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Washington University School of Medicine bulletin, 1994-1995

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CALENDAR 1994-95

1994

JUNE

6 **Monday** Academic year begins for the Third and Fourth Year Classes.

8, 9 **Wednesday, Thursday** United States Medical Licensing Examination, Step 1.

10 **Friday** Deadline for registration and initial payment of tuition for the Third and Fourth Year Classes.

21, 22 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 3.

JULY

4 **Monday** Independence Day observance.

15 **Friday** End of Clinical Clerkship Final Examinations.

AUGUST

10 **Wednesday** Orientation, matriculation, and initial payment of tuition and fees for the First Year Class.

15 **Monday** Academic year begins for the First and Second Year Classes.

19 **Friday** Deadline for registration and initial payment of tuition for the Second Year Class.

26 **Friday** End of Clinical Clerkship Final Examinations.

31-9/1 **Wednesday, Thursday** United States Medical Licensing Examination, Step 2.

SEPTEMBER

5 **Monday** Labor Day observance.

22, 23 **Thursday, Friday** United States Medical Licensing Examination, Step 1.

OCTOBER

7 **Friday** End of Clinical Clerkship Final Examinations.

NOVEMBER

4 **Friday** First trimester ends at 5:00 p.m. for the Second Year Class.

7 **Monday** Second trimester begins at 8:00 a.m. for the Second Year Class.

18 **Friday** Deadline for payment of the balance of tuition for the Third and Fourth Year Classes.

End of Clinical Clerkship Final Examinations.

24 **Thursday** Thanksgiving Day observance.

25 **Friday** Holiday for First and Second Year Classes.

DECEMBER

6, 7 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 3.

17 **Saturday** Winter recess begins at 1:00 p.m. for all classes.

First semester ends for the First Year Class.

1995

JANUARY

3 **Tuesday** Winter recess ends at 8:00 a.m. for all classes.

Second semester begins at 8:00 a.m. for the First Year Class.

13 **Friday** End of Clinical Clerkship Final Examinations.

Deadline for payment of the balance of tuition for the First and Second Year Classes.

16 **Monday** Observance of birthday of Martin Luther King, Jr.

FEBRUARY

10 **Friday** Second trimester ends at 5:00 p.m. for the Second Year Class.

13 **Monday** Third trimester begins at 8:00 a.m. for the Second Year Class.

24 **Friday** End of Clinical Clerkship Final Examinations.

MARCH

1, 2 **Wednesday, Thursday** United States Medical Licensing Examination, Step 2.

12 **Sunday** Spring recess begins for the First and Second Year Classes.

20 **Monday** Classes resume at 8:00 a.m. for the First and Second Year Classes.

APRIL

7 **Friday** End of Clinical Clerkship Final Examinations.

14 **Friday** Spring recess begins for the Third and Fourth Year Classes.

17 **Monday** Classes resume at 8:00 a.m. for the Third and Fourth Year Classes.

MAY

5 **Friday** Third trimester ends at 5:00 p.m. for the Second Year Class.

18 **Thursday** Academic year ends at 5:00 p.m. for graduating students.

End of Clinical Clerkship Final Examinations.

19 **Friday** Commencement.

Second Semester ends at 5:00 p.m. for the First Year Class.

20 **Saturday** Academic year ends at 5:00 p.m. for the Third Year Class.

JUNE

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

27, 28 **Tuesday, Wednesday** United States Medical Licensing Examination, Step 3.

CLERKSHIP AND SIX-WEEK ELECTIVE PERIODS

Period	*Weeks*	*Begins*
I	1-6	June 6, 1994
II	7-12	July 18, 1994
III	13-18	August 29, 1994
IV	19-24	October 10, 1994
V	25-30	November 21, 1994
VI	31-36	January 17, 1995
VII	37-42	February 27, 1995
VIII	43-48	April 10, 1995

FOUR-WEEK ELECTIVE PERIODS

Period	*Weeks*	*Begins*
A	1-4	June 6, 1994
B	5-8	July 5, 1994
C	9-12	August 1, 1994
D	13-16	August 29, 1994
E	17-20	September 26, 1994
F	21-24	October 24, 1994
G	25-28	November 21, 1994
H	29-32	January 3, 1995
I	33-36	January 30, 1995
J	37-40	February 27, 1995
K	41-44	March 27, 1995
L	45-48	April 24, 1995

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. Fourteen Nobel laureates have been associated with the School of Medicine, and 21 have been elected to the National Academy of Sciences.

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.

In 1993-94, The School of Medicine signed new affiliation agreements with Barnes Hospital and Jewish Hospital that forged an even closer affiliation by giving the school and hospitals an unprecedented stake in each other's successes. Simultaneously, Jewish and Barnes established new links through the creation of a parent organization called Barnes-Jewish, Inc. (BJI). In a further move to strengthen the delivery and better contain the cost of health care services, and in anticipation of national reforms in the health care system, St. Louis-based Christian Health Services (CHS) and BJI announced a plan to jointly create a comprehensive primary-through-tertiary health care system in association with the School of Medicine. Jewish and Barnes remain members of the Washington University Medical Center, but through their affiliation with CHS become part of a 4,400 bed multi-hospital alliance covering St. Louis and the surrounding region.

RESEARCH SUPPORT

Grants totaling $151.5 million currently support faculty research efforts, including $16.6 million from corporate partners. In the 1993 fiscal year, the School of Medicine ranked fourth out of 126 medical schools in the amount of total funding provided by the National Institutes of Health:

Johns Hopkins University	$187,390,679
University of California-San Francisco	$163,478,296
Yale University	$137,630,704
Washington University	**$125,981,592**
University of Pennsylvania	$117,571,102
University of Washington	$115,386,965
Stanford University	$112,141,448
Columbia University	$110,937,076
Duke University	$107,417,561
University of Michigan	$103,009,258

RESEARCH HIGHLIGHTS

Following is a sampling of the many medical firsts that have taken place at the School of Medicine:

- The first to use yeast artificial chromosomes to study hereditary diseases in humans.
- Built the first PET scanner, a device that images body function and has been used to map emotions in the brain.
- Among the first to give patients insulin for diabetes and has recently shown that cell transplants can eliminate the need for insulin injections.
- Proposed the now-common practice of taking aspirin to prevent heart attacks.
- Proved that a simple blood test can effectively diagnose prostate cancer in its early stages.
- Found a cure for hepatitis B.
- Devised endoscopic surgery techniques that remove diseased organs through tiny incisions, reducing patient pain levels, recovery time, scarring and medical bills.
- Developed a surgical cure for the abnormal heart rhythm called atrial fibrillation.
- Proved certain exercises and calcium supplements can rebuild brittle bones in some patients.
- Discovered and pioneered research into excitotoxic amino acids and brain injury.

Following are descriptions of the research that is ongoing at Washington University School of Medicine.

A Washington researcher developed and performed the world's first nerve transplant procedure that uses nerve tissue from a cadaver donor. Susan Mackinnon, M.D., professor of plastic and reconstructive surgery, has worked more than a decade in the laboratory to unravel the mysteries of nerve regeneration and transplantation. Nerve autografts, which are nerves from the patient's own body, have been successful for smaller nerve injuries, but they inevitably rob the patient of sensation in the area where surgeons harvest the nerve and result in additional scarring and pain. Using nerves from cadaver donors requires only a short time on immunosuppressive medication until the severed nerve endings grow together. Candidates for nerve transplants include people who have suffered traumatic nerve damage in their extremities. In the United States alone, hundreds of people suffer peripheral nerve injuries each year. The nerve transplant surgery will not work for people with central nervous system injuries that result in paraplegia or quadriplegia or with diseases of the central nervous system, such as multiple sclerosis, muscular dystrophy, ALS or other neurological disorders.

Thousands of patients with severe emphysema may benefit from a new surgical procedure developed at Washington in which surgeons remove heavily damaged portions of patients' lungs. The surgery dramatically improves lung function and helps patients breathe easier, according to Joel D. Cooper, M.D., the lung transplant surgeon who

pioneered the surgery. Cooper says that in the future, the surgery may be the treatment of choice for patients with severe, debilitating emphysema who have not responded to medical therapy. During the surgery, Cooper removes 20-30 percent of the most damaged portions of each lung. As emphysema progresses, patients' lungs gradually enlarge, crowding the chest cavity and flattening the diaphragm. Reducing the size of their lungs gives patients more room to breathe.

The School of Medicine together with Barnes Hospital opened the world's first Diabetes Islet Transplant Center Processing Laboratory in March 1993. The tissue processing laboratory and cell bank was established to isolate and purify insulin-producing cells for transplantation in persons with insulin-dependent diabetes. The new laboratory will increase cell processing and create a tissue bank so clinical trials for encapsulated islet cell transplantation can be expanded. Experimental islet transplantation was pioneered in 1985 by researchers Paul Lacy, M.D., Ph.D., and David Scharp, M.D. Encapsulation devices isolate implanted cells from the immune system. They have successfully controlled blood sugar levels for extended periods in mice. To date, three islet cell transplants have been performed in humans that eradicated the need for them to inject insulin. The transplanted islet cells functioned for 11 months in one patient and several weeks in another before they were required to resume insulin injections. Another 30 patients had partial functioning of the transplanted islets that reduced their need for insulin, but not enough to stop the injections.

M. Alan Permutt, M.D., professor of medicine in the division of metabolism, was involved in identifying 16 gene mutations responsible for causing what is known as maturity-onset diabetes of the young, or MODY. A subform of non-insulin-dependent diabetes (NIDDM), MODY accounts for about 5 percent of all NIDDM cases. The mutations were discovered in the gene for glucokinase, an enzyme critical for stimulating pancreatic insulin secretion. Gene mutations were found in 18 of 32 MODY families involved in the study, leading researchers to believe that the glucokinase gene is the primary cause of MODY.

The development of adult-onset diabetes has been linked with advancing age, but exercise physiologist Wendy Kohrt, Ph.D., published findings which indicate that belly fat may play a bigger role in the body's inability to produce enough insulin or respond properly to insulin in later years. Kohrt studied 67 men and women aged 60 to 70 and found that those with impaired glucose tolerance and insulin resistance had more body fat around their midsections. Her findings suggest that many of the changes previously associated with aging are the result of changes in distribution of body fat, which can be modified with exercise.

Gary K. Ackers, Ph.D., Raymond H. Wittcoff Professor and head of the Department of Biochemistry and Molecular Biophysics, has been appointed director of a multi-center effort to develop a synthetic blood substitute. Ackers will coordinate the five-year, $7.5 million program project grant awarded by the National Heart Lung and Blood Institute. Washington has joined with other university groups to develop a more complete understanding of hemoglobin, an oxygen-carrying protein present in all red blood cells. A better understanding of hemoglobin, Ackers says, is a necessary prelude to further efforts to develop artificial blood.

