and metabolism in humans.

There is close collaboration with the Biomedical Computer Laboratory, and opportunities exist for the application of computer systems to biological modeling and data processing.

Bruce Kaufman, M.D., 454-2810
Dr. Kaufman is coordinator of the multidisciplinary Pediatric Neuro-Oncology Group, with primary responsibility for the pediatric tumor patients. He is actively involved in the evaluation and treatment of these patients, including experimental treatment protocols. His clinical activities include development of neuro-endoscopy techniques and involvement

with the Division of Neuroradiology in the evaluation of imaging techniques used in Neurosurgery, particularly as applied to the patients with neoplasms and spinal dysraphism.

T.S. Park, M.D., 454-2811
Dr. Park investigates chemical and molecular mechanisms of neutrophil-mediated microvascular injury following ischemia. Neutrophil-endothelial adherence and consequent endothelial cell injury are studied in reperfusion models using whole animals and cultured endothelial cells. The role of nitric oxide, oxygen radicals, adenosine and adhesion molecules on neutrophil and endothelial cells in regulating neutrophil-endothelial interactions is under investigation.

Keith M. Rich, M.D., 362-3566
Research on neuronal and glioma cellular apoptosis. Studies examine effects of radiation and/or chemotherapy on glioma cell survival and proliferation. Techniques include cell culture, bioassay for apoptosis, proliferation assays and protein immunoblotting.

Thomas A. Woolsey, M.D., 362-3600
Dr. Woolsey studies the structure, function and development of the central nervous system and the relation of blood supply to these properties. The rodent whisker barrel cortex is the model system for examining the interactions between the microcirculation and discrete groups of neurons of known function and connectivity. Currently under study are: 1) pattern formation in a central neural pathway including the roles of activity and cell surface molecules, 2) interactions of small groups of cortical neurons in processing of sensory information, and 3) dynamic changes in the cerebral microcirculation with neuronal activity.

Faculty

Neurology

ANDREW B. AND GRETCHEN P. JONES PROFESSOR OF NEUROLOGY AND HEAD OF DEPARTMENT

Dennis W. Choi, M.D., Ph.D., Harvard University, 1978.

Professors Emeriti

Margaret H. Clare, M.A., Washington University, 1951. (Neurophysiology)

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.)

Edward F. Vastola, M.D., Columbia University, 1947.

Professors

David A. Balota, Ph.D., University of South Carolina, 1981. (Also Department of Psychology)

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 Medical Center)

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.

Norman J. Stupp Professor of Neurology

Eugene M. Johnson Jr., Ph.D., University of Maryland, 1970. (See Department of Molecular Biology and Pharmacology.)

William M. Landau, M.D., Washington University, 1947.

John C. Morris, M.D., University of Rochester, 1974. (See Department of Pathology.)

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 Department of Pathology.)

Steven E. Petersen, Ph.D., California Institute of Technology, 1981. (Neuropsychology) (See Neurological Surgery, Department of Anatomy and Neurobiology and Department of Radiology.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prensky, M.D., New York University, 1955. (See Department of Pediatrics.)

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

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.)

William D. Snider, M.D. University of North Carolina, 1977.

Martha Storandt, Ph.D., Washington University, 1966. (Psychology) (Also Psychology)

W. Thomas Thach Jr., M.D., Harvard University, 1964. (See Department of Anatomy and Neurobiology and Department of Biochemistry and Molecular Biophysics, Program in Biological and Biomedical Engineering and Program in Physical Therapy.)

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) (See Neurological Surgery and Department of Psychiatry.)

Thomas A. Woolsey, M.D., The Johns Hopkins University, 1969. (George H. and Ethel R. Bishop Scholar in Neuroscience) (Neuroscience) (See Neurological Surgery, Department of Anatomy and Neurobiology and Department of Cell Biology and Physiology.)

Research Professor

Mark F. Jacquin, Ph.D., City University of New York, 1980.

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.

Professor (Adjunct)

John L. Burns, Ph.D., Columbia University, 1950.

Associate Professor Emeritus

Lawrence A. Coben, M.D., Case Western Reserve University, 1954.

Associate Professors

C. Robert Almli, Ph.D., Michigan State University, 1970. (See Program in Occupational Therapy.)

Anthony J. Margherita, M.D., Georgetown University, 1985.

John W. Miller, M.D., University of Illinois, 1977; Ph.D., 1981.

Michael J. Noetzel, M.D., University of Virginia, 1977. (See Department of Pediatrics.)

Joel S. Perlmutter, M.D., University of Missouri, 1979. (See Department of Radiology.)

William J. Powers, M.D., Cornell University, 1975. (See Department of Radiology.)

Shirley A. Sahrmann, Ph.D., Washington University, 1973. (Neurophysiology) (See Department of Cell Biology and Physiology and Program in Physical Therapy.)

Richard S. Sohn, M.D., The University of Chicago, 1968.

Associate Professor Emeritus (Clinical)

Joseph M. Dooley Jr., M.D., St. Louis University, 1958

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.)

Walter Lemann, M.D., Tulane University, 1979.

James R. Rohrbaugh, M.D., Ohio State University, 1974. (See Department of Pediatrics.)

Associate Professor (Adjunct)

Warren E. Lux, M.D., New York University, 1970.

Assistant Professors

Susan T. Arnold, M.D., Cornell University, 1988. (See Department of Pediatrics.)

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. (See Department of Pediatrics.)

Maurizio Corbetta, M.D., University of Pavia, 1985. (See Department of Anatomy and Neurobiology.)

Anne H. Cross, M.D., University of Alabama, 1980.

Michael N. Diringer, M.D., University of Kentucky, 1982. (See Neurological Surgery and Program in Occupational Therapy.)

Alexander W. Dromerick, M.D., University of Maryland, 1986. (See Program in Occupational Therapy.)

Laura L. Dugan, M.D., Ohio State University, 1987. (See Department of Medicine.)

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. (See Department of Molecular Biology and Pharmacology.)

K. Philip Lee, M.D., Tufts University, 1990.

Edward M. Manno, M.D., Medical University of South Carolina, 1984.

Jonathan W. Mink, M.D., Ph.D., Washington University, 1989. (See Department of Anatomy and Neurobiology and Department of Pediatrics.)

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.

Yvette I. Sheline, M.D., Boston University, 1979. (See Departments of Psychiatry and Radiology.)

Abraham Z. Snyder, Ph.D., The Rockefeller University, 1977; M.D., State University of New York at Buffalo, 1981. (See Department of Radiology.)

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 Neurological Surgery.)

Research Assistant Professors

Maria Margarita Behrens, Ph.D., Universidad Autonoma de Madrid, 1990.

Virginia D. Buckles, Ph.D., University of Wisconsin, Madison, 1981.

Julaine Florence, M.H.S, Washington University, 1983.

Robert E. Hanlon, Ph.D., City University of New York, 1988. (See Program in Occupational Therapy.)

Kathleen Mann Koepke, Ph.D., University of North Carolina, 1983. (Psychology)

Emily A. LaBarge, Ed.D., University of Missouri, 1990. (Also Psychology)

Abbas Parsian, Ph.D., Western Michigan University, 1986. (See Department of Psychiatry.)

Tom O. Videen, Ph.D., University of Washington, 1981. (Neurophysiology) (See Department of Radiology.)

Ling Wei, M.D., Beijing Capital Institute of Medicine, Beijing, China, 1977.

Jian Xu, Ph.D., Shanghai Institute of Materia Medica, 1991.

Shan Ping Yu, M.D., Ph.D., Capital Institute of Medicine, 1979.

Assistant Professors Emeriti (Clinical)

William B. Hardin, M.D., University of Texas, Galveston, 1957.

David Mendelson, M.D., Indiana University, 1948.

Assistant Professors (Clinical)

Denis I. Altman, M.B., University of the Witwatersrand, 1975. (See Department of Pediatrics.)

Lynn B. Blackburn, Ph.D., Indiana University, 1972.

Royal Grueneich, Ph.D., University of Minnesota, 1978.

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 M. Reisler, M.D., Washington University, 1961.

Eli R. Shuter, M.D., Washington University, 1960.

Howard I. Weiss, M.D., Tulane University, 1972.

Research Scientists

Francis Miezin, M.S. University of Wisconsin, 1972.

Gordon L. Shulman, Ph.D., University of Oregon, 1979. (Neuropsychology) (See Neurological Surgery and Department of Psychology.)

Instructors

Robert E. Adams, M.D., University of Virginia, 1990.

Muhammad T. Al-Lozi, M.D., King Edward Medical College, 1980.

Lizette Alvarez, M.D., Ponce School of Medicine, Ponce, Puerto Rico, 1991.

Deborah Babcock, M.D., Ph.D., University of Illinios, 1988.

Kevin J. Black, M.D., Duke University, 1990. (See Department of Psychiatry.)

Janice E. Brunstrom, M.D., Medical College of Virginia, 1987. (See Department of Pediatrics.)

John Choi, M.D., Hahnemann University Medical School, 1992.

Jeffrey L. Elliott, M.D., Washington University, 1988.

Ashok Kumar, M.D., Dow Medical College, Pakistan, 1985.

Jin-Moo Lee, M.D., Cornell University, 1993.

Michael Levin, M.D. Washington University, 1993.

Todd Levine, M.D., Duke University, 1993.

Glenn Lopate, M.D., Ohio State University, 1987.

Theodore Lowenkopf, M.D. Jefferson Medical College, 1993.

John McDonald, M.D., Ph.D., University of Michigan, 1992.

David Murphy, M.D., University of Arkansas, 1992.

Patricia Nemeth, Ph.D., University of California, Los Angeles, 1977; M.D., Washington University, 1993.

James Park, M.D., Ph.D., Baylor College, 1987.

Brad Racette, M.D., Northwestern University, 1992.

Joy B. Snider, M.D., Ph.D., University of Texas, Southwestern, 1986.

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.

Terri L. Hosto, M.S.W., University of Michigan, 1986.

Pamela E. Millsap, M.S.G., University of Texas, Arlington, 1989.

Joanne Norton, M.S.N., St. Louis University, 1992.

Janice Palmer, M.S.G., University of Missouri, St. Louis, 1994.

Maria Stehman, M.S.N., St. Louis University, 1994.

Instructors (Clinical)

Sylvia Awadalla, M.D., Ohio State University, 1985.

Max Benzaquen, M.D., Ph.D. San Marcos University, 1978.

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 Peeples, M.D., The University of Chicago, 1986.

Karen J. Pentella, M.D., Ohio State University, 1979.

Daniel Phillips, M.D., Washington University, 1980.

Sandra L. Tate, M.D., Southern Illinois University, 1987.

Neurological Surgery

EDITH R. AND HENRY G. SCHWARTZ PROFESSOR AND CHAIRMAN OF DEPARTMENT

Ralph G. Dacey Jr., M.D., University of Virginia, 1974.

Professors Emeriti

William S. Coxe, M.D., The Johns Hopkins University, 1948.

Sidney Goldring, M.D., Washington University, 1947.

August A. Busch, Jr., Professor Emeritus and Lecturer

Henry G. Schwartz, M.D., The Johns Hopkins University, 1932.

Professors

Mokhtar Gado, M.D., 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.)

Shi H. Huang Professor of Neurological Surgery

Tae Sung Park, M.D., Yonsei University, 1971. (See Department of Pediatrics and Department of Anatomy and Neurobiology.)

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. (George H. and Ethel R. Bishop Scholar in Neuroscience) (See Neurology, 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.)

Bruce A. Kaufman, M.D., Case Western Reserve University, 1982.

Steven E. Petersen, Ph.D., California Institute of Technology, 1981. (See Neurology, Department of Anatomy and Neurobiology and Department of Radiology.)

Keith M. Rich, M.D., Indiana University, 1977. (See Department of Anatomy and Neurobiology and Department of Radiology.)

René Tempelhoff, M.D., University of Lyon, 1984. (See Department of Anesthesiology.)

Research Associate Professor

Jack R. Engsberg, Ph.D., University of Iowa, 1985.

Assistant Professors

Michael N. Diringer, M.D., University of Kentucky, 1982. (See Neurology and Program in Occupational Therapy.)

Robert E. Drzymala, Ph.D., University of Oklahoma, 1977. (See Department of Radiology.)

Jeffrey M. Gidday, Ph.D., University of Virginia, 1986. (See Department of Ophthalmology and Department of Cell Biology and Physiology.)

Carl Lauryssen, M.B., Ch.B., University of Cape Town, 1988.

Assistant Professor (Adjunct)

Matthew A. Howard, M.D., University of Cincinnati, 1984.

Research Scientists

Gary W. Harding, M.S.E., University of Washington, 1983. (See Department of Otolaryngology.)

Gordon L. Shulman, Ph.D., University of Oregon, 1979. (See Neurology.) (Also Psychology)

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

The Department of Obstetrics and Gynecology has clinical teaching services located at Barnes-Jewish Hospital under the following director:

Barnes-Jewish Hospital
James R. Schreiber, M.D.,
Professor and Head, Department of Obstetrics and Gynecology

In addition, for the purposes of teaching, clinical care and research, the Department of Obstetrics and Gynecology is divided into subspecialty divisions under the following directors:

Gynecologic Oncology: David G. Mutch, M.D.
Maternal-Fetal Medicine: D. Michael Nelson, M.D., Ph.D.
Reproductive Endocrinology and Infertility: Randall R. Odem, M.D.
Gynecology: Rebecca P. McAlister, M.D.
Ultrasound and Genetics: Diana L. Gray, M.D.

Instruction in Obstetrics and Gynecology is provided during all four years of the medical curriculum, beginning with an introductory course in the first year as a component of Clinical Medicine. Teaching in the second year is designed to correlate basic science with the physiologic basis of normal pregnancy and parturition, reproductive biology and gynecologic malignancies. All third-year medical students participate in a clinical clerkship of six weeks, divided into two three-week components of obstetrics and gynecology. In the fourth year, students may elect a subinternship in the listed clinical subspecialties or a research elective.

FIRST YEAR

As a component of the course in Clinical Medicine offered by the Department of Medicine, the student is introduced to the essentials in the medical history and examination for the gynecological evaluation of the adult woman patient.

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.

M25 636 PP DEVELOPMENTAL MEDICINE
Instructor: *Andrea Stephens, M.D.*, 879-6390

The obstetrical component of this course emphasizes the physiologic basis of normal pregnancy, labor and delivery. In addition, adaptations of other organ systems to pregnancy will be discussed. Appreciation for deviations from normal labor also will be presented. The gynecologic component of the course includes topics such as amenorrhea and abnormal uterine bleeding, pediatric and adolescent gynecology, as well as benign and malignant gynecologic tumors.

THIRD YEAR

M45 730 OB/GYN CLERKSHIP
Instructor: *Diane Merritt, M.D.*, 454-7889

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, routine and high risk obstetrics, care of the infertile and oncology patient, and surgical management. Students are assigned as clinical clerks to rotations at Barnes-Jewish Hospital. Teaching is provided by faculty, attending physicians, house officers and nurse clinicians. Students participate in all teaching conferences offered by the department, and receive formal instruction in a core curriculum seminar series.

FOURTH YEAR

Fourth-year students wishing to take an externship or research elective can choose from a variety of courses.

Electives

M45 804 OB/GYN OUTPATIENT CARE SUBINTERNSHIP
Instructor: *Jodie Rai, M.D.*, 362-4211

This experience is designed to acquaint the student 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 three to four half-days weekly participating in outpatient surgery under the supervision of attendings and house staff, and five or six additional half-days in clinic and private offices. Students will receive a better understanding of mechanisms utilized in providing surgical care to outpatients, and an introduction to both the style and substance of office care. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M45 810 OB-GYN ENDOCRINOLOGY — INFERTILITY SUBINTERNSHIP

Instructor: *Randall Odem, M.D.,* 362-8054

The subintern will participate (in the office and hospital) in the study and treatment of women with reproductive endocrine disorders and infertility. She or he will attend and present in conferences, attend surgery, observe assisted reproductive technology procedures, have assigned reading and be an integral part of the reproductive endocrine service. Opportunities for clinical research projects in reproductive endocrinology also are available. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M45 830 GYN ONCOLOGY SUBINTERNSHIP

Instructor: *David Mutch, M.D.,* 362-3181

The subintern will take part in the workup of tumor patients prior to surgery and/or radiotherapy, assist in pelvic operations, help render postoperative care and review pathology specimens and slides. She or he will participate in GYN Tumor Clinic sessions, make hospital rounds with house staff, consultations and attend OB-GYN conferences. Opportunities for clinical or basic research project in gynecologic malignancy also are available. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M45 840 MATERNAL-FETAL MEDICINE SUBINTERNSHIP

Instructor: *Jaye M. Shyken, M.D.,* 362-2983

Sub-interns will participate in the antepartum management of high risk hospitalized patients as well as complicated outpatients through the High Risk Obstetrics Clinics and the Center for Diabetes in Pregnancy. Examples include diabetes, hypertension, renal disease, hematologic abnormalities, preterm labor, and others. Antepartum evaluation and monitoring of the pregnant woman and her fetus are emphasized. Supervision is by the Antepartum Chief Resident and a Maternal-Fetal Medicine faculty member. An opportunity for intense labor and delivery experience with the Night Team is also encouraged. The student will prepare a brief talk on a topic of his/her interest during the course of the rotation. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M45 856 OB/GYN ULTRASOUND-GENETICS

Instructor: *Jeffrey Dicke, M.D.,* 454-8135

The student will learn the principles and techniques of noninvasive screening for fetal disorders, observe the performance of invasive prenatal diagnostic procedures and learn the standards and guidelines for performance of the antepartum obstetrical ultrasound examination and female pelvic examination. The student will also observe specimen preparation in the cytogenetics laboratory and gain experience in pedigree analysis and familial risk factor assessment working with genetic counselors. Opportunities for participation in clinical research are also available. Valid start weeks for two-week blocks are: Weeks 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41 and 43.

Research (M45 900)

Irving Boime, Ph.D., 362-2556

Our laboratory is concerned with the biosynthesis of the gonadotropin hormones in the placenta and pituitary. Specifically, these interests can be divided into two general categories: 1) structure-function studies that deal with the determinants for secretion, sorting and biological activity of these hormones. Such work includes the design of analogs for potential clinical use. and 2) factors governing expression of several placental and pituitary hormone genes. The approaches to these problems involve the use of site-directed mutagenesis and transgenic animals.

Lisa M. Olson, Ph.D., 362-1765

Gene Expression: The student will choose a project in an ongoing study of the differences in gene expression between normal ovarian epithelium and ovarian adenocarcinoma. A number of techniques including PCR, mRNA extraction and DNA sequencing will be utilized.

Yoel Sadovsky, M.D., 362-3223

1. Steroid receptors: We are investigating the mechanism of transcriptional activation by Steroidogenic Factor 1 (SF-1). This 'orphan' nuclear receptor is essential for development of both female and male gonads, and the adrenal glands. 2. Placental injury: In collaboration with Michael Nelson we are studying placental dysfunction in preeclampsia and fetal growth retardation. We presently use molecular approaches to analyze the regulation cyclooxygenase (1 & 2) expression in normal and abnormal placentas.

Frederick Sweet, Ph.D., 362-3174

Estrogens and progesterone control 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. Most recently, new analogs of estrone and estradiol are tested as inhibitors of natural and recombinant estrogen-binding proteins.

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 Molecular Biology and 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.

Frederick Sweet, Ph.D., University of Alberta, 1968.

Professors Emeriti (Clinical)

S. Michael Freiman, M.D., Washington University, 1955.

John E. Hobbs, M.D., Washington University, 1927.

William H. Masters, M.D., University of Rochester, 1943. (See Department of Psychiatry.)

Professors (Clinical)

Robert Burstein, M.D., Washington University, 1948.

Andrew E. Galakatos, M.D., University of Missouri, 1965.

Marvin Rennard, M.D., Washington University, 1952.

Associate Professors Emeriti

Jacques P. Sauvage, M.D., University of Liege, 1957.

George J. L. Wulff Jr., M.D., Washington University, 1933.

Associate Professors

Rita Basuray, Ph.D., University of Illinois, 1983.

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, 1975.

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.

Klaus J. Staisch, M.D., Free University of Berlin, 1966.

Daniel B. Williams, M.D., University of Missouri, 1985.

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)

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.

James A. Bartelsmeyer, M.D., University of Illinois, 1985.

Lisa M. Bernhard, M.D., Louisiana State University, 1985.

Ronald J. Chod, M.D., University of Texas, 1983.

Vincente M. Colon-Alcaraz, M.D., Ponce School of Medicine, 1982.

Ashi R. Daftary, M.D., Washington University, 1986.

Alaa A. Elbendary, M.D., Loyola University, 1989.

Diana L. Gray, M.D., University of Illinois, 1981.

Thomas J. Herzog, M.D., University of Cincinnati, 1986.

William L. Holcomb Jr., M.D., Indiana University, 1975.

Fah Che Leong, M.D., Loyola University, 1989.

Rebecca P. McAlister, M.D., University of Kentucky, 1979.

Dorothea J. Mostello, M.D., The Johns Hopkins University, 1982.

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.

Research Assistant Professor

James L. Thomas, Ph.D., University of Alabama, 1981.

Assistant Professors Emeriti (Clinical)

William Berman, M.D., Washington University, 1935.

Justin F. Kraner, M.D., University of Michigan, 1949.

Willard C. Scrivner, M.D., Washington University, 1930.

J. Leslie Walker, M.D., University of Tennessee, 1960.

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.
Robert J. Brown, M.D., Washington University, 1983.
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.
Cathleen R. Faris, M.D., University of Kansas, 1982.
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.
David J. Levine, M.D., Autonomous University of Guadalajara, 1976.
Carolyn M. Martin, M.D., Washington University, 1976.
Darryl N. McKinney, M.D., Washington University, 1980.
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.
Jerome D. Sachar, M.D., University of Missouri, 1979.
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.
David L. Weinstein, M.D., St. Louis University, 1985.

Instructors

Jan L. Albrecht, M.D., St. Louis University, 1989.
Eyal Anteby, M.D., Hebrew University, 1989.
Anthony Auyeung, M.D., University of Toronto, 1991.
Robert H. Ball, M.D., Oxford University, 1985.
Jane E. Corteville, M.D., Washington University, 1983.
Gilad A. Gross, M.D., St. Louis University, 1992.
Lynn D. Kowalski, M.D., Washington University, 1991.
Carol A. Lennon, M.D., University of Connecticut, 1992.
Kelle H. Moley, M.D., Yale University, 1988.
Jodie Rai, M.D., University of Illinois, 1988.
Valerie S. Ratts, M.D., The Johns Hopkins University, 1987.
Elizabeth M. Swisher, M.D., University of California, San Diego, 1992.

Research Instructor

Roger D. Johnson, Ph.D., University of Tennessee, 1990.

Instructors Emeriti (Clinical)

Theodore Merrims, M.D., Washington University, 1954.
Parker H. Word, M.D., Howard University, 1944.

Instructors (Clinical)

John K. Appelbaum, M.D., Washington University, 1984. (See Health Key Beacon.)
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.
Lawrence V. Boveri, M.D., University of Missouri, Kansas City, 1988.
Jane R. Brady, M.D., George Washington University, 1992.
Christine M. Cernik, M.D., Rush University, 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.
Marsha N. Fisher, M.D., University of Missouri, 1992.
Gordon M. Goldman, M.D., St. Louis University, 1966.
Joseph Hazan, M.D., Ege University, 1971.
Kathleen M. Hogan, M.D., University of Missouri, 1989.
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.
Lauri Klabi, M.D., University of Missouri, 1991.
Richard T. Kubiniec, M.D., St. Louis University, 1992.
Koteswara R. Kunda, M.D., University of Missouri, 1991.
Christine M. Ladd, M.D., University of Missouri, 1990.
Gary G. Lee, D.O., Kirksville College of Osteopathic Medicine, 1976.
Fanee J. Lekkas, M.D., St. Louis University, 1991.
Edward S. Levy, M.D., Washington University, 1991.
Margaret McCarthy, M.D., Washington University, 1988.
Daniel S. McDonald, M.D., University of Missouri, 1989.
Denise A. Meckler, M.D., Ohio State University, 1992.
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, 1975.

Jeffrey S. Mormol, M.D., Washington University, 1991.

Roy P. Neimark, M.D., University of Bologna, 1971.

Gerald Newport, M.D., Washington University, 1953.

Joseph D. O'Keefe, M.D., Washington University, 1950.

Allen S. Palmer, D.O., Kansas City College of Osteopathy, 1967.

Anthony C. Pearlstone, M.D., Washington University, 1985.

Carlton S. Pearse, M.D., Washington University, 1978.

Aaron J. Pile, M.D., Eastern Virginia Medical School, 1983.

Ann Marie S. Rockamann, M.D., St. Louis University, 1991.

Sudha R. Saha, M.D., Calcutta University, 1962.

Kevin B. Schaberg, M.D., Washington University, 1966.

Daniel J. Semenoff, M.D., St. Louis University, 1963.

Robert K. Sigman, M.D., University of Pittsburgh, 1972.

Anita L. Silva, M.D., Creighton University, 1991.

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.

Anna C. Wolaniuk, M.D., Medical Academy of Lodz, 1975.

Willie D. Zoma, M.D., University of Bucharest, 1979.

Instructors (Adjunct)

Mary Lee Barron, F.N.P., University of Missouri, 1986.

Cynthia Bechtel, C.N.M., St. Louis University, 1980.

Cathleen Brethauer, O.G.N.P., University of Maryland, 1981.

Nancy Cibulka, O.G.N.P., University of Wisconsin, 1978.

Patricia Lazaroff, C.N.M., St. Louis University, 1974.

Catherine Williamson, O.G.N.P., Harbor-UCLA Medical Center, 1988.

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 12-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 fundus exam and 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. *Carla Siegfried, M.D., and staff*

THIRD YEAR

M50 740 OPHTHALMOLOGY CLERKSHIP

Instructor: *Carla Siegfried, M.D.,* 362-5722

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, and how to handle an ocular emergency in the emergency room (chemical burns). During this one week, there is again emphasis on the use of the ophthalmoscope, and a problem-solving case history manual is reviewed and studied by the students.

FOURTH YEAR
Electives

M50 801 OPHTHALMOLOGY

Instructor: *Carla Siegfried, M.D.,* 362-5722

Students attend a meeting with Dr. Siegfried and involved faculty from the department. Students may then choose the subspeciality service and period of the rotation:

- Cornea & External Disease (Drs. Pepose and Lubniewski)
- Neuro-ophthalmology (Dr. Hart)
- Retina (Barnes Retina Institute)
- Chief Resident's Service (Dr. Ray Chuck)
- Pediatrics (Drs. Tychsen and Lueder)

Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M50 900)

Usha P. Andley, Ph.D., 362-7167

1) Photobiology of cataract. 2) Molecular biology of prostaglandins in the lens.

Steven Bassnett, Ph.D., 362-1604

Physiology and cell biology of the developing lens; role of tyrosine kinases in terminal differentiation; mouse models of cataract, probing membrane synthetic pathways with viral vectors; mechanisms of presbyopia.

David C. Beebe, Ph.D., 362-1621

1) Expression of the gene for neurofibromatosis type-2 in the lens and its role in cataract formation (confocal microscopy, western blotting, *in situ* hybridization).

2) Homeobox gene expression during early eye development (PCR, *in situ* hybridization, microsurgery).

3) Cytoskeleton-membrane interactions during lens fiber cell differentiation (confocal microscopy, western blotting).

4) Signal transduction through growth factor receptors in early eye formation (western blotting, recombinant retrovirus construction, confocal microscopy).

Nalini S. Bora, Ph.D., 362-1665

1) Immunology, biochemistry and molecular biology of intraocular inflammation. 2) Anterior and intermediate uveitis.

Lucian Del Priore, M.D., Ph.D., 362-3723

Pre-ophthalmology lab elective to introduce student to research in tissue/organ culture and transplantation of RPE.

Thomas A. Ferguson, Ph.D., 362-3745

Regulation of cell death, ocular immunology, immune tolerance, immunobiology of corneal transplantation.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

Timothy P. Fleming, Ph.D., 362-4981
Molecular mechanisms in malignancy, with emphasis on oncogenes in ocular melanoma.

Mae Gordon, Ph.D., 362-3716
1) Multicenter randomized clinical trial to determine if medical treatment of ocular hypertension prevents or delays glaucomatous optic nerve damage. 2) Compliance to medical therapy using unobtrusive electronic monitors. 3) Refinement and quantitation of optic nerve damage. 4) Multicenter epidemiological study of keratoconus.

William Hart, M.D., Ph.D., 362-7162
1) Computer applications in visual fields. 2) Computational image analysis of the ocular fundus.

M. Rosario Hernandez, D.D.S., 747-1448
1) Cell biology of the human optic nerve. 2) Molecular mechanisms of optic nerve degeneration in glaucoma.

Henry J. Kaplan, M.D., 362-3744
1) Immunologic studies of uveitis (anterior uveitis, pars planitis). 2) Retinal transplantation.

David A. Leib, Ph.D., 362-3826
Cloning, sequencing and transcriptional activation assays of genes of herpes simplex virus.

Peter Lukasiewicz, Ph.D., 362-4284
The synaptic basis of visual information processing in vertebrate retina.

Arthur H. Neufeld, Ph.D., 747-1487
1) Ophthalmic pharmacology. 2) Pharmacologic neuroprotection — a) glaucoma, b) macular degeneration.

Jay Pepose, Ph.D., M.D., 362-5895
Ocular inflammation and infection with focus on: 1) Molecular virology, pharmacology and immunology of Herpes Simplex; 2) Cytokines and MHC class II activation in corneal allograft rejection. 3) Ocular manifestations of AIDS.

J. Mark Petrash, Ph.D., 362-1172
1) Molecular biology of cataracts. 2) Structural biology of lens proteins and enzymes.

Nathan Ravi, Ph.D., M.D., 362-1395
Prevention and treatment of diabetic complications: synthesizing drugs as inhibitors of non-enzymatic glycosylation of proteins and DNA.

Carl Romano, Ph.D., 362-2676
1) Glutamate receptors and mechanisms in brain and retina. 2) Retinal excitotoxicity.

Alan Shiels, Ph.D., 362-1637
Molecular genetics of cataract using gene mapping strategies.

P. Michael Stuart, Ph.D., 362-9336
1) Mechanisms of corneal allograft. 2) Role of yersinia superantigens in bacterial-induced connective tissue diseases.

Larry Tychsen, M.D., 454-6026
Pediatric Ophthalmology: Development of eye movements, strabismus and amblyopia; orbital anatomy in children.

Martin Wax, M.D., 362-3305
Glaucoma: Biochemistry and pharmacology of drugs and ciliary epithelial cells.

Faculty

PROFESSOR AND HEAD OF DEPARTMENT

Henry J. Kaplan, M.D., Cornell University, 1968.

Professors Emeriti

Bernard Becker, M.D., Harvard University, 1944.

Robert A. Moses, M.D., University of Maryland, 1942.

Morton E. Smith, M.D., University of Maryland, 1960. (See Department of Pathology.)

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.

Arthur H. Neufeld, Ph.D., New York University, 1970.

Bernard Becker Clinical Professor

Jay S. Pepose, Ph.D., University of California, Los Angeles, 1980; M.D., 1982. (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.

Allan E. Kolker, 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 Professors

Philip L. Custer, M.D., Vanderbilt University, 1978.

Thomas A. Ferguson, Ph.D., University of Cincinnati, 1982. (See Department of Pathology.)

Mae Gordon, Ph.D., University of Wisconsin, 1978. (See Division of Biostatistics.)

M. Rosario Hernandez, D.D.S., University of Chile, 1973.

J. Mark Petrash, Ph.D., University of Texas, Galveston, 1981. (See Department of Genetics.)

Lawrence Tychsen, M.D., Georgetown University, 1979. (See Department of Anatomy and Neurobiology and Department of Pediatrics.)

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)

Neva P. Arribas, M.D., Manila Central University, 1954.

Glen P. Johnston, M.D., Washington University, 1956.

Associate Professors (Clinical)

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.)

Timothy P. Fleming, Ph.D., University of Missouri, 1985. (See Department of Genetics.)

J. William Harbour, M.D., The Johns Hopkins University, 1990.

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.)

Alan Shiels, Ph.D., University of London, 1983.

Carla Siegfried, M.D., University of Missouri, Kansas City, 1989.

Research Assistant Professors

Nalini S. Bora, Ph.D., All India Institute of Medical Science, 1981. (See Department of Pathology.)

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)

Navinkumar 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.

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, Ph.D., Virginia Tech, 1980; M.D., University of Miami, 1988.

Instructors Emeritus (Clinical)

Ruth S. Freedman, M.D., Washington University, 1942.

Maxwell Rachlin, M.D., University of Toronto, 1942.

Mickey L. Salmon, M.D., Louisiana State University, 1959.

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.

Michael S. Korenfeld, M.D., Washington University, 1986.

Donald S. Levy, M.D., Washington University, 1991.

Barry A. Mandell, M.D., Medical College of Virginia, 1987.

Nancy S. Melberg, M.D., The Johns Hopkins University, 1989.

Travis A. Meredith, M.D., The Johns Hopkins University, 1969.

Robert F. Munsch, M.D., St. Louis University, 1977.

Paul F. Nichols, M.D., University of California, 1982.

Mark A. Rothstein, M.D., University of Utah, 1991.

Steven M. Shields, M.D., Washington University, 1986.

Howard N. Short, M.D., St. Louis University, 1978.

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.

Gerald P. Birkmann, O.D., Southern College of Optometry, 1968.

Mark G. Birkmann, O.D., University of Missouri, 1992.

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.

James A. DeClue, O.D., Illinois College of Optometry, 1949.

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.

Lesa 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.

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 five affiliated hospitals. These include Barnes-Jewish Hospital, St. Louis Children's Hospital, Shriners Hospital for Children, Regional Medical Center and the Veterans Administration Medical Center. The orthopaedic activities at Barnes-Jewish Hospital are divided into six services: Shoulder, Elbow and Hand Surgery; Spine Surgery; Sports Medicine; Reconstructive Surgery; Foot and Ankle Surgery; and Orthopaedic Trauma. 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 operative 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, Wednesday and Thursday mornings, 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-Jewish Reconstructive Surgery Service *(Dr. Maloney)*, Barnes-Jewish Trauma Surgery Service *(Dr. Borrelli)*, Barnes-Jewish Hospital North Campus *(Dr. Gilden)*, St. Louis Children's Hospital *(Dr. Bassett)*, Regional Medical Center *(Dr. Perry)* and the Veterans Administration Medical Center *(Dr. Miller)*. Night call, which is optional, is encouraged.

FOURTH YEAR
Electives

M95 840 ORTHOPAEDIC SURGERY

Instructor: *Eric Gordon, M.D.*, 747-2543

This clinical elective is available for four weeks, during which time the student will participate in orthopedic 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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Clerkships are offered on one of seven orthopaedic clinical rotations:

1) Barnes-Jewish Hospital-Upper Extremity (Richard H. Gelberman, M.D., Paul Manske, M.D., and Ken Yamaguchi, M.D.)

2) Barnes-Jewish Hospital-Trauma (Joseph Borrelli, M.D., and Clayton R. Perry, M.D.)

3) Barnes-Jewish Hospital-Reconstructive (William J. Maloney, M.D.)

4) Regional Medical Center (Clayton R. Perry, M.D.)

5) Veterans Administration Medical Center (Gary A. Miller, M.D.)

6) St. Louis Children's Hospital (George S. Bassett, M.D.)

7) Shriners Hospital for Children (Perry L. Schoenecker, M.D.)

Dr. Eric Gordon is the student adviser and course master. Deanna Rickert is the coordinator. Students should call Deanna at 747-2543, ext. 305, to initiate an interview with Dr. Gordon and to register for elective(s).