Work led by Dennis W. Choi, M.D., Ph.D., and John W. Olney, M.D., examines the possibilities for preventing and reversing brain injury caused by the release of an excess of neurotransmitters, especially glutamate. Normally important in sending signals between neighboring brain cells, too much glutamate can excite brain cells to death. Choi and Olney explore ways of blocking glutamate receptors in the brain.

The School of Medicine received $8 million from the National Institute of Allergy and Infectious Diseases (NIAID) to support research in the school's AIDS Clinical Trials Unit (ACTU). The ACTU was established in 1987 with a $5.5 million, five-year grant from the NIAID to study the effect of AIDS on the body. In the unit, researchers evaluate the effectiveness of new and old drugs to treat AIDS, develop new treatments and educate physicians in the St. Louis area about how to care for AIDS patients.

Researchers have identified a natural target receptor for the bacterium *Helicobacter pylori*, a pathogen that causes gastritis, ulcers and may lead to stomach cancer. This research could pave the way for a new line of ulcer drugs and explain why ulcers are more common in persons with type O blood.

Three teams of investigators will share a program project grant to study the mechanisms by which general anesthetics produce their effects. The grant is one of two program project grants awarded by the National Institutes of Health to investigate the cellular and molecular mechanisms by which anesthetics work. The grant is worth more than $2 million over five years with the first-year award totaling $585,000.

Blood tests that enable physicians to quickly and safely determine whether heart attack patients will need invasive treatment to open blocked arteries were developed by researchers at the School of Medicine. The tests identify heart attack patients whose blood flow is not restored by clot-dissolving drugs. Until recently, the only reliable way to assess return of blood flow was an invasive X-ray imaging procedure called angiography. The test involves using a catheter to inject a special dye that shows up on X-rays. The blood tests allow physicians to perform other necessary therapies within the short amount of time available in order to minimize heart damage.

A $6 million grant from the National Institutes of Health is funding research into a group of genetic

diseases known as MEN type 2 syndromes, which cause the development of tumors in several of the endocrine glands. Samuel A. Wells, Jr., M.D., professor and chairman of the Department of Surgery, is directing the investigation into two types of the disease - MEN-2A and MEN-2B. MEN-2A can cause tumors of the adrenal gland, medullary thyroid cancer and hyperparathyroidism; MEN-2B, the most severe form of the disease, can cause adrenal gland tumors, thyroid cancer and is associated with numerous soft tissue and skeletal abnormalities. In advance of cloning the MEN-2A gene, the group has mapped its location near the center of chromosome 10 and has developed a DNA screening test that can predict with great accuracy who carries the MEN-2A disease gene. The multidisciplinary study involves researchers in the departments of genetics, surgery, pediatrics and pathology.

Washington was one of the Public Health Service's first four centers of investigation for the federally funded Human Genome Initiative. Robert H. Waterston, M.D., Ph.D., chairman and professor of genetics, has recently received a $29.7 million grant to continue his work in the human genome project, which seeks to decipher the genetic makeup of humans and a handful of more basic organisms. The five-year award comes from the National Institutes of Health's Center for Human Genome Research. Waterston, who also is an associate professor of anatomy and neurobiology, has played a leading role in the human genome project. The genome project will dramatically improve scientists' understanding of inherited diseases and help identify individuals at risk for inheriting genes that may predispose them to disease. The grant to Waterston will enable him to complete his project to sequence, or spell out, all 100 million chemical bases that determine the genetic blueprint of the *C. elegans* nematode, a tiny transparent worm. Recently, genome researchers studying the worm at Washington have "spelled out" the longest continuous DNA sequence from any organism to date. In the process, they have sequenced DNA faster than was previously done and uncovered nearly three times as many genes than was predicted.

A Washington University team led by David Schlessinger, Ph.D., is working to produce maps of both chromosome 7 and the X chromosome. Intense work on the X chromosome by researchers around the world has resulted in the identification of 225 genes, 111 of which are disease-related. Included among the disease-related genes found are those for retinitis pigmentosa, chronic granulomatous disease and Duchenne muscular dystrophy. Schlessinger and his colleagues have brought two technologies to bear on the work: YACs, or yeast artificial chromosomes, that allow the isolation of large, discrete pieces of DNA that can be overlapped to reconstitute the whole chromosome; and the use of sequence tagged sites (STS), each a string of the base pairs that make up DNA long enough to be unique. When two large YACs contain the same tiny STS, it tells the mapper that they overlap at that STS sequence and they can be pieced together in order. This powerful concept was originated at the School of Medicine and now organizes the work of the international mapping community.

The School of Medicine has a $1.9 million contract with the National Institutes of Health (NIH) to coordinate a multi-center study of heart disease in 15,000 families. The study will help explain how a person's genes and family environment work together to cause heart disease, the nation's No. 1 killer. It is the first study to examine both factors in such a large group.

Using positron emission tomography (PET), researchers have found a circuit in the brain that automates certain non-motor tasks. The group found that the brain has two distinct circuits for completing a single task. When learning a task, a person uses a "novel" circuit specifically designed for handling new tasks. After practice, there is a switch to a second circuit in a different location in the brain that handles learned tasks. As the task is repeated it becomes automatic, requiring less attention and little activity in the areas of the brain previously involved. The study shows how the brain might free itself from having to "fret" over mundane tasks — like shifting a car at the right time or walking — in order to devote energy to other endeavors.

For years, surgeons had only temporary treatments for a debilitating aortic valve disease in children and younger adults. Now a study conducted at The Jewish Hospital of St. Louis by Washington University School of Medicine researchers reports that replacing diseased aortic valves in children and younger adults with another valve moved from elsewhere in their own hearts may be a promising, long-term remedy. All 33 patients who underwent the new surgical procedure were successfully treated. While more follow-up is needed before assessing the technique's overall success, the new procedure may be the optimal substitute for diseased aortic valves in children and young adults.

Researchers at the School of Medicine have discovered a fatal genetic disorder responsible for a form of respiratory failure in full-term newborns. Congenital alveolar proteinosis (CAP) always strikes newborn infants. Despite maximal medical therapy, all infants who have been diagnosed with CAP have died of respiratory failure within their first year of life. Researchers found that CAP can be caused by a deficiency of surfactant protein B (SP-B).

Investigators have demonstrated for the first time that a simple blood test for prostate cancer helps to detect the disease before it spreads. The report brings researchers one step closer to showing that a blood test may help reduce the high mortality rate of prostate cancer, currently the number two cancer killer of American men. Researchers led by William Catalona, M.D., vice chairman of the Department of Surgery, found the PSA test nearly doubles the percentage of tumors discovered while they are still confined to the prostate — and therefore curable —

compared with the gold-standard rectal exam. Early detection may help improve the survival rate for prostate cancer, the most common cancer in American men over the age of 50. This year in the United States, some 165,000 men will be diagnosed with prostate cancer and another 35,000 will die from the disease.

Investigators have found that routine prenatal ultrasound screening does not improve newborn health in low-risk pregnancies and should not be a standard procedure. They found that babies born to mothers who received ultrasound exams only for medically necessary reasons were just as healthy as babies whose mothers underwent routine ultrasound screenings. The study is the largest of its kind to assess the potential benefits of ultrasound in low-risk pregnancies.

The School of Medicine was part of a multi-center study that has shown that drinking alcohol does not affect weight. The same study shows that people who quit smoking risk gaining enough weight to reduce the health benefits of quitting. The study of nearly 4,000 twins provides the most comprehensive evaluation yet of the impact of cigarette and alcohol consumption on weight.

A protein that is essential for normal immune system function is also necessary for development of an AIDS-like disease in mice. Washington investigators have found that without the immune system protein IL-4, mice become resistant to murine acquired immunodeficiency syndrome (MAIDS), a disease that causes symptoms similar to human AIDS. By helping to explain how MAIDS interacts with the immune system, the findings may lead scientists to a better understanding of AIDS in humans.

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, 21 faculty members are in the National Academy of Sciences. Fourteen Nobel laureates have been associated with the School of Medicine. During 1993-94, 54 members of the faculty held individual or career development awards: 22 from the National Institutes of Health, six from the Alcohol, Drug Abuse, and Mental Health Administration, 12 from the American Heart Association, one from the Juvenile Diabetes Foundation, one from the American Lung Association, five from the American Cancer Society, one from the American Society of Hematology, one from the Child Neurology Society, four from the Pediatric Scientist Development Program, and one from Research to Prevent Blindness. The School of Medicine has 23 faculty members with Method to Extend Research in Time (MERIT) status, a special recognition given to only a few NIH grantees, which provides long-term, uninterrupted financial support to investigators who have demonstrated superior achievement during previous research projects.

In 1993-94, the School employed 1,128 full-time, salaried faculty members in its 17 preclinical and clinical departments. The clinical departments are further strengthened by 853 part-time faculty members, a group of physicians who practice their medical specialties in St. Louis and are members of one or more of the staffs of the four hospitals in the Washington University Medical Center.

STUDENTS

The School of Medicine attracts a student body of exceptional quality. The 1993 Entering Class of 122 students was selected from a pool of 6,270 applicants. The School is a national institution with 41 states and nine foreign countries represented in the current enrollment.

In 1994, the School conferred the M.D. degree upon 95 individuals. In addition, seven of the students received the M.A./M.D. degrees and eight students graduated with the M.D. and the Ph.D. degrees. Graduating students who participated in the 1994 National Residency Matching Program matched in programs recognized for high quality and selectivity. Beginning on page 173, 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 556 medical students. Programs are also conducted for 524 students who are pursuing degrees in health administration, occupational therapy or physical therapy. The Division of Biology and Biomedical Sciences has extensive graduate training programs for 414 students seeking the Doctor of Philosophy degree in areas of Developmental Biology, Evolutionary and Population Biology, Immunology, Molecular Biophysics, Molecular Cell Biology, Biochemistry, Molecular Genetics, Molecular Microbiology and Microbial Pathogenesis, Neurosciences, and Plant Biology.

PHILOSOPHY

The efforts of the School of Medicine are directed toward providing able students with a stimulating and challenging milieu in which they may acquire a thorough background in scientific medicine, as well as a deep understanding of the meaning of comprehensive medical care. In a field that is developing as rapidly as is medicine, education begun in medical school must serve as the foundation for a lifelong course of learning. As Sir William Osler pointed out some decades ago, a faculty, no matter how talented, can "only instill principles, put the student in the right path, give him methods, teach him how to study, and early to discern between essentials and nonessentials."

Students today are preparing to cope with a changing world and to contribute in a constructive, considered way, to resolving the problems of

medicine and of health care. To assist in that preparation, the faculty's mission is to preserve the joy of learning and to foster a spirit of discrimination and creativity. It is hoped that all students will achieve this grounding during their years at the School of Medicine.

In summary, the Washington University School of Medicine and the institutions at the Washington University Medical Center are committed to providing patients with high-quality medical care in a concerned, compassionate way, to increasing medical knowledge through research, and to educating superbly qualified young men and women in the health professions.

TEACHING FACILITIES

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

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

Unprecedented growth has occurred in the last 10 years with construction of eight new buildings totalling 1,352,360 gross square feet. This expansion includes the Medical Library and Biomedical Communications Center, the Clinical Sciences Research Building (CSRB), the East Building, the 4480 Clayton Avenue Building, the new 1500-car Parking Garage, the Mallinckrodt Institute of Radiology Imaging Research Facility, the new CSRB North Tower Research Addition, and the new East McDonnell Sciences Building. The three-tower, 10-story CSRB alone added nearly 400,000 gross square feet totally dedicated to research when it was completed in 1984. The Medical Library and Biomedical Communications Center was completed in the fall of 1989. The completion of this $14 million structure, consisting of 113,000 gross square feet, has enabled the expansion of its programs, as well as long-term growth of its collections. Even more importantly, it provided state-of-the-art information management. The 4480 Clayton Avenue Building houses Central Administration offices for the School of Medicine and the Department of Surgery. The new 494,500 gross square feet, 1500-car parking garage, built on the northeast corner of Taylor and Clayton Avenues, is a reinforced seven-story structure that provides much needed additional campus parking.

Three buildings currently under construction are: 1) The combination new addition of 45,000 gross square feet and renovation of 22,000 gross square feet in the Mallinckrodt Institute of Radiology Imaging Research Facility, East Building, to provide space for the creation of an Imaging Center which will house four major MRI (Magnetic Resonance Imaging) units. The new Imaging Center will initially focus on neuroimaging, but will also provide resources for the scientific evaluation of imaging technology in future years. 2) The new 223,260 gross square feet 10-story CSRB North Tower Research Addition will consolidate all medical school specialized research into one structure. The top three floors of the addition will house wet lab research space. 3) The new 131,200 gross square feet seven-story East McDonnell Sciences Building will be a maximum barrier research facility to accommodate higher brain function research and transgenic studies.

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

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

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

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

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

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

The following facilities are owned or operated by Washington University:

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

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

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

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

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

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

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

Institute for Biomedical Computing

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

The Institute has its primary location on the campus of the School of Medicine, but it also occupies the Edward L. Bowles Laboratory on the Hilltop campus, where the School of Engineering is located. The Bowles Laboratory is adjacent to Computer Science, Electrical Engineering, and other departments of the School of Engineering. This provides an Engineering School location for research

and teaching activities. The Institute creates opportunities for collaborations between the two campuses and encourages involvement of students in activities spanning the medical and engineering sciences.

Library and Biomedical Communications Center

Founded in 1911, the Washington University School of Medicine Library and Biomedical Communications Center is one of the oldest and most comprehensive medical libraries in the United States. It 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.

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

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

The Medical School Computing Services provide 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 Medical School Network Coordinator's Office is a newly established position to ensure that present and future network based information resources available through the library are disseminated effectively to all Medical Center collaborators. It is responsive to a comprehensive set of networking needs from the School of Medicine and, in collaboration with other staff in the School of Medicine Library, participates in a wide range of instructional programs available through the Library's Instructional Media Center.

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

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

Current activities include the StudySpace Project – an effort to incorporate blackboard-sized, pen-based computing systems into educational and administrative environments. The combined resources of the Library and Biomedical Communications Center ensure that School of Medicine faculty and students have access to all state-of-the-art biomedical information technology and ensure that the School will retain its leadership position as information technology evolves over the coming decades.

For information on the Library's special services, the "Library Guide," "Library Newsletter," or Information Services Division telephone 362-7085. E-mail address: reference@medicine.wustl.edu) may be consulted.

Library hours are:

M-Th 8:00 a.m.- midnight
Fri 8:00 a.m. - 10:00 p.m.
Sat 8:30 a.m. - 6:00 p.m.
Sun 1:00 p.m. - 10:00 p.m.

Circulation	362-7080
Reference	362-7085
Interlibrary Loan	362-2780
Audiovisual Center	362-2793

The Medical Center

The School of Medicine is part of a medical center of 2,071 operating beds and over 16,000 employees. In 1993, the Medical Center treated 59,671 inpatients and 540,000 outpatients (including emergency room visits). Organized formally in 1962, the umbrella organization now known as Washington University Medical Center consists of a strong confederation of private institutions committed to the pursuit of excellence in health care, teaching, and research. Students receive clinical instruction and gain experience in all divisions of the Medical Center.

The 100-acre Washington University Medical Center, spread over portions of six city blocks, is located along the eastern edge of Forest Park in St. Louis. Along the western edge of the park is the 169-acre Hilltop Campus of the University. The Medical Center consists of the Washington University School of Medicine, Barnes Hospital, The Jewish Hospital of St. Louis, Barnes-Christian-Jewish Health Service, St. Louis Children's Hospital, Barnard Hospital, and the Central Institute for the Deaf. Integral units of the Medical Center include the Mallinckrodt Institute of Radiology and the Institute for Biomedical Computing. Over the years, with the growing confidence of working together, the Medical Center has undertaken increasingly complex projects. Evidence of this is the massive redevelopment project under way in the 38-block area surrounding the Medical Center. Working closely with the neighborhood, the Washington University Medical Center Redevelopment Corporation has, over a 17-year period, provided impetus for new office buildings, laboratories, apartment buildings, commercial areas, renovated single dwellings, and many public improvements. To date, more than $500 million worth of construction, renovation, and improvements have been completed or commissioned, with new construction by Medical Center institutions accounting for about 80 percent of this total.

Barnes Hospital, the largest hospital in the Medical Center, provides a major source of clinical experience for medical students. Barnes Hospital has consistently been recognized as one of the best hospitals in America, both in terms of medical research and patient care. The hospital consistently receives high marks in its patient satisfaction surveys. With a national reputation, Barnes is considered a major referral center, annually receiving more than 30,000 patient referrals from across the country. The hospital has been the site of several medical achievements, notably in lung, islet cell and nerve transplantation, macular degeneration, developments of innovative laparoscopic surgical techniques, and contributions toward the development of the Prostate Specific Antigen test for prostate cancer.

Barnes Hospital is licensed for 1,208 beds and includes teaching facilities for all clinical departments except Pediatrics. All activities of the School of Medicine and Barnes Hospital are closely integrated, and the hospital medical staff is composed exclusively of members of the School of Medicine. The 18-story Queeny Tower has seven nursing floors and five floors of doctors' offices. It also has three floors of ambulatory care rooms. The East Pavilion and a companion structure, the 18-story West Pavilion, house over 750 patient care beds, over 50 operating rooms, a chronic renal dialysis unit, a 110-seat amphitheatre, doctors' offices, and additional facilities for the Mallinckrodt Institute of Radiology. The East-West Pavilion is one of the largest, most sophisticated tertiary medical facilities in the world.

Barnard Free Skin and Cancer Hospital houses the Washington University General Clinic Research Center (GCRC). Through effective collaboration of Barnard and Barnes hospitals and Washington University, medically indigent patients with diseases of the skin or with cancer receive free care from Barnes/Washington University physicians and GCRC nurses. A 15-bed patient care area and research testing area comprise the fourth and fifth floors of Barnard Hospital. Other floors of the hospital are devoted to radiology, laboratory and research support.

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

Its main 235-bed facility includes pediatric and neonatal ICUs, research and clinical labs, a heliport, Emergency Unit with Level 1 trauma capability, 10 operating rooms plus a same-day surgery suite. A renovated building on the campus houses support and administrative staff in a modern office complex.

Through affiliate relationships with a number of local hospitals, including Barnes and Jewish hospitals in the Washington University Medical Center, St. Louis Children's provides tertiary care for pediatric patients from community hospitals in the region.

A poll of the nation's pediatric department heads placed St. Louis Children's Department of Pediatrics among the top three pediatric departments in the United States. Children's has more than 600 staff physicians with faculty appointments at the School of Medicine.

Among Children's specialized care programs are those for cancer and leukemia, organ transplantation, speech and hearing disorders, cleft palate and craniofacial deformities, hereditary disorders, heart defects, seizures and neurological disorders and cystic fibrosis, asthma and other chronic breathing disorders. Children's established the first designated pediatric lung transplant program in the nation.

The Jewish Hospital of St. Louis is a 628-bed, acute care teaching hospital, dedicated since 1902 to outstanding patient care and advance medical research. The more than 900-member medical staff includes full-time academic faculty, private physicians and dentists. Supporting the medical staff is a house staff of more than 160 fellows, residents and interns; and a dedicated complement of nurses, technicians,

service and support personnel. As a full-service healthcare facility, the hospital specializes in age-related illnesses, bone health, cancer, heart disease, Ob/Gyn, psychiatric disorders, radiation oncology, rehabilitation medicine, and colorectal and orthopedic surgery. As a research facility, the hospital ranks as a national leader for funding of independent hospital-based research by the National Institutes of Health. Some examples of Jewish Hospital's leadership in patient care include establishing Missouri's first successful *in vitro* fertilization program and providing the world's first successful use of a defibrillator to restore normal heart rhythm via a phone line. The hospital offers one of only a few bone health/osteoporosis programs in the country. It serves as a worldwide center for the study of psychiatric genetics and has the area's first hospital-based home care and rehabilitation-medicine programs.

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

In addition to the above facilities which make up the Washington University Medical Center, the following are affiliated with the School of Medicine, and various members of the staffs hold University appointments.

St. Louis Regional Medical Center—St. Louis City and St. Louis County, with 304 beds.

Malcolm Bliss Mental Health Center, with 114 beds.

Ellis Fischel Cancer Center, Columbia, Missouri, with 60 beds.

Department of Veterans Affairs, VA Medical Center, St. Louis, with 540 authorized beds.

Shriners Hospitals for Crippled Children, St. Louis, with 80 beds.

CURRICULUM

The curriculum is the product of prolonged and continuing study, by both faculty and students, of the present and probable future course of medical science and medical practice, and of the ways in which medical education can be kept abreast of this course. It is planned to provide students who enter medical school with diverse backgrounds and interests and who will undertake a wide variety of careers, with the basic knowledge and skills essential for their further professional development. Modern medical education can no longer hope to be comprehensive; it must be selective. Yet students must develop facility in the understanding and use of several related technical languages: those of anatomy, chemistry, physiology, and clinical medicine. They must share responsibility for the care of the patient. They must also learn how these areas of endeavor are interrelated, how the organization and needs of society influence the methods of providing medical care, and how new knowledge is acquired and old knowledge re-evaluated.

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

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

Table of Credit Hours 1994-95

As reported to the Liaison Committee on Medical Education, representing the Council on Medical Education of the American Medical Association and the Executive Council of the Association of American Medical Colleges, credit hours for courses are expressed in terms of clock hours—the hours per year of contact between faculty and students. These clock hours are not to be interpreted as semester or quarter hours.