M95 845 ORTHOPAEDIC HAND AND UPPER EXTREMITY SURGERY ELECTIVE

Instructors: *Ken Yamaguchi, M.D.; Paul Manske, M.D.; Richard H. Gelberman, M.D.* (all: 747-2543)

Clinical elective available for four-week period, during which time the student will work with attending surgeons primarily at Barnes-Jewish Hospital. Activities will include participation in the care of hospitalized inpatients, participation in inpatient and outpatient procedures, attendance at designated attending office hours, attendance at designated orthopaedic conferences and dissection of upper extremity anatomical specimens. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 846 ORTHOPAEDIC TRAUMA ELECTIVE

Instructors: *Clayton Perry, M.D.; Joseph Borrelli, M.D.* (both: 362-4080)

Clinical elective available for a four-week period, during which time the student will work in orthopaedic trauma at Barnes-Jewish Hospital. Activities will include participation in the care of hospitalized inpatients, participation in inpatient and outpatient procedures, attendance at designated orthopaedic conferences and participation in ongoing research projects. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

M95 848 ORTHOPAEDIC (PEDIATRIC) SURGERY ELECTIVE

Instructors: *George S. Bassett, M.D.; Perry Schoenecker, M.D.* (both: 454-6163)

Clinical elective available for four weeks, during which time the student will work with attending surgeons primarily at Shriners and Children's hospitals observing and assisting in outpatient and inpatient care. To be included are activities in the OR, ER and outpatient clinics. Attendance at and participation in the weekly pediatric orthopaedic conference activities is required. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Faculty

FRED C. REYNOLDS PROFESSOR OF ORTHOPAEDIC SURGERY AND HEAD OF DEPARTMENT

Richard H. Gelberman, M.D., University of Tennessee, 1969.

Professor Emeritus

Lee T. Ford, M.D., University of Tennessee, 1940.

Professors

Louis V. Avioli, M.D., Yale University, 1957. (See Department of Medicine.)

Keith H. Bridwell, M.D., Washington University, 1977.

Paul R. Manske, M.D., Washington University, 1964.

Linda J. Sandell, Ph.D., Northwestern University, 1980.

Perry L. Schoenecker, M.D., University of Wisconsin, 1968.

Associate Professors

George S. Bassett, M.D., SUNY, Syracuse, 1976.

Roberto Civitelli, M.D., Siena University, 1980. (See Department of Medicine.)

Jeffrey E. Johnson, M.D., Georgetown University, 1980.

William J. Maloney III, M.D., Columbia University, 1983.

Gary A. Miller, M.D., Jefferson Medical College, 1977.

Clayton R. Perry, M.D., St. Louis University, 1977.

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

Joseph Borrelli Jr., M.D., University of South Florida, 1988.

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.

Kiehyun Daniel Riew, M.D., Case Western Reserve University, 1984.

Robert A. Shively, M.D., University of Illinois, 1969.

Ken D. Yamaguchi, M.D., George Washington University, 1989.

Research Assistant Professor

Jueren Lou, M.D., Kiangi Medical College, 1983.

Instructors

J. Eric Gordon, M.D., University of California, 1988.

Matthew J. Silva, Ph.D., Massachusetts Institute of Technology, 1996.

Rick W. Wright, M.D., University of Missouri, 1988.

Instructor Emeritus (Clinical)

W. Edward Lansche, M.D., Washington University, 1952.

DEPARTMENT OF OTOLARYNGOLOGY

Otolaryngology is presented to students in the second-, third- and fourth-year classes. Clinically oriented lectures and a physical diagnosis workshop are presented to sophomores. In the third year of the medical curriculum, two-week elective rotations on one of the services in East Pavilion, the Veterans Administration Medical Center or St. Louis Children's Hospital are offered. 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.

Fourth-year students who show a special interest may take a 4-6 week 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, neurotology, audiology and middle ear surgery.

The postgraduate program in Otolaryngology at Washington University consists of one year of general surgery and four years of otolaryngology. A two-year research position is offered for two selected candidates from each class. During the clinical years of training, residents rotate on various services, which include the Head and Neck Surgery Service at Barnes-Jewish Hospital, the ENT Clinic, Otology, the Veterans Administration and St. Louis Children's 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 and a two-year rotating core curriculum lecture series throughout the residency. There is also a temporal bone otology course, as well as a head and neck dissection course. Additional conferences include Grand Rounds, Morbidity and Mortality Conference, Journal Club, Otology Conference and Joint Tumor Conference. 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, trauma, otology and neurotology, pediatric otolaryngology including pediatric endoscopy and allergy and endoscopic nasal sinus surgery.

SECOND YEAR

OTOLARYNGOLOGY AND PHYSICAL DIAGNOSIS
Lecturer: *Joel Goebel, M.D.,* 747-0553

Clinically oriented lectures in otolaryngology are given to the entire class. Subjects include ear disease, vertigo, nose, sinus and larynx problems and head and neck cancer.

THIRD YEAR

M55 750 OTOLARYNGOLOGY CLERKSHIP
Instructor: *Joel Goebel, M.D.,* 747-0553

A two-week exposure to otolaryngology outpatient and inpatient management. Emphasis will be on ambulatory care evaluation and decision-making skills.

FOURTH YEAR
Electives

M55 801 OTOLARYNGOLOGY
Instructor: *Joel Goebel, M.D.,* 747-0553

Four-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. Options of rotations on the ENT Service at the Veterans Administration Medical Center and Regional Medical Center are available. Valid start weeks for four-week blocks are: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M55 802 GENERAL OTOLARYNGOLOGY
Instructor: *Joel Goebel, M.D.,* 747-0553

This two-week elective is an extremely flexible program consisting of several options:

General Ear, Nose and Throat Service — Student functions as a junior resident at either Barnes-Jewish, the Veterans Administration Medical Center or Regional Medical Center. At Barnes-Jewish, participation in Clinic, hospital inpatient and operating room settings will expose the student to a broad spectrum of patients. At the Veterans Administration Medical

Center, the emphasis will be on head and neck tumors and at Regional Medical Center more emphasis will be placed on acute care and facial trauma.

Head and Neck Service — Barnes-Jewish Hospital. Student functions as junior resident on ENT hospital floor with great deal of exposure to head and neck surgery.

Pediatric Otolaryngology — St. Louis Children's Hospital. Student participates as a junior resident and is involved in pre- and postoperative surgical care, as well as outpatient medical care.

Preceptorship. Student is assigned to a private practitioner's office, functioning in his office as well as hospital service.

Other options can be entertained and formulated according to the student's particular needs. Students participating in this elective will be required to spend an afternoon or morning in the Audiology/Vestibular Laboratory learning fundamentals of audiological and vestibular evaluation. Attendance at Monday afternoon conferences as well as Grand Rounds on Wednesday mornings is expected. Valid start weeks for two-week blocks are: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41 and 43.

M55 820 PRACTICUM IN ADULT CLINICAL AUDIOLOGY

Instructor: *Michael Valente, Ph.D.,* 362-7489

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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M55 831 NEUROTOLOGY

Instructor: *Joel Goebel, M.D.,* 747-0553

Active student participation in the physical exam, advanced testing and management of patients with balance dysfunction. Attend patient clinic two days per week and test patients on ENG, rotary chair and computerized platform three days a week. Research participation welcome with prior arrangements. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M55 832 OTOLOGY/NEUROTOLOGY/BASE SKULL SURGERY

Instructor: *J. Gail Neely, M.D.,* 362-7344

The students will be active participants in the clinical office and in surgery with Dr. Neely concentrating on medicine and surgery of the ear and skull base in adults and children. They also will have access to and be expected to dissect in the temporal bone surgical dissection laboratory. The hospitals used are Barnes-Jewish and St. Louis Children's and the Veterans Administration Medical Center. Days begin at 7 a.m. and end at 6 p.m. In the evening, students are expected to read voraciously and prepare a study packet on an otologic topic of their choice; this package is to consist of: 1) an annotated OUTLINE, 2) a formal bibliography of KEY ARTICLES, and 3) FACT SHEETS recording the pertinent facts from the articles. During this written exercise, students will be instructed on the use of literature as a research tool, preparation of oral presentations and the anatomy and methodology of publishable articles, and they will tour a peer-reviewed journal office and publishing company. Students will have the opportunity to present their work formally to the resident staff.

The purpose of this elective is to use the milieu of a surgical practice to learn to efficiently identify dangerous and/or correctable lesions affecting the hearing, balance and facial nerve function and to develop experiences and concepts of applied basic and clinical science to the practice of medicine in order to stimulate scientific physicians. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M55 900)

Barbara A. Bohne, Ph.D., 362-7497

Structure and function of the normal and abnormal inner ear. Normal mice and those with various inner-ear mutations are tested functionally by recording auditory evoked potential thresholds to clicks and frequency-specific tone pips. Their ears are then prepared for quantitative evaluation at the light and transmission electron microscopic level. The anatomical data are correlated with functional data. Currently, the following mice are under investigation: one that develops presbycusis at an early age and is very susceptible to noise-induced hearing loss; one with Alport's like syndrome which has a collagen IV defect and develops progressive kidney disease and occasionally sensorineural hearing loss; FGFR3 null, a mouse in which development of its organ of Corti arrests at the newborn stage. Tilted, a mouse that cannot swim because it lacks vestibular otoconia. Other studies utilize noise-exposed chinchillas as a model for humans with severe sensorineural hearing loss. In this case, we are developing strategies to deliver drugs and growth factors directly to the inner ear in an atraumatic fashion. The long-term goal is to stimulate nerve-fiber regeneration in the profoundly deaf ear prior to surgical placement of a cochlear prosthesis.

John M. Fredrickson, M.D., 362-7550

Research into the feasibility of a middle ear implantable hearing aid for patients with severe bilateral "nerve" hearing loss. Students will become familiar with evoked response studies in humans, temporal

bone dissection, interpretation of special CT scanning and the fundamentals of biologically inert implants.

Joel A. Goebel, M.D., 747-0553
Clinical research testing of posture and ocular motor control. Projects include headshake testing of the vestibulo-ocular reflex (VOR), interlaboratory rotary chair studies, dynamic posturography and outcome research in dizzy patients.

Bruce H. Haughey, M.B., Ch.B., 362-0365
Work in progress is investigating the functional results of allotransplantation of the canine hemitongue. Successful recovery has been inhibited in some cases by allograft rejection, despite immunosuppression. Much scope exists for further study of the immunosuppression of tongue tissue and its functional recovery.

Harlan R. Muntz, M.D., 454-6162
Evaluation and treatment methods for disorders of the velopharynx and larynx in children.

J. Gail Neely, M.D., 362-7344
Facial motion analysis laboratory: clinical research application of subtracted digitized image light reflectance. The student(s) will participate in videotaping normal subjects and patients with facial paralysis and synkinesis, in using an unique computer program to analyze dynamic surface deformations during facial expression, and in using spread sheet and statistical applications in order to quantitatively define outcomes during treatments of disorders of the facial nerve.

Steven B. Scholnick, Ph.D., 362-7549
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 towards the development of diagnostic/prognostic tools.

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.)

J. Gail Neely, M.D., University of Oklahoma, 1965.

Colin Painter, Ph.D., University of London, 1969.

Donald G. Sessions, M.D., Washington University, 1962.

Margaret W. Skinner, Ph.D., Washington University, 1976.

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. (Audiology) (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.

David A. Bensinger, D.D.S., St. Louis University, 1948. (Professor of Periodontics)

Harold M. Cutler, M.D., Tufts University, 1937.

Morris Davidson, M.D., Indiana University, 1938.

Professors (Clinical)

Susan E. Mackinnon, M.D., Queen's University, Kingston, Ontario, 1975. (See Department of Surgery and Program in Occupational Therapy.)

Allen Sclaroff, D.D.S., Temple University, 1972.

Professor (Clinical) (Adjunct)

Donald W. Nielsen, Ph.D., Wayne State University, 1968.

Associate Professors

W. Donald Gay, D.D.S. University of Tennessee, 1966.

Joel A. Goebel, M.D., Washington University, 1980.

Bruce H. Haughey, M.B., Ch.B., University of Auckland, 1977.

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.

Steven B. Scholnick, Ph.D., Cornell University, 1982.

Stanley E. Thawley, M.D., University of Texas Medical Branch, 1967.
Michael Valente, Ph.D., University of Illinois, 1975. (Audiology)

Research Associate Professors

A. Maynard Engebretson, D.Sc., Washington University, 1970.
Isolde Thalmann, Ph.D., California Western University, 1982.

Research Associate Professor (Adjunct)

Roanne G. Karzon, Ph.D., Washington University, 1982. (Audiology)

Associate Professor Emeritus (Clinical)

Guerdan Hardy, M.D., Washington University, 1929.

Associate Professors (Clinical)

Samir K. El-Mofty, Ph.D., Temple University, 1975. (See Department of Pathology.)
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

Randall A. Clary, M.D., University of Illinois, 1984. (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.
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.
Mark S. Wallace, M.D., Louisiana State University, 1987.

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)
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.
Lloyd Thompson, M.D., Howard University, 1964.

Assistant Professor (Clinical) (Adjunct)

Margaret G. Peak, Ph.D., Columbia University, 1975. (Audiology)

Instructors

Carl F. Ehrlich, M.D., University of Missouri, 1965.
James W. Forsen Jr., M.D. Washington University, 1988.

Instructors (Clinical)

Marc B. Abrams, D.D.S., University of Missouri, 1972.
Susanna Aceto, D.D.S., University of Nebraska, 1991.
Murray H. Appelbaum, D.M.D., Washington University, 1983.
Ellis M. Arjmand, M.D., Northwestern University, 1987.
Perry J. Bartels, D.D.S., Marquette University, 1991.
Douglas A. Carano, D.D.S., University of Iowa, 1984.
Phadung Chadaratana, M.D., Mahidol University, 1964.
Steven D. Chod, D.D.S., University of Missouri, Kansas City, 1980.
Gene C. Cohen, D.D.S., University of Kansas City, 1975.
Sheldon C. Cohen, D.M.D., Southern Illinois University, 1976.
William Cohen, D.M.D., University of North Carolina, 1991.
J. Michael Conoyer, M.D., Vanderbilt University, 1975.
Richard Davidson, D.M.D., Washington University, 1978.
Tamara K. Ehlert, M.D., University of Wisconsin, 1983.
James A. Fernandez, M.D., St. Louis University, 1981.
Debra F. Fink, D.M.D., Washington University, 1988.
Richard I. Goldberg, D.M.D., Washington University, 1988.
Barry S. Goldenberg, D.M.D., Washington University, 1982.
Slayden H. Harris, D.D.S., University of Tennessee, 1956.
Jay F. Hauser, D.D.S., University of Iowa, 1988.
Lawrence M. Hoffman, D.M.D., Washington University, 1976.
Arnold S. Jacobson, D.M.D., Washington University, 1976.
Eugenia Kardaris, D.D.S., Loyola University Dental School, 1991.
Andrew M. Kim, D.M.D., Washington University, 1984.

June Kleinfeld, D.M.D., Washington University, 1985.
George R. Kletzker, M.D., University of Missouri, 1984.
Kenneth E. Kram, D.M.D., Washington University, 1981.
Michael P. Lillmars, D.D.S., Northwestern University, 1984.
Robert D. Lowe, D.M.D., Washington University, 1982.
Richard Maack, M.D., University of Maryland, 1985.
Marshall S. Manne, D.D.S., Washington University, 1960.
Scott A. McClain, D.D.S., University of Missouri, Kansas City, 1991.
Murray D. McGrady, M.D., University of Illinois, 1986.
John W. McKinney, M.D., University of Missouri, 1979.
Stewart E. Mooreland, D.M.D., Washington University, 1983.
Michael J. Pernoud, D.D.S., University of Missouri, Kansas City, 1975.
Barry A. Polinksy, D.D.S., University of Missouri, Kansas City, 1987.
Julie L. Ring, D.D.S., University of Missouri, Kansas City, 1994.
Robert V. Rivlin, D.M.D., Washington University, 1979.
Harold R. Schreiber, D.D.S., University of Missouri, 1977.
Richard E. Schrick, M.D., University of Missouri, 1977.
Karl E. Shanker, D.D.S., University of Missouri, Kansas City, 1978.
Robert S. Simon, D.D.S., Washington University, 1953.
Jules M. Snitzer, D.D.S., Washington University, 1955.
Herman Turner, D.D.S., Georgetown University, 1951.
Thomas J. Veraldi, D.M.D., Washington University, 1979.
Chan P. Vo, M.D., University of Missouri, 1985.
Calvin H. Weiss, D.D.S., St. Louis University, 1946.
Alan P.K. Wild, M.D., Tulane University, 1983.

Research Instructors

Thomas H. Comegys, B.A., Central Methodist College, 1966.
John E. Demott, M.A., University of Missouri, 1978.

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 Service, *Dr. J. Saffitz*
Graduate Program in Immunology, *Dr. R. Schreiber*
Pathology Course/Course Master, *Dr. E. Crouch*

FIRST YEAR

M30 523 IMMUNOLOGY

Instructors: *Emil Unanue, M.D.,* 362-7440; *Andrey Shaw, M.D.,* 362-4614

The course consists of lectures and laboratory exercises. It covers all aspects of the immune response — general properties of the immune system, effector molecules, cells and their function, cellular interactions and immunological diseases. The Immunology course has a heavy component of biochemistry, genetics and cell biology. Some of the basic concepts from these fields should be reviewed during the course. The five laboratory exercises (not required for non-medical students) consist of five POPS (Patient Oriented Problem-Solving System in Immunology). The POPS consist of workbooks that contain a clinical problem. This clinical problem should be analyzed and solved during the session. For each session students should assemble in groups of four. Each student is given a workbook that contains part of the information. The group should exchange information and together solve the clinical problem. The time period for each exercise will be two to three hours. The first edition of *Cellular and Molecular Immunology* by Abbas, Lichtmand and Pober is used. Handouts will be given for selected lectures to either clarify or expand on the information in the textbook. The exam consists of 50 multiple choice questions on the topics described in the lectures and in the laboratory exercises. Prerequisite: medical student or graduate student status, some background in biochemistry and genetics helpful. Non-medical students register under cross listed course L41 (Bio) 5171 (SPRING ONLY).

SECOND YEAR

M60 665 PATHOLOGY

Instructor: *Erika C. Crouch, Ph.D., M.D.,* 454-8462

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.

THIRD YEAR

CONFERENCES

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 per 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*

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

FOURTH YEAR
Electives

M60 805 AUTOPSY PATHOLOGY

Instructors: *Jeffrey Saffitz, Ph.D., M.D., and staff,* 362-7728

A full-time elective. Students will assist in performing autopsies and participate fully in Autopsy Service activities with the first year house staff under the direction of senior Pathology faculty. Students will be encouraged to learn as much gross pathology as possible and will participate in brain cutting, specialty microscopic conferences and weekly autopsy case conferences. Valid start weeks for four-week blocks are: Weeks 1, 13, 17, 21, 25, 29, 33, 37 and 41.

M60 815 OB-GYN PATHOLOGY SUBINTERNSHIP

Instructor: *Deborah Gersell, M.D.,* 362-0115

The elective stresses the principles of anatomic pathology when applied to operative material in Obstetrics and Gynecology. The subintern will examine gross and microscopic specimens in the Ob-Gyn Pathology Lab and review pertinent literature with a senior pathologist. Ample time will be available for attending regular conferences in Ob-Gyn and Pathology. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M60 820 SURGICAL PATHOLOGY — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructors: *Louis Dehner, M.D., and surgical pathology staff,* 362-0150

Surgical Pathology offers an elective for a four-week period under Surgical Pathology I. Students participate fully in activities of the Division of Surgical Pathology and 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 faculty, surgical and medical grand rounds, and a variety of subspecialty conferences in which the division participates. In addition, Surgical Pathology II includes rotations through selected subspecialties: Neuropathology, Hematopathology, Dermatopathology, ENT Pathology and Gynecologic Pathology. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M60 825 INTRODUCTION TO NEUROPATHOLOGY

Instructor: *Steven Carroll, Ph.D., M.D.,* 362-9130

The course is structured to give the student a full-time immersion in the specialty of Neuropathology. There are daily didactic sessions which cover the spectrum of neurological diseases, review neuroanatomy, discuss approaches to the diagnosis of nervous system disease and point out the interrelationships of research to clinical problems. Multiple clinical conferences and diagnostic working sessions complement the reading and project work. Time 35-40 hrs./week. Valid start weeks for four-week blocks are: Weeks 13, 17, 21, 29, 33, 37 and 41.

M60 841 PEDIATRIC PATHOLOGY

Instructor: *Frances V. White, M.D.,* 362-0147

This four-week elective offers an experience in Pediatric Pathology involving material from both the Pediatric Autopsy Service and the Division of Surgical Pathology based on cases from St. Louis Children's and Barnes-Jewish hospitals. In Surgical Pathology, students will have the opportunity to review current cases with senior staff. They will assist residents on the Pediatric Autopsy Service with gross and microscopic diagnosis under supervision of senior staff. Conferences, slide review and possible independent research projects are included. Valid start weeks for this rotation should be arranged with Dr. White.

M60 850 SURGICAL PATHOLOGY — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructors: *Steven Teitelbaum, M.D., and staff,* 454-8463

This elective is designed to acquaint the 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 per period in order to permit maximum interaction with the Surgical Pathology staff and house staff. During the course of the elective, the student will be taught to function as junior house staff. The student will participate in the examination and dissection of gross specimens, observe frozen section diagnosis and formulate histopathological diagnoses, all in conjunction with residents and members of the senior staff. Since the Laboratory of Surgical Pathology 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, Surgery and Radiology as well as for those who intend to enter the field of Pathology. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M60 860 CLINICAL LABORATORY MEDICINE — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructor: *Joseph Miletich, M.D., Ph.D.,* 362-3110

This 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. The four-week elective includes rotations through laboratories in Clinical Chemistry, Clinical Microbiology, DNA-based Diagnostics, Hematology, Coagulation, Clinical Immunology, Histocompatibility and Blood Bank.

During the elective, the student will have a carefully planned daily schedule which includes regular didactic sessions with senior staff and house staff. Particularly useful clinical skills to be acquired include analysis of peripheral blood smears and coagulation tests, interpretation of cardiac enzyme and serum protein electrophoresis patterns, and appropriate use of blood component therapy. Students will be given the opportunity to present and lead case discussions during this elective. Valid start weeks for four-week blocks are: Weeks 13, 17, 21, 29 and 33.

M25 883 TRANSFUSION MEDICINE

Instructor: *Lawrence T. Goodnough, M.D.*, 362-1546

This elective is designed to introduce the student to the clinical aspects of blood banking and interventional hematology. The four-week elective will consist of regular didactic sessions with senior staff, teaching conferences, participation in daily clinical rounds and exposure to developing programs. The student will develop clinical skills in areas related to transfusion practice, blood conservation and evaluation of transfusion reactions. Complex hematologic diseases such as the coagulopathies and diseases that require apheresis will serve to instruct in current clinical practice along with future indications for application of interventional hematology, such as photopheresis and peripheral stem cell harvest for marrow transplantation. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

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.

L41 (BIO) 5051 FOUNDATIONS IN IMMUNOLOGY

L41 (BIO) 5171 MEDICAL IMMUNOLOGY

L41 (BIO) 5261 MOLECULAR MECHANISMS OF DISEASE

L41 (BIO) 5272 ADVANCED TOPICS IN MOLECULAR IMMUNOLOGY

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

Research (M60 900)

Cross listed with L41 (Bio) 590

Paul M. Allen, Ph.D., 362-8758
Research in immunology. The processing and presentation of self proteins and their relationship to self-tolerance and autoimmunity.

Jacques U. Baenziger, M.D., Ph.D., 362-8730
Glycobiology; informational role of carbohydrates in protein targeting and reproductive endocrinology.

Steven L. Carroll, Ph.D., M.D., 362-9130
The focus of research in our laboratory is the role of the neuregulin family of growth and differentiation factors in Schwann cell neoplasia and regeneration in the injured nervous system.

Erika C. Crouch, Ph. D., M.D., 454-8462
Investigations relating to the Surfactant Protein D (SP-D) — a collagenous, carbohydrate binding protein that has been implicated in the innate pulmonary host defense against a wide variety of important bacterial, fungal, and viral pathogens. Transcriptional regulation of SP-D gene expression. Protein mutagenesis to examine the structural requirements for assembly, secretion and biologic activity.

Jonathan D. Katz, Ph.D., 747-1221
The genesis and pathogenesis of autoreactive T cells in insulin-dependent diabetes mellitus. Issues of T cell selection, tolerance, activation and control and the etiology of autoimmune diabetes using cellular and molecular approaches.

George S. Kobayashi, Ph.D., 362-3186
Biochemical studies of the control of cellular differentiation of the medically important systemic mycotic agents, in particular *Histoplasma capsulatum*, are being carried out in the division. In the conversion of the unicellular (yeast like) to multicellular (mold) and reverse systems, the changes caused by environmental stimuli can be followed and the relationships between induction, the biochemical change and morphological differentiation can be established. The opportunity to participate in studies of this phenomenon are available by an arrangement as an elective for one student for a period of 18 weeks.

Jack Ladenson, Ph.D., 362-3186
Development and use of single chain monoclonal antibodies for research and clinical assays.

Robinna G. Lorenz, M.D., Ph.D., 362-3669
The focus of research in our laboratory is the cellular and molecular immunology of the gastrointestinal tract. The research focuses on the mechanisms which allow microorganisms and foreign proteins to initiate an immune response, while similar oral exposure to commensal microorganisms and food proteins results in tolerance. One area of our research focuses on a specialized epithelial transport

cell, the M cell, which is thought to play a key role in achieving mucosal immunity to luminal antigens. Our second area of interest is oral tolerance. The cells involved in the induction of tolerance, as well as the molecular mechanisms, are currently under investigation.

Douglas Lublin, Ph.D., M.D., 362-8849
My laboratory is investigating membrane proteins that are modified by attachment of lipids. The role of the lipid is studied by biochemical, cellular and molecular biological approaches.

Michael McDaniel, Ph.D., 362-7435
The focus of this laboratory is to identify cellular mechanisms responsible for destruction of the pancreatic B-cell associated with insulin-dependent diabetes mellitus (IDDM) with emphasis on inflammatory cytokines and the free radical nitric oxide and the identification of signal transduction mechanisms which mediate abnormal insulin secretory responses associated with non-insulin-dependent diabetes mellitus (IDDM).

Daniel W. McKeel Jr., M.D., 362-7421
This laboratory is investigating the pathogenesis and neuropathology of Alzheimer's and other dementias in relation to normal aging. There is close collaboration with the Memory and Aging Project (MAP) research team and the Laboratory of Neuroimaging (LONI). Emphasis is on mapping the distribution and severity of early lesions and the derivation of neuritic plaques and neurofibrillary tangles, and defining their relationship to cerebrovascular amyloid and cytoskeletal components.

Current research focuses on developing silver stains and immunochemical probes to assist computer imaging and quantification of plaques, tangles and neurons. Projects include: 1) lesion quantification in brains of the very aged (over 80 years), 2) correlation of lesion severity with precise clinical measurements of cognitive deficits, 3) interactive and automated computer-assisted quantification of neuritic plaque sybtypes, and 4) a multicenter study (CERAD) to validate pathologic criteria for diagnosing Alzheimer's disease.

Jeffrey D. Milbrandt, M.D., Ph.D., 362-4650
We are interested in a subset of genes, termed immediate-early genes, that are rapidly activated by a variety of extracellular stimuli including exposure to growth factors, membrane depolarization such as occurs during neuronal activity, or physiologic stress such as seizure, nerve injury, hypotension or exposure to endotoxin. Many of these genes, including those we have identified (NGFI-A, NGFI-B, NGFI-C), encode transcription factors which presumably guide the cellular responses to environmental change. Understanding the biological function of these proteins within the context of the nervous system is now being pursued via mutagenesis experiments and, by determining their expression patterns in fetal and adult rats, both before and after stress or injury. The phenotype of transgenic mice containing either loss-of-function mutations of these genes or inappropriately high expression of these proteins is now being examined.

Joseph P. Miletich, M.D., Ph.D., 362-3110
Of all the proteins involved in blood coagulation, factor X is most centrally positioned for regulation. More than a dozen other plasma proteins can interact with factor X to effect its activation, local concentration, activity or inhibition. We are systematically studying the regions of the factor X molecule that mediate these interactions using a variety of traditional and novel cellular and molecular biological approaches, with particular emphasis on expression of recombinant proteins. The long-term goal is a better understanding of how coagulation is normally regulated and what goes wrong when clots form that block blood flow.

Curtis A. Parvin, Ph.D., 362-8849
The analytical techniques and theoretical concepts underlying the field of medical decision analysis are investigated. Critical review of the literature is combined with microcomputer application of the techniques to medical problems of interest.

Kevin A. Roth, M.D., Ph.D., 362-7449
The regulation of neuronal death during development and neuropathological conditions.

Jeffrey E. Saffitz, Ph.D., M.D., 362-7728
The goals of our research are to elucidate mechanisms of sudden cardiac death and, ultimately, to develop novel therapies to prevent lethal arrhythmias. Our research is focused on characterization of structural and molecular determinants of intercellular coupling in the normal and diseased heart and elucidation of the role of deranged intercellular coupling at gap junctions in the pathogenesis of sudden cardiac death. We have shown that gap junctions interconnecting mammalian cardiac myocytes contain channels made of three distinct proteins (connexins) that have unique functional properties. Diverse structural and molecular features of intercellular coupling appear to determine the special electrophysiological properties of atrial and ventricular myocardium. Our current research efforts involve the use of genetically altered mice to understand the functional roles of specific connexin gene products and to elucidate cellular and molecular mechanisms underlying remodeling of intercellular connections in the diseased heart that may predispose to the development of lethal ventricular arrhythmias. We take advantage of multiple experimental techniques including the production of new genetically altered mouse models, cellular and tissue electrophysiology, general molecular biological analyses of gene expression, and quantitative morphometric methods involving confocal immunofluorescence microscopy, electron microscopy, and three-dimensional reconstructions of the microscopic structure of myocardium as it pertains to impulse propagation.

Samuel Santoro, M.D., Ph.D., 362-8849
Research is aimed at defining the molecular mechanisms of cell-cell and cell-substrate adhesion. Investigations are centered on the structure, function and regulation of adhesion receptor molecules in platelet function, development and malignancy.

Robert E. Schmidt, M.D., Ph.D, 362-7429
Areas of research interest in this laboratory include: 1) the development and characterization of an experimental model of diabetic autonomic neuropathy in streptozotocin diabetic rats; 2) human sympathetic nervous system in aging and diabetes; 3) susceptibility of subpopulations of sympathetic neurons to experimental injury; and 4) the response of axoplasmic transport to experimental injury, particularly the reversal of the polarity of axonal transport at the site of mechanical injury.

Robert D. Schreiber, Ph.D., 362-8747
Research on the biochemistry and biology of cytokines and their receptors. Our current work focuses on defining the structure-function relationships that are operative within the receptors for interferon-gamma and tumor necrosis factor, elucidating the molecular interactions that underlie signaling through these receptors and exploring the functional defects displayed by mice which have been engineered to express genetic deficiencies in specific signaling components utilized by these receptor systems. These issues are being studied using models of innate and specific resistance to microbial pathogens and tumors.

Andrey S. Shaw, M.D., 362-4614
Signal transduction in lymphocytes.

Carl H. Smith, M.D., 454-6029
Placental transport and surface membrane structure and function.

Steven Teitelbaum, M.D., 454-8463
Cellular and molecular mechanisms of osteoclastic bone resorption. Our laboratory focuses on the means by which osteoclasts develop from macrophage precursors and express their resorptive apparatus, including polarization, proton pump expression and cytokine and steroid regulation of integrins essential to bone recognition. In addition to a series of *in vitro* systems of osteoclast development and function, we have in hand a series of *in vivo* models of osteoporosis, osteopetrosis and skeletal metastasis, each of which facilitates our understanding of how osteoclasts perform in health and disease.

Matthew L. Thomas, Ph.D., 362-8722
Biochemical and genetic analysis of leukocyte activation and adhesion.

John Turk, M.D., Ph.D., 362-8190
Lipid mediators and insulin secretion. The role of phospholipid hydrolysis and the enzymes mediating this process in glucose-induced insulin secretion are under study. Islets from rats and humans express at least four distinct phospholipase A2 enzymes, including a novel Ca^{2+}-independent enzyme which we have recently cloned from an islet cDNA library, and each enzyme is believed to play a distinct role in the secretory process.

Emil R. Unanue, M.D., 362-7440
Research in immunobiology/immunopathology. Examination of cellular interactions resulting in immune induction and cellular immunity. Emphasis is placed on the studies on the cell biology of macrophage and of lymphocyte activation, on the role of macrophages in promoting growth and differentiation of lymphocytes and on the biochemistry of protein handling. These cellular interactions are being studied in normal and infectious processes and in autoimmune diseases.

Joseph R. Williamson, M.D., 362-7297
Research on vascular metabolism, function and structure in diabetes. Current emphasis is focused on elucidating the nature of glucose-induced metabolic imbalances, glycoxidation and free radicals that initiate early vascular functional and structural changes linked to end-stage vascular disease and organ failure. These studies are performed in the retina, peripheral nerve, large vessels and kidney and in several animal models of diabetes.

Terry A. Woodford-Thomas, Ph.D., 362-8768
Molecular and genetic studies on the role of specific protein tyrosine phosphatases in cell proliferation and differentiation, with special emphasis on lymphopoiesis and lymphocyte maturation.

Mary M. Zutter, M.D., 362-0114
Division of Anatomic Pathology. Our laboratory focuses on the role and regulation of the $\alpha_2\beta_1$ integrin in normal development and in breast cancer biology using *in vitro* and *in vivo* models of hematopoiesis and breast epithelial differentiation and tumorigenesis.

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.)

Erika 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.

Lawrence T. Goodnough, M.D., University of Pennsylvania, 1975. (See Department of Medicine.)

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 Departments of Medicine and 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 Departments 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.)

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.

Wayne M. Yokoyama, M.D., University of Hawaii, 1978. (See Department of Medicine.)

Professor (Clinical)

Richard Torack, M.D., Georgetown University, 1952.

Associate Professors

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. (See Department of Otolaryngology.)

Thomas A. Ferguson, Ph.D., University of Cincinnati, 1982. (See Department of Ophthalmology and Visual Sciences.)

Jonathan D. Gitlin, M.D., University of Pittsburgh, 1978. (See Department of Pediatrics.)

Peter A. Humphrey, M.D., Ph.D., University of Kansas, 1984.

Osami Kanagawa, M.D., Okayama University, 1974; Ph.D., 1978. (See Department of Medicine.)

Michael R. Lieber, Ph.D., The University of Chicago, 1981; M.D., 1983. (See Department of Medicine and Department of Biochemistry and Molecular Biophysics.)

Douglas M. Lublin, Ph.D., Stanford University, 1976; M.D., University of California, Los Angeles, 1982. (See Department of Medicine.)

Daniel W. McKeel Jr., M.D., University of Virginia, 1966.

Kenneth M. Murphy, Ph.D., The Johns Hopkins University, 1982, M.D., 1984.

Jay S. Pepose, Ph.D., University of California, 1980; M.D., 1982. (See Department of Ophthalmology 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.

Andrey S. Shaw, M.D., Columbia University, 1984.

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 Molecular Microbiology.)

Mary M. Zutter, M.D., Tulane University, 1981.

Research Associate Professors

Frederick P. Ross, Ph.D., University of Warwick, 1976.

Barbara A. Zehnbauer, Ph.D., The University of Chicago, 1979. (See Department of Pediatrics.)

Associate Professor (Clinical)

Steven L. Leary, D.V.M., Iowa State University, 1971. (Also 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.

Larry E. Fields, M.D., Harvard University, 1980. (See Department of Medicine.)

Jonathan M. Green, M.D., Wayne State University, 1986. (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.

Daniel C. Link, M.D., University of Wisconsin, 1985. (See Department of Medicine.)

Robinna G. Lorenz, M.D., Ph.D., Washington University, 1990. (See Department of Medicine.)

Craig A. MacArthur, M.D., Ph.D., Washington University, 1987. (See Department of Pediatrics.)

Hector D. Molina-Vicenty, M.D., University of Puerto Rico, 1985. (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 Departments of Medicine and Molecular Microbiology.)

Jon R. Ritter, M.D., University of Minnesota, 1988.

Stacy C. Smith, M.D., University of California, 1986. (See Department of Medicine.)

Herbert W. Virgin IV, M.D., Ph.D., Harvard University, 1985. (See Departments of Medicine and Molecular Microbiology.)

Frances V. White, M.D., University of North Carolina, 1978.