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

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

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

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

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

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

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

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

Elective (Fourth) Year is a 48-week academic year. To qualify for the Doctor of Medicine degree at Washington University School of Medicine, fourth-year students are required to participate in a minimum of 36 weeks of electives (full-time clinical or research courses). Two-thirds of the minimum required time for the Elective Year must be taken exclusively in residence in the Washington University School of Medicine elective course program. A complete listing of fourth-year elective offerings at Washington University School of Medicine is available through the Office of the Associate Dean for Curriculum. Students may participate in clinical electives of four and six weeks duration. If a student takes a research elective, that elective must be of at least 12 weeks duration.

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

Credit may be given for elective work done at any point in the standard four-year Doctor of Medicine degree program so long as participation conforms to current elective guidelines and (a) the student is a duly registered, full-time student for a minimum of three years and nine months, including scheduled vacation time, and tuition is paid for four complete academic years; or (b) if transferring into the Second Year Class, the student is a duly registered, full-time student for a minimum of two years and nine months and tuition is paid for three complete academic years; or (c) if transferring into the Third Year Class, the student is a duly registered, full-time student for a minimum of 22 months and tuition is paid for two complete academic years.

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

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

Humanities Program in Medicine

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

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

The current curriculum includes:

Physicians and Patients (Fall semester, First Year)

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

Topics in Medicine (Spring semester, First Year)

This interdepartmental course is highly coordinated with "Medical Humanities." Students select topics of interest for in-depth study initiated by discussions in a small group seminar format. Development of topics includes input from a broad range of disciplines,

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

Clinical Ethics (Third Year)

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

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

Course Evaluations

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

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

Adviser System

A formal academic advising program is currently under development, and it is anticipated that it will be in place by August 1994. Current student advising occurs within two broad programs:

1. Clinical Advisers: The first year students are assigned in small groups to a "clinical adviser" who meets with the students once or twice a month, 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 clinical advisers serve as a faculty contact but do not have any formal academic advisory role.

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

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

All first year students shall receive a letter from the Administrator of the Academic Society Program during the orientation week inviting them to join. 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.

Course Masters, 1994-95

First Year

Gross Anatomy	
Glenn Conroy, Ph.D.	*362-3397*
Biochemistry	
David Silbert, M.D.	*362-3336*
Biostatistics	
Bradley Evanoff, M.D.	*362-4355*
Jay Piccirillo, M.D.	*362-7350*
Molecular Genetics	
Jeffrey Gordon, M.D.	*362-7243*
Ted Hansen, Ph.D.	*362-2716*
Cell Biology	
Robert P. Mecham, Ph.D.	*362-2211*
Physicians & Patients	
Stephen Lefrak, M.D.	*454-7116*
Clinical Medicine-I	
Elliot Abbey, M.D.	*362-2724*
Electives	
Carl Rovainen, Ph.D.	*362-2299*

Histology
David Menton, Ph.D. 362-3593

Immunology
Emil Unanue, M.D. 362-7440

Medical Microbiology
Julian Fleischman, Ph.D. 362-2528

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

Physiology
Robert Wilkinson, Ph.D. 362-2300

Topics in Medicine
Stephen Lefrak, M.D. 454-7116

Second Year

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

Ophthalmology
Morton Smith, M.D. 362-5722

ENT
Joel Goebel, M.D. 362-7532

Pediatrics
Bruce Dowton, M.D. 362-7800

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

Pharmacology
Douglas Covey, Ph.D. 362-1726

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

Pathophysiology
Bruce Dowton, M.D. 362-7800

Infectious Diseases
Gerald Medoff, M.D. 362-1334
Lawrence Gelb, M.D. 362-7481

Cardiology
Julio Perez, M.D. 362-5363

Pulmonary
Michael Lippmann, M.D. 289-6306

Renal
Keith Hruska, M.D. 454-7774

Metabolism-Endocrinology
William Clutter, M.D. 362-8065

Gastroenterology
William Stenson, M.D. 362-8940

Nutrition
William Stenson, M.D. 362-8940

Hematology
Scot Hickman, M.D. 289-6536

Oncology
Mary Graham, M.D. 362-8566

Neurology
Alan Pearlman, M.D. 362-6947

Developmental Medicine
Andrea Stephens, M.D. 879-6390

Rheumatology
Leslie Kahl, M.D. 362-7481

Third Year

Medicine Clerkship
Alison Whelan, M.D. 362-8628

Surgery Clerkship
Dorothy Andriole, M.D. 362-7400

Obstetrics and Gynecology
Diane Merritt, M.D. 362-3143

Pediatrics Clerkship
J. Neal Middelkamp, M.D. 454-6015

Psychiatry Clerkship
Wayne Drevets, M.D. 362-2459

Neurology
Alan Pearlman, M.D. 362-3296

Otolaryngology Clerkship
Joel Goebel, M.D. 362-7552

Ophthalmology Clerkship
Morton Smith, M.D. 362-5722

Pathology and Laboratory Medicine Clerkship
Jeffrey E. Saffitz, Ph.D. 362-7728

DEGREE PROGRAMS

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

Doctor of Medicine

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

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

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

Five-Year Program

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

Master of Arts and Doctor of Medicine

Medical students who are interested in an intensive research experience may apply for admission to the M.A. and M.D. degrees program after the first, second or third year of medical school. Students spend one year (12 months) working in the laboratory of the faculty member whom they have selected. Application to the program consists primarily of a student-prepared proposal for a significant and feasible project defined with the advice of the faculty mentor. The program requires submission 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 during the research year. Additional information can be obtained from the Office of the Medical Scientist Training Program.

Four Schools Program

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

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

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

Announcements concerning the availability of the Four Schools Program will be made to medical students at each of the four participating schools early in the course of their third year of medical school. Those interested will apply to their school coordinator as candidates for entrance into this Program. Two students will be selected from each of the four participating schools. The local coordinator (Dr. James B. Lefkowith, 362-8621) will help the scholar in choosing an appropriate, established investigator for the scholarly year and will serve as preceptor for the scholars. Timetable for selection and assignment of students: Application deadline - end of January; selection of students - mid-February; students travel to other institutions to select research site - latter part of March; starting date - July 1.

Doctor of Medicine and Doctor of Philosophy

Washington University offers a combined M.D. and Ph.D. degrees program that utilizes the resources of the Division of Biology and Biomedical Sciences and the School of Medicine. This program, the Medical Scientist Training Program (MSTP), is designed for students interested in careers in academic medicine. Its purpose is to provide the basic research training needed for careers at major medical schools and research institutions. The Program was started in

1969, is one of the oldest and largest in the country, and is currently authorized to accept 22 students per year. The Program, which is usually completed in six years, has been highly successful; more than 90 percent of those who have completed their residencies are actively involved in research programs at leading institutions.

All students in the Program receive financial support in the form of stipends (currently $14,000 per year) 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 is also recommended. For those students whose major interests are in the more biological aspects of medical science, the requirements for chemistry are less rigorous, but a strong background in mathematics and physics is important. Although most individuals enter the Program as first-year students, applications will be accepted from students in their first or second year at this medical school.

The Program consists of three parts: (1) Two years of the usual medical curriculum; (2) At least three years of original research toward a thesis to satisfy the requirements for the Ph.D. degree; (3) A final year which is the usual clinical year of the medical curriculum and is adjusted to each student's career goals. Since the fourth year at Washington University School of Medicine is entirely elective, the medical scientist will have taken the equivalent of that year during the graduate portion of the Medical Scientist Training Program. Students normally take the first two years of the usual medical curriculum before entering the graduate portion of the Program, but it is possible to begin research following completion of the first year of the regular medical curriculum. Either sequence will satisfy requirements for both the M.D. and Ph.D. degrees. Degrees are awarded upon completion of the entire program.

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

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

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

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

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

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

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

The Ph.D. degree may be obtained in any of the programs of the Division of Biology and Biomedical Sciences that includes the Departments of Anatomy and Neurobiology, Biochemistry and Molecular Biophysics, Biology, Cell Biology and Physiology, Genetics, Molecular Microbiology, Pathology, and Molecular Biology and Pharmacology. These departments jointly provide training in the following interdisciplinary programs:

Biochemistry
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.

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

Application Procedure

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

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

Doctor of Philosophy

The Division of Biology and Biomedical Sciences offers predoctoral programs in Biochemistry, 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 the seven preclinical departments of the School of Medicine, as well as the Department of Biology in the School of Arts and Sciences. All degrees are awarded through the Washington University Graduate School of Arts and Sciences. Additional information about the Divisional programs may be obtained by writing to:

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

APPLYING FOR ADMISSION

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

Preparation for the Study of Medicine

Entrance requirements to the School of Medicine are:
1. Evidence of superior intellectual ability and scholastic achievement;
2. Completion of at least 90 semester hours of college courses in an approved college or university;
3. Completion of the Medical College Admission Test of the Association of American Medical Colleges;
4. Evidence of character, a caring and compassionate attitude, scientific and humanitarian interests, and motivation suitable for a career in medicine.

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

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

Application Procedure

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

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

Applicants to the 1995 First Year Class must submit their AMCAS application so that it is postmarked no later than November 15, 1994. On receipt of the application from AMCAS, the Office of Admissions promptly forwards to applicants the additional materials that must be submitted to complete the application process. At this stage, a nonrefundable Application Service Fee of $50 is charged by the University. Once complete, the applicant's admission credentials are reviewed and independently evaluated by members of the Committee on Admissions. The Committee would like to interview every applicant, however, since this would involve several thousand applicants, it is physically impossible to accomplish. Therefore, selected applicants are invited for a personal interview, as well as a tour of the School of Medicine and the Washington University Medical Center. This visit provides an opportunity for the applicant to meet and talk with students and faculty members.

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

Admission decisions are made by the Committee on Admissions. Washington University School of Medicine operates on a rolling admissions schedule beginning October 15, and applicants are notified as soon as a final admission decision has been made on their application. By April 13, 1995, every applicant should have a final decision: accepted, waiting list, or not accepted.

Upon notification of acceptance for admission to the School, the applicant is required to file a Statement of Intent. Three options are presented: 1) accept the offer of admission and submit the $100 acceptance deposit; 2) accept the offer of admission, submit the $100 deposit, and request financial aid materials; and 3) decline the offer of admission. The $100 acceptance deposit reserves a place in the class and is applied to the tuition charge at the time of matriculation. If an accepted applicant withdraws from the class with written notification to the Admissions Office prior to May 14, 1995, 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 16 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 1994, selected applicants for admission to the School's 1995 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 1995-96 scholarship recipients will be made on May 1, 1995.

Distinguished Alumni Scholarships

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

The 1994-95 Distinguished Alumni Scholarships honor Nicholas T. Kouchoukos, M.D.; Ira J. Kodner, M.D.; Gerald Medoff, M.D.; and Penelope G. Shackelford, M.D.