Xiao-Feng S. Zheng, Ph.D., Harvard University, 1993.

Research Assistant Professors

Nalini S. Bora, Ph.D., All India Institute of Medical Science, 1981. (See Department of Ophthalmology and Visual Sciences.)

Kathleen C. Sheehan, Ph.D., St. Louis University, 1986.

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

Ann M. Gronowski, Ph.D., University of Wisconsin, 1992.

Madeline D. Kraus, M.D., Washington University, 1991.

Anne C. Lind, M.D., Creighton University, 1989.

Mitchell R. Ryan, M.D., Oregon Health Sciences University, 1990.

Mark A. Watson, M.D., Ph.D., Washington University, 1992.

Research Instructors

Katherine C. Chang, Ph.D., University of Iowa, 1974.

Dorothy J. Fiete, B.S., Marymount College, 1966.

Yvonne Landt, M.S., University of Illinois, 1972.

Theresa L. Murphy, Ph.D., The Johns Hopkins University, 1983.

Michael W. Olszowy, Ph.D., University of Pittsburgh, 1992.

Karen E. Weck, M.D., Duke University, 1988.

Mariana M. Yaneva, Ph.D., Institute of Molecular Biology, Bulgaria, 1978.

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-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

M65 760 PEDIATRIC CLERKSHIP

Instructors: *Kathleen McGann, M.D.; Angela Sharkey, M.D.* (both: 454-6299)

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 physician, 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, and 7) pediatric research conferences. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

FOURTH YEAR
Electives

M65 802 GENERAL CLINICAL PEDIATRICS — ST. LOUIS CHILDREN'S HOSPITAL

Instructors: *Alan Schwartz, Ph.D., M.D., James Keating, M.D.; Kathleen McGann, M.D.; Angela Sharkey, M.D.* (all: 454-6005 or 454-6006)

The student will be assigned patients on a General Pediatric Division for initial evaluation and continuing care. The student works as an extern and is expected to take 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 the management of many pediatric medical conditions, including a wide variety of infectious disease, failure to thrive, acute asthma, poisoning, immune deficiency diseases and gastrointestinal disorders. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 808 PEDIATRIC ASTHMA AND ALLERGY

Instructors: *Thomas F. Smith, M.D.; Robert Strunk, M.D.* (both: 454-2694)

This elective provides outpatient experience in the assessment and treatment of children with asthma, allergic diseases (including allergic rhinitis, food allergies, and allergies to drugs and vaccines) and common chronic respiratory diseases and complaints (such as sinusitis, chronic cough and exercise-induced dyspnea). Emphasis will be on direct patient contact, physical exam, appropriate use and interpretation of diagnostic testing, therapeutic alternatives, and evaluation of response to treatment. Weekly divisional conferences provide additional learning opportunities. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 811 PEDIATRIC CRITICAL CARE MEDICINE

Instructor: *J. Julio Pérez Fontán, M.D.*, 454-2527

This elective is designed to familiarize the student with the diagnosis and treatment of critical illness in infants and children. To this end, each student is made responsible for a small number of assigned cases under the direct supervision of pediatric residents, pediatric critical care fellows and faculty. The teaching activities emphasize the understanding of pathophysiological processes that lead to respiratory, cardiocirculatory and central nervous system dysfunction and their therapy in the developing subject. Students are expected to participate in all the daily activities of the Pediatric Intensive Care Unit at St. Louis Children's Hospital and be on occasional call after hours. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 813 PEDIATRIC CARDIAC CATHETERIZATION

Instructor: *David Balzer, M.D.*, 454-6095

This elective focuses on interpretation of hemodynamic and angiographic data acquired in the cardiac catheterization laboratory. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 818 PEDIATRIC CARDIOLOGY — INPATIENT SERVICE

Instructors: *Arnold Strauss, M.D.; Angela Sharkey, M.D.; Charles E. Canter, M.D.; Mark Johnson, M.D.; David Balzer, M.D.* (all: 454-6095)

The student works as a subintern and is assigned selected patients on the Pediatric Cardiology ward. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 819 PEDIATRIC CARDIOLOGY — OUTPATIENT SERVICE

Instructors: *Arnold Strauss, M.D.; Angela Sharkey, M.D.; Charles E. Canter, M.D.; Mark Johnson, M.D.; David Balzer, M.D.* (all: 454-6095)

The student will see patients attending all of the outpatient clinics including both new referrals and follow-up visits. The student also will be responsible for the interpretation of electrocardiograms and 24-hour Holter monitor examinations performed in the cardiology noninvasive laboratory. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 825 CLINICAL GENETICS

Instructors: *S. Bruce Dowton, M.D. (Syd.); David Gutmann, Ph.D., M.D.; Anne V. Hing, M.D.; Michael S. Watson, Ph.D.; Alison Whelan, M.D.; Barbara Zehnbauer, Ph.D.* (all: 454-6093)

Students will be exposed to a broad variety of clinical problems encountered in the Division of Medical Genetics. Patients will be seen during the 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, and 3) integration of diagnostic laboratory and radiographic studies with clinical information in genetic diseases. Students will participate in multiple didactic sessions conducted each week. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 835 PEDIATRIC IMMUNOLOGY AND RHEUMATOLOGY

Instructors: *Talal Chatila, M.D.; Jonathan Gitlin, M.D.; Catherine Tripp, M.D., Ph.D.* (all: 454-6124)

Opportunities are available to care for pediatric patients with a variety of immunologic and rheumatologic disorders. Students will see children in outpatient clinic and inpatient consultation. An in-depth approach to evaluating disorders of the immunologic system will be provided. Students also will participate in evaluation of new patients with rheumatologic disease at Shriners Hospital JRA clinic. Students may elect to participate in conferences and seminars. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 840 PEDIATRIC INFECTIOUS DISEASES

Instructors: *Penelope Shackelford, M.D.; Irene Graham, M.D.; Gregory Storch, M.D.; Joseph W. St. Geme, M.D.; Kathleen McGann, M.D.; David Haslam, M.D..; Neal Middelkamp, M.D.; Margaret MacDonald, M.D., Ph.D.* (all: 454-6050)

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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 841 CARE OF THE HIV-INFECTED PATIENT

Instructors: *Kathleen McGann, M.D.; Victoria Fraser, M.D; Gregory Storch, M.D. and staff* (all: 454-6050)

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 Children's Hospital and Barnes-Jewish Hospital. Specifically, they will rotate through the joint Maternal-Child clinic. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 845 PEDIATRIC EMERGENCY MEDICINE

Instructor: *David M. Jaffe, M.D.*, 454-2341

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 and fever.

Students will work either a day shift (7:30 a.m.-3:30 p.m.) or an evening shift (3:30 p.m.-11:00 p.m.) in rotation. Daily teaching conferences are provided by the attending staff. A weekly meeting of the students and senior faculty will occur to review interesting cases. Also, attending staff and senior pediatric residents provide 24-hour, on-site supervision. Each medical student will be asked to prepare a 30-minute presentation on a topic of his/her choosing. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 850 PEDIATRIC ENDOCRINOLOGY AND METABOLISM

Instructors: *Julio V. Santiago, M.D.; Sherida E. Tollefsen, M.D.; Neil H. White, M.D.; Stuart Kupfer, M.D; Abby Hollander, M.D.; Bess Marshall, M.D.* (all: 454-6051)

This elective is designed to include broad clinical experience in pediatric endocrinology and diabetes. The student will have an opportunity to evaluate both patients admitted to Children's Hospital and patients referred for consultation in our three outpatient clinics each week. In addition to a divisional conference to review referred patients, several joint conferences with the adult Endocrinology and Metabolism Division (clinical rounds, journal club/research seminar, case conference) are held weekly. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 851 CLINICAL PEDIATRIC GI ELECTIVE

Instructor: *Jean Pappas Molleston, M.D.,* 454-6173

Opportunities to learn about inpatient pediatric GI, hepatology and nutrition are many. Time is also spent participating in endoscopic procedures. Outpatient GI clinic exposes students to ambulatory subspecialty pediatrics. Clinical research projects are also open for participation. This rotation encompasses a wide variety of pediatric experiences. Valid start weeks for 4-week blocks are: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 852 CLINICAL PEDIATRIC PULMONARY MEDICINE

Instructors: *Robert C. Strunk, M.D.; Alan H. Cohen, M.D.; James S. Kemp, M.D.; George B. Mallory Jr., M.D.; Thomas F. Smith, M.D.; Stuart C. Sweet, M.D., Ph.D.,* (all: 454-2694)

This elective provides an opportunity for students to be exposed to the full scope of respiratory diseases in infants and children. Pediatric referrals will be seen in both an inpatient and outpatient setting. Goals include: 1) to learn the importance of the physical exam using inspection, percussion and auscultation; 2) indications and interpretation of diagnostic tests such as CXR, pulmonary functions, bronchoscopy with biopsy and lavage; 3) therapeutic interventions and the use of bronchodilators, anti-inflammatory agents, et al. Unique aspects of this rotation include a broad exposure to children with congenital lung defects, life-threatening asthma, cystic fibrosis and end-stage cardiopulmonary diseases referred for transplantation. Weekly didactic sessions, as well as weekly divisional patient care sections, are an opportunity to further learn and practice presentational skills. Valid start weeks for 4-week blocks are: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 861 NEWBORN MEDICINE

Instructor: *F. Sessions Cole, M.D.,* 454-6148

The goal of this course is to provide students with responsibility for caring for newborn infants who range from normal to acutely ill to chronically ill, as well as for 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 required.

Students during each rotation will be assigned to the special care nursery at St. Louis Children's Hospital and to the labor and delivery services at Barnes-Jewish Hospital. Students assigned to the 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 fourth night. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 875 PEDIATRIC RENAL DISEASE

Instructors: *Barbara R. Cole, M.D.; Anne M. Beck, M.D.; S. Paul Hmiel, M.D., Ph.D.* (all: 454-6043)

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 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 he or she 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, including renal attending rounds, renal research rounds and journal clubs which are conducted weekly in conjunction with the renal divisions of

Barnes-Jewish Hospital. Renal biopsy material is reviewed with the renal pathologists. Attendance at the weekly pediatric grand rounds and pediatric case conferences is encouraged. The student will be required to present one or two in-depth reviews in areas of interest. Valid start weeks for four-week blocks are: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M65 876 PEDIATRIC LUNG TRANSPLANTATION

Instructors: *Alan H. Cohen, M.D.; George B. Mallory Jr., M.D.; Stuart C. Sweet, M.D., Ph.D.* (all: 454-2694)

St. Louis Children's Hospital has the largest pediatric lung transplant program in North America. This unique clinical rotation will enable students to be exposed to the process of transplantation from referral and listing to the actual surgery and postoperative care. Both inpatient and twice-weekly outpatient clinics will be available for participation and learning. The use of diagnostic tests, such as flexible fiber-optic bronchoscopy with biopsies, the histopathology of infection and graft rejection, and the complexities of immunosuppression will all be explored. Weekly transplant meetings with our multidisciplinary team, as well as didactic/psychosocial and ethical and divisional care meetings will all be available. Our patient referral base is worldwide, and the primary cardiopulmonary disease states include: cystic fibrosis, pulmonary hypertension, complex congenital heart defects and alveolar proteinosis. Valid start weeks for 4-week blocks are: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M25 831 PEDIATRIC DERMATOLOGY

Instructor: *Susan Mallory, M.D.,* 454-2714

This clinical rotation will be available to students interested in dermatology and/or pediatrics. Students will follow the dermatology rotation (M25 830) with an emphasis on pediatric dermatology by attending pediatric dermatology clinics and seeing consults. Enthusiastic students will have an opportunity to write up a case report if they wish. Students can take either this elective or M25 830 — not both. Valid start weeks for four-week blocks are: Weeks 17, 21, 25, 29, 33 and 37.

M80 870 CLERKSHIP IN PRIMARY CARE IN GENERAL PEDIATRICS

Instructors: *Paul Simons, M.D.; Jay Epstein, M.D.* (both: 535-7855)

The Clerkship in Primary Care in General Pediatrics is designed to provide the student with firsthand experience in general pediatric practice in a model ambulatory care setting at the Health Key Beacon office on the medical campus. The major component of the clerkship is direct patient care under the supervision of the senior physicians who are members of the group. The Health Key Beacon is a group practice caring for managed care and commercial insurance patients in a number of offices in the metropolitan area, including an office on the medical school campus.

Students will join individual pediatricians as colleagues caring for pediatric patients under supervision. The broad spectrum of general ambulatory pediatrics including behaviorally developmental, preventive medicine and acute care aspects of pediatric practice will be emphasized. 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 broad-based population receiving care through different insurance systems. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M65 900)

Anne M. Beck, M.D., 454-6043

Studies of the treatment of hypercalciuria and dialysis in children are the foci of research.

Eric C. Beyer, Ph.D., M.D., 454-6128

Current laboratory investigation is aimed at understanding the cell biology of intercellular communication. Molecular and biochemical approaches are used to examine the structure and function of gap junction channel proteins.

Charles E. Canter, M.D., 454-6095

Clinical studies on cardiac transplantation in infants and children.

Barbara R. Cole, M.D., 454-6043

Clinical interests include glomerular and tubular function in patients with solid organ transplants receiving cyclosporine and other immunosuppressives and studies of hypertension in children.

F. Sessions Cole, M.D., 454-6148

Using population-based databases, investigation priorities include: 1) impact of surfactant replacement therapy on racial disparities in infant mortality, and 2) the molecular epidemiology of surfactant protein B deficiency.

Michael W. Crossman, Ph.D., M.D., 454-4077

Developmental regulation of enterohepatic circulation. Investigative efforts are aimed at understanding the development and regulation of enterohepatic circulation. Cell and molecular biological approaches, including transgenic and knockout mouse technologies, are employed to dissect the functional and regulatory elements associated with transport processes that facilitate enterohepatic circulation.

Michael R. DeBaun, M.D., M.P.H., 454-6128

Dr. DeBaun is the principal investigator of the Pediatric Oncology Group at Washington University. As such, he is responsible for the organization and execution of more than 100 protocol studies at 36 major medical centers plus 24 affiliate institutions in the United States, Canada and Europe, and more than 700 investigators who care for children with cancer. Additional research interests include:

1) clinical investigation of the natural history of stroke in sickle cell disease and 2) genotype/phenotype analysis in pediatric overgrowth syndromes associated with cancer.

Irene L. Graham, M.D., 454-6050
The role of integrin CD11b/CD18 (CR3) in neutrophil activation. Activated neutrophils are important for host defense, but also are responsible for significant tissue damage and inflammatory sites. Blockade of CR3 function prevents neutrophil-mediated tissue damage. We are studying signal transduction via CR3, focusing on the regulation of tyrosine phosphorylation in both primary cells and transfected cell lines.

Brian Hackett, Ph.D., M.D., 454-6231
Molecular biology of lung development. Research focuses on the molecular regulation of pulmonary epithelial differentiation. Areas of interest include the use of molecular markers for all lineage analysis and the role of forkhead transcription factors in pulmonary epithelial differentiation.

Aaron Hamvas, M.D., 454-6148
Clinical research interests are: 1) the clinical and molecular epidemiology of Surfactant Protein B deficiency; 2) the identification, evaluation and treatment of newborns with genetic lung disease and 3) improving care delivery to newborns in the intensive care environment.

Sherrie M. Hauft, M.D., 454-4007
Molecular biology of intestinal epithelial development and functional maturation. Studies focus on understanding: 1) the dynamics of epithelial cell migration and renewal during normal development and injury repair; and 2) regulation of developmental stage-specific patterns of gene expression.

Robert J. Hayashi, M.D., 454-6128
Laboratory investigation is focused on the role of T lymphocytes in immune tolerance during viral and bacterial infection.

S. Paul Hmiel, M.D., Ph.D., 454-6043
Clinical interests include the pharmacology of drugs in renal failure, growth in renal transplant patients, and evaluation of renal function.

David M. Jaffe, M.D., 454-2341
Clinical research interests are: 1) occult bacteremia — identification, clinical decision making; 2) trauma — injury prevention, head and cervical spine injuries; 3) resuscitation — high-dose epinephrine, collaborative clinical trials; 4) health care delivery system — role of the pediatric emergency department; and 5) conscious sedation.

James S. Kemp, M.D., 454-2161
Factors leading to putative suffocation deaths in early infancy. Airway function in infants with chronic lung disease.

Stuart R. Kupfer, M.D., 454-6049
Steroid hormone receptors are members of a class of nuclear receptors that mediate profound effects on embryonic development, cellular differentiation and homeostasis by regulating gene expression in target tissues. Studies in this laboratory include: 1) analyzing the determinants of specificity of steroid-regulated transcriptional activity, and 2) evaluating the mechanisms of steroid-mediated effects on osteoclast differentiation and bone resorption.

Lori Luchtman-Jones, M.D., 454-6128
Investigative efforts are aimed at understanding the regulation of coagulation by Tissue Factor Pathway Inhibitor.

Craig A. MacArthur, M.D., Ph.D., 454-2547
Investigative interests are directed toward elucidation of the structure and function of regulatory oncoproteins in transgenic mouse models of malignancy.

George B. Mallory Jr., M.D., 454-2694
Clinical investigative interests: 1) Uses of flexible fiber-optic bronchoscopy and bronchoalveolar lavage in pediatric lung disease; 2) pediatric lung transplantation; 3) sleep-associated breathing disorders and 4) cystic fibrosis: correlations between genotype and phenotype.

Louis J. Muglia, Ph.D., M.D., 454-2382
Research interests focus on the role of hypothalamic neuropeptides in the control of normal development. Molecular biologic and transgenic methodologies are employed to develop animals systems for determination of the role of neuropeptides in control of lung and thymus maturation, parturition and the stress response.

David H. Perlmutter, M.D., 454-6033
The laboratory studies the cellular biochemistry of a genetic deficiency of alpha-1-antitrypsin. This deficiency is the most common metabolic cause of liver disease in infants and emphysema in adults. It results from an abnormally folded protein that is unable to traverse the secretory pathway and accumulates within the endoplasmic reticulum. The lab is also studying a specific cell-surface receptor, the SEC receptor, which recognizes alpha-1-AT-elastase and other serpin-enzyme complexes, mediates an increase in synthesis of alpha-1-AT, probably mediates clearance and catabolism of serpin-enzyme complexes and mediates the neutrophil chemotactic effects of serpin-enzyme complexes. The SEC receptor recognizes a highly conserved pentapeptide in the alpha-1-AT sequence and a homologous sequence in the amyloid-beta peptide and the tachykinins. It may, therefore, be important in the pathogenesis of Alzheimer's disease.

Fran L. Porter, Ph.D., 454-2722
The laboratory studies acute and chronic pain in at-risk populations.

Alan L. Schwartz, Ph.D., M.D., 454-6005
Investigative efforts are aimed at understanding 1) the cell biology of cell-surface receptors including biochemical and molecular dissection of the mechanisms responsible for receptor-mediated endocytosis of blood coagulation proteins, and 2) the regulation of intracellular protein turnover.

Shalini Shenoy, M.D., 454-6128
Investigation of immunologic basis of graft versus host disease.

Carl H. Smith, M.D., 454-6029
The laboratory investigates the cellular process underlying the maternal/fetal transport of amino acids and other nutrients by the human placental syncytiotrophoblast. Molecular and functional approaches are used to investigate transport mechanisms in plasma membranes isolated specifically from the maternal- and fetal-facing surfaces and in trophoblast cells that differentiate in culture.

Thomas F. Smith, M.D., 454-2694
Laboratory studies of clinical studies on outcome of childhood asthma.

Joseph W. St. Geme, M.D., 454-6050
The molecular basis of *Haemophilus influenzae* attachment and invasion. *Haemophilus influenzae* is a common cause of localized respiratory tract infections, such as otitis media, sinusitis and pneumonia. In addition, this organism is an important cause of meningitis and septicemia. We are employing methods of molecular and cell biology to characterize the bacterial and the host cell structures involved in the processes of attachment and invasion, which are likely critical early steps in the pathogenesis of disease.

Gregory A. Storch, M.D.; Richard S. Buller, Ph.D.; and staff (all: 454-6079)
Rapid diagnosis of viral and other unconventional infections. The Molecular Diagnostics Section of the Diagnostic Virology Laboratory is studying the use of the polymerase chain reaction and oligonucleotide sequencing for the diagnosis of infections caused by viruses and other unconventional pathogens and the detection of resistance to antiviral agents. Current projects include: 1) the detection of herpes simplex virus, cytomegalovirus, Epstein-Barr and JC virus, and the protozoan *Toxoplasma gondii* on cerebrospinal fluid, 2) the detection of cytomegalovirus and Epstein-Barr virus in the blood of organ transplant recipients, 3) the detection of parvovirus B19 in blood and amniotic fluid, and 4) the detection of Ehrlichia and Rickettsiae in blood. Future projects will explore infections caused by other unconventional pathogens that are not easily diagnosed using existing methods and the application of PCR for quantitation of infectious agents and the detection of resistance to antiviral agents.

Arnold W. Strauss, M.D., 454-6095
Studies concern molecular basis of human mitochondrial enzyme deficiency syndromes in totally acid oxidation causing liver disease, heart disease or sudden death. This research involves recombinant DNA technology, cloning of various DNA fragments and cell biological techniques.

Robert C. Strunk, M.D., 454-2694
Clinical studies of patients with asthma aimed at understanding the mechanisms of death due to asthma in children.

Bradley T. Thach, M.D., 454-6148
Studies include: 1) mechanical and neural mechanisms in regulation of upper airway patency in infants and in an animal model, and 2) pathophysiology of apneic episodes in young infants.

Teresa J. Vietti, M.D., 367-3446
Research interests include chemotherapeutic agent trials for pediatric oncology.

David B. Wilson, M.D., Ph.D., 454-6128
Research is focused on the molecular switches that regulate control genes during early embryonic development and differentiation.

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 Molecular Biology and Pharmacology.)

Professors Emeriti

John C. Herweg, M.D., Washington University, 1945.

Lawrence I. Kahn, M.D., Louisiana State University, 1945.

Jessie L. Ternberg, Ph.D., University of Texas, 1950; M.D., Washington University, 1953; Sc.D. (hon.), Grinnell College, 1972. (See Department of Surgery.)

Jean H. Thurston, M.D., University of Alberta, 1941. (See Departments of Neurology and Neurological Surgery.)

Professor Emeritus and Lecturer

Philip 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.

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 Department of Neurological Surgery.)

Donald Strominger Professor

David H. Perlmutter, M.D., St. Louis University, 1978. (See Department of Cell Biology and Physiology.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prensky, 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 Departments of Neurology and Neurological Surgery.)

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.)

Thomas F. Smith, M.D., University of Virginia, 1974.

Gregory A. Storch, M.D., New York University, 1973. (See Departments of Medicine and Molecular Microbiology.)

Arnold W. Strauss, M.D., Washington University, 1970. (See Department of Biochemistry and Molecular Biophysics.)

Robert C. Strunk, M.D., Northwestern University, 1968.

Bradley T. Thach, M.D., Washington University, 1968.

Teresa J. Vietti, M.D., Baylor University, 1953. (See Department of Radiology.)

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)

Mohamad T. Amjad, M.D., University of Teheran, 1961.

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. Tsifutis, 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.)

Michael E. Fant, M.D., Ph.D., Vanderbilt University, 1980.

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.)

Aaron Hamvas, M.D., Washington University, 1981.

Gary E. Hirshberg, 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.)

George B. Mallory Jr., M.D., Albert Einstein College of Medicine, 1974.

Susan B. Mallory, M.D., University of Texas, 1974. (See Department of Medicine.)

Jeffrey L. Marsh, M.D., The Johns Hopkins University, 1970. (See Department of Surgery.)

Virginia L. Miller, Ph.D., Harvard University, 1985.

Michael J. Noetzel, M.D., University of Virginia, 1977. (See Departments of Neurology and Neurological Surgery.)

J. Julio Pérez Fontán, M.D., Universidad de Santiago, 1977. (See Department of Anesthesiology.)

Robert J. Rothbaum, M.D., The University of Chicago, 1976.

Paul S. Simons, M.D., Washington University, 1967. (See Health Key Beacon.)

Sherida E. Tollefsen, M.D., Washington University, 1975.

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

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, Ph.D., University of Oregon, 1976. (Laboratory Medicine) (See Department of Pathology.)

Barbara A. Zehnbauer, 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.

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.

Gerald Wool, M.D., Washington University, 1962.

Assistant Professors

David T. Balzer, M.D., St. Louis University, 1985.

Guojun Bu, Ph.D., Virginia Polytechnic Institute, 1990.

Douglas W. Carlson, M.D., Southern Illinois University, 1984.

Randall A. Clary, M.D., University of Illinois, 1984. (See Department of Otolaryngology.)

Alan H. Cohen, M.D., New York Medical College, 1988.

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.

Michael R. DeBaun, M.D., Stanford University, 1987; M.P.H., The Johns Hopkins University, 1993.

Joan C. Downey, M.P.H., M.D., Harvard University, 1985.

Katherine A. Gnauck, M.D., Universite Libre de Bruxelles, 1985.

Irene L. Graham, M.D., Baylor College of Medicine, 1982.

Paul F. Grim, M.D., St. Louis University, 1976.

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.

Z. Leah Harris, M.D., Chicago Medical School, 1987.

Sherrie M. Hauft, M.D., University of Texas, 1984.

Robert J. Hayashi, M.D., Washington University, 1986.

Anne V. Hing, M.D., Washington University, 1985.

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.

Fiona H. Levy, M.D., New York Medical College, 1987.

Mark E. Lowe, M.D., University of Miami, 1984.

Jeffrey A. Lowell, M.D., Yale University, 1985. (See Department of Surgery.)

Lori Luchtman-Jones, M.D., University of California, San Diego, 1987.

Gregg T. Lueder, M.D., University of Iowa. (See Department of Ophthalmology and Visual Sciences.)

Craig A. MacArthur, M.D., Ph.D., Washington University, 1987.

Mark J. Manary, M.D., Washington University, 1982.

Barry P. Markovitz, M.D., University of Pennsylvania, 1983. (See Department of Anesthesiology.)

Bess A. Marshall, M.D., Vanderbilt University, 1986.

Kathleen A. McGann, M.D., University of Pennsylvania, 1985.

Jean Pappas Molleston, M.D., Washington University, 1986.

Louis J. Muglia, Ph.D., The University of Chicago, 1986; M.D., 1988. (See Department of Molecular Biology and Pharmacology.)

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.)

Robert T. Paschall, M.D., University of Tennessee, 1974.

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.

Angela M. Sharkey, M.D., St. Louis University, 1986.

Theodore C. Simon, Ph.D., George Washington University, 1990.

Joseph W. St. Geme, M.D., Harvard University, 1984.

Catherine S. Tripp, M.D., Ph.D., Washington University, 1988.

Alison J. Whelan, M.D., Washington University, 1986. (See Department of Medicine.)

Lynn K. White, M.D., Harvard Medical School, 1984. (See Department of Medicine.)

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.)

Jane 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.

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.

Alfred S. Schwartz, M.D., The Johns Hopkins University, 1936.

Assistant Professors (Clinical)

Denis I. Altman, M.B., B.Ch., University of Witwatersrand, 1975. (See Departments of Neurology and Neurological Surgery.)

Patricia J. Amato, M.D., Medical College of Ohio, 1982. (See Health Key Beacon.)

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.

Jay S. 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 Beacon.)

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.

John F. Mantovani, M.D., University of Missouri, 1974. (See Departments of Neurology and Neurological Surgery.)

M. Michael Maurer, M.D., Washington University, 1972.

Thomas C. McKinney, M.D., Washington University, 1980. (See Health Key Beacon.)

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.

C. Jeffrey Sippel, Ph.D., St. Louis University, 1980; M.D., 1983.

Harold B. Sitrin, M.D., St. Louis University, 1971.

Robert H. Strashun, M.D., New York University, 1982.

M. Anne Street, M.D., University of Illinois, 1976.

Marc E. Weber, M.D., University of Tennessee, 1974.

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 Beacon.)

Instructors

Sanjay Aurora, M.B.,B.S., Jawnharial Institute of Postgraduate Medical Education and Research, 1986.

Anne M. Beck, M.D., Southern Illinois University, Springfield, 1988.

Leigh Ann Berry, Ph.D., University of Virginia, 1993.

Janice E. Brunstrom, M.D., Medical College of Virginia, 1987. (See Departments of Neurology and Neurological Surgery.)

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.)

Kenneth A. Haller, M.D., Creighton University, 1980.

Michael R. Harris, Ph.D., St. Louis University, 1981; M.D., 1991.

David B. Haslam, M.D., University of Calgary, 1987.

Robert O. Heuckeroth, M.D., Ph.D., Washington University, 1990.

Russel Hirsch, M.B., Ch.B., University of Cape Town, 1988.

S. Paul Hmiel, M.D., Ph.D., Case Western Reserve University, 1989.

Dee Hodge III, M.D., University of California, San Francisco, 1978.

Donald V. Huebener, D.D.S., Washington University, 1969. (Dental Medicine) (See Department of Radiology.)

Mark C. Johnson, M.D., The Johns Hopkins University, 1982.

Craig J. Leesman, M.D., Wright State University, 1993.

David L. Lohmeyer, M.D., University of Missouri, 1977.

Margaret R. MacDonald, M.D., Ph.D., Washington University, 1990.

William A. McManus, M.D., St. Louis University, 1986.

Janet G. Mueller, M.D., Washington University, 1992.

Cynthia K. Powell, M.D., University of Oklahoma, 1984.

Kimberly S. Quayle, M.D., Washington University, 1988.

Kristie A. Rutledge, M.D., University of Missouri, Kansas City, 1993.

Shalini Shenoy, M.D., University of Mysore, 1981.

Shannon J. Sullivan, M.D., University of Wisconsin, 1985. (See Department of Radiology.)

Stuart C. Sweet, M.D., Ph.D., University of Michigan, 1989.

Jeffrey H. Teckman, M.D., Washington University, 1989.

Chrysanthy M. Tsifutis, M.D., University of Missouri, 1991.

Scott J. Weiner, M.D., Ph.D., Washington University, 1993.

Calvin B. Williams, M.D., Ph.D., University of California, Irvine, 1991.

Pauline A. Wills, M.D., State University of New York, Buffalo, 1981.

Ralph Wuebeker, M.D., University of Missouri, Kansas City, 1994.

Research Instructors

Richard S. Buller, Ph.D., University of Montana, 1983.

Sharon L. Pontious, Ph.D., New Mexico State University, 1980.

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 Beacon.)

Ivette N. Baker, M.D., Universidad Central del Caribe, 1984.

Johnie C. Baker, M.D., Universidad Central del Caribe, 1984.

Huldah C. Blamoville, M.D., Meharry Medical College, 1965.

Robert J. Bradshaw, M.D., St. Louis University, 1980.

Yolette V. Brown, M.D., Washington University, 1982.

Seth J. Brownridge, M.D., Washington University, 1982.

John R. Carlile, M.D., University of Kansas, 1975.

Rubilinda Casino, M.D., University of Santo Tomas, 1979.

Tattamangalam P. Chandrika, M.S.B.S., Calicut Medical College, 1973. (See Health Key Beacon.)

Glenn S. Cheng, M.D., University of Texas, San Antonio, 1988.

Tammy S. Chi, M.D., University of California, Los Angeles, 1990.

Oliver H.P. Chrisler, M.D., The University of Chicago, 1991.

Douglas G. Cottrell, D.O., University Health Sciences College of Osteopathic Medicine, 1979.

Janet L. Cranshaw, M.D., Washington University, 1988.

Michael E. Danter, M.D., University of Illinois, 1987.

David P. Dempsher, M.D., Ph.D., The Johns Hopkins University, 1982.

Alla Dorfman, M.D., Chernovtsy State Medical School, 1986.

Robert W. Edmonds, M.D., Washington University, 1960.

Diane M. Eschmann, M.D., University of Missouri, 1993.

Laura A. Esswein, M.D., University of Missouri, 1991.

Elliott H. Farberman, M.D., St. Louis University, 1973.

Kathleen V. Farrell, M.D., University of Nebraska, 1993.

Anna M. Fitz-James, M.D., George Washington University, 1981.

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.

Alice B. Granoff, M.D., University of Texas, Southwestern, 1963.

Roman E. Hammes, M.D., University of Iowa, 1954.

Melanie G. Hampton, M.D., University of Louisville, 1981.

David E. Hartenbach, M.D., University of Missouri, 1987.

Mary Ann Hollman, M.D., University of Alabama, Birmingham, 1988.

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.

Jennifer S. Ladage, M.D.,
St. Louis University, 1991.

Stacie S. Laff, M.D.,
Rush Medical College, 1993.

Leland M. Laycob, M.D.,
University of Missouri, 1968.

Robert D. Lins, M.D.,
University of Missouri, 1969.

Robert J. Lobonc, M.D.,
Northwestern University, 1981.

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.

Karen K. Norton, M.D.,
Louisiana State University, 1989.

Jerome H. O'Neil Jr., M.D.,
St. Louis University, 1981.

Eugenia M. Pierce, M.D.,
St. Louis University, 1958.

Daniel S. Plax, M.D.,
Washington University, 1993.

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.

Pathmawathy T. Ramesvara, M.B.,B.S., University of Sri Lanka, 1972.

Emanuel Rashet, M.D.,
St. Louis University, 1962.

George H. Rezabek, D.O.,
Chicago College of Osteopathic Medicine, 1971.

Janis B. Robinson, M.D.,
University of Pennsylvania, 1977.

Vernon J. Roden, M.D.,
St. Louis University, 1971.

Isabel L. Rosenbloom, M.D.,
University of Maryland, 1984.
(See Health Key Beacon.)

Ella Rozin, M.D.,
Minsk State Medical School, 1980.

Diane M. Rup, M.D.,
Case Western Reserve University, 1986.

Howard J. Schlansky, M.D.,
University of Missouri, Kansas City, 1978.

Seymour M. Schlansky, M.D.,
Chicago Medical School, 1950.

Martin P. Schmidt, M.D.,
St. Louis University, 1986.

Jacquelyn C. Schnidman, M.D.,
St. Louis University, 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.

Lois B. Sullivan, M.D.,
Washington University, 1991.

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.

Sharon D. Vermont, M.D.,
University of Missouri, Kansas City, 1993.

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.

Mona Yassin, M.D.,
Al-Azhan University Faculty of Medicine, 1979.

Cecilia H. Yu, M.D.,
University of Texas, Southwestern, 1992.

Instructor (Adjunct)

Mary L. Krywanio, D.N.S.,
Louisiana State University, 1993.

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

M85 676 INTRODUCTION TO PSYCHIATRY

Instructor: *Michael Jarvis, Ph.D., M.D.*, 362-3072

This course will emphasize the diagnosis of major psychiatric illnesses. Psychiatric diseases will be 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.

THIRD YEAR

M85 770 PSYCHIATRY CLERKSHIP

Instructor: *Kevin Black, M.D.*, 747-2013

Students in groups of about 15 persons spend six weeks on the inpatient services of Barnes-Jewish Hospital and Metropolitan St. Louis Psychiatric Center. 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.

FOURTH YEAR

Electives

M85 805 PSYCHIATRY CONSULT SERVICE

Instructor: *Carol North, M.D.*, 747-2013

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 will attend weekly consult/liaison teaching conferences, as well as Grand Rounds and Research Rounds. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M85 810 OUTPATIENT COMMUNITY PSYCHIATRY

Instructor: *Theodore Reich, M.D.*, 362-2149

This is a flexible clerkship in which effort is made to tailor the activities to the students' interests. Students will assist in diagnosis and treatment of adult psychiatric clinic patients. The patients present with a wide variety of psychological and interpersonal problems, such as are encountered in an everyday office practice of an internist or general practice specialist. In this setting, the student will have the opportunity to learn a variety of treatment techniques under supervision. Students completing the clerkship have indicated their enjoyment of the opportunity for independent patient management.

M85 831 ELECTROCONVULSIVE THERAPY (ECT)

Instructors: *Keith Isenberg, M.D., and ECT staff*, 362-1819

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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M85 836 CLINICAL PSYCHIATRY AT BARNES-JEWISH HOSPITAL SOUTH CAMPUS, INPATIENT PSYCHIATRIC SERVICE

Instructor: *Eugene Rubin, Ph.D., M.D.*, 362-2462

This is a senior course that provides the students with an opportunity to expand their knowledge of inpatient clinical psychiatry by functioning as externs. Students attend all staffing and teaching conferences given to first-year psychiatry residents, take patients in rotation and share night call with other first-year residents approximately every fifth night.