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

To assist matriculating WUSM students who enter with Ph.D. science degrees, the School established in 1973 a three-year program. Once admitted to the regular, four-year program, these students may apply to the Medical Science Training Placement Curriculum Committee (MSTPCC) for approval to complete medical school in three years by receiving credit for their Ph.D. work in lieu of the elective fourth year of the standard M.D. program. Additional information about the MSTPCC Program may be obtained by writing to: Mabel L. Purkerson, M.D., MSTPCC Campus Box 8077, Washington University School of Medicine, 660 S. Euclid Ave. St. Louis, MO 63110, or by calling (314) 362-6838.

Third Year Class Transfer Program

Each year the Washington University School of Medicine accepts up to 12 transfer students into its Third Year Class. This class enlargement is permitted because of the abundant clinical training facilities available in the Medical Center. Transfer applications are accepted from well-qualified students who are enrolled in good standing and eligible to continue in their U.S. medical schools, who have a cogent reason for requesting transfer, and who have the full approval of the dean of their current school.

Transfer application forms for our 1995 Third Year Class are available on August 1, 1994. Application deadline is March 22, 1995. Those applicants selected for interview will be invited to visit the Medical Center. All applicants will be notified of the decision of the Committee on Admissions by April 13, 1995.

Inquiries should be directed to:

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

FINANCIAL INFORMATION

Cost of Education

For the First-Year Class matriculant, tuition and housing rates for the 1994-95 academic year are listed below. Students who enter in 1994 will benefit from a tuition stabilization plan, which provides that their annual tuition of $23,525 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 $31,534. Allowances for entertainment, travel, clothing and other miscellaneous items must be added to this estimate.

Tuition (includes Student Health Service and Microscope Lending Plan)	$23,525
Books, supplies, and instruments	1,416
Housing (single room, Olin Residence Hall)	2,910
Board (Medical Center cafeterias)	3,683

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.

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.

At the time accepted students indicate they will matriculate in the School of Medicine, they may request an application for financial aid. The Financial Aid Form and other financial aid materials, information, and instructions will be sent to the students by return mail. The Financial Aid Form solicits 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). In addition, it requests information about the income, expenses, education, and employment history of the student's spouse (or spouse-to-be). The School asks that the forms be completed promptly, within two weeks from date of receipt.

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 award decisions are made by the five-member Committee on Student Financial Aid, and applicants are notified of the award decision within two weeks of the date the processed Graduate Financial Aid Form (GradFAF) is received.

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 Stafford Loan program. All loans awarded by the Committee are free of interest while a student is enrolled in the School. Financial aid awards are made for a given academic year. Students may reapply for financial assistance in succeeding years if they remain in good academic and personal standing, and if there is continued financial need. Awards made to a student may vary from year to year, depending upon the student's needs and upon the availability of funds to the Committee. Students are responsible for filing applications for renewal of awards in the spring of each year.

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

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

Policy For International Students

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

Standards for Satisfactory Academic Progress for Financial Aid Eligibility

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

Academic requirements for the M.D. degree include the satisfactory completion of the curriculum designated by the faculty. The progress of each

student working toward an M.D. degree is monitored carefully by the Committee on Academic Evaluation of Students (CAES). Refer to the section, "Assessing Academic Achievement."

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

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

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

Scholarship Funds

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

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

American Medical Association - Education and Research Foundation Medical Student Assistance Fund. Begun in 1983, donors' gifts supplement the Foundation's gift to support excellence and contribute to the Distinguished Student Scholarships and Distinguished Alumni Scholarships Program.

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

Joseph C. Bancroft Scholarship Fund. Established in 1993 by Mr. Joseph C. Bancroft for merit based scholarships for medical students.

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

Dr. William 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.

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

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Anne L. 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 1991-92 academic year are: Jonathan Glickman; Theodore Ross; Sally York; and, John Zempel.

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

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

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

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

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

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

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

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

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

The Monsanto Scholars Program. Established in 1990 with generous support from the Monsanto Fund, The Monsanto-Washington University Minority Medical Scientist Scholarship Program provides a monthly stipend and full tuition support for outstanding minority students who are committed to becoming academic physicians. Participants pursue both the M.D. and Ph.D. degrees in the six-year Medical Scientist Training Program (M.S.T.P.).

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

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

Dr. Helen E. Nash Scholarship for African-American Medical Students. $5,000 awarded for the first year of medical studies to an individual of demonstrated academic excellence, personal

achievement and commitment to serve the African-American community. The scholarship honors Dr. Helen E. Nash, a Clinical Professor of Pediatrics, and a distinguished citizen of St. Louis.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Loan Funds

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

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

Jess K. Goldberg Memorial Loan Fund by Ophelia H. Kooden and Violet G. Sachs. Created in 1970 to provide loans for medical students in memory of the donors' brother who passed away while attending medical school.

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

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

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

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

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

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

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

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

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

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

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

Aline Rixman Loan Fund. Created in 1940 by William Rixman in memory of his wife, the fund is used to alleviate unexpected financial emergencies of medical students.

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

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

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

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

ASSESSING ACADEMIC ACHIEVEMENT

Committee on Academic Evaluation of Students

Responsibility of the Committee

Overall evaluation of academic performance by students at the Washington University School of Medicine will be made by the Committee on Academic Evaluation of Students (CAES). The deliberations of the CAES are generally positive in approach and are committed to the ultimate aim of

assisting students to successfully complete the courses of study required by the School. The principle that careful selection of students will minimize attrition from the School is strongly endorsed by the CAES. The CAES has several important roles, including:

1. approving promotion of students to a subsequent year of study;

2. recommending to the Executive Faculty those students who have successfully completed all the prescribed requirements of the School and are qualified to receive the Doctor of Medicine degree;

3. requiring entry of a student into an individualized program of study;

4. deciding upon matters of academic disciplinary action.

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

1. students who are engaged in the preclinical and clinical education requirements for the M.D. degree.

2. students in a five year M.A./M.D. degree program taking the pre-clinical or clinical portion of their M.D. education.

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

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

Membership of CAES

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

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

Chair of CAES

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

Meeting Frequency

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

Quorum for CAES Meetings

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

The Evaluation and Grading System

General

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

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

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

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

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

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

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

Grading System in the First Year

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

Grading System in the Second and Subsequent Years

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

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

Actions for Academic Review

General

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

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

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

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

1. No student may take more than three years to complete the course work required for the first two years. The end of such a "three year" period, is defined as 36 months from the date of matriculation to the School. Time periods included in a "Leave of Absence" are not counted in these 36 months.

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

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

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

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

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

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

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

First Year

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

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

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

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

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

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

Second Year

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

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

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

(B) Re-examinations in complete courses in Pathology, Pharmacology, Introduction to Psychiatry, or Clinical Medicine will generally be offered during the last week of the inter-academic year break, prior to entry into the Third year. Re-examinations for students who have failed one or two Pathophysiology sections will be generally offered on the following schedule:

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

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

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

1. two or more complete courses (Pathology, Pharmacology, Clinical Medicine, Introduction to Psychiatry) OR

2. three or more sections of Pathophysiology OR

3. one complete course and two sections of Pathophysiology.

4. a student for whom the Registrar has recorded a Fail/Incomplete grade in any re-examination.

(D) At review by CAES for students referred to above Secion C, the Committee may decide to permit the student to take re- examinations, if a re-examination has not already been taken, in the courses for which Failed/Incomplete grades have been recorded. Such re-examinations will generally occur during the last week of the interacademic year break. The CAES may allow the student to defer beginning the clinical rotations so that re-examinations may be taken up to 12 weeks after the beginning of the usual cycle of clinical clerkships. Such extra time, used for study and preparation, will ordinarily mean that the student

will not have the usual 'unscheduled time' in the elective year. In the event that a Fail/Incomplete grade is recorded at a re-examination, CAES may require that a student enter an Individualized Study Program or that enrollment in the School of Medicine be terminated. In the event that CAES decides not simply to permit re- examination, the CAES may require that the student enter an Individualized Study Program as detailed below, or that enrollment in the School be terminated.

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

Third and Subsequent Years

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

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

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

Individual Study Program

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

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

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

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

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

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

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

Tutorial Assistance Program

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

Leave of Absence

A student may request a leave of absence for academic or personal reasons by submitting a statement in writing to the Office of Student Affairs. Such a statement should include indication of the beginning and anticipated ending dates and a brief statement of the reason (academic or personal). Requests for leave of absence must be approved by the Associate Dean for Student Affairs.

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

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

Policy on Student Status and Benefits During Research Years or LOA

M.D./Ph.D.

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

M.D./M.A

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

Five Year M.D. Program

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

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

Leave of Absence

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

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

Liability Insurance

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

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

Defense/indemnification will not be provided for any criminal act or any act committed while in violation of any law or ordinance or University program guideline, or where the injury or damage resulted from intentional wrongdoing, gross negligence or recklessness, or in the event that the action or proceeding is brought by or on behalf of Washington University. This indemnification does not

cover any liability which is insured elsewhere, but it may be in excess of any amount payable under any other such insurance.

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

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

Procedures Concerning Breaches of Professional Integrity

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

In such matters, the following rules apply:

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

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

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

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

(E) Appointment to a Disciplinary Committee will be made by the Dean and will include four faculty members and one academic representative from the Office of Student Affairs. Appointees will decline if assurances of their impartiality in the matter are not evident. Members of the Committee will elect a chairperson who will be responsible for applying correct procedure to the hearing. The Registrar will attend the meeting to record the minutes. A simple majority will prevail (three out of five votes), except when the motion is for dismissal from enrollment in the school, where four out of five votes will be required.

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

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

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

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

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

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

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

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

Appeals Process

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

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

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

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

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

United States Medical Licensing Exam (USMLE)

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

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

The Committee on Medical Education recently approved a proposal to require students to take and pass Steps 1 and 2 of the USMLE prior to graduation from the School of Medicine. Details for implementation of this requirement are in process.

ST. LOUIS

It comes as no surprise to residents—natives and newcomers alike—that St. Louis is considered to be among the 10 most livable areas in the United States. In health care, education, and transportation, St. Louis ranks among the top 20. For recreation, the lively arts, and great everyday living, St. Louis is a city of opportunity and variety.

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

Ambitious renovation and architectural experimentation characterize busy downtown St. Louis. The Old Post Office and the massive Romanesque Union Station have been revitalized. Union Station now houses a hotel and expansive shopping mall, inviting convention visitors and tourists to explore commerce St. Louis-style. New corporate headquarters buildings downtown display the variety of modern architecture evident in major metropolitan centers around the nation. Members of the Washington University School of Architecture consult with local firms in the creation of new structures and the refurbishing of the old. A new housing area in the fashionable Central West End, home to the Washington University Medical Center, is the design of a School of Architecture professor.

Though the St. Louis area has nearly 2.5 million residents, living here is simple and affordable. You are never farther than a 20-minute drive from any place you want to go in the metropolitan area, especially from Washington University's central location in suburban St. Louis. A convenient, modern highway system, a new light rail system, and a simple city plan allow easy access to all parts of the city and its many activities.