Immediate supervision is provided by the inpatient attending and additional supervision can be arranged as desired. 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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

M85 840 CHILD PSYCHIATRY

Instructor: *Joan Luby, M.D.,* 454-2303

This elective in Child Psychiatry utilizes the Child Psychiatry Outpatient Clinic at St. Louis Children's Hospital. It provides experience in age-appropriate diagnostic and treatment methods in children and adolescents. Experience also is provided on the Consultation Service of Children's Hospital. Since there is an active research program in Child Psychiatry, students who are interested in gaining research experience can do so by participating in one of the several ongoing projects. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M85 850 SUBSTANCE ABUSE

Instructor: *Wilson Compton III, M.D.,* 286-2261

The rotation gives the student the opportunity to learn about the inpatient and formal day or evening group 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. Valid start weeks for four-week blocks are: Weeks 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M85 900)

Linda B. Cottler, Ph.D., 286-2252

There are several NIDA-funded projects pertaining to many broad areas of research: 1) factors leading to AIDS high-risk behaviors in drug users, 2) testing the reliability and validity of the substance use disorders criteria, 3) assessment of substance abuse and dependence disorders, and 4) an NIMH-funded national study of 13,000 children and adolescent mental health and mental health services.

John G. Csernansky, M.D., 362-2616

Schizophrenia and psychopharmacology. Students may participate in the conduct of clinical or preclinical studies of schizophrenia, brain dopamine systems and related topics. Involvement in clinical studies will include training and experience in interviewing psychiatric patients with severe symptoms. Involvement in preclinical studies will involve training and experience in receptor binding and microdialysis.

Joan Luby, M.D., 454-2303

Developmental psychopathology and the parent-infant relationship. This research elective involves work with an infant psychiatrist who is exploring the role of emotion regulation and the parent-child relationship in early-onset psychopathology. It would involve videotaped dyadic relational assessments of caretakers and their infants/preschoolers, work with data of this nature and the opportunity to observe clinical psychiatric assessments of infants and preschoolers.

John W. Newcomer, M.D., 362-2459

Clinical memory research. This elective offers the student a broad exposure to clinical protocols related to the neuroendocrinology and neurochemistry of memory performance, including protocols in patients with schizophrenia. Students will have an opportunity to focus on a particular project of interest.

Note — There are always a number of ongoing research projects in the Department of Psychiatry. For additional information, contact Eugene H. Rubin, Ph.D., M.D., 362-2462.

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 Hospital. Outpatient services are organized through the Child Psychiatry Center located at Children's Hospital. Active consultation with all medical and surgical units of the hospital also is maintained. Trainees are assigned to these various services, where they participate in diagnostic evaluations and see patients in treatment, under supervision.

Faculty

Department of Psychiatry

HEAD OF THE DEPARTMENT AND PROFESSOR

Charles F. Zorumski, M.D., St. Louis University, 1978. (See Department of Anatomy and Neurobiology.)

Professors Emeriti

Blake W. Moore, Ph.D., Northwestern University, 1952. (Biochemistry)

George E. Murphy, M.D., Washington University, 1952.

Saul Rosenzweig, Ph.D., Harvard University, 1932. (Medical Psychology) (Also Psychology)

William R. Sherman, Ph.D., University of Illinois, 1955. (Biochemistry)

Professors

Robert M. Carney, Ph.D., Washington University, 1978. (Medical Psychology) (Also Psychology)

Theodore J. Cicero, Ph.D., Purdue University, 1968. (Neuro-pharmacology) (See Administration and Department of Anatomy and Neurobiology.)

Wallace Renard Professor

C. Robert Cloninger, M.D., Washington University, 1970; M.D. (hon.), Umea University, Sweden, 1983. (See Department of Genetics.) (Also Psychology)

Gregory B. Couch Professor

John Csernansky, M.D., New York University, 1979. (See Department of Anatomy and Neurobiology.)

Helen Donis-Keller, Ph.D., Harvard University, 1979. (Genetics) (See Department of Genetics.)

Spencer T. Olin Professor

Samuel B. Guze, M.D., Washington University, 1945. (See Department of Medicine.)

Andrew C. Heath, D.Phil., University of Oxford, 1983. (Psychology) (See Department of Genetics.) (Also Psychology)

Richard W. Hudgens, M.D., Washington University, 1956.

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) (Also Faculty of Arts and Sciences)

Eugene H. Rubin, Ph.D., Washington University, 1977; M.D., 1978.

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.)

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.

Professor (Clinical)

Marcel T. Saghir, M.D., American University, 1963.

Professor (Adjunct)

Norman Sartorius, M.D., University of Zagreb, 1958.

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) (Also Psychology)

Alison M. Goate, D.Phil., University of Oxford, 1983. (Genetics) (See Department of Genetics.)

Barry Hong, Ph.D., St. Louis University, 1982. (Medical Psychology) (See Department of Medicine.) (Also Psychology)

Keith E. Isenberg, M.D., Indiana University, 1978.

Michael R. Jarvis, Ph.D., University of Illinois, 1982; M.D., Washington University, 1985.

Collins E. Lewis, M.D., Harvard University, 1971.

Patrick J. Lustman, Ph.D., Michigan State University, 1980. (Medical Psychology) (Also Psychology)

Mark A. Mintun, M.D., Washington University, 1981. (See Department of Radiology.)

Bruce L. Nock, Ph.D., Rutgers University, 1980. (Neurobiology) (See Department of Anatomy and Neurobiology.)

Carol S. North, M.D., Washington University, 1983.

Daniel D. Pugh, M.D., Washington University, 1964.

John Rohrbaugh, Ph.D., University of Illinois, 1973. (Psychology) (Also Psychology)

Research Associate Professor

Kathleen K. Bucholz, Ph.D., Yale University, 1986. (Epidemiology)

Associate Professor Emeritus (Clinical)

Edward H. Kowert, M.D., Washington University, 1943.

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.

Aleksandar Janca, M.D., University of Novi Sad, 1977.

Assistant Professors

Laura Bierut, M.D., Washington University, 1987.

Kevin J. Black, M.D., Duke University, 1990. (See Departments of Neurology and Radiology.)

Wilson Compton III, M.D., Washington University, 1986.

Nuri Farber, M.D., Washington University, 1989.

Daniela S. Gerhard, Ph.D., Cornell University, 1982. (See Department of Genetics.)

Elliot Nelson, M.D., University of Illinois, 1986.

John W. Newcomer, M.D., Wayne State University, 1985.

Joel Posener, M.D., McGill University, 1987.

Yvette I. Sheline, M.D., Boston University, 1979. (See Departments of Medicine and Radiology.)

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)

Yukitoshi Izumi, M.D., Yamagata University, 1985; Ph.D., 1989. (Neurobiology)

Rosalind J. Neuman, Ph.D., Washington University, 1981. (Mathematics)

Lynn H. O'Connor, Ph.D., Rutgers University, 1983. (Neuroendocrinology)

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) (Also Psychology)

Assistant Professor Emeritus (Clinical)

Hyman H. Fingert, M.D., State University of Iowa, 1934.

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. (Metropolitan St. Louis Psychiatric Center)

Mary Davis, M.D., Washington University, 1952.

Paul Dewald, M.D., University of Rochester, 1945.

Terry A. Fuller, M.D., Washington University, 1974.

Anna Hartnett, M.D., University of Ottawa, 1960.

Thomas Hartnett, M.D., University of Ottawa, 1959.

Frederick G. Hicks, M.D., University of Minnesota, 1981.

Sheldon G. Holstad, Pharm.D., University of Iowa, 1986. (Pharmacy) (St. Louis College of Pharmacy)

Saaid Khojasteh, M.D., Shiraz University, 1981.

Ervin Lipschitz, M.D., Washington University, 1949.

Scott McCormick, M.D., The University of Chicago, 1985.

James R. Mikolajczak, M.D., St. Louis University, 1972.

Jule Miller, M.D., Washington University, 1953.

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.

Diane Rankin, M.D., University of Colorado, 1968.

Randall Rosenthal, M.D., Washington University, 1967.

James L. Rutherford, M.D., University of Iowa, 1980.

Jo-Ellyn M. Ryall, M.D., Washington University, 1975.

Berette Salazar, M.D., University of New Mexico, 1982.

Paul W. Sheffner, M.D., Washington University, 1974.

Nathan Simon, M.D., Washington University, 1955.

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

Annette Friend, M.D., University of Miami, 1991.

Aileen Lee, Ph.D., Ohio State University, 1977. (Medical Psychology)

Devna Rastogi-Cruz, M.D., Washington University, 1991.

Research Instructors

Renee Cunningham, Ph.D., Washington University, 1994. (Social Work)

Jeffrey Gavard, Ph.D., University of Pittsburgh, 1990. (Epidemiology)

Linda Griffith, M.S.W., St. Louis University, 1978. (Social Work) (Also School of Social Work)

Corinne Lendon, Ph.D., King's College, 1991.

Pamela Madden, Ph.D., University of Pittsburgh, 1992. (Psychology)

Wendy Slutske, Ph.D., University of Minnesota, 1993. (Psychology)

Instructors (Clinical)

Dale J. Anderson, M.D., Washington University, 1979.

Richard H. Anderson, Ph.D., Brigham Young University, 1986; M.D., St. Louis University, 1989.

Scott J. Arbaugh, M.D.,
St. Louis University, 1985.
Allyson Boyle, M.D.,
Columbia University, 1983.
David M. Conner, M.D.,
University of Oklahoma, 1983.
Cynthia Florin, M.D.,
Columbia University, 1984.
David J. Goldmeier, M.D.,
Washington University, 1982.
Steven Harvey, M.D.
Washington University, 1992.
Linda S. Horne, M.D.,
Ohio State University, 1986.
Virgil L. Malmberg, M.D.,
University of Missouri, 1978.
Gregory Mattingly, M.D.,
Washington University, 1989.
Douglas McCoy, M.D.,
Southern Illinois University, 1990.

Division of Child Psychiatry

Blanche F. Ittleson Professor and Director of Division

Richard D. Todd, Ph.D.,
University of Texas, 1977; M.D.,
1981. (Child Psychiatry) (See
Department of Genetics.)

Professor Emeritus

E. James Anthony, D.P.M.,
University of London, 1947
(Child Psychiatry); M.D., 1949.

Professor

Barbara Geller, M.D.,
Albert Einstein College of
Medicine, 1964. (Child Psychiatry)

Associate Professor

Richard Mattison, M.D.,
Cornell University, 1972.
(Child Psychiatry)

Research Associate Professor

Gwendolyn G. Reich, Ph.D.,
Washington University, 1978.
(Anthropology) (Child Psychiatry)

Associate Professors (Clinical)

Haruo Kusama, M.D.,
Washington University, 1965.
(Child Psychiatry)
Zila Welner, M.D.,
Hebrew University, 1961.
(Child Psychiatry) (See Depart-
ment of Pediatrics.) (Hawthorn
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.)

John N. Constantino, M.D.,
Washington University, 1988.
(Child Psychiatry) (See
Department of Pediatrics.)
Joan Luby, M.D.,
Wayne State University, 1985.
(Child Psychiatry)
Barbara S. Silverstein, Ph.D.,
St. Louis University, 1994; M.S.W.,
Washington University, 1981.
(Social Work)

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)

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.
(Hawthorn 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 St. Louis region's most comprehensive vascular and interventional radiology center
- application of PET for measuring metabolic activity in relation to cardiac blood flow
- development of a three-dimensional treatment planning program for cancer
- collaboration on the development and installation of the world's first Tandem Cascade Accelerator.

The Institute occupies more than 400,000 total square feet, comprising its own 13-story building with satellite facilities in Barnes-Jewish, Barnard, St. Louis Children's and Wohl hospitals; the Clinical Sciences Research, Forest Park and East buildings; and the Scott Avenue Imaging Center. The department provides diagnostic radiology, nuclear medicine, radiation physics and radiation oncology services for all hospitals in the Washington University Medical Center, Barnes-Jewish Hospital West County and Barnes-Jewish Hospital St. Peters.

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-Jewish Hospital South Campus are on the ground and first floors of the Institute, on the ground floor of the Waldheim Building at Barnes-Jewish Hospital North Campus, in Barnard Hospital and in the Barnes-Jewish Hospital West Pavilion. Therapy equipment consists of state-of-the-art Clinac linear accelerators: 2300, 2100C, 6-100, and 4MV. Three 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 three 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, computed radiography); third floor (neuroradiology, angiography, MRI); fourth floor (gastrointestinal and genitourinary radiology); and the fifth floor (MRI). 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-Jewish Hospital West Pavilion. The 10th floor of the West Pavilion houses ultrasonography and outpatient radiology, including a comprehensive Breast Diagnostic Center. A mammography screening center is on the first floor of the Barnes-Jewish Hospital East Pavilion. 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 Barnes-Jewish Hospital North Campus 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 102 examination rooms for diagnostic radiology, nine CT scanners (six with spiral CT capability), four PET scanners, 10 MR scanners (five devoted to research), 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-Jewish Hospital a mobile mammography van that provides screening services at corporate and public sites in the St. Louis metropolitan area.

MIR research facilities are on the third (hyperthermia and brachytherapy) and sixth (physics)

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

floors of Barnard Hospital, in the Clinical Sciences Research Building (radiation oncology, radiological sciences, nuclear medicine), in the East Building (electronic radiology and three-dimensional image processing) and in the Scott Avenue Imaging Center (neurological PET, molecular radiopharmacology, MR imaging).

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 sixth floor and the ninth through 12th floors of the Institute. The Forest Park Building houses the Radiation Oncology Center's administrative offices, cancer biology and the oncology data and computer center.

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, two 4.7 Tesla MR scanners, two Siemens Vision 1.5 Tesla MR scanners with Echo Planar Imaging capability, two medical cyclotrons, 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.

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.

M04 501 ANATOMY THROUGH THE EYES OF THE RADIOLOGIST

Coordinator: *Linda Macker,* 362-2911

A five-week seminar that seeks to reinforce the first semester anatomy experience by relating previously learned anatomical information to radiographic images. As a by-product this elective provides a link for the first year anatomists to the real world of medicine. Students will be expected to work in small groups prior to the meeting of each seminar to review a set of radiographic images and/or review recommended reading. Groups assigned a case will be responsible for presenting their findings to the class. Radiologists from radiology subspecialties will moderate the conference and supply appropriate complementary cases as needed.

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. *Joseph Simpson, Ph.D., M.D.*

SECOND YEAR

Twelve 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 also is introduced. The course also includes review of individual teaching file cases at small group sessions. *Harvey Glazer, M.D.*

FOURTH YEAR

Electives

M90 805 RADIOLOGY — MALLINCKRODT INSTITUTE OF RADIOLOGY

Instructor: *Lawrence Kotner Jr., M.D.,* 454-7400

Lectures, seminars and innovative conferences emphasizing film interpretation and the role of Radiology in the solution of clinical diagnostic problems are the "core" of this elective. The student will have an opportunity to be involved in the daily work load of subspecialty Radiology and will be able to observe diagnostic and therapeutic examinations. Each student will spend one to two weeks on each of two or more of the following sections of Radiology.

Chest Radiology	Pediatric Radiology
GI Radiology	Neuroradiology
GU Radiology	Nuclear Medicine
Skeletal Radiology/ER	Radiation Oncology
Cross-Sectional Imaging	Interventional Radiology

All efforts will be made to arrange these subspecialty assignments to meet the needs and interests of the individual student. The ACR teaching file and audiovisual materials, as well as an extensive library, will be available. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M90 806 RADIOLOGY — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructor: *Lawrence Kotner Jr., M.D.*, 454-7400

The course consists of daily teaching sessions emphasizing the principles of film interpretation and the use of imaging in the solution of clinical diagnostic problems. There will be opportunity for observing fluoroscopy and nuclear medicine procedures as well as CT and MRI. Audiovisual teaching aids are available for use. Emphasis is placed on radiologic-pathologic correlation. Valid start weeks for four-week blocks are: Weeks 1, 5, 13, 17, 21, 25, 37 and 41.

M90 820 CLINICAL NUCLEAR MEDICINE

Instructor: *Barry Siegel, M.D.*, 362-2809

The student will be exposed to the full range of current nuclear medicine techniques. In conjunction with the staff, the student will be responsible for planning and interpreting radionuclide studies in patients referred to the Department. Opportunity exists to learn instrumentation techniques, including computer applications. There are daily conferences and scan interpretation sessions. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M90 840 CLINICAL RADIATION ONCOLOGY

Instructors: *Joseph Simpson, Ph.D., M.D.*, 362-8516; *Carlos Perez, M.D.*, 362-8500

The clinical section offers an elective with emphasis on the evaluation, planning and administration of radiation therapy in patients with malignant tumors. The students have the opportunity to enhance their knowledge on the natural history, pathological and biological features of cancer and to sharpen their clinical skills participating in the management of these patients. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29 33, 37 and 41.

M90 841 CLINICAL AND INVESTIGATIVE RADIATION ONCOLOGY

Instructors: *Joseph Simpson, Ph.D., M.D.*, 362-8516; *Carlos Perez, M.D.*, 362-9709

A multifaceted working group of clinicians, physicists, computer scientists and biologists interested in meaningful applications to improve results of radiation treatments. Under the leadership of several clinical staff and Dr. Purdy, research projects are available in computer applications, three-dimensional treatment planning and clinical studies. Current computer research includes: 1) development of three-dimensional display software for three-dimensional treatment planning and quantitative plan evaluation, 2) development of dose calculational algorithms, and 3) development of software for on-line electronic portal imaging. Previous computer experience is essential for computer-related research.

In collaboration with Dr. Roti Roti, there are numerous research opportunities in the Section of Cancer Biology, including: 1) the role of the nuclear matrix in the response of mammalian cells to ionizing radiation; 2) the cellular and molecular aspects of the response of mammalian cells to elevated temperatures; 3) heat shock protein function and regulation with emphasis on roles in genetic disease and cancer therapy; 4) DNA repair and GI cell-cycle arrest in irradiated cells; 5) molecular mechanisms of killing of cells exposed to long duration, moderate hyperthermia; 6) the production and consequences of free radicals involved in the effects of ionizing radiation, hyperthermia, oxygen toxicity, nitric oxide-induced toxicity, and tumor cell resistance to therapy and chemotherapy; 7) regulation of gene expression in the eukaryotic cell cycle under perturbed conditions; and 8) identification of parameters useful in identifying disease outcome or therapeutic response and the role of adaptation in radiobiology and cancer treatments.

Projects also are available involving retrospective reviews of various aspects of irradiation in the management of patients with carcinoma of the head and neck, lung, breast, prostate and gynecological organs. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

Research (M90 900)

G. James Blaine, D.Sc., 362-6965

Active research projects at the Electronic Radiology Laboratory include digital image acquisition and display of radiology and non-radiology modalities, information management, telecommunications utilizing ATM high-speed local and wide-area technologies and medical video.

Jeffrey Brown, M.D., 362-2967
My research is primarily concerned with MR imaging of anatomic areas outside the central nervous system. Specific areas of interest include evaluation of new MR pulse sequences and contrast agents for abdominal, cardiac and breast MRI.

Thomas Conturo, M.D., Ph.D., 362-8421
My research interests include magnetic resonance (MR) cerebral perfusion imaging, MR imaging of brain functional activation and development of MR contrast agents.

Farrokh Dehdashti, M.D., 362-7418
Research projects relating to positron emission tomography are available in the following areas: 1) non-invasive assessment of estrogen receptors status of primary, recurrent and metastatic breast cancer utilizing radiolabeled estrogen compounds; 2) the role of imaging in detecting neoplasm in preliver transcript patients (comparison of FDG-PET, MRI, CT and ultrasound); 3) non-invasive assessment of patients with colorectal carcinoma with radiolabeled monoclonal antibody and FDG; 4) non-invasive assessment of somatostatin receptors status of neuroendocrine tumors utilizing a radiolabeled somatostatin analogue with PET; and 5) restaging in ovarian cancer (comparison of FDG-PET and MRI).

Robert Gropler, M.D., 362-7418
In this laboratory, conventional single photon and positron emission tomographic imaging, magnetic resonance imaging and echocardiography are used to investigate the following: 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 syndromes on myocardial energy production and transduction.

Mark Haacke, Ph.D., 362-2737
The MR research group has interests in cardiovascular and brain functional imaging. Projects cover technical aspects of MR methodology and clinical applications of methodology.

Charles Hildebolt, D.D.S., Ph.D., 362-8410
The assessment of alveolar bone loss by digital radiographic imaging, including the determination of whether or not there is an interrelationship between alveolar and post-cranial bone loss after menopause.

R. Gilbert Jost, M.D., 362-7130
The Mallinckrodt Institute of Radiology is actively engaged in picture archiving and communication systems (PACS) research, development and deployment. Opportunities exist in the Electronic Radiology Laboratory for work related to the storage, high-speed distribution and electronic display of medical images.

Debiao Li, Ph.D., 362-2737
The MR research group has interests in cardiovascular and brain functional imaging. Projects convert technical aspects of MR methodology and clinical applications of the methodology.

Weili Lin, Ph.D., 362-2737
The MR research group has interests in cardiovascular and brain functional imaging. Projects convert technical aspects of MR methodology and clinical applications of the methodology.

Timothy J. McCarthy, Ph.D., 362-8429
Synthesis and evaluation of novel radiopharmaceuticals suitable for Positron Emission Tomography. Primarily using fluorine-18 and carbon-11 as radiolabels, and adapting modern organic chemistry to the "carrier-free" level. Biological areas of interest include enzyme inhibition (NOS and COX) and novel steroidal compounds.

Tom R. Miller, Ph.D., M.D., 362-2807
Research projects are available in computer applications, evaluation of new radiopharmaceuticals and clinical studies. Current computer research includes: 1) development of three-dimensional display software for tomographic imaging, 2) quantitative analysis of cardiac PET studies, and 3) development of tomographic reconstruction algorithms with use of a mini-supercomputer. Some previous computer experience is essential for the computer-related research.

Stephen M. Moerlein, Ph.D., 362-8466
Research interests lie in the general area of labeled tracer development for nuclear medicine imaging, especially positron emission tomography (PET). Developmental effort begins with synthesis of target structures, preclinical screening that involves *in vitro* biochemistry and pharmacological testing and *ex vivo* biodistribution studies in small animals. Promising tracers are then examined by using *in vivo* imaging of large animals and tracer kinetic modeling. The final step in the transition of a radiochemical into a labeled drug takes into account determination of radiation dosimetry, pharmaceutical quality and the development of automated production to streamline delivery to human subjects. Each of these aspects are researched, with a primary interest in novel agents for examination of neurological processes by PET.

Carlos Perez, M.D., 362-3499
A broad range of opportunities exists for investigation in: 1) prognostic factors and therapy outcome in a variety of patients with cancer; 2) three-dimensional treatment planning in radiation therapy; 3) biological studies exploring mechanisms involved in cellular DNA damages and repair by irradiation, heat and/or cytologic agents; and 4) computer applications in data analysis and information systems.

David Piwnica-Worms, M.D., Ph.D., 362-9356
The multidrug resistance P-glycoprotein, a 170 kDa plasma membrane protein encoded by the human multidrug resistance gene (MDRI), functions as an energy-dependent efflux pump of many of the most potent chemotherapeutic drugs in cancer treatment. This transporter and highly homologous ATP-binding cassette membrane transporters involved in parasitic and bacterial drug resistance, immune response and cystic fibrosis are targets for development of novel metallopharmaceuticals used in characterizing transport regulation, evaluating structure/activity relationships, and when radiolabeled, enabling functional imaging of the expression of these gene products *in vivo*.

William Powers, M.D., 362-7116
Research opportunities are available using positron emission tomography to measure cerebral blood flow and metabolism in human subjects to investigate how the blood-borne supply of oxygen and glucose is regulated to energy demand in physiological and pathological conditions. Ongoing projects include studies of cerebrovascular disease, diabetes mellitus and newborn infants.

Marc Raichle, M.D., 362-6907
We use functional imaging techniques, both positron emission tomography and functional magnetic resonance imaging, to study the normal organization of the human brain and the effect of selected diseases. The research focuses on both the methodology (imaging and experimental) and specific questions in cognitive neuroscience.

Henry D. Royal, M.D., 362-2809
Research opportunities are available in the field of technology assessment. Given limited resources, how do we decide how we can deliver the most health benefit for the least cost?

Barry A. Siegel, M.D., 362-2809
Research projects are available relating to oncologic applications of positron emission tomography (PET), including ongoing studies of breast cancer imaging. Individual projects to analyze clinical results of nuclear medicine examinations (case series review) can be arranged.

Jerold Wallis, M.D., 362-2809
Recent research projects have included three-dimensional display of tomographic images, software development for analysis of (and correction for) patient motion during tomographic acquisition, development of new iterative tomographic image reconstruction techniques and work on image registration.

Michael J. Welch, Ph.D., 362-8435
Short-lived positron-emitting radionuclides such as carbon-11 and flouorine-18 can be used to trace physiologic and pharmacologic processes in humans. Tracers are being developed to probe brain receptors, tumor receptors and enzyme systems.

Faculty

ELIZABETH E. MALLINCKRODT PROFESSOR, HEAD OF DEPARTMENT AND DIRECTOR OF THE MALLINCKRODT INSTITUTE OF RADIOLOGY

Ronald G. Evens, M.D., Washington University, 1964. (Also Department of Economics)

Professors

Joseph J.H. Ackerman, Ph.D., Colorado State University, 1977. (See Department of Medicine.) (Also Department of Chemistry)

D. Claire Anderson, M.D., Washington University, 1971.

Dennis M. Balfe, M.D., Medical College of Wisconsin, 1975.

G. James Blaine III, D.Sc., Washington University, 1974. (See Institute for Biomedical Computing.)

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, M.D., Cairo University, 1960. (See Department of 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.)

Jeffrey L. Marsh, M.D., The Johns Hopkins University, 1970. (See Departments of Surgery and Pediatrics.)

William H. McAlister, M.D., Wayne State University, 1954. (See Department of Pediatrics.)

William D. Middleton, M.D., Duke University, 1981.

Michael I. Miller, Ph.D., The Johns Hopkins University, 1983. (See Institute for Biomedical Computing.) (Also Department of Electrical Engineering)

Tom R. Miller, Ph.D., Stanford University, 1971; M.D., University of Missouri, 1976. (Also Department of Electrical Engineering)

Barbara S. Monsees, M.D., Washington University, 1975.

Michael K. Pasque, M.D., University of Oklahoma, 1989. (See Department of Surgery.)

Steven E. Petersen, Ph.D., California Institute of Technology, 1982. (See Departments of Neurology and Neurological Surgery.)

Gordon W. Philpott, M.D., Washington University, 1961. (See Department of Surgery.)

Daniel D. Picus, M.D., The University of Chicago, 1981. (See Department of Surgery.)

Marcus E. Raichle, M.D., University of Washington, 1964. (See Department of Neurology, Department of Anatomy and Neurobiology and Program in Biological and Biomedical Engineering.)

Henry D. Royal, M.D., St. Louis University, 1974.

Stuart S. Sagel, M.D., Temple University, 1965.

Daniel P. Schuster, M.D., Yale University, 1976. (See Department of Medicine.)

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 Technology, 1966. (See Institute for Biomedical Computing.) (Also Department of Electrical Engineering)

William G. Totty, M.D., University of Tennessee, 1975.

Michael J. Welch, Ph.D., University of London, 1965. (See Department of Molecular Biology and Pharmacology.) (Also Department of Chemistry)

Professor Emeritus and Lecturer

Fred J. Hodges III, M.D., University of Wisconsin, 1946.

Professor (Clinical)

Noah Susman, M.D., Washington University, 1952.

Professor (Adjunct)

Edward A. Deutsch, Ph.D., Stanford University, 1967.

Associate Professors

Jeffrey J. Brown, M.D., University of California, San Diego, 1983.

Michael D. Darcy, M.D., Ohio State University, 1979.

William B. Dawson, M.D., University of Oklahoma, 1973.

Keith C. Fischer, M.D., The Johns Hopkins University, 1971.

Fernando R. Gutierrez, M.D., University of Valladolid, 1974.

Thomas E. Herman, M.D., The Johns Hopkins University, 1975.

Marshall E. Hicks, M.D., University of Kentucky, 1982.

Charles F. Hildebolt, D.D.S., Ohio State University, 1970; Ph.D., Washington University, 1987.

Lawrence M. Kotner Jr., M.D., Washington University, 1968.

Benjamin C.P. Lee, M.B.,B.S., University of London, 1965.

Robert G. Levitt, M.D., University of California, 1972.

Robert C. McKnight, M.D., Washington University, 1961. (See Department of Medicine.)

Mark A. Mintun, M.D., Washington University, 1981.

Scott A. Mirowitz, M.D., Washington University, 1985.

Stephen M. Moerlein, Ph.D., Washington University, 1982. (See Department of Biochemistry and Molecular Biophysics.)

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.)

David R. Piwnica-Worms, M.D., Ph.D., Duke University, 1984. (See Department of Molecular Biology and Pharmacology.)

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.)

Sharlene A. Teefey, M.D., University of Hawaii, 1980.

Jerold W. Wallis, M.D., Stanford University, 1981.

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. (See Department of Molecular Biology and Pharmacology.)

Carlos F. Aquino-Aponte, M.D., University of Puerto Rico, 1985.

Mark M. Bahn, M.D., University of Minnesota, 1981; Ph.D., University of California, Los Angeles, 1988.

Premsri T. Barton, M.D., Mahidol University, 1973.

Harold F. Bennett, M.D., Ph.D., University of Illinois, 1988.

Kevin J. Black, M.D., Duke University, 1990. (See Department of Psychiatry and Department of Neurology.)

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. (Also Department of Physics)

DeWitte T. Cross III, M.D, University of Alabama, 1980.

P. Duffy Cutler, Ph.D., University of California, Los Angeles, 1992.

Farrokh Dehdashti, M.D., Pahlavi University, 1977.

Colin P. Derdeyn, M.D., University of Virginia, 1988.

Steven Don, M.D., Vanderbilt University, 1985.

Edward M. Geltman, M.D., New York University, 1971. (See Department of Medicine.)

David S. Gierada, M.D., Wayne State University, 1988.

Diana L. Gray, M.D., University of Illinois, 1981. (See Department of Obstetrics and Gynecology.)

Robert J. Gropler, M.D., University of Cincinnati, 1981. (See Department of Medicine.) (Cardiovascular Division)

John W. Haller, Ph.D., University of Missouri, St. Louis, 1991. (See Department of Psychiatry.)

David M. Hovsepian, M.D., Columbia University, 1986.

Debiao Li, Ph.D., University of Virginia, 1992.

Weili Lin, Ph.D., Case Western Reserve University, 1993.

Eric S. Malden, M.D., Washington University, 1992.

Timothy J. McCarthy, Ph.D., University of Liverpool, 1989.

Elizabeth Gerard McFarland, M.D., University of California, San Diego, 1987.

William B. Mehard, M.D., Medical University of South Carolina, 1990.

Mary A. Middleton, M.D., Medical College of Wisconsin, 1982.

John M. Ollinger, D.Sc., Washington University, 1986. (See Institute for Biomedical Computing.)

Roberto Pacifici, M.D., Perugia University, 1981. (See Department of Medicine.)

Linda King Proctor, M.D., University of Pennsylvania, 1989.

Tracy L. Roberts, M.D., University of South Carolina, 1986.

Douglas D. Robertson Jr., M.D., Ph.D., Georgetown University, 1982. (See Department of Orthopaedic Surgery.)

Douglas C. Schmidt, Ph.D., University of California, Irvine, 1994. (Also Department of Computer Science.)

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 Department of Medicine.)

Cary L. Siegel, M.D., University of Michigan, 1987.

Celette Sugg Skinner, Ph.D., University of North Carolina, Chapel Hill, 1991.

Richard M. Slone, M.D., University of Florida, 1989.

Emily L. Smith, M.D., Washington University, 1968.

Alan J. Tiefenbrunn, M.D., Washington University, 1974. (See Department of Medicine.)

Thomas M. Vesley, M.D., Mayo Medical School, 1986.

Darryl A. Zuckerman, M.D., State University of New York, Syracuse, 1983.

Research Assistant Professors

Stephen M. Moore, M.S., Washington University, 1984.

Kondapuram S. Sampathkumaran, M.S., McMaster University, Canada, 1977. (See Department of Medicine.)

Vijay Sharma, Ph.D., Panjab University, 1987.

Tom O. Videen, Ph.D., University of Washington, 1981. (See Department of Neurology.)

Assistant Professors (Clinical)

John L. Bardsley, M.D., University of Illinois, 1964.

Gene L. Davis Jr., M.D., University of Virginia, 1972.

James W. Debnam Jr., 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.

Ben R. Mayes Jr., M.D., Washington University, 1966.

Allan H. McCown, M.D., Washington University, 1964.

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.

Instructors

John L. Alfieri, M.D., Hahnemann University, 1993.

Lefian Al-Otaibi, M.D., KFU College of Medicine and Medical Sciences, Saudi Arabia, 1989.

Dwayne Anderson, M.D., Medical College of Pennsylvania, 1990.

Kyongtae T. Bae, M.D., University of Pennsylvania, 1992.

H. Scott Beasley, M.D., Indiana University, 1993.

James W. Blechman, M.D., New Jersey Medical School, 1993.

Robert O. Buse Jr., M.D., University of Cincinnati, 1992.

Maria Chong, M.D., University of Washington, Seattle, 1992.

Laurie A. Cleland, M.D., Oregon Health Sciences University, 1987.

Constance S. Courtois, M.D., Medical University of South Carolina, 1985.

Michael G. Crowley, Ph.D., University of Florida, 1982.

David A. Feinberg, Ph.D., University of California, Berkeley, 1982; M.D., University of Miami, 1988.

Robert J. Feiwell, M.D., University of California, San Diego, 1990.

Fidelma Flanagan, M.D., University College, Dublin, Ireland, 1987.

Glenn Fletcher, Ph.D., Michigan State University, 1981.

Howard D. Goldberg, M.D., University of Maryland, 1992.

Cole B. Graham III, M.D., University of North Carolina, Chapel Hill, 1993.

D. Daniel Hassell III, M.D., The University of Chicago, 1993.

Donald V. Heck, M.D., Duke University, 1993.

Noah W. Jaffee, M.D., Baylor College of Medicine, 1992.

William James, M.D., University of Missouri, 1993.

Annette J. Johnson, M.D., Medical College of Virginia, 1992.

George Kimbiris, M.D., Hahnemann University, 1993.

Debra M. Lau, M.D., Albert Einstein College of Medicine, 1993.

J.H. Edmund Lee, M.D., University of California, San Diego, 1992.

David M. Leifer, M.D., The University of Chicago, 1993.

Eugene C. Lin, M.D., Northwestern University, 1992.

Gary D. Luker, M.D., Washington University, 1991.

Lee A. Madeline, M.D., Vanderbilt University, 1992.

Paul N. Malcolm, M.D., King's College Hospital, 1986.

Robert C. McKinstry III, Ph.D., Massachusetts Institute of Technology, 1991; M.D., Harvard University, 1992.

Vamsidhar Rao Narra, M.D., Osmania University, India, 1990.

Nathan C. Nelson, M.S., University of Colorado, 1993.

Thomas K. Pilgram, Ph.D., University of California, Berkeley, 1982.

Vallabhaneni V. Rao, Ph.D., University of Hyderabad, 1987.

Farid F. Shafaie, M.D., Eastern Virginia Medical School, 1992.

Ali Shaibani, M.D., Northeastern Ohio University, 1992.

Felix L. Song, M.D., Washington University, 1993.

Joseph R. Steele, M.D., University of Texas, Southwestern, 1993.

Katy D.T. Vo, M.D., Cornell University, 1991.

Pamela K. Woodard, M.D., Duke University, 1990.

Dmitriy A. Yablonskiy, Ph.D., Ukrainian Academy of Sciences, 1981.

Research Instructors

Carmen S. Dence, M.S., Florida State University, 1972.

David E.C. Reichert, Ph.D., University of Illinois, 1994.

Sally Wagner 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.

Division of Radiation Oncology

Professor and Director

Carlos A. Perez, M.D., University of Antioquia, 1960.

Professors

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 Microbiology.)

Robert J. Myerson, Ph.D., University of California, 1974; M.D., University of Miami, 1980.

James A. Purdy, Ph.D., University of Texas, 1971. (Radiation 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)

Gilbert H. Nussbaum, Ph.D., Harvard University, 1967. (Radiation Physics)

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

Joseph R. Simpson, Ph.D., The University of Chicago, 1967; M.D., Harvard University, 1973.

Associate Professors (Clinical)

Venkata R. Devineni, M.D., Osmania Medical College, 1974.

Bruce J. Walz, M.D., Washington University, 1966.

Assistant Professors

Clifford K.S. Chao, M.D., Kaohsiung Medical College, 1982.

Robert E. Drzymala, Ph.D., University of Oklahoma, 1977. (Radiation Physics) (See Department of Neurological 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)

Eric E. Klein, M.S., University of Massachusetts, 1985.

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 Professor (Clinical)

McDonald B. Logie, M.D., Northwestern University, 1967.

Instructors

Walter R. Bosch, D.Sc., Washington University, 1990. (Radiation Physics)

Ming-shun Chen, Ph.D., Kansas State University, 1991. (Cancer Biology)

Seymour Fox, Ph.D., University of Oklahoma, 1977. (Computer Sciences)

Russell L. Gerber, M.S., St. Louis University, 1985. (Radiation Physics)

William B. Harms Sr., B.S., University of Missouri, 1979. (Radiation Physics)

Assen S. Kirov, Ph.D., University Sofia, Bulgaria, 1993. (Radiation Physics)

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, Kansas City, 1977.

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.)

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 Surgery, students are assigned clinical rotations, both within the Department of Surgery and in other departments at the School of Medicine, 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, within the Department of Surgery, electives are available in pediatric surgery, transplant surgery, vascular surgery, cardiovascular and thoracic surgery, urologic surgery, and plastic and reconstructive surgery.

THIRD YEAR

M95 780 SURGERY CLERKSHIP

Instructor: *Dorothy Andriole, M.D.,* 362-8029

During the 12-week surgery clerkship, students spend four weeks on each of three separate rotations. Each student spends one four-week block on a general surgery rotation at Barnes-Jewish Hospital or John Cochran Veterans Administration Medical Center. In addition, each student selects two rotations in general surgical fields, surgical subspecialties and related disciplines of critical care. The student is an active participant in the daily care of patients on each service and attends the service teaching conferences and rounds. For the duration of the 12-week rotation, there is a biweekly lecture series and weekly small-group tutorial sessions with faculty members.

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 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.

Electives

M95 801 GENERAL SURGERY SUBINTERNSHIP — BARNES-JEWISH HOSPITAL SOUTH CAMPUS

Instructor: *Dorothy Andriole, M.D.,* 362-8029

Each student will function as a member of the general surgery team, sharing most of the duties of an intern. The student will share night call under supervision of first- and second-year residents in rotation with the two ward interns. The structure of the subinternship is flexible to accommodate the individual student's interests within the department. The student may spend the entire elective period on a single service or arrangements can be made for the student to rotate on more than one service. Students attend weekly Grand Rounds and General Surgery Conferences given by the Department of Surgery. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 807 GENERAL SURGERY CLERKSHIP (RURAL PRACTICE) — KEOKUK AREA HOSPITAL

Instructors: *David Siroospour, M.D.; Ronald Kinateder, M.D.* (both: 319-524-7150)

Students work under the supervision of two general surgeons involved in a 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 covered by the hospital. Keokuk is located approximately 3 1/2 hours North of St. Louis and is accessible by car. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 808 GENERAL SURGERY SUBINTERNSHIP — VETERANS ADMINISTRATION MEDICAL CENTER

Instructor: *Jeffrey Moley, M.D.,* 362-5210

Each student will be assigned to the Washington University General Surgery Service at the Veterans Administration 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 residents in rotation. The Veterans Administration 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.

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

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 Multidisciplinary Tumor Conference. They also will attend departmental Grand Rounds and the General Surgery Conference at Barnes-Jewish Hospital South Campus. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 810 SURGERY CLERKSHIP OR PRECEPTORSHIP — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructor: *Gordon Philpott, M.D.,* 454-7170

The subinternship at Barnes-Jewish Hospital North Campus, is a flexible rotation. The student has the opportunity to gain experience in many areas of general surgery including vascular surgery, laparoscopic surgery and surgery for breast disease. The student will be involved in inpatient care both on the ward and in the intensive care unit. The student may elect to spend the entire rotation on the general surgery service or to divide the rotation between the general surgery and the colorectal surgery services. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 811 COLON AND RECTAL SURGERY PRECEPTORSHIP — BARNES-JEWISH HOSPITAL NORTH CAMPUS

Instructor: *Ira J. Kodner, M.D.,* 454-7177

A four-week preceptorship is offered in Colon and Rectal Surgery. This consists of an intensive outpatient experience with the senior faculty. Surgical problems are evaluated and planning for immediate and long-term care is undertaken. The student will acquire a comprehensive understanding of a wide range of benign and malignant colorectal disease. There is little required time in the operating room and in duties on the inpatient service. The student is expected to attend and participate in all conferences. There is exposure to radiation oncology and the specialized areas of nursing related to care of patients with colorectal cancer and inflammatory bowel disease. Specifics of the elective should be planned in advance with Dr. Kodner. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 813 GRAHAM/TRAUMA — ELECTIVE ROTATION

Instructor: *Timothy G. Buchman, Ph.D., M.D.,* 362-9347

The student will function as a subintern on the Evarts A. Graham Service, which includes the Trauma Service. It is a busy inpatient service. The student will be involved with the comprehensive management of emergency and trauma patients. The student also 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 also will 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 and otherwise critically ill surgical patient. The student will be able to manage most routine problems in perioperative surgical care. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 820 CARDIOTHORACIC SURGERY

Instructors: *Joel D. Cooper, M.D.; Thomas B. Ferguson Sr., M.D.; G. Alexander Patterson, M.D.; Michael K. Pasque, M.D.; Charles L. Roper, M.D.; Sudhir Sundaresan, M.D.; Thoralf Sundt III, M.D.; Charles B. Huddleston, M.D.; William A. Gay Jr., M.D.; Eric N. Mendeloff, M.D.* (all: 362-6185)

The senior elective in Cardiothoracic Surgery is a four-week clinical rotation. Students have the choice of spending the entire four weeks in adult cardiac surgery, adult general thoracic surgery or in pediatric cardiac surgery. If the student wishes, the four-week rotation can be divided into any combination of the above three subrotations. While on the cardiothoracic surgery service, students will participate in morning work rounds with the cardiothoracic surgery house staff, attend the operative procedures of their choice, attend weekly cardiothoracic surgery conference, and attend teaching rounds and cardiac catheterization conference (combined Cardiology and Cardiothoracic Surgery). The students will be introduced not only to the surgical techniques involved in cardiothoracic surgery, but emphasis also will be placed on postoperative care. In addition, the principles of cardiopulmonary bypass, left and right heart assist devices, intra-aortic balloon counterpulsation, cardiac transplantation, lung transplantation, cardiac arrhythmia surgery, coronary artery bypass surgery, valve repair and replacement, and pulmonary and esophageal neoplastic disorders will be emphasized. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 830 PLASTIC RECONSTRUCTIVE SURGERY

Instructor: *Susan Mackinnon, M.D.,* 362-7388

The period on plastic surgery may either be spent as a clinical clerk or conducting a basic laboratory project. The purpose of the clinical clerkship is to familiarize the student with the basic principles of tissue repair and reconstruction. The student will have successive assignments to each of the attending staff and the ward resident during the four weeks. This will expose the student to the breadth and

depth of plastic surgery. The student will assume an active role on the plastic surgery service and will participate in the total management of a wide variety of surgical problems including congenital anomalies, microvascular surgery, surgery of the upper extremity, peripheral nerve surgery, cosmetic surgery and general reconstructive plastic surgery. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 850 UROLOGY

Instructor: *William Catalona, M.D.*, 362-8205

A four-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 non-surgical 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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 880 PEDIATRIC SURGERY

Instructor: *Robert Foglia, M.D.*, 454-6022

The student will fully participate as a subintern in all aspects of pediatric surgical patient care, including preoperative evaluation, surgery and postoperative care. Twice daily rounds are made with the resident staff and daily rounds with the attending staff. Participation in general surgery pediatric clinic, emergency room care, pediatric oncology conference, weekly conferences including mortality and morbidity, radiology, pathology, and monthly trauma and medical surgical GI conferences, as well as daily contact with Pediatric Radiology, are expected. Students are encouraged to undertake clinical investigations if elective time permits. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 891 ORGAN TRANSPLANTATION

Instructors: *Todd Howard, M.D.*, 362-5701; *Jeffrey Lowell, M.D.*, 362-2820; *Surendra Shenoy, M.D., Ph.D.*, 362-4338

The care of transplant patients requires the integration of multiple diverse medical and surgical disciplines. This elective clerkship in organ transplantation encompasses the preoperative evaluation of adult and pediatric recipients of kidney, liver or organ grafts procured from cadaveric or living related donors and participation in the operative management of these patients. Emphasis also is placed on postoperative care, multimodality immunosuppression, management of allograft rejection and organ retrieval and preservation. Basic hepatic and renal physiology, fluid and electrolyte balance 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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 892 MINIMALLY INVASIVE SURGERY

Instructor: *Nathaniel J. Soper, M.D.*, 362-6900

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 division's Hepatobiliary Pancreatic (HPB) Section. 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 the outpatient office and direct 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 specialty sections within the Division of General Surgery, including Endocrine/Oncology (Drs. Doherty and Brunt), Colorectal Surgery (Dr. Fleshman) and Urologic Surgery (Drs. Clayman and McDougall). The student may also elect to participate in the laboratory of the Washington University Institute for Minimally Invasive Surgery one or two days per week. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 896 PRECEPTORSHIP IN GENERAL SURGERY WITH DR. TIMOTHY BUCHMAN

Instructor: *Timothy G. Buchman, Ph.D., M.D.*, 362-9347

The student will work closely with Dr. Buchman within the Section of Burns, Trauma & Surgical Critical Care. 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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 898 PRECEPTORSHIP IN GENERAL SURGERY WITH DR. STEVEN STRASBERG

Instructor: *Steven Strasberg, M.D.*, 362-7147

The student will work closely with Dr. Strasberg within the Hepatobiliary Pancreatic Section in 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. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

M95 899 PRECEPTORSHIP 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. Students should contact Dr. Dorothy Andriole with questions or for further information, 362-8029.

Brent T. Allen, M.D.
Section of Vascular Surgery
362-7408

Gerard M. Doherty, M.D.
Section of Surgical Oncology and Endocrinology
362-8323

Jeffrey Lowell, M.D.
Section of Transplant Surgery
362-2820

Nathaniel J. Soper, M.D.
Hepatobiliary Pancreatic Section
362-6900

Research M95 (900)

Gerard M. Doherty, M.D., 362-8370
Cytokine and metabolism laboratory/surgical oncology. Minimum rotation length: three months. This laboratory focuses on the role of interferon gamma in endogenous tumor immunity. The principle techniques utilized for the study of *in vitro* cell culture and *in vivo* models of tumor growth include plasmid vector construction and overexpression of cytokines, cytokine receptors and transcription factors.

James W. Fleshman Jr., M.D., 454-7177
Research in laparoscopy of colorectal disease. Minimum rotation length: three months. Ongoing projects in the laboratory are focused on defining the effects of laparoscopic techniques on tumor implantation. Other projects in which the student may participate include delineation of tumor cell desquamation within the abdominal cavity after colectomy for cancer and manipulation of the instrumentation site incision to prevent tumor implantation. The student will work under the direct supervision of Dr. James Fleshman and Dr. Judith Connett. The student will have the opportunity to gain familiarity with radioimmunoassay techniques and histologic techniques, as well as to participate directly in small animal surgical procedures.

Jeffrey Lowell, M.D., 362-5701
Extracorporeal liver assist device. Minimum rotation length: one month. The student will participate in the development of an extracorporeal liver assist device. Hepatocytes from animals and humans will be isolated and placed in a dialysis cartridge. Efforts initially will be focused on characterizing the cells which will potentially be utilized in designing an extracorporeal liver assist device.

Susan E. Mackinnon, M.D., 362-4587
Peripheral nerve surgical research. The laboratory investigates nerve injury and regeneration, including nerve transplantation. The student will be encouraged to design and complete his or her own research study during the elective.

Susan E. Mackinnon, M.D., 362-4593
Plastic surgery research laboratories. Minimum rotation length: six weeks. The research rotation can be conducted in the plastic surgery laboratories under the direction of Drs. Higgs, Jones, Kraemer, Mackinnon, Marsh, Weeks, Witt and Young. A project will be designed with the student prior to his or her rotation on plastic surgery so that all the materials and methods will be available at the beginning of the rotation. Ongoing projects include: 1) nerve repair and regeneration; 2) the effects of growth factors on wound healing; 3) fabrication of body parts using tissue flaps and peptide growth factors; 4) *in vivo* tissue generation and tissue differentiation; 5) the mechanical, structural and biochemical effects of stress on scar tissue maturation; 6) *in vivo* anatomy of craniofacial deformities; 7) microvascular thrombosis research; and 8) outcome analysis of methods of cleft lip and palate management.

Jeffrey F. Moley, M.D., 362-5210
Molecular genetics of cancer progression. Minimum rotation length: three months. We are studying the molecular genetic events that contribute to the progression of tumors through the stages of hyperplasia, to carcinoma *in situ*, to invasive carcinoma and then metastatic cancer. We have been working on medullary thyroid cancer and colon cancer as models for these investigations. Both these tumor types have precursor lesions and our tissue bank is stocked with many samples which would provide the student the opportunity to study a variety of specific molecular genetic aspects of tumorigenesis. The laboratory is equipped to train and provide a student with the opportunity to learn DNA and RNA analysis including Southern blotting, Northern blotting, polymerase chain reaction-based techniques, cloning, sequencing, differential display, *in situ* hybridization and Western blotting.

Brian G. Rubin, M.D., 454-5527
Thrombosis and vascular wall biology. Minimum rotation length: eight weeks. This laboratory is interested in evaluating the molecular events that transpire in the vascular wall subsequent to arterial thrombosis. The laboratory experience will include an exposure to animal surgical techniques, standard histology and immunohistochemical preparations, and analysis of induced alterations in vascular wall mRNA levels. Interested students must contact Dr. Rubin prior to choosing this research experience.

Nathaniel J. Soper, M.D., 362-6900
Minimally invasive surgery. Minimum rotation length: four weeks. Under the auspices of the Washington University Institute for Minimally Invasive Surgery (WUIMIS), a number of surgeons are investigating the physiologic consequences of laparoscopic surgery and new applications for procedures and technologies. The student may choose a specific staff member's research project or participate in several different projects. These investigators and their projects include: Nathaniel J. Soper, M.D., physiology of smoke absorption across peritoneum and laparoscopic hepatic surgery; James W. Fleshman Jr., M.D., influence of pneumoperitoneum on intraperitoneal spread of colorectal cancer; L. Michael Brunt, M.D., application of endoscopic surgery to the neck and axilla; Jacob C. Langer, M.D., endoscopic fetal surgery and laparoscopic repair of rectal prolapse.

Robert W. Thompson, M.D., 362-7410
Pathophysiology of abdominal aortic aneurysms. Minimum rotation length: eight weeks. This laboratory research elective allows the student the opportunity to be exposed to, and participate in, active basic science investigations regarding the pathophysiology and treatment of abdominal aortic aneurysms. This laboratory utilizes both human clinical material and animal models of aneurysm disease, combined with molecular and cellular techniques such as Western and Northern blots, reverse transcriptase polymerase chain reactions, immunohistochemistry and *in situ* hybridization. The student will have the opportunity to integrate these laboratory studies with clinical knowledge based on a busy clinical practice in vascular surgery and to interact frequently with faculty and staff in the Section of Vascular Surgery.

Faculty

BIXBY PROFESSOR OF SURGERY AND CHAIR OF DEPARTMENT
Samuel A. Wells Jr., M.D., Emory University, 1961.

Division of Cardiothoracic Surgery

Evarts A. Graham Professor of Surgery and Head of Division
Joel D. Cooper, M.D., Harvard College, 1964.

Professors Emeriti

Thomas B. Ferguson Sr., M.D., Duke University, 1947.
Charles L. Roper, M.D., University of Colorado, 1953.

Professors

Hendrick B. Barner, M.D., University of Washington, 1957.
John P. Boineau, M.D., Duke University, 1959.
William A. Gay Jr., M.D., Duke University, 1961.
Michael K. Pasque, M.D., University of Oklahoma, 1978.

Joseph C. Bancroft Professor
G. Alexander Patterson, M.D., Queen's University, 1974.

Associate Professor

Charles B. Huddleston, M.D., Vanderbilt University, 1978.

Assistant Professors

Scott H. Johnson, M.D., Duke University, 1986.
Eric N. Mendeloff, M.D., University of California, Los Angeles, 1985.
R. Sudhir Sundaresan, 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

Bixby Professor and 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 Microbiology.)
Ira J. Kodner, M.D., Washington University, 1967.
Thalachallour Mohanakumar, Ph.D., Duke University, 1974. (See Departments of Medicine and Pathology.)

Harry Edison Professor of Surgery

Gordon W. Philpott, M.D., Washington University, 1961.

Gregorio A. Sicard, M.D., University of Puerto Rico, 1972.

Nathaniel J. Soper, M.D., University of Iowa, 1980.

Steven M. Strasberg, M.D., University of Toronto, 1963.

Associate Professors

Brent T. Allen, M.D., Washington University, 1979.

James W. Fleshman Jr., M.D., Washington University, 1980.

Paul J. Goodfellow, Ph.D., Queens University, 1985.

Jeffrey F. Moley, M.D., Columbia University, 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

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.

J. Perren Cobb, M.D., University of Louisville, 1986.

Gerard M. Doherty, M.D., Yale University, 1986.

Jeffrey A. Drebin, M.D., Ph.D., Harvard University, 1987.

J. Christopher Eagon, M.D., Harvard University, 1988.

Bradley D. Freeman, M.D., Duke University, 1988.

Todd K. Howard, M.D., University of Cincinnati, 1981.

Terry C. Lairmore, M.D., Vanderbilt University, 1988.

Jeffrey A. Lowell, M.D., Yale University, 1985.

Thomas E. Read, M.D., University of California, San Francisco, 1988.

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.

Eric D. Whitman, M.D., Pennsylvania State University, 1985.

Research Assistant Professor

Judith M. Connett, Ph.D., Washington University, 1979.

Assistant Professors (Clinical)

Kenneth J. Arnold, M.D., Washington University, 1968.

Ronald Kinateder, M.D., University of Missouri, 1966.

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.

David Siroospour, M.D., Shiraz University, 1967.

Andrew D. Spencer, M.D., Indiana University, 1954.

Leonard B. Weinstock, M.D., University of Rochester, 1981.

Instructors

Michael J. Buckmaster, M.D., University of Michigan, 1990.

Manuel Miralles Hernandez, M.D., Universidad de Barcelona, 1982.

Sirish Parvathaneni, M.D., Northwestern University, 1992.

Surendra Shenoy, M.D., Ph.D., Kasturba Medical College, 1975.

Laurence Yee, M.D., University of Pittsburgh, 1990.

H. Michael Yin-Hu, M.D., University of Minnesota, 1989.

Yvonne Zabala, D.O., Southeastern University of the Health Sciences, 1992.

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.

Ronald J. Gaskin, M.D., Washington University, 1970.

Jay W. Haines, M.D., Chicago Medical School, 1974.

Elizabeth Hilliker, M.D., Washington University, 1970.

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.

Marlys E. Schuh, M.D., Washington University, 1979.

Erik P. Thyssen, M.,D., Michael Reese Hospital, 1990.

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 and Associate Professor

Robert P. Foglia, M.D., Georgetown University, 1974.

Professor Emeritus

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 and Professor

Susan E. Mackinnon, M.D., Queen's University, 1975. (See Department of Otolaryngology and Program in Occupational Therapy.)

Professors Emeriti

Minot P. Fryer, M.D., The Johns Hopkins University, 1940; D.S.C., Brown University, 1972.

Paul M. Weeks, M.D., University of North Carolina, 1958. (See Irene Walter Johnson Institute of Rehabilitation.)

Professors

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.

Bruce A. Kraemer, M.D., Washington University, 1979.

Research Associate Professor

Mary P. Watkins, M.S., Boston University, 1974.

Assistant Professors

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.

Michael W. Vannier, M.D., University of Kentucky, 1979. (See Department of Radiology.)

Peter D. Witt, M.D., Case Western Reserve University, 1983.

Research Assistant Professor

Christine B. Novak, M.S., University of Toronto, 1992.

Assistant Professors (Clinical)

Mark E. Beehner, D.D.S., Loyola University, 1979; M.D., St. Louis University, 1990.

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.

Homa Youn Sedighi, D.D.S., Washington University, 1987.

Instructors

Michelle J. Place, M.D. Baylor College of Medicine, 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.

Bruce I. White, M.D., Washington University, 1964.

Robert A. Young, M.D., Ohio State University, 1978.

Division of Urologic Surgery

Head of Division and Professor

William J. Catalona, M.D., Yale University, 1968.

Professors

Gerald L. Andriole Jr., M.D., Jefferson Medical College, 1978.

Ralph V. Clayman, M.D., University of California, San Diego, 1973. (See Department of Radiology.)

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 Professors

M'Liss A. Hudson, M.D., University of Texas, 1982.

Carl G. Klutke, M.D., University of Michigan, 1983.

Elspeth M. McDougall, M.D., University of Calgary, 1979.

Associate Professor Emeritus (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.

David W. Keetch, M.D., University of Utah, 1987.

Research Assistant Professor

Deborah S. Smith, Ph.D., Washington University, 1989.

Assistant Professor Emeritus (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.

John F. McCarthy, M.D., Georgetown University, 1989.

Charles H. Nicolai, M.D., Washington University, 1946.

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, INSTITUTES AND PROGRAMS

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 predoctoral 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.

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 also are 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.

The division provides consultation in a wide range of areas including the statistical design of experiments and clinical trials, protocol development, database 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.

FOURTH YEAR

Electives

M80 871 BIOSTATISTICS FOR RESEARCH WORKERS

Instructors: *Michael A. Province, Ph.D., and staff,* 362-3616

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. Cross listed with L41 (Bio) 5066 and MPE Program.

Research (M80 900)

Dabeeru C. Rao, Ph.D., 362-3606
Genetic Epidemiology. After being introduced to current approaches in genetic epidemiology, interested students will be supervised on research projects dealing with methodological development and application of the techniques. Topics to be included are path analysis, variance components, segregation analysis, linkage with genetic counseling.

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.)

Research Associate Professor

Ingrid B. Borecki, Ph.D., University of Hawaii, 1981.

Assistant Professor Emeritus

Barbara B. Hixon, B.S., University of Illinois, 1941.

Assistant Professors

Curtis A. Parvin, Ph.D. University of Minnesota, 1980. (See Departments of Pathology and Medicine.)

William D. Shannon, Ph.D., University of Pittsburgh, 1995. (See Division of General Medical Sciences.)

Research Assistant Professors

Chi Gu, Ph.D., Washington University, 1992.

Treva K. Rice, Ph.D., University of Colorado, 1987.

Research Instructors

Kimberly D. Siegmund, Ph.D., University of Washington, 1995.

Alexandre A. Todorov, Ph.D., Louisiana State University, 1992.

INSTITUTE FOR BIOMEDICAL COMPUTING

The Institute for Biomedical Computing is an inter-school faculty unit with a mission to foster the development and application of advanced computing technology to problems in medicine and biology. Institute activities include research and training collaborations with both the School of Medicine and the School of Engineering and Applied Science. The Institute consists of research laboratory components that 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 Biomedical Computer Laboratory (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 that 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 computers 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. Research involves algorithm development, database design and data analysis, with a particular emphasis on biochemical and neuromuscular structure and function. The center also is involved in technology development and informatics support for genome mapping and sequencing.

The primary mission 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 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, image 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. Course numbers for these research opportunities are listed within the appropriate departments. Current emphasis in the core research program or 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.

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 noninvasive 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. Rosenberger, McNally and Conchello*

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, modeling of integral membrane proteins including G protein coupled receptors, three-dimensional quantitative structure-activity relationships and predictions of protein tertiary structure. *Drs. Marshall and Nikiforovich*

Research in the CCB focuses on computational aspects of molecular biology including molecular sequence interpretation, RNA structure prediction, design and analysis of 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 also is involved in technology development and informatics support for genome mapping and sequencing. *Drs. States, Kazic and Zuker*

For additional information, see: http://www.ibc.wustl.edu

FOURTH YEAR Research (M80 900)

David J. States, M.D., Ph.D., 362-2135

The Institute for Biomedical Computing (IBC) offers research opportunities in computational molecular biology, genome analysis, computational support for genome mapping and sequencing, electrophoretic gel image analysis, molecular design and macromolecular biophysics. Inquiries are encouraged, and placements within the IBC's program are arranged on an *ad hoc* basis according to student interests and background. Minimum period 12 weeks, 18 weeks preferred.

Frederick U. Rosenberger, D.Sc., 362-2135

Special projects are offered in a wide variety of application areas coinciding with ongoing research projects. Current activities include computational optical sectioning microscopy, neuroimaging and shape modeling, three-dimensional positron emission tomography, quantitative biomedical imaging and biomedical computing broadly. Opportunities are matched to the student's area of interest, capabilities and objectives, through consultation in advance of the elective period. Minimum period 12 weeks, 18 weeks preferred.

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 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 IBC

Frederick U. Rosenberger, D.Sc., New York University, 1969. (Also School of Engineering and Applied Science)

Professors Emeriti

Harold W. Shipton, C.Eng., Shrewsbury Technical College, 1949. (Also School of Engineering and Applied Science)

Lewis J. Thomas Jr., M.D., Washington University, 1957. (See Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science)

Professors

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)

James A. Purdy, Ph.D., University of Texas, 1971. (Radiation Physics)

Donald L. Snyder, Ph.D., Massachusetts Institute of Technology, 1966. (Also School of Engineering and Applied Science)

Research Professors

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 Bernard Becker Medical Library and Department of Medicine.)

Will D. Gillett, Ph.D., University of Illinois, 1977. (Also Computer Science)

Michael I. Miller, Ph.D., The Johns Hopkins University, 1983. (Also School of Engineering and Applied Science)

Michael S. Zuker, Ph.D., Massachusetts Institute of Technology, 1974.

Research Associate Professor

Jack R. Engsberg, Ph.D., University of Iowa, 1985. (See Department of Neurological Surgery.)

Assistant Professors

José-Angel Conchello, Ph.D., Dartmouth College, 1991.

Ron K. Cytron, Ph.D., University of Illinois, 1984. (Also Computer Science)

Sean R. Eddy, Ph.D., University of Colorado, Boulder, 1991. (See Department of Genetics.)

Warren R. Gish, Ph.D., University of California, Berkeley, 1988. (See Department of Genetics.)

Eileen Kraemer, Ph.D., Georgia Institute of Technology, 1995. (Also Computer Science)

Christine H. Lorenz, Ph.D., Vanderbilt University, 1992.

Jay W. Ponder, Ph.D., Harvard University, 1984. (See Department of Biochemistry and Molecular Biophysics.)

Joseph M. Smith, M.D., Harvard Medical School, 1987. (See Department of Medicine.)

Research Assistant Professors

James G. McNally, Ph.D., The University of Chicago, 1983. (See Department of Cell Biology and Physiology.) (Also Faculty of Arts and Sciences)

Volker Nowotny, Ph.D., Technische Universitat, 1981. (See Department of Genetics.)

John M. Ollinger, D.Sc., Washington University, 1986.

Instructor

Toni M. Kazic, Ph.D., University of Pennsylvania, 1984.

HEALTH KEY BEACON

Health Key Beacon is a primary care group practice providing comprehensive health services to more than 150,000 people in the St. Louis area. The group was originally established in 1969 as The Medical Care Group of Washington University, a teaching and research unit within a medical school environment. Today, the group provides care in pediatrics, internal medicine, allergy and obstetrics/gynecology in 16 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 Beacon Pediatric Division actively participates in the COPE program of the Department of Pediatrics.

Health Key Beacon also is a source of data for various clinical and health services research. The expanded Health Key Beacon practice is staffed by physicians in private practice, some of whom are members of the faculty of the School of Medicine in the Departments of Medicine, Pediatrics, and Obstetrics and Gynecology.

Executive Committee/ Board of Directors

President

Charles J. Willey, M.D., University of Missouri, 1985. (Internal Medicine)

Executive Vice President

John H. Rice, M.D., University of Missouri, 1980.

Vice President

Richard L. Lazaroff, M.D., St. Louis University, 1978. (See Department of Pediatrics.)

Board of Directors

William S. Adams, M.D., University of Virginia, 1992. (See Department of Pediatrics.)

Curt E. Calcaterra, M.D., University of Missouri, 1980. (Internal Medicine)

James M. Corry, M.D., Washington University, 1974. (See Department of Pediatrics.)

E.J. Cunningham, M.D., St. Louis University, 1963. (Internal Medicine)

Charles H. Dougherty, M.D., University of Rochester School of Medicine, 1973. (See Department of Pediatrics.)

Elizabeth A. Tracy, M.D., Medical College of Wisconsin, 1986. (See Department of Medicine.)

Paul B. Votterott Jr., M.D., St. Louis University, 1974. (Internal Medicine)

John F. Wiedner, M.D., Rush Medical College, 1985. (Internal Medicine)

Health Key Beacon Physicians

Susan R. Adams, M.D., University of Virginia, 1992. (See Department of Medicine.)

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.)

Joyce E. Boehmer, M.D., University of Missouri, 1979. (See Department of Medicine.)

Kathleen S. Brunts, 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.)

Janet L. 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.)

Judith A. Dibble, M.D. Washington University, 1986.

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.)

James E. Ebel, M.D., St. Louis University, 1982. (Internal Medicine)

Renee D. Ewing, M.D., Southern Illinois University, 1984. (See Department of Obstetrics and 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.)

Robert C. Geekie, M.D., University of Missouri, 1980. (Internal Medicine)

David E. Hartenbach, M.D., University of Missouri, 1987. (See Department of Pediatrics.)

Thomas Hastings, M.D., University of Missouri, Kansas City, 1986. (Internal Medicine)

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.)

James W. Ketchum, M.D., Southern Illinois University, 1982. (Internal Medicine)

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.)

Margaret L. Lewis, C.P.N.P., Washington University, 1978.

Gary Maassen, M.D., St. Louis University, 1986. (Internal Medicine)

Gerald M. Mahon, M.D., University of Texas, Dallas 1983. (See Department of Medicine.)

Marjorie Maxwell, R.D., C.D.E., University of Missouri, 1971.

Richard Muchnick, M.D., St. Louis University, 1976. (Internal Medicine)

Karen K. Norton, M.D., Louisiana State University, 1989. (See Department of Pediatrics.)

Robert Oertli, M.D., St. Louis University, 1976.

Dennis R. Patton, M.D., St. Louis University, 1993.

Katherine F. Phelps, C.P.N.P., Washington University, 1983.

Nancy Quigley, C.P.N.P., Washington University, 1970.

Catherine R. Remus, M.D., Rush Medical College, 1983. (See Department of Pediatrics.)

Carol A. Robinson, M.D., University of Missouri, 1985. (See Departments of Pediatrics and 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.)

Robert M. Saitz, M.D., Washington University, 1981. (Internal Medicine)

Joseph Schachter, M.D., Indiana University, 1979. (See Department of Pediatrics.)

David F. Schlitt, M.D., St. Louis University, 1972. (Internal Medicine)

Margaret A. Schmandt, M.D., St. Louis University, 1987. (See Department of Pediatrics.)

David Schoenwalder, M.D., University of Missouri, 1974. (Internal Medicine)

Kristen Scullin, M.D., University of Missouri, Kansas City, 1988. (Internal Medicine)

J. Howard Shane III, M.D., University of Texas, Galveston, 1992. (Internal Medicine)

James C. Speiser, M.D., University of Missouri, Kansas City, 1979.

Stanley G. Vriezelaar, M.D., University of Iowa, 1981. (See Department of Medicine.)

Ronald K. Wepprich, M.D., University of Missouri, 1981.

Nancy J. Williams, M.D., University of Kansas, 1987. (See Department of Medicine.)

PROGRAM IN MEDICAL HUMANITIES

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 and 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.

M80 541 TOPICS IN MEDICINE/MEDICAL HUMANITIES

Instructors: *Stephen Lefrak, M.D.*, 454-7116; *Thomas Gallagher, M.D., 454-8664; and staff*

This is a required course given in the spring semester of the first year of medical school. 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 and 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.

M80 542 PHYSICIANS AND PATIENTS/MEDICAL HUMANITIES

Instructors: *Stephen Lefrak, M.D.*, 454-7116; *Thomas Gallagher, M.D.*, 454-8664; *and staff*

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

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.

OTHER COURSES

M04 582 ALZHEIMER'S DISEASE

Instructors: *John Morris, M.D.; Alison Goate, D.Phil.; Eugene M. Johnson Jr., Ph.D.; Daniel W. McKeel Jr., M.D.* (all: 454-5605)

Alzheimer's disease affects more than 4 million Americans. The cost of caring for these patients has been estimated at $100 billion each year. The population most vulnerable to Alzheimer's disease, those over 65 years of age, is predicted to increase significantly in the near future, ensuring that it will continue to be a public health problem of enormous proportions. In this elective, we will explore the current state of both clinical and basic research into the causes and treatment of Alzheimer's disease. This will be achieved by case presentations and discussion of relevant literature. The elective will involve visits to a clinical research office where patient assessments are performed, a neuropathological laboratory to look at the characteristic lesions of the illness and presentation of research papers in a journal club format. In all these experiences, the distinction of Alzheimer's disease from normal aging will be emphasized.

M04 584 MEDICAL ASPECTS OF DOMESTIC VIOLENCE

Instructor: *Carolyn Haase, M.D.*, 362-9200

This elective is an opportunity to learn about a significant issue that will undoubtedly touch every physician's practice at some point. The first component of the course involves interactive discussion and student presentations. The students will role play and become comfortable asking patients about violent relationships and discussing options. They will gain practical knowledge in identifying domestic violence victims in the clinic, routinely screening patients and addressing community support services. The social and psychological aspects of the issue will also be addressed. The second component is participation in a local conference in which the complexities of domestic violence will be presented from the points of view of the victim, offender, physician, police, lawyer and counselor. The overall objective is for students to gain a practical working knowledge that will be of the utmost value to them in the clinic. Attendance at both the class sessions and the conference is required to receive elective credit. Selection of students will use the same lottery numbers as for standard electives.

M04 587A PHYSICIAN AS HEALTH PROTECTOR AND PATIENT ADVOCATE

Instructors: *Robert Paine, M.D.; Anne Herron, M.B., B.Ch.; Gail Birkenmeier, M.D.; Donald Busiek, M.D.; Tsishwaka Kayembe, M.D.; Allen Mathew, M.D.; Will Ross, M.D.; Erik Stabell, M.D.* (all: 747-1397)

This course is designed to give freshman and sophomore medical students direct patient contact and assignment, history-taking and physical examination skills and medical school course integration. Students will assume guided responsibility for patients under the supervision of physician faculty in a clinic setting at St. Louis Regional Medical Center. From their first clinic meeting, first-year students take an active part in the management of their patients and are the intermediaries between patients and physicians. Long-term association between students and patients is maintained by regular office visits with systematic telephone follow-up and by care during urgent and emergency episodes. Students are given complete records of their patients and updated after each encounter, and their reports and comments are included in the patients' ongoing records. Students develop their skills in acquisition of information by close association with their patients with emphasis on history-taking and physical examination. Knowledge obtained from other medical school courses is integrated with the detailed knowledge of their patient. As the student advances into the second year, correlation of those courses is interrelated with personal, family, social and economic factors affecting the individual. Freshmen meet their patients on alternate Tuesday afternoons; sophomores meet their patients on alternate Wednesday afternoons. All of this is accomplished without making excessive demands on the students' time. Sixteen students are accepted.