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

Cultural Opportunities

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

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

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

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

Recreation

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

Nineteen years old in 1994, the Opera Theatre of St. Louis has been enormously successful, nationally and internationally, bringing English-language versions of the classics and presentation of contemporary operas to the stage. The Repertory Theatre of St. Louis has an extensive annual season, which includes experimental works and traditional dramas.

The Theatre Project Company, City Players of St. Louis, and the Black Repertory Theatre enrich the dramatic offerings available in the immediate area. Right on campus, Edison Theatre offers the very highest quality in national and international programs in theater, dance, and music each season.

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

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

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

The ice hockey book in St. Louis began when the Blues moved here in 1967. They have a winning history and play 40 games per year in the Arena.

Employment

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

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

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

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

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

The George Warren Brown School of Social Work is also linked in many ways to the St. Louis social work community. Students find practicum assignments throughout the area and faculty both 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 short, Washington University, though a national research university, enjoys a special relationship with St. Louis.

STUDENT LIFE

Fourth Year Class Officers

President
Abdolreza Raissi

CME Representative
Kenneth Hirsch

Social Chairmen
Ann Starr
Kenneth Shindler

Third Year Class Officers

President
Scott Gilbert

CME Representative
Tim Trask

Social Chairman
Andrea Blum

Second Year Class Officers

President
Todd Vedder

CME Representative
Anjala Vaishampayan

Social Chairmen
Christine Ferrone
Clint Merrick
Lisa Oldham

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

Article I:

Name, Purpose, and Membership

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

Article II:

Class Officers

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

a. First Year: Elections shall be held within two weeks after the completion of the sixth week of first semester classes. Each position carries a term of one academic year.
b. Second Year: Elections shall be held within eight weeks prior to the completion of the first academic year. Each position carries a term of one academic year.
c. Third and Fourth Year: Elections shall be held within eight weeks prior to the completion of the second academic year. Each position carries a term of two academic years.

3. Balloting: To be elected a candidate must receive a simple majority of a quorum of one-half of the class members. Write-in candidates shall be allowed on all ballots. Proxy ballots shall be allowed only if they are given in writing to the Election Official. Ballot counting shall be the responsibility of the Election Official with a witness agreeable to all candidates.
4. Runoff Procedures: If no candidate receives a simple majority for a particular position, a runoff between the top two candidates shall be held within three days of the initial election.
5. Vacant Offices: If any office is vacated before its set term, an election for that office shall be held within three weeks of the vacancy. All students of a given group shall be eligible to run for the vacated office. If a current class officer runs for the vacated post, that officer must vacate the post he/she occupies.

D. M.D./Ph.D. Research Students: There shall be a Representative of the M.D./Ph.D. Students who are outside the core medical curriculum. This Representative shall have the same duties and responsibilities as a Class President and CME Rep and shall be elected by the M.D./Ph.D. Students who are in the Ph.D. phase of their training. The election shall be held within eight weeks of the finish of the University's academic calendar under the conditions of Article II, Section C. The term shall be one year.

Article III:

The Medical Student Government

A. Membership: The Student Government shall consist of the President and the Representative to the Committee on Medical Education from each of the four classes, the Representative of M.D./Ph.D. Students, and the University's Official Representative to the Organization of Student Representatives of the Association of American Medical Colleges. In addition, the Student Government may offer a non-voting position to a duly elected representative of any student group which is recognized nationally, regionally, or within the Medical School so long as such a group is open to all medical students without discrimination and that such a group is not in conflict with the goals of the Student Government.

B. Purpose and Responsibilities: The Student Government shall carry out the business of the Student Government pursuant to the goals stated in Article I. The purpose of the Student government shall be to represent and promote the interests and concerns of the medical student body through activities including but not limited to:

1. Forming and representing official student body opinions for interaction with the University, its Administration, and other groups associated with medical education.
2. Serving as a forum for interaction between student groups.
3. Serving as a forum for student-initiated curricular review and reform in the pursuit of academic excellence.
4. Promoting interaction among the Medical School students, faculty and administration, and with the wider University community.
5. Establishing a funding mechanism and budget with the associated collection and disbursements of funds for activities pursuant to goals stated in Article I.
6. Organizing elections for class officers and any other official representative of the student body at large.
7. Exercising any such additional authority as may be granted to it by the Medical School or by other organizations, so long as such authority is consistent with the purposes stated in Article I.
8. Posting minutes of all meetings for public reference. Minutes shall be approved by a simple majority within one week of a given meeting.
9. Formulating all rules and bylaws necessary for the Student Government to carry out the responsibilities and powers granted through this constitution. Such rules and bylaws shall require a simple majority of a quorum of two-thirds of the voting Student Government members.
10. Each member of the Student Government shall take on a Student Government approved project or program which conforms to the completed during the term of his/her office.
11. Upon completion of the academic year, each member of the Student Government shall prepare a typed summary brief of the activities undertaken during their term. The brief shall include detailed descriptions of all activities for permanent record. Descriptions shall be as specific as possible and include names, dates, prices, telephone numbers, and other pertinent information as appropriate.
12. The Student Government shall meet regularly and at intervals of no more than six weeks.
13. The CME Reps shall keep the Student Government informed of all activities associated with their posts in the form of a written brief to be presented at the Student Government meeting

immediately following a given meeting of the CME. The responsibility for the brief can be distributed among the CME Reps at their discretion.

14. Representatives from the various student groups sitting on the Student Government shall keep the Student Government informed of all activities associated with their posts in the form of a written brief to be presented at the Student government meeting as appropriate for their group's activities.

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

1. Student Government Chair: The Student Government Chair shall reside at all meetings of the Student Government and have specific responsibilities:
   a. The Chair shall serve as official representative and spokesperson for the Student Government to the University, its Administration, and to other groups associated with medical education.
   b. The Chair shall be responsible to ensure the duties of the Student Government are carried out efficiently and in a timely manner.
   c. The Chair shall report the names of the Class Officers to the Dean, and post such a list for public reference.
   d. The Chair shall be responsible for overseeing and maintaining records and to set the agenda for such meetings in written form for distribution to Student Government members prior to each meeting.
   e. The Chair shall be responsible for overseeing and maintaining records of all financial transactions of the Student Government. The Chair shall regularly update the Student Government on its financial standing, and must make all financial records available to any medical student, member of the Administration, or to any official of the University. All transactions shall require the signatures of the Chair and the Vice-Chair.
   f. The Chair shall be empowered to call for and appoint standing and ad-hoc committees to evaluate and make recommendations about specific areas of concern to the Student Government, the Medical School and its students.
   g. The Chair shall be empowered to designate another Student Government member to take on one or more of his/her duties.

Article VII:

Ratification

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

William A. Peck, M.D.
Executive Vice Chancellor and Dean

Darrell Kotton
President, Class of 1994

Abdolreza Raissi
President, Class of 1995

Scott Gilbert
President, Class of 1996

Katherine A. Lee
Representative of the M.D./Ph.D. Research Students

Housing

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

The Spencer T. Olin Residence Hall (Telephone: (314) 362-3230), located at 4550 Scott Avenue in the Medical Center, has accommodations for approximately 200 single men and women. Shared cooking facilities are available. The building was made possible by generous gifts from Spencer T. Olin, alumni and friends of the School of Medicine. Olin Hall is planned for the convenience of students in the medical or paramedical sciences. Every effort is

made to provide an atmosphere that not only aids them in meeting their study obligations, but also recognizes their privileges as graduate students.

The rates for rooms during 1994-95 are:

School Year: Late August-May (Nine Months)	
Two-room suite	$3,180
Single room	$2,395
Double room	$1,615
Large single	$2,870

Summer 1994: for Three Months	
Two-room suite	$950
Single room	$695
Double room	$475
Large single	$855

Summer 1994: Weekly Rates for Student Visitor	
Two-room suite	$89
Single room	$80
Double room	$71

Daily Rates for Visitors	
Two-room suite (furnished)	$39
Single room	$30
Single room (prospective student)	$27

Parking

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

Check Cashing

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

Bulletin Boards

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

Lockers

Student lockers with combination padlocks are located on the second floor, McDonnell Sciences Building. Locker assignments are made by the Registrar's Office. A $5.00 fee is charged which is refundable at the end of the academic year when the lockers are vacated and the padlock is returned.

Mail

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

Jane Doe Medical Student
Washington University School of Medicine
660 S. Euclid Ave. St. Louis, MO 63110

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

Student Health Service

The Student Health Service is located on the third floor of the Old Children's Hospital Annex, rooom 390. Office hours are 8:00 a.m. to 4:00 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 Barnes Hospital Emergency Room.

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

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

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

Counseling Services

Students within the medical center may have concerns over poor concentration, ineffective study habits, anxiety over their performance, low self-esteem, getting along with others, grief or depression.The psychiatry and clinical psychology staff members are available to help students cope with these concerns. Initial evaluations are made at the Medical Campus Health Service. Subsequent care

may be at the medical campus, a designated physician's office, or at the Hilltop Health Service in Umrath Hall on the Main Campus. Call 362-2346 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 $10,000 life insurance benefit. Call 362-2346 for more information.

Washington University Medical Campus Policy on HIV and HBV Infection

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

Medical School Jazz Ensemble

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

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

Organized Medicine

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

AMSA

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

the American Heart Association. Other community service based 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 is a program in which trained medical students 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.

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

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

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

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

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

Washington University Medical Center Housestaff Auxiliary (WUMCHA)
WUMCHA is an organization comprised of female residents and female spouses of those affiliated with Washington University Medical Center, including Jewish, Children's and Barnes hospitals, the Medical School and Mallinckrodt Institute of Radiology. The purpose of the organization is to provide friendship and social support among the members. In addition to sponsoring numerous recreational and educational activities, WUMCHA publishes a "Guide to St. Louis" as well as a directory of members. Annual dues are $15.00 and information about membership and applications can be obtained by writing to WUMCHA, c/o Yvonne Howerton, Treasurer, 4303 A Laclede Avenue, St. Louis, MO 63108.

Students are also actively involved in the Public Health Care Project, providing health care to the indigent in local clinics; and the Hunger Project, which collects food for the homeless.

Intramural Program

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

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

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

Transcript Service

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

Student Research Fellowships

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

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

Alpha Omega Alpha (AOA)

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

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

Awards and Prizes

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

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

Morris Alex, M.D. Prize. Awarded each year to that medical student who is outstanding among his or her peers in the second-year course, Introduction to Clinical Medicine. The 1994 recipient: David A. Rudnick.

Alpha Omega Alpha Book Prize. Awarded at the end of the fourth year to a member of the graduating class who has performed outstandingly for the entire medical course. The 1994 recipient: D. Gregory Farwell.

The American College of Physicians Megan E. Wren Book Award. Presented annually to a member of the graduating class committed to a career in internal medicine in recognition of highest achievement in the field of internal medicine. The 1994 recipient: Dana Ashley Hill.

American College of Physicians Clerkships 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 1994 recipient: D. Gregory Farwell.