M80 601 CLINICAL EPIDEMIOLOGY AND BIOSTATISTICS

Instructors: *Bradley A. Evanoff, M.D.*, 454-8603; *Jay F. Piccirillo, M.D.*, 362-7504

This required course will be presented in the second year by clinicians and will emphasize important principles of applying biostatistic and epidemiologic rules to the study of human diseases. Practical applications of statistical tools in biomedical and clinical settings will be discussed along with other subjects such as clinical study design. This course will consist of formal lectures followed by a discussion session in which students will meet in small groups to discuss pertinent papers with particular emphasis on methodologies.

M80 856 HEALTH ADMINISTRATION

Instructors: *Walter F. Ballinger, M.D.,* 362-7407; *James O. Hepner, Ph.D.,* 362-3272

During the 1990s, the American health care system is undergoing dynamic change as never seen before. Socioeconomic changes are resulting in new forms of health care delivery. The goal of this elective is to expose the senior medical student to the history of health care organization in the United States, currently involving large health care systems. It also will explore the impact of these new health care systems such as managed care. The elective will be conducted by senior faculty using a seminar approach drawing upon background textbooks, monographs, timely topical articles and current research publications to focus the weekly discussions. The medical student will also have the opportunity to audit Health Administration Program classes of their choice in finance, human resource management, health law, health policy, management information systems and case studies. This will be arranged according to individual interest and schedules. An interview with the course master to arrange an optimal program is suggested in advance of enrollment. Valid start weeks for four-week blocks are: Weeks 1, 5, 9, 13, 17, 21, 25, 29, 33, 37 and 41.

GRADUATE PROGRAMS

DIVISION OF BIOLOGY AND BIOMEDICAL SCIENCES

The Division of Biology and Biomedical Sciences, organized in 1973, is a consortium of university departments that 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; 10 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 and research training. 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 17). 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. Most students choose a research adviser by the end of the first year.

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 S. Euclid Ave., Campus Box 8226, St. Louis, Missouri 63110-1093 (e-mail: dbbs_office@wums.wustl.edu). Students who wish to pursue both the Ph.D. and M.D. degrees must apply to the Medical Scientist Training Program (see page 17).

Students admitted to the graduate programs are guaranteed full stipend and tuition support contingent upon satisfactory performance. The stipend for the 1996-97 academic year will be $14,000 annually. Tuition remission is provided to all students, and life, disability and health insurance also is 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 his or her 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.

L41 (BIO) 501 HUMAN ANATOMY

For full description, see Department of Anatomy and Neurobiology's M05 501 Gross Anatomy.

L41 (BIO) 5011 ETHICS AND RESEARCH SCIENCE

Instructor: *Joseph H. Steinbach, Ph.D.,* 362-8560

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. Case study and scenario presentations will

NOTE: Curriculum information in this chapter may have been revised since this chapter was compiled for press. See p. 13 for more information.

provide focus for discussions. Prerequisite: open to undergraduate and graduate students engaged in research. Eight 90-minute sessions. Credit 1 unit.

L41 (BIO) 502 GENERAL PHYSIOLOGY

For full description, see Department of Cell Biology and Physiology's M75 503 Cell and Organ Systems Biology.

L41 (BIO) 5051 FOUNDATIONS OF IMMUNOLOGY

Instructor: *Matthew L. Thomas, Ph.D.*, 362-8722

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 1-2 p.m. Prerequisite: Introductory Biochemistry and/or Genetics helpful. Permission of instructor. This course is referenced in the Department of Pathology. Credit 4 units.

L41 (BIO) 5061 CELL BIOLOGY

For full description, see Department of Cell Biology and Physiology's M75 511 Cell Biology.

L41 (BIO) 5062 CENTRAL QUESTIONS IN CELL BIOLOGY

Instructor: *Maurine Linder, Ph.D.*, 362-6040

Fundamental and "cutting-edge" research in the following areas: cell-cell interactions, biogenesis of organelles, cytoskeleton, cell physiology and 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: L41 (Bio) 5063, or permission of instructor. Two hours each week alternating between lectures and discussions. This is referenced in Department of Cell Biology and Physiology. Credit 2 units.

L41 (BIO) 5064 INTRODUCTION TO MODERN TECHNIQUES OF ELECTRON MICROSCOPY

Instructor: *John Heuser, M.D.*, 362-6948

A practical course for those students who anticipate using election 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.

L41 (BIO) 5065 CELL BIOLOGY OF THE STRESS RESPONSE

Instructor: *Joseph L. Roti Roti, Ph.D.*, 362-9771

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 2 units.

L41 (BIO) 5066 BIOSTATISTICS FOR RESEARCH WORKERS

For full description, see Division of Biostatistics' M80 871.

L41 (BIO) 5068 FUNDAMENTALS OF MOLECULAR CELL BIOLOGY

Instructor: *Susan R. Wente, Ph.D.*, 362-2713

This course is one of the two courses in the core curriculum for the graduate programs in Cell and Molecular Biology. It integrates basic protein biochemistry into a fundamental molecular analysis of cell structure and function. The overall tone of the course is strongly research-based and experimental strategy oriented. Broad areas covered in this course include protein structure analysis, protein purification, membranes, protein and vesicular trafficking, enzyme kinetics, channel electrophysiology, signal transduction, cell motility, cell-cell interactions and extracellular matrix. The format includes both lectures and small-group discussion sections directed by faculty from the Division. Original articles from the research literature will be discussed in detail in the sections, and homework problems will be given. Exams will be in the format of take-home over-the-weekend. This is referenced in the Department of Cell Biology and Physiology. Credit 3 units.

L41 (BIO) 507 PHARMACOLOGY

Instructor: *Douglas F. Covey, Ph.D.*, 362-1724

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular and neuropharmacology. Credit 4 units. Prerequisite: L41 (Bio) 451, 502 and permission of instructor.

L41 (BIO) 5071 BIOORGANIC CHEMISTRY I: FUNDAMENTALS OF MOLECULAR INTERACTIONS AND CHEMICAL CATALYSIS

Instructors: *Douglas F. Covey, Ph.D.*, 362-1724; *George W. Gokel, Ph.D.*, 362-9297

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. Two 75-minute lectures per week. Credit 3 units.

L41 (BIO) 5072 SYNTHESIS FOR BIOORGANIC CHEMISTS

Instructor: *George W. Gokel, Ph.D.*, 362-9297

Survey of modern methodology (tactics) and strategies in organic synthesis with emphasis on molecules of biological relevance such as nucleic acids, peptides, lipids, etc. Prerequisites: Bioorganic Chemistry I, Chem 451 or Chem 556. Three hours per week. Credit 3 units.

L41 (BIO) 5073 BIOORGANIC CHEMISTRY JOURNAL CLUB

Instructor: *Michael Welch, Ph.D.*, 362-8436

Discussion of recent literature and research topics in Bioorganic Chemistry. Credit 1 unit.

L41 (BIO) 508 PHARMACOLOGY

Instructor: *Douglas F. Covey, Ph.D.*, 362-1724

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular and neuropharmacology. Continuation of L41 (Bio) 507. Credit 4 units.

L41 (BIO) 5092 MOLECULAR AND DEVELOPMENTAL BIOLOGY JOURNAL CLUB

Instructor: *Ross L. Cagan, Ph.D.*, 362-7796

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 and developmental biology, 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 Cagan. Credit 1 unit.

L41 (BIO) 512 SPECIAL TOPICS IN DEVELOPMENTAL BIOLOGY

Instructors: *Clarissa M. Cheney, Ph.D., and staff*, 362-2694

Focuses on advanced *drosophila* developmental genetics. This is cross listed in Department of Genetics. Credit 2 units.

L41 (BIO) 5122 CELL-MATRIX INTERACTIONS

Instructors: *Robert P. Mecham, Ph.D.*, 362-2254; *William Parks, Ph.D.*, 454-7543

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 the role of cell-matrix interactions in development, inflammation and disease. Prerequisite: Basic Biochemistry/Cell Biology. This is referenced in the Department of Cell Biology and Physiology. Credit 3 units.

L41 (BIO) 5124 CELL BIOLOGY JOURNAL CLUB

Instructor: *Robert W. Mercer, Ph.D.*, 362-6924

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.

L41 (BIO) 5125 STUDENT-RUN CELL BIOLOGY JOURNAL CLUB

Instructor: *Philip Stahl, Ph.D.*, 362-6950

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.

L41 (BIO) 5126 DEVELOPMENTAL BIOLOGY JOURNAL CLUB

Instructor: *James G. McNally, Ph.D.*, 362-2135

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 attendance and one presentation per semester.

L41 (BIO) 5127 PATHOBIOLOGY JOURNAL CLUB

Instructor: *Jacques U. Baenziger, M.D., Ph.D.*, 362-8730

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.

L41 (BIO) 5128 EXTRACELLULAR MATRIX AND CELL MATRIX INTERACTIONS JOURNAL CLUB

Instructor: *William C. Parks, Ph.D.*, 454-7543

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 or two papers from the current literature. Presentations are given by faculty, students and postdoctorates. Students receive one credit for regular participation and for making three presentations.

L41 (BIO) 5132 CELL MOTILITY AND CYTOSKELETON JOURNAL CLUB

Instructor: *Elliot L. Elson, Ph.D.*, 362-3346

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: L41 (Bio) 5063 or undergraduate course in cell biology. This is referenced in the Department of Cell Biology and Physiology. Credit 1 unit.

L41 (BIO) 5136 TOPICS IN HERPES VIROLOGY AND NEUROVIROLOGY

Instructor: *David A. Leib, Ph.D.*, 362-3826

Participants present summaries of current research published in various journals predominantly in the field of herpes virology. 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.

L41 (BIO) 5142 CELL AND MOLECULAR BIOLOGY OF BONE

Instructor: *Keith A. Hruska, M.D.*, 454-7771

The course is designed around a core of general lectures, each supplemented by two to four student presentations, from the recent literature. Topics include, but are not limited to, bone cell ontogeny, integrin/cadherin-based signal transduction, hormonal regulation, and cell:cell communication. Prerequisite: Biol 5063 or consent of course master. Credit 1 unit.

L41 (BIO) 5171 MEDICAL IMMUNOLOGY

Instructors: *John P. Atkinson, M.D.*, 362-8060; *Robert D. Schreiber, Ph.D.*, 362-8747; *Emil R. Unanue, M.D.*, 362-7440

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). This is cross listed in Department of Pathology's M30 523 Immunology.

L41 (BIO) 5191 PATHOBIOLOGY OF HUMAN DISEASE STATES

Instructor: *Timothy J. Ley, M.D.*, 362-8831

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.

L41 (BIO) 5217 SPECIAL TOPICS IN MICROBIAL PATHOGENESIS

Instructor: *L. David Sibley, Ph.D.*, 362-8873

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. Two class hours a week. Credit 2 units. This is referenced in the Department of Molecular Microbiology.

L41 (BIO) 5225 PROTEINS JOURNAL CLUB

Instructor: *Linda C. Kurz, Ph.D.*, 362-3401

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 faculty. Presentation of controversial topics and results are encouraged. Credit 1 unit, contingent upon regular attendance and one presentation. Prerequisite: graduate standing.

L41 (BIO) 5261 MOLECULAR MECHANISMS OF DISEASE

Instructor: *Herbert W. Virgin IV, M.D., Ph.D.*, 362-9223

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: Foundations in Immunology or permission of instructor. Credit 2 units. This is referenced in the Department of Pathology.

L41 (BIO) 5272 ADVANCED TOPICS IN MOLECULAR IMMUNOLOGY

Instructors: *Jonathan Katz, Ph.D.*, 747-1221; *Robinna Lorenz, M.D., Ph.D.*, 362-3669

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: L41 (Bio) 5051 or permission of instructor. Credit 2 units. This is referenced in the Department of Pathology.

L41 (BIO) 5281 DEVELOPMENTAL GENETICS

Instructor: *Tim Schedl, Ph.D.*, 362-6162

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: L41 (Bio) 301 or equivalent Genetics courses and permission of instructor. Credit 3 units.

L41 (BIO) 5288 SPECIAL TOPICS IN MOLECULAR GENETICS

Instructor: *Kathy Parker Ponder, M.D.,* 362-5188

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 L41 (Bio) 548 and Molecular Cell Biology L41 (Bio) 5063. Two hours per week, 2 units credit.

L41 (BIO) 5312 MACROMOLECULAR INTERACTIONS

Instructor: *Timothy M. Lohman, Ph.D.,* 362-4393

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. Three class hours per week, 3 units credit.

L41 (BIO) 5319 MOLECULAR FOUNDATIONS OF MEDICINE

Instructor: *Linda J. Pike, Ph.D.,* 362-9502

This course is designed primarily for medical students and will cover fundamental aspects of biochemistry and cell biology. The course begins with a treatment of protein structure and the function of proteins in the cytoskeleton and cell motility. The principles of enzyme kinetics and regulation are then discussed and basic pathways for the synthesis and metabolism of carbohydrates and lipids are introduced. This leads into a discussion of membrane structure and the function of cellular organelles in biological processes including energy production, protein degradation and protein trafficking. Special topics workshops presented by physicians serve to link the basic science to the clinic. This course is cross listed in the Department of Biochemistry and Molecular Biophysics' M15 502 (Molecular Foundations of Medicine). Credit 3 units.

L41 (BIO) 5325 PROTEIN STRUCTURE AND FUNCTION

Instructor: *David P. Cistola, M.D., Ph.D.,* 362-4382

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. This is referenced in Department of Biochemistry and Molecular Biophysics. Credit 3 units.

L41 (BIO) 5342 MACROPHAGE BIOLOGY

Instructor: *Thomas H. Steinberg, M.D.,* 362-9218

This special topics course will examine aspects of cell and molecular biology of the macrophage: endocytosis, phagocytosis, adhesion, motility, signal transduction, antigen processing, lysosomes and intracellular parasitism. Prerequisite: Molecular Cell Biology L41 (Bio) 5063 or Foundations in Immunology L41 (Bio) 5051. Offered in alternate years. Two hours a week, 2 units credit.

L41 (BIO) 5346 PHYSICAL DNA MAPPING

Same as Computer Science 534.

L41 (BIO) 5352 DEVELOPMENTAL BIOLOGY

Instructor: *James G. McNally, Ph.D.,* 362-2135

Analysis of a selected set of key processes in development, such as pattern formation, cell-cell signaling and morphogenesis. The focus is on molecular approaches applied to important model systems, but framed in classical concepts. Prerequisite: Molecular Cell Biology (5063) and Nucleic Acids (548). Credit 3 units.

L41 (BIO) 536 PHYSICAL CHEMISTRY OF MACROMOLECULES

Instructor: *Alfred Holtzer, Ph.D.,* 935-6572

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.

L41 (BIO) 5361 SITE-SPECIFIC THERMODYNAMICS

Instructor: *Enrico Di Cera, M.D.,* 362-0268

Basic principles of cooperativity in ligand binding, molecular recognition and mutational effects of biological macromolecules. Credit 3 units.

L41 (BIO) 5381 MECHANISMS OF PROTEIN TARGETING AND INTERCOMPARTMENTAL TRANSPORT

Instructors: *Kendall Blumer, Ph.D.,* 362-1668; *Philip Stahl, Ph.D.,* 362-6950

Recent advances regarding the molecular mechanisms responsible for targeting and intercompartmental transport of proteins 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.

L41 (BIO) 5384 ADVANCED CELL BIOLOGY/ BIOCHEMISTRY OF MEMBRANES

Instructor: *William A. Frazier, Ph.D.,* 362-3348

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: L41 (Bio) 548, L41 (Bio) 5063 and L41 (Bio) 5083. Credit 3 units.

L41 (BIO) 5391 MOLECULAR VIROLOGY

Instructors: *Charles Rice, Ph.D.,* 362-2842; *Henry Huang, Ph.D.,* 362-2755

Emphasis is on the basic molecular biology of virus replication, gene expression, host interactions and pathogenesis. The course will be a combination of lectures and student-led discussion sessions. Prerequisite: first-semester core curriculum for Programs in Cell and Molecular Biology. Special topics course. Credit 2 units.

L41 (BIO) 5392 MOLECULAR MICROBIOLOGY AND PATHOGENESIS

Instructor: *William E. Goldman, Ph.D.,* 362-2742

First half focuses on microbial 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. This is referenced in the Department of Molecular Microbiology.

L41 (BIO) 5393 MOLECULAR VIROLOGY JOURNAL CLUB

Instructor: *John E. Majors, Ph.D.,* 362-1135

Journal club with a minimum of one student presentation with faculty critique. Credit 1 unit.

L41 (BIO) 5404 MOLECULAR NEUROBIOLOGY

Instructor: *Mark B. Willard, Ph.D.,* 362-3462

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.

L41 (BIO) 5406 RNA STRUCTURE AND METABOLISM

Instructor: *David E. Kennell, Ph.D.,* 362-2751

This seminar course will include topics on any aspect of RNA structure and metabolism in procaryotic or eucaryotic 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 L41 (Bio) 548 can be used, but not exclusively. Topics will change from year to year. One two-hour meeting per week. Credit 1 unit.

L41 (BIO) 5416 MOLECULAR MICROBIOLOGY AND PATHOGENESIS JOURNAL CLUB

Instructor: *Scott J. Hultgren, Ph.D.,* 362-6772

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. Credit requires attendance at all sessions and one or two presentations during the year. Credit 1 unit.

L41 (BIO) 5417 HEMATOLOGY/ONCOLOGY JOURNAL CLUB

Instructors: *Stuart A. Kornfeld, M.D.,* 362-8803; *Philip W. Majerus, M.D.,* 362-8801

This journal club, founded in 1966, 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. Credit 1 unit.

L41 (BIO) 5418 MOLECULAR ONCOLOGY/ HEMATOPOIESIS JOURNAL CLUB

Instructors: *Stanley J. Korsmeyer, M.D.,* 362-9050; *Timothy J. Ley, M.D.,* 362-8831

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.

L41 (BIO) 5443 NUCLEIC ACIDS AND NUCLEIC ACID PROTEIN INTERACTIONS JOURNAL CLUB

Instructor: *Kathleen B. Hall, Ph.D.*, 362-4196

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.

L41 (BIO) 5456 ADVANCED CRYSTALLOGRAPHY

Instructor: *Gabriel Waksman, Ph.D.*, 362-4562

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 L41 (Bio) 5315 Macromolecular Structure. Two class hours per week. This is referenced in the Department of Biochemistry and Molecular Biophysics. Credit 2 units.

L41 (BIO) 5458 SPECIAL TOPICS IN MOLECULAR BIOPHYSICS

Instructor: *David P. Cistola, M.D., Ph.D.*, 362-4382

This course covers topics of current relevance in Molecular Biophysics such as Polymer Statistics, NMR spectroscopy, X-ray Diffraction, Protein Structure, Protein-Nucleic Acid Interactions, and Random Coil Polymers. Each topic is covered by a module integrated in the course during the semester. Two to three modules are expected to be offered in the Spring semester. Each module will be taught by a different course master each semester. At the discretion of the instructor, the course may be organized in lecture or seminar format. Prerequisites: L41 (Bio) 5315 Macromolecular Structure and L41 (Bio) 5312 Macromolecular Interactions. Credit 2 units.

L41 (BIO) 5461 MOLECULAR RECOGNITION

Instructor: *Garland R. Marshall, Ph.D.*, 935-4678 (a.m.), 362-2286 (p.m.)

The physical basis of recognition as exemplified in ligand binding to receptors 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 five students. This is referenced in the Department of Biochemistry and Molecular Biophysics. Credit 3 units.

L41 (BIO) 5464 COMPUTATIONAL BIOCHEMISTRY

Instructor: *Garland R. Marshall, Ph.D.*, 935-4678 (a.m.), 362-2286 (p.m.)

This course will cover the application of computer modeling and simulation to problems involving biological macromolecules of interest such as enzymes, receptors, nucleic acids, etc. Lectures will discuss the theory and algorithms behind a variety of simulation techniques. Implementation of these approaches through computational chemistry and molecular modeling will be used to explore their applicability to experimental systems. Alternative paradigms and methods for handling problems at differing levels of structural resolution will be emphasized. Topics examined in detail include molecular mechanics force fields, optimization, dynamics-based simulation, protein folding, homology modeling, tertiary structure prediction, etc. Applications will be taken from well-defined biological systems with critical experimental data available for comparison and validation. Each student should expect to complete a project applying one of the computational methods discussed. Prerequisites: Calculus and Physical Chemistry. Minimum five students. This is referenced in the Department of Biochemistry and Molecular Biophysics. Credit 3 units.

L41 (BIO) 548 NUCLEIC ACIDS AND PROTEIN BIOSYNTHESIS

Instructor: *John E. Majors, Ph.D.*, 362-1135

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: L41 (Bio) 337, 449, or equivalent or permission of instructor. This is referenced in the Department of Biochemistry and Molecular Biophysics. Credit 3 units.

L41 (BIO) 5481 STUDENT-RUN MOLECULAR GENETICS JOURNAL CLUB

Instructor: *H. Mark Johnston, Ph.D.*, 362-2735

Students in the Molecular Genetics Program have organized this journal club, which meets weekly. The speaker provides the faculty member in charge with a one-page outline of their presentation ahead of the class time. Students provide written evaluations of the quality and content of each others' talks. The forms are given to each speaker by way of the

faculty member in charge. All students receiving credit are expected to give one presentation per semester and to attend regularly. This is referenced in Department of Biochemistry and Molecular Biophysics. Credit 1 unit.

L41 (BIO) 5491 ADVANCED GENETICS

Instructors: *H. Mark Johnston, Ph.D.*, 362-2735; *Tim B. Schedl, Ph.D.*, 362-6162

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. This is cross listed in Department of Genetics.

L41 (BIO) 5498 ADVANCED GENETICS: AN INTRODUCTION TO GENOMIC ANALYSIS

Instructors: *Paul J. Goodfellow, Ph.D.*, 362-8106; *Milton J. Schlessinger, Ph.D.*, 362-2762

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 L41 (Bio) 548 or permission of course master. One-hour lecture and one-hour laboratory demonstration/lecture each week. Credit 2 units.

L41 (BIO) 550 MEDICAL GENETICS

Instructor: *Ted H. Hansen, Ph.D.*, 362-2716

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. This is cross listed with Department of Genetics' M30 510A Molecular and Medical Genetics.

L41 (BIO) 5502 MOLECULAR ASPECTS OF VISION

Instructor: *J. Mark Petrash, Ph.D.*, 362-1172

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 pigmentosis included. Prerequisite: 3 units of Biochemistry. Credit 1 unit.

L41 (BIO) 5503 MOLECULAR PATHOBIOLOGY OF VISUAL DISORDERS

Instructor: *J. Mark Petrash, Ph.D.*, 362-1172

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.

L41 (BIO) 5511 MOLEKOOLZ

Instructor: *Ross L. Cagan, Ph.D.*, 362-7796

Our knowledge of the molecules that direct development has been exploding. This course examines the "hottest" developmental molecules (and techniques) of the past year and presents the biology behind them. Each class focuses on a single molecule, and its role is examined across several species. These molecules include the molecules that convey signals between cells, the activated signal transduction pathways and the transcription factors which direct fate.

L41 (BIO) 5522 MEMORY

Instructor: *Jeffery Lichtman, M.D., Ph.D.*, 362-2504

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.

L41 (BIO) 5533 MULTIDRUG RESISTANCE JOURNAL CLUB

Instructor: *David R. Piwnica-Worms, M.D., Ph.D.*, 362-9356

The multidrug resistance (MDRI) P-glycoprotein and ATP-binding cassette family members function as energy-dependent efflux pumps of a wide variety of natural and xenobiotic substrates, including anticancer drugs. A journal club format will enable study and discussion of topics broadly based on any and all aspects of the multidrug resistance family of transporters: cell and molecular biology, biochemistry, genetics, pharmacology, bioorganic chemistry and pharmaceutics, imaging and clinical correlates of multidrug resistance in cancer and infectious disease are relevant. Credit 1 unit.

L41 (BIO) 554 NEURAL SCIENCES

For full description, see Department of Anatomy and Neurobiology's M35 554 Neural Sciences.

L41 (BIO) 5553 DEVELOPMENTAL NEUROBIOLOGY JOURNAL CLUB

Instructors: *Alan L. Pearlman, M.D.*, 362-6947; *Paul H. Taghert, Ph.D.*, 362-3641; *Rachel Wong, Ph.D.*, 362-4941

A weekly journal club to review important recent publications in developmental neurobiology. Prerequisite: one year of graduate study in Division of Biology and Biomedical Sciences or equivalent. Credit 1 unit.

L41 (BIO) 5562 PRINCIPLES OF NEURAL DEVELOPMENT

Instructors: *Yi Rao, Ph.D.*, 362-9388; *Rachel O. Wong, Ph.D.*, 362-4941

An introduction to the development of the nervous system. Prerequisite: graduate status or permission of instructors. Credit 4 units.

L41 (BIO) 5565 ORAL PRESENTATION OF SCIENTIFIC DATA

Instructors: *Joshua R. Sanes, Ph.D.*, 362-2507; *Steven E. Petersen, Ph.D.*, 362-3319

Practical course on how to prepare and present scientific data to an audience, either as a seminar or as a course lecture. Prerequisite: first-year neuroscience program courses. Credit 1 unit.

L41 (BIO) 5571 CELLULAR NEUROBIOLOGY

Instructor: *Peter D. Lukasiewicz, Ph.D.*, 362-4284

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 and Biomedical Sciences or in the medical school, advanced undergraduate standing or permission of instructor. Four hours per week, 4 units credit.

L41 (BIO) 5581 PHYSIOLOGICAL BASIS OF ACOUSTIC COMMUNICATION

Instructor: *Nobuo Suga, Ph.D.*, 935-8530

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: L41 (Bio) 3411 or L41 (Bio) 3421, or a course comparable to Physiological Psychology. One two-hour class per week. Offered in the fall semester of odd-numbered years. Credit 2 units.

L41 (BIO) 5601 TOPICS IN COGNITIVE NEUROSCIENCE

Instructor: *Steven E. Petersen, Ph.D.*, 362-3319

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.

L41 (BIO) 5641 COMPUTATIONAL NEUROSCIENCE

Instructor: *Charles H. Anderson, Ph.D.*, 362-1799

This course will review methods for applying basic principles of computation and information processing to neurobiological systems. The goal is to provide a general framework for formulating computational models and to aid in the design of physiological and psychological experiments to elucidate critical aspects of how neural systems encode and process information. Prerequisites: Calculus and Elementary Statistics. Some knowledge of Neurobiology would be useful, but it is not essential. Credit 1 unit.

L41 (BIO) 5651 NEURAL SYSTEMS

Instructor: *Joseph L. Price, Ph.D.*, 362-3587

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 L41 (Bio) 3411, L41 (Bio) 3421, and permission of instructor. Two hours of lecture, one and one-half hours of discussion and three hours of laboratory per week. Credit 4 units.

L41 (BIO) 5662 BIOLOGICAL APPLICATIONS OF OPTICAL MICROSCOPY

Instructor: *Mark P. Goldberg, M.D.*, 362-3258

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 standing or permission of instructor. Audit only by prior arrangement with instructor. Enrollment for laboratory section limited to six. Two class hours per week. Credit 2 units. Laboratory: Six two-hour sessions, 1 unit credit.

L41 (BIO) 567 ADVANCED TUTORIALS IN NEURAL SCIENCES

Instructor: *Jeffery Lichtman, M.D., Ph.D.*, 362-2504

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 per week for six weeks, 1 unit. 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.

L41 (BIO) 5681 PATHOGENESIS OF NEUROLOGIC DISEASES

Instructor: *William D. Snider, M.D.,* 362-7149

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.

L41 (BIO) 572 SEMINAR IN PLANT BIOLOGY

Instructor: *Eric J. Richards, Ph.D.,* 935-7196

A consideration of modern plant biology, emphasizing critical analysis of research literature in a selected area (e.g., plant development, biochemistry, physiology.) Course registrants are required to present at least one seminar and actively participate in the weekly discussions. To be offered every year, Spring semester only. One two-hour session per week, TBA. Credit 2 units.

L41 (BIO) 575 ADVANCED STUDIES IN PLANT SYSTEMATICS

Instructor: *Walter H. Lewis, Ph.D.,* 935-6841

Seminars in specific topics with main emphasis in economic botany, emphasizing ethnomedicine. Prerequisite: L41 (Bio) 3261 or permission of instructor. One seminar alternate weeks. Credit 1 unit per semester.

L41 (BIO) 580 SEMINAR IN POPULATION BIOLOGY

Instructors: *Staff, Department of Biology,* 935-6860

This weekly seminar, covering different topics each semester, should be taken by graduate students in the program. Prerequisite: graduate standing or either L41 (Bio) 301 or 302; and L41 (Bio) 419. Credit variable, 2 or 3 units.

L41 (BIO) 581 SEMINAR IN TECHNIQUES IN FIELD BIOLOGY

Instructor: *Owen J. Sexton, Ph.D.,* 935-6849

Planning and presentation of techniques in selected areas of population biology. Prerequisite: permission of instructor. Credit 3 units.

L41 (BIO) 5821 THEORETICAL POPULATION GENETICS

Instructor: *Alan R. Templeton, Ph.D.,* 935-6868

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: L41 (Bio) 301, Math 118 and either 217 or 320. Credit 3 units.

L41 (BIO) 585 SEMINAR IN FLORISTIC TAXONOMY

Instructor: *P. Mick Richardson, Ph.D.,* 577-5176

A survey of angiosperm families, their morphology, cytology, anatomy, palynology, chemistry and evolution. Prerequisite: L41 (Bio) 308 or equivalent. Credit 1 unit.

L41 (BIO) 590 RESEARCH

Instructors: *Staff, Division of Biology and Biomedical Sciences,* 362-3365

Credit to be arranged. Research is listed as 900 level course in each department.

L41 (BIO) 5911 SEMINAR IN BIOLOGY AND BIOMEDICAL SCIENCES

Instructors: *Staff, Division of Biology and Biomedical Sciences,* 362-3365

These seminars cover the recent literature in various areas not included in other courses, or in more depth than other courses. Credit to be arranged.

L41 (BIO) 5915 TEACHING PRACTICE IN BIOLOGY AND BIOMEDICAL SCIENCES

Instructor: *Barbara Fox,* 362-7191

Students serve as teaching assistants for undergraduate and graduate-level courses. Faculty-supervised activities include lecture presentation, leading discussion and problem-solving sessions and laboratory instruction. Prerequisite: restricted to graduate students in the Division of Biology and Biomedical Sciences. Credit 1 unit.

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

Biomedical engineering is the application of engineering methods to biological science and medical practice. It is concerned with mathematical models, instruments, informatics, biomaterials and medical devices and strives to provide increased quantitative understanding of complex living organisms. Through this increased understanding, biomedical engineers can contribute to the conduct of biomedical research, to improvements in health care and to the utilization of natural rather than artificial processes in meeting society's goals.

In many areas of medicine and biology, advances are being driven by information technology. For example, modern computer technology is fundamental to the new fields of computational molecular biology, genome analysis and computational neuroanatomy. Other facets of biomedical engineering will lead to improved diagnostic and therapeutic agents, improved prostheses, and new approaches to tissue and organ repair including the use of bioresorbable materials, reconstituted tissue and regenerated cells. With the increased understanding that comes from scientific research and the tools of biomedical engineering, a bountiful era of increased understanding of disease, health care informatics, new biomaterials, and revolutionary medical devices can be realized.

These discoveries will open new opportunities for M.S. and D.Sc. graduates that go beyond those presently available in academic research, teaching and health care. Growth of a new industrial sector concerned with biomaterials and medical devices will create many new jobs for biomedical engineering graduates in the next century.

Biomedical engineering has been a focus of activity for almost 40 years in both the School of Engineering and Applied Science and the School of Medicine at Washington University in St. Louis. Contributions of the University include advances in imaging technologies for biology and medicine; positron emission tomography, confocal optical microscopy, advanced ultrasound imaging, magnetic resonance imaging, and X-ray tomography. The University has played a leading role in applying high-speed communications systems to transmit scientific and medical information. Furthermore, the University is recognized worldwide for its work in mapping and sequencing the human genome, in computational molecular biology, in mapping of the human brain, and in cardiovascular engineering.

Biomedical engineering is an extremely diverse field encompassing the activities of faculty at Washington University in departments ranging from genetics to cardiology, as well as most of the engineering departments. Recognizing the strength and diversity of existing programs, biomedical engineering involves faculty from six departments in the School of Engineering and Applied Science, from 15 departments in the School of Medicine, from the Institute for Biomedical Computing and also from the College of Arts & Sciences.

The goals of the Graduate Program in Biomedical 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 and directing novel applications of engineering science throughout biology and medicine in government, industry and academia. This is a broad vision of biomedical engineering as a field and defines a role for which Washington University is ideally suited.

The Institute of Biological and Medical Engineering has been established to promote the Graduate Program in Biomedical Engineering. At Washington University, activities in biomedical engineering are carried out in more than 20 organizational units throughout the campus. These activities have been organized through the Institute into a number of specialized programs to provide research opportunities for graduate study. The Executive Council of the Institute, with broad representations from both the School of Engineering and Applied Science and the School of Medicine, has the responsibility to facilitate and coordinate student access to these various research opportunities. A graduate committee composed of members of the Executive Council of the Institute determines the guidelines for graduate students in biomedical engineering.

Biomedical Engineering course offerings:

BMed 500 Independent Study
BMed 501 Graduate Seminar
BMed 502 Mathematical Methods in Biophysics
BMed 546 Algorithms for Computational Biology
BMed 547 Biological Mass and Momentum Transfer
BMed 559 Introduction to Biomechanics
BMed 560A Biomechanics
BMed 566 Cardiac Electrophysiology
BMed 567 Cardiac Mechanics
BMed 568 Medical Computer Vision
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 Biological Polymers
BMed 693 Special Topics

For additional related courses, see Biomedical Computer Laboratory in this Bulletin and the Bulletin of the School of Engineering and Applied Science.

Faculty

Professors Emeriti

Harold W. Shipton, C.Eng., Shrewsbury Technical College, 1949. (See Institute for Biomedical Computing.)

Lewis J. Thomas Jr., M.D., Washington University 1957. (See Institute for Biomedical Computing.)

Professors

R. Martin Arthur, Ph.D., University of Pennsylvania, 1968.

John P. Boineau, M.D., Duke University, 1959. (See Departments of Medicine and Surgery.)

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

Michael E. Cain, M.D., George Washington University, 1975. (See Department of Medicine.)

James L. Cox, M.D., University of Tennessee, 1967. (See Department of Surgery.)

Jerome R. Cox Jr., Sc.D., Massachusetts Institute of Technology, 1955. (See Department of Cell Biology and Physiology and Institute for Biomedical Computing.)

Richard A. Dammkoehler, M.S., Washington University, 1959.

Elliot L. Elson, Ph.D., Stanford University, 1966. (See Department of Biochemistry and Molecular Biophysics.)

William A. Frazier III, Ph.D., Washington University, 1973. (See Department of Biochemistry and Molecular Biophysics and Department of Cell Biology and Physiology.)

Bijoy K. Ghosh, Ph.D., Harvard University, 1983.

Gregory I. Goldberg, Ph.D., Weizmann Institute of Science, 1977. (See Departments of Biochemistry and Molecular Biophysics, Medicine, and Molecular Microbiology.)

Richard W. Gross, M.D., New York University Medical School, 1976; Ph.D., Washington University, 1982. (See Department of Medicine and Department of Molecular Biology and Pharmacology.)

E. Mark Haacke, Ph.D., University of Toronto, 1978. (See Department of Radiology.)

John E. Heuser, M.D., Harvard University, 1969. (See Department of Cell Biology and Physiology.)

Stephen M. Highstein, M.D., University of Maryland Medical School, 1965; Ph.D., University of Tokyo Faculty of Medicine, 1976. (See Department of Anatomy and Neurobiology and Department of Otolaryngology.)

John L. Kardos, Ph.D., Case Western Reserve University, 1965.

Jeffery Lichtman, M.D., Ph.D., Washington University, 1980. (See Department of Anatomy and Neurobiology.)

Garland R. Marshall, Ph.D., Rockefeller University, 1966. (See Department of Biochemistry and Molecular Biophysics, Department of Molecular Biology and Pharmacology, and Institute for Biomedical Computing.)

Robert P. Mecham, Ph.D., Boston University, 1976. (See Department of Cell Biology and Physiology and Department of Medicine.)

James G. Miller, Ph.D., Washington University, 1969. (See Department of Medicine.)

Michael I. Miller, Ph.D., The Johns Hopkins University, 1983. (See Department of Radiology and Institute for Biomedical Computing.)

Tom R. Miller, M.D., University of Missouri, 1976. (See Department of Radiology.)

Michael K. Pasque, M.D., University of Oklahoma, 1978. (See Departments of Radiology and Surgery.)

William F. Pickard, Ph.D., Harvard University, 1962.

James A. Purdy, Ph.D., University of Texas, 1971. (See Department of Radiology and Institute for Biomedical Computing.)

Marcus E. Raichle, M.D., University of Washington, 1964. (See Departments of Anatomy and Neurobiology, Neurology, and Radiology.

David Schlessinger, Ph.D., Harvard University, 1961. (See Departments of Genetics, Medicine, and Molecular Microbiology.)

Donald L. Snyder, Ph.D., Massachusetts Institute of Technology, 1966. (See Department of Radiology and Institute for Biomedical Computing.)

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

Salvatore P. Sutera, Ph.D., California Institute of Technology, 1960.

Barna A. Szabo, Ph.D., State University of New York, 1969.

Tzyh-Jong Tarn, D.Sc., Washington University, 1968.

W. Thomas Thach Jr., M.D., Harvard University, 1964. (See Department of Anatomy and Neurobiology, Department of Biochemistry and Molecular Biophysics, Department of Neurology, and Program in Physical Therapy.)

Curt Theis, Ph.D., Michigan State University, 1962.

David C. Van Essen, Ph.D., Harvard University, 1971. (See Department of Anatomy and Neurobiology.)

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

Michael J. Welch, Ph.D., University of London, 1965. (See Department of Molecular Biology and Pharmacology and Department of Radiology.)

George I. Zahalak, Eng. Sc.D., Columbia University, 1972.

Research Professors

Charles H. Anderson, Ph.D., Harvard University, 1962. (See Department of Anatomy and Neurobiology and Institute for Biomedical Computing.)

Julius Goldstein, Ph.D., University of Rochester, 1965.

Gregory V. Nikiforovich, Ph.D., Byelorussian Academy of Science, 1972, D.Sc., Latvian Academy of Science, 1983. (See Institute for Biomedical Computing.)

Associate Professors

E. Richard Bischoff, Ph.D., Washington University, 1966. (See Department of Anatomy and Neurobiology.)

Stuart B. Boxerman, D.Sc., Washington University, 1970. (See Health Administration Program.)

Paul C. Bridgman, Ph.D., Purdue University, 1980. (See Department of Anatomy and Neurobiology.)

Andreas H. Burkhalter, Ph.D., University of Zurich, 1977. (See Department of Anatomy and Neurobiology and Department of Neurological Surgery.)

Ron K. Cytron, Ph.D., University of Illinois, 1984. (See Institute for Biomedical Computing.)

Mark E. Frisse, M.D., Washington University, 1978. (See Department of Medicine and Institute for Biomedical Computing.)

Daniel R. Furhmann, Ph.D., Princeton University, 1984.

Will D. Gillett, Ph.D., University of Illinois, 1977.

Sándor J. Kovács, Ph.D., California Institute of Technology, 1977; M.D., University of Miami, 1979. (See Department of Medicine.)

Stanley Misler, Ph.D., New York University, 1976; M.D., 1978. (See Department of Cell Biology and Physiology and Department of Medicine.)

Robert E. Morely Jr., D.Sc., Washington University, 1977.

Joseph A. O'Sullivan, Ph.D., University of Notre Dame, 1986.

Steven E. Petersen, Ph.D., California Institute of Technology, 1982. (See Departments of Anatomy and Neurobiology, Neurology, Neurological Surgery, and Radiology.)

William D. Richard, Ph.D., University of Missouri, Rolla, 1988.

Frederick U. Rosenberger, D.Sc., Washington University, 1969. (See Institute for Biomedical Computing.)

David J. States, M.D., Ph.D., Harvard University, 1983. (See Department of Biochemistry and Molecular Biophysics, Department of Genetics, and Institute for Biomedical Computing.)

M. Victor Wickerhauser, Ph.D., Yale University, 1985.

Samuel A. Wickline, M.D., University of Hawaii, 1980. (See Department of Medicine.)

Michael S. Zuker, Ph.D., Massachusetts Institute of Technology, 1976. (See Department of Genetics and Institute for Biomedical Computing.)

Research Associate Professor

Richard B. Schuessler, Ph.D., Clemson University, 1977. (See Department of Surgery.)

Richard K. Wilson, Ph.D., University of Oklahoma, 1986. (See Department of Genetics.)

Assistant Professors

Amir Arsham Amini, D.Sc., University of Michigan, 1990.

Philip V. Bayly, Ph.D., Duke University, 1993.

José-Angel Conchello, Ph.D., Dartmouth College, 1991. (See Institute for Biomedical Computing.)

Thomas E. Conturo, M.D., Ph.D., Vanderbilt University, 1989. (See Department of Radiology.)

P. Duffy Cutler, Ph.D., University of California, Los Angeles, 1992. (See Department of Radiology.)

Sean R. Eddy, Ph.D., University of Colorado, 1991. (See Department of Genetics.)

Warren R. Gish, Ph.D., University of California, Berkeley, 1988. (See Department of Genetics and Institute for Biomedical Computing.)

Julius M. Guccione, Ph.D., University of California, San Diego, 1990.

James E. Huettner, Ph.D., Harvard University, 1987. (See Department of Cell Biology and Physiology.)

Eileen Kraemer, Ph.D., Georgia Institute of Technology, 1995.

Debiao Li, Ph.D., University of Virginia, 1992. (See Department of Radiology.)

Weili Lin, Ph.D., Case Western Reserve University, 1993. (See Department of Radiology.)

Christine H. Lorenz, Ph.D., Vanderbilt University, 1992. (See Department of Medicine and Institute for Biomedical Computing.)

Jay W. Ponder, Ph.D., Harvard University, 1984. (See Department of Biochemistry and Molecular Biophysics.)

Daniel L. Silbergeld, M.D., University of Cincinatti, 1984. (See Department of Anatomy and Neurobiology and Department of Neurological Surgery.)

Joseph M. Smith, Ph.D., Massachusetts Institute of Technology, 1985; M.D., Harvard Medical School, 1987. (See Department of Medicine and Institute for Biomedical Computing.)

Jerold W. Wallis, M.D., Stanford University, 1981. (See Department of Radiology.)

Research Assistant Professors

James G. McNally, Ph.D., The University of Chicago, 1983. (See Department of Cell Biology and Physiology and Institute for Biomedical Computing.)

Volker Nowotny, Ph.D., Technische University, Berlin, 1981. (See Department of Genetics and Institute for Biomedical Computing.)

John M. Ollinger, D.Sc., Ph.D., Washington University, 1986. (See Department of Radiology and Institute for Biomedical Computing.)

Instructor

Toni M. Kazic, Ph.D., University of Pennsylvania, 1984. (See Institute for Biomedical Computing.)

HEALTH ADMINISTRATION PROGRAM

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 strategic planning unique to the health care field. 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 management knowledge and skills, but also an understanding of the many complexities unique to the health care 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 dual M.H.A.-J.D. degree between the Health Administration Program and the School of Law, a dual M.H.A.-M.B.A. degree between the Health Administration Program and the Graduate School of Business Administration and a dual M.H.A.-M.I.M. degree between the Health Administration Program and the School of Engineering. Dual degrees are also 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. Dual M.H.A./M.D. degree option is also available.

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's 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 12-24 month postgraduate administrative fellowship. A certificate will be awarded by Washington University School of Medicine and the affiliated fellowship organization upon its satisfactory completion.

Administrative Fellowship

The 12-24 month optional postgraduate administrative fellowship will be served in a hospital, health agency, health organization or health system that 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 practical exposure is deemed necessary for adequate professional career preparation. The fellowship is completed under the direction of a well-qualified and experienced health care executive.

The full-time faculty maintains close liaison with the administrative fellow and the preceptor. An educational plan that outlines the fellow's activities for the coming year must be filed by the preceptor, and the fellow reviews his/her learning progression at the end of the fellowship in a report to HAP's director. 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.

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. An on-site interview is required.

Tuition per semester	$9,900
Books and supplies (per semester)	700
Application fee (nonrefundable)	30

FOURTH YEAR
Medical Student Elective

M80 856 HEALTH ADMINISTRATION
This elective is described in the Teaching and Research Divisions, Institutes and Programs chapter.

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. (See Program in Biological and Biomedical Engineering.)

Associate Professor
Robert S. Woodward, Ph.D., Washington University, 1972. (See Department of Medicine.)

Assistant Professor
Ronald E. Gribbins, Ph.D., University of Wisconsin, 1975.

Instructor
Dennis L. Lambert, Ph.D., Washington University, 1994.

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 bachelor's 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 health care 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

CO-DIRECTORS
Debra L. Haire-Joshu, Ph.D., St. Louis University, 1988. (Research Associate Professor in Medicine, Center for Health Behavior Research)
Cheryl A. Houston, M.S., St. Louis University, 1990. (Research Instructor in Medicine, Center for Health Behavior Research)

ASSOCIATE DIRECTOR/ PROGRAM INSTRUCTOR
Jan Munroe, M.Ed., University of Missouri, St. Louis, 1991. (Research Patient Coordinator, Center for Health Behavior Research)

Professor of Psychology
Edwin B. Fisher Jr., Ph.D., State University of New York, 1972. (Director, Center for Health Behavior Research) (See Department of Medicine.)

Instructors
Wendy Auslander, Ph.D., Washington University, 1986. (Associate Professor, George Warren Brown School of Social Work)
Carol Dyer, M.A., Washington University, 1992.
Joan Heins, M.A., Washington University, 1990. (Research Patient Coordinator, Center for Health Behavior Research)

Donna B. Jeffe, Ph.D., Washington University, 1993. (Trainee in Medicine, Center for Health Behavior Research)

Judy Musick, M.B.A., University of Missouri, St. Louis, 1986. (Research Instructor, Center for Health Behavior Research)

Gabrielle Richards Reed, Ph.D., University of Rhode Island, 1995. (Research Instructor, Center for Health Behavior Research)

Donald Richert, Ph.D., St. Louis University, 1984. (Vice President of Student Affairs, St. Louis College of Pharmacy)

Carol Stubblefield, Ph.D., St. Louis University, 1996. (Associate Professor, Jewish Hospital School of Nursing)

Linda K. Sussman, Ph.D., Washington University, 1983. (Research Instructor, Center for Health Behavior Research)

Sam Young, M.S., Arkansas State University, 1981.

Ex Officio

Julio V. Santiago, M.D., University of Puerto Rico, 1967. (Division Director, Department of Pediatrics)

PROGRAM IN OCCUPATIONAL THERAPY

The mission of the Program in Occupational Therapy is to provide excellence in teaching, research, practice and professional development related to promoting occupational performance for persons with, or at risk for, disabilities. Occupational therapists assist people with disabilities to become as independent as possible in the performance of activities necessary to function in their home, school, community or work environments.

Master of Science in Occupational Therapy Degree Program

The professional Master of Science in Occupational Therapy degree requires courses that develop the knowledge and skills necessary for entry level into the profession. The curriculum focuses on occupational performance, which is the dynamic interaction of client, environment and occupational factors that enables persons to fulfill roles, to maximize function and to enhance quality of life. Applicants must hold a bachelor's degree or be a participant in an approved three-two program and have completed prerequisites from an accredited college or university.

Each candidate for a Master of Science in Occupational Therapy degree must complete the professional curriculum, which consists of 77 hours of coursework and is usually accomplished in five semesters of academic study (two academic years and the intervening summer). The student must meet professional development requirements, complete an assistantship and a master's project during the five semester program. Six months of supervised clinical internship is required following coursework.

Tuition (graduate) per semester	$9,375
Fee, clinical internship	$4,000

Faculty

ELIAS MICHAEL DIRECTOR

M. Carolyn Baum, Ph.D., Washington University, 1993.

ASSOCIATE DIRECTOR, PROFESSIONAL EDUCATION

Catherine Rose, M.A., Washington University, 1992.

ASSOCIATE DIRECTOR, PROFESSIONAL AND PROGRAM DEVELOPMENT

Jayne B. Lux, M.S., Pennsylvania State University, 1983.

ASSOCIATE DIRECTOR, COMMUNITY PRACTICE

Carol A. Brownson, M.S.P.H., University of Missouri, 1979.

ASSOCIATE DIRECTOR, ADVANCED GRADUATE STUDIES

Gerald R. Popelka, Ph.D., CCC-A, University of Wisconsin, 1974.

ASSOCIATE DIRECTOR, RESEARCH

David B. Gray, Ph.D., University of Minnesota, 1974.

FIELDWORK COORDINATOR

Karen Parker Davis, M.A., Webster University, 1983.

STUDENT ACTIVITY COORDINATOR

Kathleen Kniepmann, M.P.H., Harvard University, 1981.

ASSISTANT PROFESSOR (ADJUNCT) AND PUBLIC RELATIONS, RECRUITMENT AND DEVELOPMENT

Mary M. Evert, M.B.A., National University, 1980.

Professors

Susan E. Mackinnon, M.D., Queen's University, 1975. (See Departments of Surgery and Otolaryngology.)

J. Gail Neely, M.D., University of Oklahoma, 1965.

Associate Professor

C. Robert Almli, Ph.D., Michigan State University, 1970.

Assistant Professors

Ellen F. Binder, M.D., Washington University, 1981.

Michael N. Diringer, M.D., University of Kentucky, 1982. (See Departments of Neurology and Neurological Surgery).

Alexander W. Dromerick, M.D., University of Maryland, 1986.

Janet Duchek, Ph.D., University of South Carolina, 1982.

Bradley A. Evanoff, M.D., Washington University, 1986.

Robert E. Hanlon, Ph.D., City College of City University of New York, 1988.

Philip E. Higgs, M.D., University of Florida, 1974.

Luci Kohn, Ph.D., University of Wisconsin, 1989.

Leonard N. Matheson, Ph.D., University of Southern California, 1979.

Jay F. Piccirillo, M.D., University of Vermont, 1985.

Research Assistant Professors

Dorothy F. Edwards, Ph.D., Washington University, 1980.

Christine B. Novak, M.S., University of Toronto, 1992.

Instructors

Christine Berg, M.S., Boston University, 1979.

Mary Bettlach, M.P.H., St. Louis University, 1992.

Paula C. Bohr, Ph.D., University of Oklahoma, 1993.

Debora Davidson, M.S., Boston University, 1982.

Shan-Pin Fanchiang, M.S., University of Southern California, 1988.

Linda Hunt, M.S., Washington University, 1991.

Patricia D. La Vesser, M.A.T., Webster University, 1987.

Peggy A. Neufeld, M.A., New York University, 1976.

Monica Perlmutter, M.A., Washington University, 1989.

Mary K. Seaton, B.S., University of Missouri, 1977.

PROGRAM IN PHYSICAL THERAPY

The Program in Physical Therapy at the School of Medicine offers three formal curricula which collectively foster opportunities for lifelong learning and comprehensive career development. The professional curriculum is an intensive two and one-half year experience leading to the degree Master of Science in Physical Therapy. The principle focus in professional education is to develop clinical expertise in the diagnosis and treatment of movement-related conditions. This requires the integration of humanistic attributes such as compassion and empathy with skills in clinical decision making, interpersonal communications and patient advocacy. Applicants for admission must have completed: 1) a bachelor's degree at an accredited institution, and 2) prerequisite courses in English, psychology, biology, mathematics, physics, chemistry and social sciences. The post-professional curriculum, which leads to a Master of Health Science in Physical Therapy degree, offers practicing physical therapists an opportunity to enhance knowledge and skills necessary for continued competence in practice. Admissions requirements include previous graduation from an accredited professional physical therapy curriculum, eligibility for licensure as a physical therapist in the state of Missouri and an acceptable grade point average in previous academic endeavors. The focus of the interdisciplinary doctoral program in Movement Science is to prepare future researchers and faculty members who can enhance the profession of physical therapy. Admission to this curriculum requires acceptable scores on the Graduate Record Examination, excellence in previous academic work and demonstrated beginning abilities in posing questions of importance to the study of movement.

The faculty members of the Program in Physical Therapy are committed to being leaders in discovering and transmitting new knowledge related to movement dysfunction, preparing clinicians to assume multiple roles in a complex health care environment and fulfilling its service mission to society through active participation in humanistic, scientifically based patient care. Students in all curricula are expected to participate actively in an environment that values and encourages integrity, creativity, initiative and a strong belief in the potential for physical therapy intervention to promote health. In these ways, all individuals associated with the Program in Physical Therapy may achieve their highest personal and professional potential.

Tuition: Professional curriculum
$9,725 per semester

Post-professional curriculum
$310 per credit

Doctoral curriculum
$10,500 per semester

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MASTERS PROGRAM IN PSYCHIATRIC EPIDEMIOLOGY (MPE)

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 and 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, M.D., Washington University, 1970. (See Departments of Psychiatry and Genetics.)

Andrew C. Heath, D.Phil., University of Oxford, 1983. (See Departments of Psychiatry, Genetics, and Psychology.)

J. Philip Miller, A.B., Washington University, 1965. (See Division of Biostatistics.)

Dabeeru C. Rao, Ph.D., Indian Statistical Institute, 1971. (See Departments of Genetics and Psychiatry and Division of Biostatistics.)

Theodore Reich, M.D., McGill University, 1963. (See Departments of Psychiatry and Genetics.)

John P. Rice, Ph.D., Washington University, 1975. (See Department of Psychiatry and Division of Biostatistics.)

Edward L. Spitznagel Jr., Ph.D., The University of Chicago, 1965. (See Division of Biostatistics and Department of Mathematics.)

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Norman Sartorius, M.D., University of Zagreb, 1958. (See Department of Psychiatry.)

Associate Professors

Linda B. Cottler, Ph.D., Washington University, 1987. (See Department of Psychiatry and Program in Health Administration.)

Collins E. Lewis, M.D., Harvard University, 1971. (See Department of Psychiatry.)

Carol S. North, M.D., Washington University, 1983. (See Department of Psychiatry.)

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San Francisco, CA

Chan, Iris Tanchi
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St. Louis, MO
Neurology
Washington University
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Westerville, OH
B.A., Washington University, '88
Internal Medicine - Preliminary
Barnes-Jewish Hospital
St. Louis, MO
Neurology
Washington University
St. Louis, MO

Nichol, Peter Frosio
Madison, WI
B.S., Macalester College, '89
Surgery - Preliminary
University of Virginia
Charlottesville, VA
Urology
University of Virginia Health Science Center
Charlottesville, VA

Norris, Andrew William
Olathe, KS
B.S., Massachusetts Institute of Technology, '89
Pediatrics
University of Iowa Hospitals and Clinics
Iowa City, IA

Tykodi, Scott Simon[1]
South Dartmouth, MA
B.A., Northwestern University, '88
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Wu, Justina Eng Hui
Westminster, CA
B.S., University of California, Irvine, '89
Internal Medicine
The Johns Hopkins University
Baltimore, MD

Doctor of Medicine and Master of Arts Degrees

Dagnew, Elias[2]
Dallas, TX
B.S., Dallas Baptist University, '92
Surgery - Preliminary
University of Cincinnati
Cincinnati, OH
Neurosurgery
University of Cincinnati
Cincinnati, OH

Dahl, Karen Marie
Dunwoody, GA
B.S., Georgia Institute of Technology, '92
Pediatrics
University of Cincinnati
Cincinnati, OH

Dryden, Damla Karsan[3]
Gulsum, Norway
B.A., Rice University, '92
Obstetrics-Gynecology
Duke University
Durham, NC

Eaton, Adam Christopher
St. Charles, MO
B.S., University of Illinois, '92
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Liang, Griffith
Arlington Heights, IL
B.A., Northwestern University, '91
Internal Medicine - Preliminary
Loyola University
Maywood, IL

Makram, Maurice Nabil
Parkesburg, PA
B.S., Brown University, '91
ER Medicine
Barnes-Jewish Hospital
St. Louis, MO

Patel, Vikas Vanarsi
St. Louis, MO
B.S., University of Illinois, '91
Orthopaedic Surgery
University of California
San Francisco, CA

Doctor of Medicine Degrees

Agarwala, Amit Omprakash
Baltimore, MD
B.S., The Johns Hopkins University, '93
Orthopaedic Surgery
University of New Mexico
Albuquerque, NM

Allen, Thomas J.
Lexington, MA
B.A., College of the Holy Cross, '86
Transitional
National Naval Medical Center
Bethesda, MD

Anderson, Kirsten Lynn
Brentwood, MO
B.S., Princeton University, '92
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Angstreich, Greg Richard
Syosset, NY
B.A., Washington University, '93
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Appel, Noah Bennett
Houston, TX
B.A., Washington University, '93
Transitional
St. John's Mercy Hospital
St. Louis, MO
Radiology-Diagnostic
Barnes-Jewish Hospital
St. Louis, MO

Aulivola, Bernadette
Holtsville, NY
B.S., SUNY at Stony Brook, '93
General Surgery
Rush-Presbyterian-St. Luke's Medical Center
Chicago, IL

Baglan, Kathy Lynn
St. Louis, MO
B.A., Washington University, '93
Radiation Oncology
William Beaumont Hospital
Royal Oak, MI

Barnes, Alison M.
Memphis, TN
B.S., Spelman College, '93
Psychiatry
University of Tennessee
Memphis, TN

Blam, Oren Gil
Port Washington, NY
B.A., SUNY at Binghamton, '93
Orthopaedic Surgery
Thomas Jefferson University
Philadelphia, PA

Brecht-Doscher, Aimée Radhia
Venice, CA
B.A., University of California, San Diego, '93
Obstetrics-Gynecology
Santa Clara Valley Medical Center
San Jose, CA

Brown, Amy Margaret
Coon Rapids, MN
B.S., University of Wisconsin, Madison, '93
Obstetrics-Gynecology
Medical College of Wisconsin
Milwaukee, WI

Brown, Kathryn Corinne
Orange, TX
B.A., The Johns Hopkins University, '93
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Bruckel, Matthew Martin
Auburn, AL
B.S., Auburn University, '93
ER Medicine
University of Maryland
Baltimore, MD

Brunschwig, Ari S.
Denver, CO
B.S., Stanford University, '92
Surgery - Preliminary
St. Joseph Hospital
Denver, CO
Otolaryngology
University of Colorado
Denver, CO

Carns, Jason
Scottsdale, AZ
B.S., University of Pennsylvania, '92
Transitional
Mercy Hospital
San Diego, CA
Anesthesiology
University of California
San Diego, CA

Chen, Belinda
Lake Hiawatha, NJ
B.S., Washington University, '92
Pediatrics
Rush-Presbyterian-St. Luke's Medical Center
Chicago, IL

Chung, Ben Tsu-Ping
Berkeley, CA
B.A., University of California, Berkeley, '93
Internal Medicine - Preliminary
Kaiser Permanente Medical Center - LA
Oakland, CA
Physical Medicine & Rehabilitation
Stanford Health Service
Stanford, CA

Cohan, Susan Forman
Highland Park, IL
B.S., University of Illinois, '92
ER Medicine
Christ Hospital and Medical Center
Oak Lawn, IL

Cohran, Valeria Cornell
Senatobia, MS
B.S., Tougaloo College, '93
Pediatrics
University of Cincinnati
Cincinnati, OH

Cousins, Marleen Annette
Columbus, OH
B.S., Ohio State University, '93
ER Medicine
University of Cincinnati
Cincinnati, OH

DeLamielleure, Jennifer Lynn
Ann Arbor, MI
B.S., Indiana University, Bloomington, '93
General Surgery
University of Wisconsin Hospitals/ Clinics
Madison, WI

DeLaney, Jennifer Ann
Indianapolis, IN
B.A., Georgetown University, '92
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Desch, Karl Coe
St. Charles, IL
B.S., Indiana University, Bloomington, '92
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Evans, Jason Lynn
Norman, OK
B.S., Oklahoma University, '93
Family Practice
Toledo Hospital
Toledo, OH

Ferrone, Cristina
Scarsdale, NY
B.S., University of Pennsylvania, '93
General Surgery
Massachusetts General Hospital
Boston, MA

Frank, Rachel Anne
East Lansing, MI
B.A., University of Michigan, Ann Arbor, '92
Pediatrics
University of Michigan
Ann Arbor, MI

Fuchs, Julie Robin
Stanford, CA
B.S., Stanford University, '93
General Surgery
Beth Israel Deaconess Medical Center
Boston, MA

Gallahue, Fiona Elizabeth
Arlington, VA
B.A., Washington University, '92
ER Medicine
New York University Medical Center
New York, NY

Gorman, Gregory Harron
Washington, DC
B.A., Georgetown University, '93
Pediatrics
National Naval Medical Center
Bethesda, MD

Halpin, Valerie J.
Olympia, WA
B.S., University of Washington, '93
General Surgery
Barnes-Jewish Hospital
St. Louis, MO

Hanson, Travis Wade
Houston, TX
B.A., William Marsh Rice University, '93
Orthopaedic Surgery
UCLA Medical Center
Los Angeles, CA

Harper, Adrienne Kathryn
Pensacola, FL
B.S., University of West Florida, '91
Obstetrics-Gynecology
Naval Medical Center
San Diego, CA

Harper, Kimberly Louise
Alamo, CA
B.S., Stanford University, '92
Internal Medicine
Boston University
Boston, MA

Hart, Karen Manheimer
New York, NY
B.S., Princeton University, '89
Internal Medicine
The New York Hospital
New York, NY

Ifune, Catherine Kei
St. Louis, MO
B.S., California Institute of Technology, '85; Ph.D., Washington University, '90
Anesthesiology
Barnes-Jewish Hospital
St. Louis, MO

Johnson, Devin Brooke
Salt Lake City, UT
B.S., University of Utah, '93
Urology
University of Wisconsin
Madison, WI

Johnson III, Lloyd
Hanover, NH
B.A., Dartmouth College, '93
Orthopaedic Surgery
Washington University
St. Louis, MO

Johnson, Randall Roy
Overland Park, KS
B.A., Northwestern University, '87
Surgery - Preliminary
Yale-New Haven Hospital
New Haven, CT
Neurosurgery
Yale University
New Haven, CT

Jones, Michele Lili
Ann Arbor, MI
B.S., University of Michigan, Ann Arbor, '93
Surgery - Preliminary
University of Florida
Gainesville, FL
Otolaryngology
University of Florida
Gainesville, FL

Kapur, Vineet
Gilbert, AZ
B.S., Arizona State University, '93
Internal Medicine
University of California
San Diego, CA

Kleindorfer, Dawn Olson
Bloomington, IN
B.S., Indiana University at Bloomington, '92
Internal Medicine - Preliminary
University of Michigan
Ann Arbor, MI
Neurology
University of Michigan
Ann Arbor, MI

Kogelman, Laura
New Haven, CT
B.S., Yale University, '93
Internal Medicine
New England Medical Center
Boston, MA

Kuchnir, Louis
Arlington, MA
B.S., Massachusetts Institute of Technology, '87
Internal Medicine - Preliminary
Lahey-Hitchcock Clinic
Burlington, MA
Dermatology
University of Massachusetts Medical Center
Worcester, MA

Kumar, Dana Ann
Champaign, IL
B.S., University of Illinois, '93
Internal Medicine
Mercy Hospital
San Diego, CA

Kwon, Brian
St. Louis, MO
B.A., Washington University, '93
Orthopaedic Surgery
University Hospitals of Cleveland
Cleveland, OH

Lamberti, Paul Matthew
Urbana, IL
B.S., University of Illinois, '93
Orthopaedic Surgery
Loyola University Medical Center
Maywood, IL

Lawrence, Steven Jason
Clayton, IN
B.S., Rose-Hulman Institute of Technology, '92
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Le, Francoise Giao-Phuong
Germantown, MD
B.S., University of Maryland, College Park, '92
Internal Medicine
Beth Israel Deaconess Medical Center
Boston, MA

Leacock, Natasha Nicolette
Urbana, IL
B.S., University of Illinois, '93
Pediatrics
Yale-New Haven Hospital
New Haven, CT

Lee, Charles Kyung Chui
St. Louis, MO
B.A., Washington University, '93
Plastic Surgery
The University of Chicago
Chicago, IL

Liang, Pamela Barrera
Houston, TX
B.A., William Marsh Rice University, '93
Pediatrics
University of Rochester/Strong Memorial Medical Center
Rochester, NY

Lotsoff, David Scott
Arlington Heights, IL
B.S., University of Illinois, '93
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Mahoney, Robert John
St. Louis, MO
B.A., Princeton University, '93
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Mai, Julie Ann
St. Louis, MO
B.S., Brown University, '93
Obstetrics/Gynecology
Indiana University
Indianapolis, IN

Martin, Tracie Ann
Ames, IA
B.S., Iowa State University, '93
Family Practice
Cedar Rapids Program
Cedar Rapids, IA

McGregor, David Kenji
Leawood, KS
B.A., Washington University, '93
Transitional
Deaconess Hospital
St. Louis, MO

Meltzer, Sharon Gail
Englewood, CO
B.A., Duke University, '92
Pediatrics
University of Colorado
Denver, CO

Menteer, Jondavid
Colleyville, TX
B.A., University of California, Berkeley, '90
Pediatrics
Massachusetts General Hospital
Boston, MA

Monrad, Seetha Ursala
Urbana, IL
B.S., University of Illinois, '93
Internal Medicine
Barnes-Jewish Hospital
St. Louis, MO

Mooney, Kathleen Marie
Brockton, MA
B.S., University of Notre Dame, '92
Pediatrics
University of Washington
Seattle, WA

Nemeth, Blaise A.
Boulder, CO
B.A., University of Colorado, Boulder, '93
Pediatrics
University of Wisconsin
Madison, WI

Oh, Charles Jayhyuk
Ormond Beach, FL
B.S., University of Miami, '92
General Surgery
UMDNJ - Robert Wood Johnson Medical School
New Brunswick, NJ

Oldham, Lisa Marie
Chicago, IL
B.A., Stanford University, '91
Obstetrics-Gynecology
Rush-Presbyterian-St. Luke's Medical Center
Chicago, IL

Omurtag, Meral
St. Louis, MO
B.S., Washington University, '93
Internal Medicine
University of North Carolina Hospital
Chapel Hill, NC

Overdeck, Daniel Lombard
Evanston, IL
B.A., Northwestern University, '93
Internal Medicine - Preliminary
Beth Israel Deaconess Medical Center
Boston, MA
Radiology - Diagnostic
University of Michigan Hospitals
Ann Arbor, MI

Payne, Jennifer Lanier
Beckley, WV
B.S., Davidson College, '90
Psychiatry
The Johns Hopkins University
Baltimore, MD

Perron, Gregory Ashley
Glendale, AZ
B.A., University of Virginia, '93
Family Practice
Malcolm Grow Medical Center
Andrews Air Force Base, MD

Piltch, Rebecca Gail
St. Louis, MO
B.S., University of Michigan, '92
Pediatrics
Wayne State University/Detroit Medical Center
Detroit, MI

Poulin, Eric Anthony
Tulsa, OK
B.S., Oral Roberts University, '93
Family Practice
St. Paul-Ramsey Medical Center
St. Paul, MN

Puchalski, Robert
Ithaca, NY
B.A., Cornell University, '93
Otolaryngology
University of Pennsylvania
Philadelphia, PA

Rao, Rekha Chinnakotla
Menlo Park, CA
B.S., Stanford University, '92
Psychiatry
UCLA Neuropsych Institute
Los Angeles, CA

Reed, Nevada Waugh
Athens, GA
B.S., University of Georgia, '93
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Sams III, James Mac
Arlington, VA
B.A., Duke University, '89
Transitional
St. John's Mercy Hospital
St. Louis, MO
Anesthesiology
University of California
San Francisco, CA

Sater, Nicola Catherine
St. Louis, MO
B.S., University of California, Berkeley, '83
Psychiatry
The Johns Hopkins University
Baltimore, MD

Schwartz, Daniel Mark
Boston, MA
B.S., Massachusetts Institute of Technology, '93
Pediatrics
Jackson Memorial Medical Center
Miami, FL

Shannon, Scott Edwin[4]
Wheaton, IL
B.A., Wheaton College, '91
Family Practice
University of Missouri
Columbia, MO

Sheinker, Claire D.
Omaha, NE
B.S., Creighton University, '93
Pediatrics
Children's Mercy Hospital
Kansas City, MO

Sheppard, Shandra Annette
Lakewood, CO
B.S., University of Denver, '93
Surgery - Preliminary
West Virginia University
Morgantown, WV
Urology
West Virginia University
Morgantown, WV

Sheu, Susan Shuyan
San Marino, CA
B.S., California Institute of Technology, '93
Family Practice
Long Beach Memorial Medical Center
Long Beach, CA

Shiels, Aaron John
Champaign, IL
B.S., University of Illinois, '93
Research
Loyola University Medical Center
Maywood, IL

Slishman, Samuel Hans
Pawlina, NY
B.A., Wesleyan University, '93
ER Medicine
University of New Mexico
Albuquerque, NM

Socolow, Joshua Avram
Atlanta, GA
B.S., Yale University, '93
Internal Medicine
The University of Chicago Hospital
Chicago, IL

Sommers Jr., Thomas S.
St. Louis, MO
B.S., William Marsh Rice University, '93
Family Practice
St. John's Mercy Hospital
St. Louis, MO

Song, Steve S.
Emeryville, CA
B.A., University of California, Berkeley, '93
Internal Medicine
Scripps Clinic/Green Hospital
La Jolla, CA

Stevens, Susan Jane
Glen Ellyn, IL
B.S., University of Illinois, '93
Family Practice
St. Joseph Hospital
Denver, CO

Stoffel, John Thomas
Stanford, CA
B.H., Stanford University, '93
Surgery - Preliminary
Massachusetts General Hospital
Boston, MA
Urology
Lahey-Hitchcock Clinic
Burlington, MA

Stone, Laura Stewart
Baltimore, MD
B.A., Yale University, '92
Family Practice
Medical Center of Delaware
Newark, DE

Strauss, Gordon
Dania, FL
B.S., University of Florida, '92
Psychiatry
New York University Medical Center
New York, NY

Temel, Jennifer Sue
St. Louis, MO
B.S., Cornell University, '91
Internal Medicine
Brigham and Women's Hospital
Boston, MA

Thekdi, Apurva Arvind
Sylvania, OH
B.A., Northwestern University, '92
Surgery - Preliminary
St. Louis University
St. Louis, MO
Otolaryngology
SUNY - Stony Brook
Stony Brook, NY

Thomure, Jennifer Elise
Bloomington, IN
B.A., Cornell University, '93
Internal Medicine - Preliminary
Barnes-Jewish Hospital
St. Louis, MO
Radiology-Diagnostic
Barnes-Jewish Hospital
St. Louis, MO

Ung, Feodor
Flushing, NY
B.A., Harvard University, '92
Surgery - Preliminary
Brigham and Women's Hospital
Boston, MA
Otolaryngology
Harvard-Massachusetts Eye & Ear Infirmary
Boston, MA

Vaishampayan, Anjala
Providence, RI
B.S., Brown University, '93
Internal Medicine
Beth Israel Deaconess Medical Center
Boston, MA

Vedder, Charles Todd
Atlanta, GA
B.A., Emory University, '93
Pediatrics
Baylor College of Medicine
Houston, TX

Weed, Amy Lauren
Durham, NC
B.S., Duke University, '93
Pediatrics
Children's Hospital
Philadelphia, PA

Williams, Jeffrey LeMoine
Durham, NC
B.A., Duke University, '92
Transitional
Deaconess Hospital
St. Louis, MO
Anesthesiology
Stanford Health Service
Stanford, CA

Willmore, Theodore Martin
Houston, TX
B.H., University of Texas, Austin, '93
ER Medicine
Methodist Hospital
Indianapolis, IN