American Heart Association Research Fellowship Award. Given for outstanding performance in the American Heart Association Medical Student Research Fellowship Program. The 1994 recipient: F. Nicholas Franano.

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 1994 recipients: Catherine Sands Bradley, Marianne Ingels, Maria Chiara Mariencheck, Jennifer Lynn Paterson.

American Medical Women's Association Janet M. Glasgow Memorial Award. Presented to a woman who graduates first in her class. The 1994 recipient: Corina Jo Norrbom.

Alexander Berg Prize. Awarded to the student presenting the best results in research in molecular microbiology. The 1994 recipient: Thomas M. J. Niederman.

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 1994 recipients: Tricia V. Pavlopoulos and Brian S. Waggoner.

Dr. Richard Brookings and Robert Carter Medical School Prizes. Provided for medical students through a bequest of Robert S. Brookings. The 1994 recipients: Stephanie B. Cox, D. Gregory Farwell, Gregory D. Foltz, William I. Mariencheck, Jr., Corina Jo Norrbom, Christopher M. Palmer, Timothy M. Trask, and Wen-Hung Wang.

Dr. Harvey Butcher Prize in General Surgery. Awarded annually, in memory of Dr. Harvey Butcher, to the member of the graduating class who, in the opinion of the Department of Surgery, shows the greatest promise for general surgery. The 1994 recipient: Elizabeth A. Miller.

Kehar S. Chouke Prize. Awarded at the end of the first year to a medical student who has demonstrated superior scholarship in anatomy. The 1994 recipient: David M. Montani.

Ciba-Geigy Award for Outstanding Community Service. Recognizes a second year student who has performed laudable extracurricular activity within the community. The 1994 recipient: Damla Karsan.

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 1994 recipient: Robert A. Bane.

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 1994 recipient: Robert A. Bane.

Antoinette Frances Dames Prize in Cell Biology and Physiology. Awarded annually to a member of the First Year Class who has demonstrated superior scholarship in these fields. The 1994 recipients: Rosalia C. Fonseca, Vikas V. Patel, and Scott E. Shannon.

Elisabeth L. Demonchaux Prize in Pediatrics. Established in 1985, the prize is awarded annually to a graduating student who has done outstanding work in pediatrics. The 1994 recipient: Andrea E. Bonny.

William Ellis Prize. Established in 1990 by Dr. Ellis and awarded to a senior student in recognition of meritorious research in ophthalmology. The 1993 recipient: David D. Kim

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. A plaque and check are awarded to the top graduating medical student entering the specialty of Family Practice. The 1994 recipient: Jennifer Lynn Paterson.

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 1994 recipients: Julie A. Miller and David A. Rudnick.

Alfred Goldman Book Prize. Created in 1972 as an annual award to be given to a student in the School of Medicine who, in the opinion of the faculty, has done outstanding clinical work or research in diseases of the chest or pulmonary physiology. The 1994 recipient: William I. Mariencheck, Jr.

Max and Evelyn Grand Prize. Established in 1985 by Dr. M. Gilbert Grand, the prize is awarded annually to a medical student in the Fourth Year Class for excellence in ophthalmic research or clinical ophthalmology. The 1994 recipient: Katherine A. Lee.

R. R. Hannas Award for Exceptional Performance in Emergency Medicine. Offered annually by the Missouri Chapter of the American College of Emergency Physicians. The 1994 recipient: Marianne Ingels.

Dr. J. E. Kirk Scholastic Award. Established in 1975 and awarded to a graduating student of high scholastic standing. The 1994 recipient: John M. Neil.

Louis and Dorothy Kovitz Senior Prize in Surgery. Senior award prize in surgery recognizing a member of the Fourth Year Class who has shown the most outstanding ability, zeal, and interest in surgical problems. The 1994 recipient: Ruth A. Choate.

Lange Medical Publications Student Awards. Given to one graduating senior and one undergraduate for high scholastic standing. The 1994 recipients: William L. Lyons and Mathias J. Kill.

I. Wallace Leibner, M.D. Award. Established in 1988 in memory of Dr. Leibner, the award is given to the member of the graduating class who has demonstrated outstanding ability in the clinical practice of medicine. The 1994 recipient: Dana Ashley Hill.

Irwin Levy Memorial Fund. Established in 1980 by friends of Dr. Levy as a tribute to his commitment to clinical teaching. Provides a prize for the student who presents the best performance in the neurology and neurological surgery clerkship. The 1994 recipient: Bradley L. Schlaggar.

Oliver H. Lowry Prize. Awarded to a second-year medical student for academic excellence in pharmacology. The 1994 recipient: Michael E. Ohl.

Howard A. McCordock Book Prize. Awarded at the end of the second year to a member of that class for general excellence in pathology. The 1994 recipient: Michael E. Ohl.

McGraw-Hill Book Prize. Awarded annually to a medical student for outstanding achievement in the first-year curriculum. The 1994 recipients: Robert A. Bane and Deborah S. Lindes.

Edward Massie Prize for Excellence in Cardiology. Awarded to the member of the graduating class who, in the judgment of the Director of the Division of Cardiovascular Disease of the Department of Medicine, has done the most outstanding clinical or basic research work in the field of cardiovascular disease. The 1994 recipient: Mark Allen Steiner.

Medical Center Alumni Scholarship Prize. Given annually to a student who has shown excellence in his or her work during the preceding year. The 1994 recipient: John M. Neil.

Medical Fund Society Prizes. One prize awarded annually to a student of the Fourth Year Class who has excelled in the study of internal medicine; one prize awarded annually to a student of the senior

class who has excelled in the study of surgery. No individual is eligible for both prizes. The 1994 recipients: Nicholas C. Hunt and John B. Carico.

Merck Manual Awards. Given annually to three graduating medical students for scholastic achievement in medical studies. The 1994 recipients: Robert P. Guillerman, Scott M. Pinterand, and Alexander C. Wiseman, Jr.

Minority Medical Students Scholarship Prize. Provided by black alumni and friends of Washington University School of Medicine, the prizes are awarded to Minority Scholarship recipients in recognition of their achievements in the first-year curriculum. The 1994 recipients: Elias Dagnew and Carla Huff.

Missouri State Medical Association Award. Presented annually to an honor graduate of the senior class. The 1994 recipients: Kimberly C. Allman, Stanley Thomas Carmichael, and Thomas E. Wilson.

The Needleman Award. Established by his family in 1989, in honor of Dr. Needleman, Chairman of the Department of Pharmacology, 1976-1989. This annual award is given to a member of the graduating class for outstanding research in pharmacology. The 1994 recipient: David A. Rudnick.

James L. O'Leary Neuroscience Prize. Awarded annually to students who demonstrate the best accomplishments in the neuroscience course. The 1994 recipients: Robert A. Bane.

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

Dr. Philip Rosenblatt Award. Given to a third year medical student for distinguished performance during an elective in pathology or laboratory medicine. The 1994 recipient: Dana Ashley Hill.

St. Louis Pediatric Society Senior Prize. Presented to the senior student showing the greatest promise in clinical pediatrics. The 1994 recipient: Luke A. Bruns.

Sandoz Award. Given annually to a graduating student who has made a meritorious contribution to psychiatric research. The 1994 recipient: Stephen J. Seiner.

John R. Smith Memorial Fund Prize. Created in 1982 to be awarded annually to a medical student who has done meritorious clinical and/or research work in the Division of Cardiovascular Disease of the Department of Medicine. The 1994 recipient: Ankit A. Shah.

Margaret G. Smith Award. Given to a woman medical student for outstanding achievement in the first two years of medical school. The 1994 recipient: Martha Sue Terry.

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 1994 recipient: Timothy C. Philpott.

Upjohn Achievement Award. Given to the fourth-year student who has done the most meritorious work during his or her medical school career in the field of metabolism. The 1994 recipient: Ray J. Lee.

Washington University School of Medicine Academic Achievement Award. Given annually to a student who has exhibited to an unusual degree the qualities of industry, perseverance, determination, and enthusiasm in the first-year academic program. The 1994 recipient: Terence S. Young.

Washington University Internal Medicine Club Book Prize. Awarded to the member of the graduating class who has done the most significant research in any area of internal medicine. The 1994 recipient: Thomas M. J. Niederman.

Samson F. Wennerman Prize. Donated by his wife, Zelda E. Wennerman, and awarded annually to that fourth-year student who has demonstrated promise in surgery. The 1994 recipient: Mathias J. Kill.

Park J. White Prize. Created in 1992 by the Program for the Humanities in Medicine to honor the centennial of Dr. White's birth. He was a distinguished pediatrician, social activist, and pioneer teacher of medical ethics who introduced the first course on this subject to medical students in 1927. The prize is awarded to a first year student for outstanding performance in the courses offered by the Program for the Humanities in Medicine. The 1994 recipient: Jeffrey D. Baxter.

Hugh M. Wilson Award for Meritorious Work in Radiology. Given annually to a graduating medical student in recognition of outstanding work in radiology-related subjects, either clinical or basic science. The 1994 recipients: F. Nicholas Franano and Paul Ho.

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 1994 recipient: Craig C. Miller.

Lectureships and Visiting Professorships

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

THE WASHINGTON UNIVERSITY GRADUATE

Residency Training

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

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

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

Results of these efforts have been gratifying. The PGY-1 residencies selected in the most recent residency matching (1994) are identified in the Register of Students beginning on page 173. 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 orthopedic surgery.

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

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

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

Continuing Medical Education

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

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

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

Washington University Medical Center Alumni Association

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

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

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

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

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

Reunions and Other Events: The Annual Reunion is held in May for classes who return at five-year intervals, beginning with the class observing its 10th year following graduation and continuing through the class celebrating its 60th reunion. The reunion schedule includes a scientific program, social events, tours of the Medical Center, and the presentation of Alumni/Faculty, Alumni Achievement, and Distinguished Service awards to alumni. Award recipients are chosen on the basis of personal accomplishment, professional achievement, and/or service to the School of Medicine. Members of the graduating class are special guests at the awards banquet and are officially welcomed into Association membership.

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

Alumni Support: Supporting their school generously is a tradition for a large percentage of alumni of the medical school and the allied health programs. Each year alumni and friends are solicited for gifts to the Annual Fund, which supports the School's 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. Five such chairs have been created thus far, one each in Pathology, Molecular Microbiology, Pediatrics, Molecular Biology and Pharmacology, and Biochemistry and Molecular Biophysics.

DEPARTMENT OF ANATOMY AND NEUROBIOLOGY

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

FIRST YEAR

Bio 501. Human Anatomy

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

Bio 506. Microscopic Anatomy

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

Bio 554. Neural Sciences

This course provides a broad introduction to modern neuroscience, including the structure, function and molecular biology of neurons, and a comprehensive overview of major systems in the central nervous system. Material is presented in lectures, small group conferences and laboratories. A wide range of electives (6-10 hours total) provides opportunities for in-depth study of particular areas (i.e., Learning and Plasticity in the Brain; Diseases of Ion Channels; Peptide Hormones in the Brain). Credit 5 units.