Wiltrout, Lisa Marie
Silver Spring, MD
B.A., Wellesley College, '92
Pediatrics
Children's National Medical Center
Washington, DC

Yang, Howard Chaochong
Cockeysville, MD
B.S., Washington University, '93
Family Practice
University of Connecticut
Hartford, CT

Yang, Susan Helen
Palo Alto, CA
B.S., Stanford University, '92
Preliminary Year - Pediatrics
St. Louis Children's Hospital
St. Louis, MO
Ophthalmology
Washington University
St. Louis, MO

Yu, Janet Li
St. Louis, MO
B.S., Washington University, '93
Family Practice
Methodist Hospital
Sacramento, CA

Yung, David Tsun Tat
New York, NY
B.A., Columbia University, '93
Internal Medicine
Evanston Hospital
Evanston, IL

Zerega, Michael James
Bloomington, IN
B.S., Indiana University at Bloomington, '93
Internal Medicine
University of North Carolina Hospital
Chapel Hill, NC

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[1] Degree to be conferred in June 1997
[2] Degree scheduled to be conferred in August 1997
[3] Degree scheduled to be conferred in August 1997
[4] Degree conferred on December 20, 1996

Medical Scientist Training Program (M.D. and Ph.D. Degrees)

Tenth-Year Trainee

Silbert, Seth Cheng
Clayton, MO
B.S., Harvard University, '86

Eighth-Year Trainees

Bullock, Eric Daniel
Ankeny, IA
B.S., University of Iowa, '89

Colvin, Jennifer Susan
Towson, MD
A.B., Harvard University, '87

Hodsdon, Michael Edwin
Bloomington, IN
B.S., Indiana University, '89

McCoy, Roderick Lawrence
Santa Monica, CA
B.S., Stanford University, '89

Moscoso, Lisa Mae
Medford, WI
B.S., University of Wisconsin, '89

Seventh-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

Cheng, Judy Mary
Hoffman Estates, IL
B.S., University of Michigan, '89

Culican, Susan Margaret
Frederick, MD
B.A., Washington University, '90

Fogg, George Chee-Chiu
Littleton, CO
A.B., Cornell University, '90

Gubitose-Klug, Rose
Euclid, OH
B.S., Washington University, '90

Martin, Tod Andrew
Carbondale, IL
B.A., Vanderbilt University, '90

McCarter, James Philip
Northfield, IL
A.B., Princeton University, '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

Sixth-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

Fifth-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

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 California, Los Angeles, '91

Fourth-Year Trainees

Chu, Dortha T.
Taiwan, Republic of China
B.A., University of California, Berkeley, '92

Chuang, Hubert
Louisville, KY
B.S., Yale University, '92

Clements, Mark Allen
Plymouth, 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

Putcha, 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

Third-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

Bubeck-Wardenburg, Juliane
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

Lehman, David Henry
New York, NY
B.A., Wesleyan University, '92

Madden, John Crane
Middlesex, MA
B.S., Yale University, '94

Moosikasuwan, 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., Massachusetts Institute of Technology, '94

Second-Year Trainees

Afkarian, Maryam
Teheran, Iran
B.A., University of California, Berkeley, '94

Baloh, Robert Harris
Santa Monica, CA
Sc.B., Brown University, '95

Bruce, Allen Thomas
North Attleboro, MA
B.A., The Johns Hopkins University, '95

Cole, John Charles
Keokuk, IA
B.S., Washington University, '95

Dahiya, Anjali
Virginia Beach, VA
B.A., Princeton University, '95

Dorr, David Andrew
Beaverton, OR
B.A., Washington University, '94

Edelson, Brian Todd
Rosylyn, NY
Sc.B., Brown University, '95

Eisenberg, Dan
Farmington, CT
B.S., M.S., Yale University, '94

Fabian, Steven Louis
Troy, MI
B.S., University of Michigan, '93

Gimenez, Mary Ann Tan
Greendale, WI
B.S., University of Wisconsin, '95

Harris, Charles Andrew
Stony Brook, NY
Sc.B., Brown University, '94

Jacob, Jason Sanford
Olympia, WA
B.A., Washington University, '94

Johnson, Hillary Danielle
Iowa City, IA
B.S., University of Iowa, '95

Klekotka, Paul Alan
Mesa, AZ
B.S., University of Arizona, '95

Lin, Shao Pow
Houston, TX
B.S., Stanford University, '93

Schwarz, Julie Kristina
Lafayette, LA
B.S., Duke University, '95

Tang, Dagang
College Station, TX
B.S., Texas A&M University, '95

Wei, Michael Ching-sun
Urbana, IL
B.S., University of Illinois, '95

Yu, Jennifer Tong-Young
Ann Arbor, MI
B.S., University of Michigan, '95

Yuan, Alex
Sunrise, FL
B.A., Cornell University, '95

First-Year Trainees

Bartnikas, Thomas B.
Ithaca, NY
B.A, Cornell University, '96

Brewer, Judson A.
Princeton, NJ
B.A., Princeton University, '96

Burlingame, Oname O.
Claremont, CA
B.A., Claremont McKenna College, '96

Chang, Louis K.
Stanford, CA
B.S., Stanford University, '96

Cukras, Catherine A.
Scarsdale, NY
B.S., Princeton University, '96

Fink, Doran L.
Stanford, CA
B.S., Stanford University, '96

Gaut, Joseph
Springfield, MO
B.A., Washington University, '96

Gavin, Mark R.
Chicago, IL
B.A., Washington University, '95

Hellman, Nathan E.
New Haven, CT
B.S., Yale University, '96

Hofling, August A.
Cream Ridge, NJ
B.A., Cornell University, '96

Jacoby, Meagan A.
Baltimore, MD
B.A., The Johns Hopkins University, '96

King, Katherine Y.
Houston, TX
B.A., Harvard University, '96

Kozel, Beth A.
Richmond Heights, MO
B.A., Washington University, '96

Rayala, Heidi J.
St. Louis, MO
B.A., MacAlester College, '95

Resnick, Stuart B.
Pittsburgh, PA
B.S., University of Pittsburgh, '96

Sehy, Jonathan V.
Champaign, IL
B.S., University of Illinois, Urbana, '96

Staveteig, Paul T.
Louisville, KY
B.S., Northwestern University, '96

Van Berkel, Victor H.
Boston, MA
B.S., Massachusetts Institute of Technology, '96

Walsh, Mark K.
Gambier, OH
B.A., Kenyon College, '96

Willis, David M.
Provo, UT
B.S., Brigham Young University, '96

M.A. and M.D. Degrees Trainees

Dewald, Denise Debra
Middlesex, MA
B.S., Tufts University, '90

Erickson, Christopher John
Alameda, CA
B.A., University of California, Berkeley, '92

Freeman, Brian Jason
Nassau, NY
B.S., Massachusetts Institute of Technology, '90

Goergen, Corrie Ann
Batavia, NY
B.S., SUNY, Albany, '92

Gupta, Vivek Kumar
University City, MO
B.A., Washington University, '93

Hsu, Raymond M.
Gaithersburg, MD
B.S., University of Maryland, College Park, '92

Hung, Irene Hwang
Prairie Village, KS
B.A., University of California, Berkeley, '92

Ou, Henry
Ithaca, NY
B.A., Cornell University, '93

Robb, Bruce William
Clayton, MO
B.A., Washington University, '93

Stanford, Arielle Doree
Queens, NY
B.S., Brown University, '93

Howard Hughes Medical Institute Research Scholars Program Trainee

Huff, Carla Michelle
Indianapolis, IN
B.S., Duke University, '91

M.D. Degree Trainees

Fourth-Year Class

Bane, Amy Elizabeth
Edwardsville, IL
B.S., University of Illinois, '93

Liang, Jeff E.
Morton Grove, IL
B.A., Northwestern University, '91

Tun, Sovanrith
Silver Spring, MD
B.S., The Johns Hopkins University, '93

Third-Year Class

Adler, Pablo
Howard, MD
B.S., Brown University, '93

Amorosa, Valerianna
Klara, Somerset, NJ
B.A., Princeton University, '93

Arora, Vineet
Montgomery, MD
B.A., The Johns Hopkins University, '94

Beutz, Michelle Anne
Jefferson, CO
B.A., Colorado College, '94

Bhattacharyya, Timothy
Kane, IL
B.A., Northwestern University, '94

Bowdish, Michael Eugene
McHenry, IL
B.S., University of Illinois, Urbana, '94

Bridges, Letitia Teray
Harris, TX
B.A., William Marsh Rice University, '94

Chandran, Rubin
St. Louis, MO
B.A., St. Louis University, '94

Chen, Calvin K.
Portage, OH
B.A., Washington University, '94

Chen, Nancy Shaochia
Fort Bend, TX
B.A., Harvard University, '94

Chen, Vicky Hsiao
Queens, NY
B.E., The Cooper Union, '94

Cheng, Alice May
Cook, IL
B.S., Stanford University, '94

Chiu, John H.
New York, NY
B.S., Massachusetts Institute of Technology, '94

Clark, Chad Michael
Hamilton, IN
B.A., Duke University, '94

Clarke, Roy Adrian
New York, NY
B.A., Princeton University, '94

Cohen, Mark Steven
Hammond, IN
B.S., Washington University, '94

Crebo, Richard Emory
Tipton, IN
B.A., Northwestern University, '93

Doezie, Allen Michael
Los Angeles, CA
B.S., Brigham Young University, '94

Dolan, Dan Hennessy
Columbia, MO
B.S., University of Missouri, '92

Dorsey, Karen Barbara
Washington, DC
B.A., University of Virginia, '93

Drake, Daniel Paul
Oklahoma City, OK
B.S., Duke University, '94

Ebach, Dawn Renae
Pueblo, CO
B.S., Creighton University, '94

Ellingson, Christopher Ingard
Olmsted, MN
B.A., Augustana College, '94

Fairbanks, Kyrsten Del
Hennepin, MN
B.A., Washington University, '94

Fayazi, Amir Hossain
Baltimore, MD
B.S., The Johns Hopkins University, '94

Ferguson, Kevin Lamar
St. Louis, MO
B.A., University of Missouri, '94

Freehill, Angela Kathleen
Montgomery, MD
B.A., Georgetown University, '91

Frost, Stefani Lynn
Los Angeles, CA
B.A., University of California, Berkeley, '93

Gelber, Rebecca Patricia
Honolulu, HI
B.S., Stanford University, '94

Gerst, Christopher
Monroe, IN
B.S., Indiana University, Bloomington, '94

Gray, Steven Howell
Jefferson, KY
B.A., Bowdoin College, '93

Gregg, Bradley Raymond
St. Louis, MO
B.A., Washington University, '85

Gurley, Susan Ann
Jackson, MS
B.A., University of Mississippi, '90

Hardy, Steve Edward
Summit, OH
B.A., College of Wooster, '94

Harvin, Howard Jonathan
Los Angeles, CA
B.A., Stanford University, '93

Hausladen, Derek Allen
Kenton, KY
B.S., Yale University, '94

Hausladen, Jennifer
New Haven, CT
B.A., Yale University, '93

Hayes, Ericka Vanessa
Hinds, MS
B.S., Washington University, '94

Henry, Scott Eric
Madison, IN
B.S., Indiana University, Bloomington, '94

House, Paul
Muscatine, IA
B.S., University of Iowa, '94

Hsieh, Charlotte Jiahwa
Santa Clara, CA
B.S., Stanford University, '94

Hu, Chia-Chieh
Santa Clara, CA
B.A., University of California, Berkeley, '93

Hui, Rosenna Y.C.
Cook, IL
B.S., University of Illinois, Urbana, '94

Igwebuike, Ada Rita
Kent, OH
B.S., Kent State University, '93

Jacono, Frank Joseph
Geauga, OH
B.S., Case Western Reserve University, '94

Johnson, Susan Michelle
Tioga, NY
B.S., Suny At Binghamton, '93

Joist, Heidi Elaine
St. Louis, MO
B.A., George Washington University, '93

Jones, Jennifer Lee
Cook, IL
B.S., University of Illinois, Urbana, '94

Karakousis, Petros Constantine
Erie, NY
B.S., The Johns Hopkins University, '93

Kasufkin, Richard Allen
Harris, TX
B.A., William Marsh Rice University, '94

Kim, Han Woong
Johnson, IN
B.S., Stanford University, '92

Klingler, Kelly Michelle
Sangamon, IL
B.A., Pomona College, '94

Ladabaum, Dan
Santa Clara, CA
B.A., University of California, Berkeley, '94

Lee, Jaejoon
Seoul, Korea
B.S., Washington University, '94

Lee, Katrina Lafaye
Harris, TX
B.A., William Marsh Rice University, '94

Leibole, Marc Alan
Midland, MI
B.A., Northwestern University, '94

Leippe, Jennifer Michelle
Sacramento, CA
B.S., Brigham Young University, '94

Leonard, Julie C.
Brookhaven, MS
B.S. and B.A., University of Washington, '92

Lewis, James
St. Louis, MO
B.A., Washington University, '93

McGuire, Heather Lynn
Laramie, WY
B.A., Colorado College, '94

McLean, Matthew
Mcdonough, IL
B.A., Cornell University, '94

Mehrotra, Rashmi
Cook, IL
B.A., Northwestern University, '94

Merrick, John Clinton
Half Moon Bay, CA
B.A., Miami University, '92

Nathan, Devi
Douglas, CO
B.A., Washington University, '94

Nayak, Laxmeesh Mike
Effingham, IL
B.S., Yale University, '94

Nembhard, Kaye Marie
Kings, NY
B.S., St. Joseph's College, '94

Oh, Joseph
Vermilion, IL
B.A., The Johns Hopkins University, '94

Owens, David Scott
Hennepin, MN
B.A., Carleton College, '90

Page, Kathleen Raquel
La Paz, Bolivia
B.S., The Johns Hopkins University, '93

Pao, Alan Chunyao
Fairfax County, VA
B.S., Stanford University, '94

Patel, Mihir Magan
Bartholomew, IN
B.A., Washington University, '93

Paulos, Mark
Corapoulis, PA
B.A., Brown University, '93

Pennington, Andrea Amelia
De Kalb, GA
B.S., Georgia State University, '94

Petersen, David Byrum
Cassia, ID
B.A., Brigham Young University, '94

Pham, Peter Angia
Jennings, IN
B.A., Washington University, '94

Philip, Susan Sarah
Polk, FL
B.S., Duke University, '94

Raines, Jean Elizabeth
Hamilton, TN
B.A., Vassar College, '93

Rammohan, Chidambaram
Du Page, IL
B.S., University of Illinois, Urbana, '94

Rawson, Jeanie Kirsten
St. Louis, MO
B.S., University of Missouri, '91

Reistad, Chet Erik
Green Lake, WI
B.A., Washington University, '93

Rubenstein, Joel Howard
Oakland, MI
B.S., University of Michigan, Ann Arbor, '94

Rysman, Kara Phyllis
Plymouth, MA
B.A., University of Pennsylvania, '94

Salimi, Kayvon
St. Louis, MO
B.A., Princeton University, '93

Seidman, Marc Heath
Passaic, NJ
B.A., Rutgers University, New Brunswick, '91

Short, Patricia Dawn
Carter, OK
B.S., Oklahoma State University, '93

Smith, Arnold
Rochester, MN
B.S., Mississippi State University, '92

Smits, Ariel Kathleen
Oakland, MI
B.S., University of Michigan, Ann Arbor, '93

Stambuk, Mikula
Washington, DC
B.S., University of California, Berkeley, '92

Staples, Scott Alan
Cottonwood, MN
B.A., Gustavus Adolphus College, '94

Steiner, Julie Lynne
Cobb, GA
B.S., University of Georgia, '94

Stonecipher, Andrea Kay
Sangamon, IL
B.A., Washington University, '94

Sullivan, Amy Marie
St. Louis, MO
B.S., Washington University, '94

Swider, Elizabeth Mary
Cook, IL
B.A., Northwestern University, '94

Todora, Michael Anthony
Dallas, TX
B.A., University of Texas, Austin, '93

Trotter, Amy Lee
St. Louis, MO
B.A., Haverford College, '94

Tsai, Richard Zelos
Lake, IL
B.A., The Johns Hopkins University, '94

Tsai, Tony
Marinette, WI
B.S., Harvard University, '94

Tuttle, Ann
Sumner, WA
B.A., The University of Chicago, '93

Uhles, Kimberly Ann
Santa Barbara, CA
B.S., University of California, San Diego, '94

Wang, Rui
Boone, MO
B.S., University of Missouri, '94

Wei, Jeffrey Thomas
Du Page, IL
B.S., University of Illinois, Urbana, '94

Whiteside, Karen
Chesterfield, MO
B.A., Washington University, '93

Wu, Herman Poating
Mercer, NJ
B.A., Princeton University, '94

Yalavarthi, Chandrika
Cook, IL
B.A., Washington University, '94

Second-Year Class

Ainsworth, Carla R.
Gambier, OH
B.A., Kenyon College, '95

Akom, Michael C.
Tallahassee, FL
B.S., University of Florida, '95

Amusa, Gbolahan
Durham, NC
B.S.E., Duke University, '95

Bercutt, Lawrence D.
Beverly Hills, CA
B.S., Stanford University, '94

Beyer, Devra
Waltham, MA
B.A., Brandeis University, '94

Birnbaum, Shana L.
Sudbury, MA
B.A., Harvard University, '94

Brent, Jeffrey F.
Shawnee Mission, KS
B.S., Duke University, '95

Browning, Susan
Logan, UT
B.A., Utah State University, '95

Carroll, Christopher P.
Baltimore, MD
B.A., The Johns Hopkins University, '95

Cashen, Amanda S.
Louisville, KY
B.S., Yale University, '95

Chandler, Kalaokalani
Clayton, MO
B.A., Washington University, '95

Chapman, Teresa
Bellevue, WA
B.A., University of Colorado, Boulder '94

Chen, Delphine L.
Cambridge, MA
B.A., Harvard University, '95

Chen, Grace S.
Charlotte, NC
B.A., Stanford University, '95

Cheng, Andrea L.
Cambridge, MA
B.S., Harvard University, '95

Dans, Maria C.
Cockeysville, MD
B.A., Princeton University, '89

Dorr, David
Beaverton, OR
B.A., Washington University, '94

Everitt-Watson, Melanie D.
Searcy, AR
B.S., University of Arkansas, '95

Farrell, Maureen E.
Alexandria, VA
B.S., U.S. Naval Academy, '93

Fox, Douglas J.
Creve Coeur, MO
B.S., Wake Forest University, '95

Freed, Jana L.
Wooster, OH
B.A., College of Wooster, '94

Garon, Edward B.
Boston, MA
B.S., Massachusetts Institute of Technology, '95

Gladstone, Laura J.
Philadelphia, PA
B.A., University of Pennsylvania, '95

Goggin, Andrew S.
Greenville, IL
B.A., Greenville College, '91

Griffeth, Carolyn Diane
Winnebago, IL
B.S., University of Illinois, Urbana, '94

Grosvenor, Julie D.
Logan, IA
B.S., University of Iowa, '94

Guitierrez, Ernesto
Gambier, OH
B.A., Kenyon College, '95

Hakimian, Shahin
Los Angeles, CA
B.S., University of California, Los Angeles, '95

Heidemann, Amanda J.
St. Charles, MO
B.A., Baylor University, '95

Hiestand, Jenna A.
River Ridge, LA
B.S., Tulane University, '95

Ho, Alan L.
Stanford, CA
B.S., Stanford University, '95

Ho, Emily L.
New Haven, CT
B.S., Yale University, '95

Hoffman, John Langston
Dane, WI
B.A., University of Wisconsin, Madison, '94

Holschen, Jolie C.
Florissant, MO
B.A., Washington University '95

Hsu, Joyce J.
Berkeley, CA
B.A., University of California, Berkeley, '95

Hu, Edward P.
Dover, DE
B.S., University of Delaware, '95

Hui, Jennifer S.
Ithaca, NY
B.S., Cornell University, '95

Hunt, Rebecca S.
Des Moines, IA
B.S., Drake University, '95

Jauhar, Sandeep
Berkeley, CA
B.A., University of California, Berkeley, '89

Jennett, George Hemington
Cook, IL
B.S., Morehouse College, '94

Jervis, Ramiro
Paoli, PA
B.A., University of Virginia, '94

Kachalia, Allen B.
La Verne, CA
B.S., University of California, Los Angeles, '93

Kapadia, Rakhee M.
Durham, NC
B.S., Duke University, '95

Kelsey, Sekou K.
Berkeley, CA
B.A., University of California, Berkeley, '94

Kerchner, Geoffrey A.
Oak Ridge, TN
B.A., Harvard University, '94

Kim, Albert
Cambridge, MA
B.A., Harvard University, '94

Klassen, Lisa B.
Ann Arbor, MI
B.S., University of Michigan, Ann Arbor, '95

Kong, Xinna
Boston, MA
B.A., Smith College, '93

Kriwanek, Kelly L.
Manhattan Beach, CA
B.S., University of California, Los Angeles, '94

Lam, Huong M.
Lansing, KS
B.A., University of Kansas, '95

Latif, Shuaib A.
Houston, TX
B.A., William Marsh Rice University, '95

Lawrence, Tracy D.
Berkeley, CA
B.A., University of California, Berkeley, '95

Lee, Alice N.
Long Beach, CA
B.S., Yale University, '93

Lee, Teng C.
Bloomington, IN
B.S., Indiana University, Bloomington, '95

Loh, John C.
San Jose, CA
B.S., University of Michigan, Ann Arbor, '89

Lorenzo-Rivero, Shauna
Hanover, NH
B.S., Dartmouth College, '95

Lung, Jennifer M.
Urbana, IL
B.S., University of Illinois, Urbana, '95

Malhotra, Seema
Parkersburg, WV
B.S., American University, '94

McAtee, Irene Hong
Lexington, KY
B.S., University of Kentucky, '95

McCoy, Roderick Lawrence
Santa Monica, CA
B.S., Stanford University, '89

Metzler, Elise C.
Notre Dame, IN
B.S., University of Notre Dame, '95

Miller, David C.
Ann Arbor, MI
B.S., University of Michigan, Ann Arbor, '95

Moore, Matthew G.
Farm Hills, MI
B.S., University of Michigan, Ann Arbor, '95

Morgan, Esi M.
Philadelphia, PA
B.A., Harvard University, '91

Murphy, Brian A.
Decatur, IL
B.S., Illinois Wesleyan University, '95

Nakamura, Mari M.
Las Cruces, NM
B.S., Stanford University, '93

Norbash, Ali
Lawrence, KS
B.S., University of Kansas, '95

Norton, Melissa L.
Hanover, NH
B.A., Dartmouth College, '93

Nundy, Surajit
New Haven, CT
B.A., Manhattanville College, '93

Oda, Jon E.
Honolulu, HI
B.A., Princeton University, '95

Okereke, Ikenna C.
Bellevue, NE
B.S., The Johns Hopkins University, '95

Preddie, Dean
Berrien Springs, MI
B.S., Andrews University, '93

Price, Virginia S.
St. Louis, MO
B.A., Haverford College, '94

Quartarolo, Jennifer M.
Davis, CA
B.S., University of California, Davis, '94

Raichle, Timothy S.
St. Louis, MO
B.A., Washington University, '91

Ratliff, Kristin L.
Cambridge, MA
B.S., Massachusetts Institute of Technology, '95

Rave, Lelach
Springfield, MO
B.S., Northwestern University, '94

Richards, Megan Ringwald
New Haven, CT
B.H., McGill University, '95

Rockers, Kyle M.
Paola, KS
B.S., U.S. Air Force Academy, '95

Root, Timothy D.
Trumbull, CT
B.S., Hobart College, '87

Ryan, Ginny L.
Ithaca, NY
B.S., Cornell University, '95

Sharp, Gregory E.
E. Grand Rapids, MI
B.A., Hope College, '95

Shih, David C.
Lake Forest, IL
B.S., Brown University, '95

Sikka, Neal K.
Oak Ridge, TN
B.S., University of Illinois, Urbana, '95

Singh, Anurag K.
Fairport, NY
B.S., Yale University, '95

Skjei, Stephen D.
Charlottesville, VA
B.A., University of Virginia, '95

Smith, Jennifer H.
San Diego, CA
B.S., University of California, Los Angeles, '95

Smith, Marna R.
Des Moines, IA
B.S., Drake University, '95

Song, Edward W.
Vestal, NY
B.A., Harvard University, '95

Stanley, Shawn A.
San Diego, CA
B.S., University of California, San Diego, '95

Stein, Adam B.
Topeka, KS
B.S., Brown University, '93

Tam, Richard C.
Moreland Hills, OH
B.A., Case Western Reserve University, '95

VanCleave, Jeanne M.
Lawrence, KS
B.A., University of Kansas, '95

Verdine, Benjamin W.
Washington, MO
B.S., Washington University, '95

Viloria, Rebekah P.
St. Louis, MO
B.S., Washington University, '95

Walker, Jeffrey L.
St. Louis, MO
B.S., Alcorn State University, '94

Wang, Lori A.
Charlottesville, VA
B.A., University of Virginia, '95

Wendelin, Daniel S.
Corydon, IN
B.S., Ohio State University, '95

Williams, Monique M.
Rockville, MD
B.A., Washington University, '95

Williams, Scott S.
Tuskegee, AL
B.S., Morehouse College, '95

Wilson, Michele L.
Castro Valley, CA
B.S., Saint Mary's College, '95

Wong, Angela R.
New Haven, CT
B.A., Yale University, '95

Woolf, Karen E.
Providence, RI
B.S., Brown University, '95

Wurzel, Hayley M.
Providence, RI
B.S., Brown University, '95

Yue, Patrick
Pasadena, CA
B.S., California Institute of Technology, '95

First-Year Class

Allen, Tracy L.
Schwartz Creek, MI
B.H., University of Michigan, '90

Berg, Daniel R.
St. Louis, MO
B.S., Brown University, '94

Bohl, Daniel L.
Cambridge, MA
B.S., Massachusetts Institute of Technology, '96

Bourgeois, Florence T.
New Haven, CT
B.S., Yale University, '96

Boyles, Cara D.
Houston, TX
B.A., William Marsh Rice University, '96

Brookmeyer, Peter
St. Louis, MO
B.A., Washington University, '96

Calvert, George
Philadelphia, PA
B.A., University of Pennsylvania, '95

Champion, Gretchen A.
Frankfort, IL
B.S., University of Michigan, Ann Arbor, '95

Chen, Grace P.
Stanford, CA
B.A., Stanford University, '96

Chen, Vincent Y.
Chino Hills, CA
B.A., University of California, Berkeley, '95

Cheng, Tammy P.
Los Angeles, CA
B.S., University of California, Los Angeles, '96

Cho, Daniel C.
New Haven, CT
B.S., Yale University, '96

Chun, Jonathan S.
St. Louis, MO
B.A., Washington University, '96

Church, Jori L.
Lynchburg, VA
B.A., Dartmouth College, '93

Corriere, Mark D.
Ellicott City, MD
B.S., University of Notre Dame, '96

Cummings, Terri L.
East Elmhurst, NY
B.A., Princeton University, '96

Cunningham, Aimee F.
Bethesda, MD
B.A., University of Michigan, Ann Arbor, '93

Delaney, Carolyn A.
North Caldwell, NJ
B.A., William Marsh Rice University, '96

DeSai, Bimal R.
Charlotte, NC
B.S., Emory University, '95

Diskin, Emily B.
Chicago, IL
B.A., The University of Chicago, '95

Djordjevic, Andelka
Lyons, IL
B.A., Northwestern University, '96

Dow, Alan W.
Greenville, DE
B.A., University of Virginia, '96

Durkin, Monica L.
Bloomington, IN
B.S., Indiana University, '96

Ealovega, Mark W.
Canton, MI
B.S., University of Michigan, Ann Arbor, '95

Echols, Daalon B.
Princeton, NJ
B.A., Princeton University, '96

Elfiky, Aymen A.
Westbury, NY
B.S., SUNY, Stony Brook, '96

Ellis, Ramsey A.
Brookline, MA
B.A., Colby College, '94

Engelland, Emily L.
St. Louis, MO
B.A., Washington University, '96

Fahnestock, Peter A.
Wilmington, DE
B.A., The Johns Hopkins University, '95

Flinn, Denise R.
Georgetown, TX
B.A., Southwestern University, '96

Foley, Kristin M.
Columbus, OH
B.A., Yale University, '91

Fong, Christina M.
San Francisco, CA
B.A., University of California, Berkeley, '95

Fowler, Natalie L.
St. Louis, MO
B.A., Washington University, '92

Frisella, William A.
Somerville, MA
B.A., Harvard University, '95

Gross, Elizabeth K.
Storrs, CT
B.S., University of Connecticut, '96

Hanna, Eyad M.
Gates Mills, OH
B.S., Case Western Reserve University, '96

Hannallah, David
Washington, DC
B.S., Brown University, '94

Henry, Norah L.
Redwood City, CA
B.S., Louisiana State University, Baton Rouge, '91

Herant, Marc E.
Santa Fe, NM
B.S., California Institute of Technology, '86
Ph.D., Harvard University, '92

Hermann, Catherine A.
St. Louis, MO
B.A., Northeast Missouri State University, '92

Holland, Derek W.
Houston, TX
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B.S., Pennsylvania State University, '92
Ph.D., The Johns Hopkins University, '96

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B.A., Washington University, '96

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St. Louis, MO
B.S., Washington University, '96

Yoo, Albert J.
St. Louis, MO
B.A., Washington University, '96

SUMMARY OF STUDENTS IN THE SCHOOL OF MEDICINE (1996-97)

Doctor of Medicine and Doctor of Philosophy Degrees

Graduating Class	16
Tenth-Year Trainees	1
Eighth-Year Trainees	5
Seventh-Year Trainees	14
Sixth-Year Trainees	16
Fifth-Year Trainees	17
Fourth-Year Trainees	13
Third-Year Trainees	20
Second-Year Trainees	20
First-Year Trainees	20

Doctor of Medicine and Master of Arts Degrees

Graduating Class	7
Trainees	10

Doctor of Medicine Degree

Graduating Class	103
Howard Hughes Research	1
Fourth-Year Class	3
Third-Year Class	104
Second-Year Class	105
First-Year Class	104

Master of Health Administration Degree

Graduating Class	29
First-Year Class	28
Part-Time Students	6

Master of Science in Physical Therapy Degree

Graduating Class	76
Second-Year Class	82
First-Year Class	81
Part-Time Students	6

Bachelor of Science in Occupational Therapy Degree

Graduating Class	14
Second-Year Class	5
First-Year Class	1
Part-Time Students	6

Master of Art in Disabilities and Rehabilitation

Graduating Class	1
Part-Time Students	13

Master of Science in Occupational Therapy Degree

Graduating Class	74
Second-Year Class	104
First-Year Class	104
Part-Time Students	4

Master of Science in Psychiatric Epidemiology

Part-Time Students	1
Total	1214

STAFF INDEX

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z

SCHOOLS OF WASHINGTON UNIVERSITY

All schools are located at One Brookings Drive, St. Louis, Missouri 63130 except Medicine (660 S. Euclid Ave., St. Louis, Missouri 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 Architecture
School of Art
John M. Olin School of Business
School of Engineering and Applied Science
School of Law
School of Medicine
George Warren Brown School of Social Work
University College

The information that appears in this Bulletin was compiled in the spring of 1997. It is current as of June 30, 1997.

Miscellaneous

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.

Professor Emeriti of Preventive Medicine and Public Health

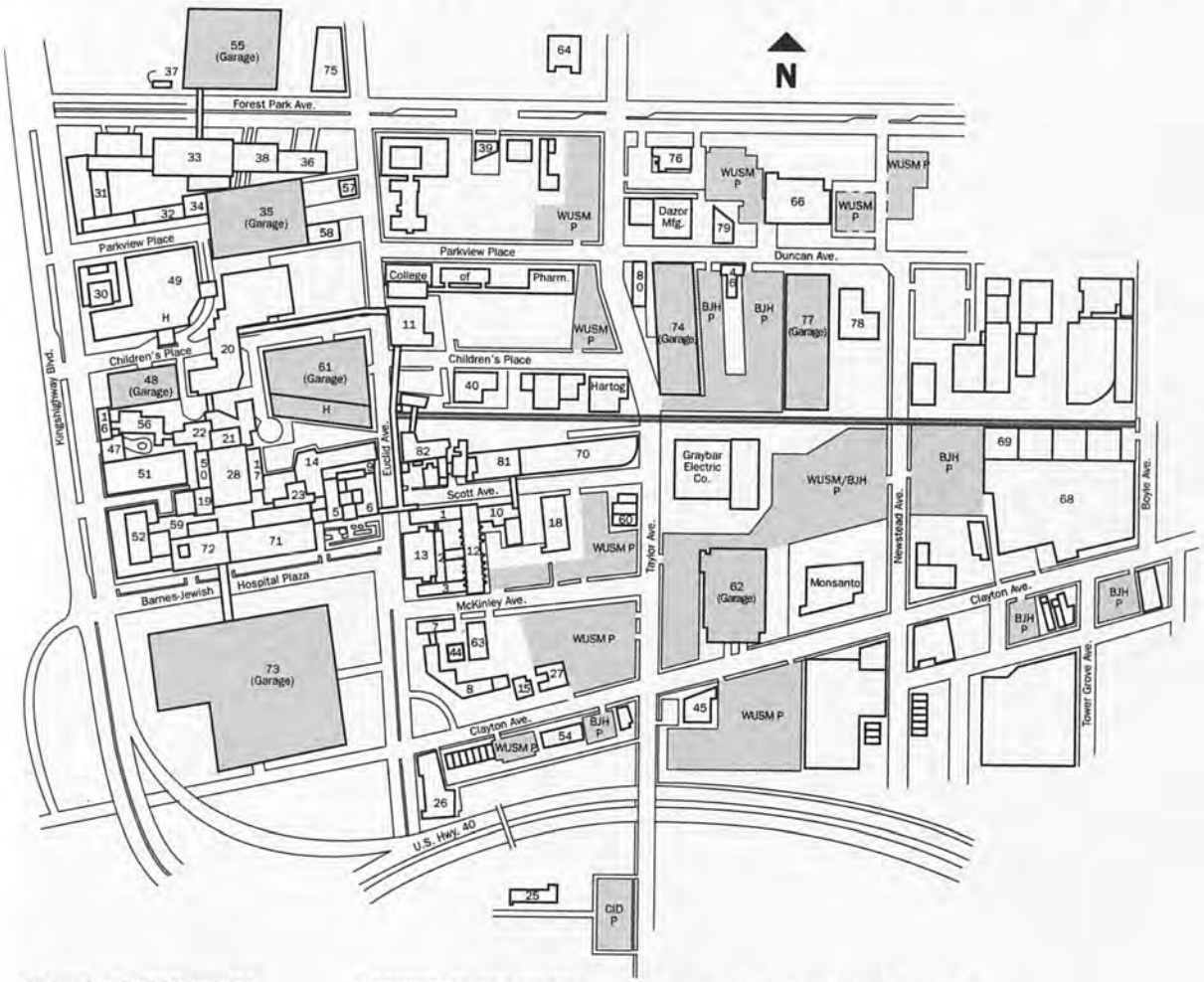
Robert E. Shank, M.D., Washington University, 1939. (See Department of Medicine.)

Danforth Professor of Preventive Medicine and Public Health

M. Kenton King, M.D., Vanderbilt University, 1951. (See Department of Medicine.)

INDEX

WASHINGTON UNIVERSITY MEDICAL CENTER



BARNES-JEWISH HOSPITAL

23 Peters Building
28 Barnes Service Building
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
52 Queeny Tower
54 Barnes Lodge
55 Parking Garage
57 225 S. Euclid
58 Power Plant
59 Rand Johnson
68 Clayton Avenue Building
69 Employee Day Care Facility
71 East Pavilion
72 West Pavilion
73 Parking Garage
74 Parking Garage
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
5 Maternity Hospital
6 McMillan Hospital
7 Institute for Biomedical Computing
8 Shriners Building
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 Hospital
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 Parkview
81 Biotechnology Center
82 Euclid Power Plant

ST. LOUIS CHILDREN'S HOSPITAL

47 Spoehrer Children's Tower
48 Parking Garage
49 St. Louis 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

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