RESEARCH

Bio 590. Research Opportunities

These are offered in the following areas:

Modeling neurobiological systems. *Dr. Anderson*

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

Growth and differentiation of muscle. *Dr. Bischoff*

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

Development and adult structure of functional organization of intracortical circuits. *Dr. Burkhalter*

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

Evolutionary quantitative genetics and morphology. *Dr. Cheverud*

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

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

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

Development of synaptic connections. *Dr. Lichtman*

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

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

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

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

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

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

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

Molecular bases of synaptogenesis and virus-mediated gene transfer to neural cells. *Dr. Sanes*

Molecular and genetic studies of neuropeptide transmitters.
Dr. Taghert

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

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

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

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

ELECTIVES

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

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

Bio 5404. Molecular Neurobiology
Bio 5562. Neural Development
Bio 5571. Cellular Neurobiology
Bio 5651. Neural Systems
Bio 567. Advanced Tutorials in Neural Science

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

Faculty

Edison Professor of Neurobiology and Head of Department

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

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.)

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

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 Medical School, 1965; Ph.D., University of Tokyo, 1976. (See Department of Otolaryngology.)

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

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

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

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

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

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

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

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

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 Department of Neurology and Neurological Surgery and Department of Cell Biology and Physiology.)

Research Professor

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

Associate Professors

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

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

Andreas H. Burkhalter, Ph.D., Brain Research Institute, University of Zurich, 1977. (See Department of Neurology and Neurological Surgery.)

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

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

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

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

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

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

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

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

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

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

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

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

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

Research Associate Professor

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

Assistant Professors

Mark P. Goldberg, M.D., Columbia University College of Physicians and Surgeons, 1984. (See Department of Neurology and Neurological Surgery.)

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

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

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

Marc H. Schieber, M.D., Ph.D., Washington University, 1982. (See Department of Neurology and Neurological Surgery.)

Martin S. Silverman, Ph.D., University of California, San Francisco, 1984. (Also Faculty of Arts and Sciences)

Scott B. Steinman, O.D., Ph.D., State University of New York College of Optometry, 1981; University of Houston, 1989. (See Department of Ophthalmology and Visual Sciences.)

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

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

Instructor

Ernesto P. Molmenti, M.D., Boston University, 1989. (See Department of Surgery.)

DEPARTMENT OF ANESTHESIOLOGY

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

The Department of Anesthesiology presents the student with the opportunity to: (1) Acquire and apply pharmacologic knowledge related to anesthetic, narcotic, paralytic and sedative drugs and to drugs affecting the autonomic nervous system; (2) Understand and apply the basic principles of 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 principle of acute and chronic pain management and; (6) Learn and apply the basic principles of critical care medicine.

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

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

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

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

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

Faculty

Acting Head of Department

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

Professors Emeriti

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

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

Professors

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

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

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

Professor (Clinical)

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

Associate Professor Emeritus

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

Associate Professors

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

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

James J. Jenkins, M.D., University of North Carolina, 1970. (Jewish Hospital)

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

J. Julio Peréz-Fontán, M.D., Universidad de Santiago, 1977. (See Department of Pediatrics.)

Necita L. Roa, M.D., University of the Phillippines, 1969.

René Tempelhoff, M.D., University of Lyon, France, 1974. (See Department of Neurological Surgery.)

Carey Ira Weiss, M.D., University of Illinois, Chicago, 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. (Jewish Hospital)

Spomenko Bauer, M.D., University of Zagreb Faculty of Medicine, 1968. (Jewish Hospital)

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

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

Robert Feinstein, Ph.D., University of Michigan, 1968; M.D., Texas A & M University, 1982.

Walter H. Folger, D.D.S., University of Tennessee, 1970; M.D., 1984; Ph.D., University of Florida, 1991.

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

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

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

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

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

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

Mitchell R. Platin, M.D., Northwestern University, 1987. (Jewish Hospital)

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

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

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

Anastasios N. Triantafillou, M.D., University of Athens, Greece, 1970.

G. Ram Volotzky, M.D., Sackler School of Medicine, Tel Aviv (Israel), 1979. (Jewish Hospital)

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

Assistant Professors (Clinical)

Margaret M. Oakley, M.D., St. Louis University, 1959. (Shriner's Hospital)

Instructors

Hussein Y. Abukhudar, M.D., Faculty of Medicine, Jordan, 1980.

Ioana Apostolidou, M.D., University of Athens, 1986.

Brad Bernstein, M.D., St. Louis University, 1984.

Matthew S. Bodner, M.D., Washington University, 1980.

Gerold N. Borodach, M.D., Tufts University, 1959.

Laila M. Bottros, M.D., Ain Shams University, Cairo, Egypt, 1978.

Robert Cerza, M.D., Northwestern University, 1970.

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

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

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

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

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

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

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

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

Robert Forstot, M.D., Washington University, 1987.

Barry A. Graff, M.D., St. Louis University, 1976. (Jewish Hospital)

Frances M. Houghton, M.D., University of Nebraska, 1974.

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

Menelaos Karanikolas, M.D., Athens Univesity Medical School, 1988.

George Kirvassilis, M.D., Aristotle University School of Medicine, Thessaloniki, Greece, 1984.

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

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

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

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

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

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

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

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

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

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

Frank E. Robbins, M.D., Washington University, 1977. (Jewish Hospital)

Barbara M. Scavone, M.D., Washington University, 1987.

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

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

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

Silvestre A. Tomeldan, M.D., Far Eastern University, Manila, 1970. (Jewish Hospital)

Steven A. Turner, M.D., Ohio State University, 1984.

Lawrence S. Waldbaum, M.D., Washington University, 1973. (Jewish Hospital)

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

Instructor (Clinical)

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

Madhav Vinjamuri, M.B.B.S., Medical College of Gulbarga, India, 1971.

DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOPHYSICS

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

FIRST YEAR

Bio 531. Advanced Biochemistry

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

RESEARCH

Bio 590. Research Opportunities

These are offered in the following areas of biochemistry:

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

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

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

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

Theoretical, experimental and computational studies of molecular recognition. *Dr. Di Cera*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Computational studies of protein structure, dynamics and self-assembly. Modeling protein folding. *Dr. Rose*

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

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

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

ELECTIVES

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

Bio 5083. Principles of Protein Chemistry

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

Bio 5382. Membranes and Mediators

This course is an advanced analyses 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 protooncogens in cellular signaling processes. Prerequisites, Bio 548, Bio 5063 and Bio 5083. *Drs. Frazier, Rotwein*

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

Faculty

Wittcoff Professor and Head of Department

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

Professors Emeriti

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

David H. Brown, Ph.D., California Institute of Technology, 1948.

George R. Drysdale, Ph.D., University of Wisconsin, 1952.

Associate Professor Emeritus

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

Professors

Thomas F. Deuel, M.D., Columbia University, 1961. (See Department of Medicine.)

Sarah C. R. Elgin, Ph.D., California Institute of Technology, 1971. (Also Department of Biology)

Elliot L. Elson, Ph.D., Stanford University, 1966.

William A. Frazier III, Ph.D., Washington University, 1973. (See Department of Cell Biology and Physiology.)

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

Rosalind H. Kornfeld, Ph.D., Washington University, 1961. (See Department of Medicine.)

Stuart A. Kornfeld, M.D., Washington University, 1962. (See Department of Medicine.)

Timothy M. Lohman, Ph.D., University of Wisconsin, 1977.

Philip W. Majerus, M.D., Washington University, 1961. (See Department of Medicine.)

Garland R. Marshall, Ph.D., Rockefeller University, 1966. (See Department of Pharmacology and Institute for Biomedical Computing.)

F. Scott Mathews, Ph.D., University of Minnesota, 1959. (See Department of Cell Biology and Physiology.)

Alumni Professor of Biochemistry and Molecular Biophysics

George D. Rose, Ph.D., Oregon State University, 1976.

Joseph L. Roti Roti, Ph.D., University of Rochester, 1972. (See Department of Radiology and Department of Cell Biology and Physiology.)

Peter S. Rotwein, M.D., Albert Einstein College of Medicine, 1975.

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

David F. Silbert, M.D., Harvard University, 1962.

Robert E. Thach, Ph.D., Harvard University, 1964. (See Department of Cell Biology and Physiology.)

Associate Professors

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

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

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

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

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

P. Robert C. Harvey, M.D., University of Toronto, 1981; Ph.D., University of Western Ontario, 1977. (See Department of Surgery.)

Ellen Li, Ph.D., M.D., Washington University, 1980. (See Department of Medicine.)

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.

Peter S. Rotwein, M.D., Albert Einstein College of Medicine, 1975.

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

Mark B. Willard, Ph.D., University of Wisconsin, 1971. (See Department of Anatomy and Neurobiology.)

Assistant Professors

Usha P. Andley, Ph.D., Jawaharlal Nehru University, 1977. (See Department of Ophthalmology and Visual Sciences.)

David P. Cistola, Ph.D., M.D., Boston University School of Medicine, 1985.

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

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

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

Robert C. Landick, Ph.D., University of Michigan, 1983. (See Department of Biology.)

Angel Wai-mun Lee, M.D., Ph.D., Harvard University, 1984.

Jay W. Ponder, Ph.D., Harvard University, 1984.

Katherine Parker Ponder, M.D., Washington University, 1983.

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

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

Research Assistant Professors

Jo H. Hazzard, Ph.D., Colorado State University, 1982.

Linda C. Kurz, Ph.D., Washington University, 1973.

Nader Sheibani-Karkhaneh, Ph.D., University of Nebraska Medical Center, 1989.

Changguo Tang, Ph.D., Massachusetts Institute of Technology, 1990.

Research Instructors

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

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

Instructor

Walter L. Nulty, Jr., M.Sc., Southern Illinois University, 1957.

DEPARTMENT OF CELL BIOLOGY AND PHYSIOLOGY

The department offers instruction to medical and graduate students. A Cell Biology course in the first semester of the medical curriculum deals with introductory cell physiology, and cellular biophysics. This course is part of an integrated basic life sciences program offered in the first semester. A Physiology course in the second semester of the first year is designed to provide students with a foundation for their further study of clinical and applied physiology. In addition, advanced courses open to medical and graduate students provide for more detailed study of specific areas of cell biology, physiology, and cellular biophysics.

The following research interests are represented in the Department at the present time: the biology of extracellular-matrix and cell-matrix interactions, the mechanism of action of polypeptide hormones, transport across cell membranes, membrane channels and G proteins, molecular biology of epithelial transport, reconstitution of intracellular transport including secretion and endocytosis, yeast cell biology; the cytoskeleton and the mechanisms of signal transduction across biological membranes, renal physiology, neurophysiology, contractile activation of muscle, peripheral circulation, respiration, and the application of computer techniques to biological problems. Electron microscopy of nerve and muscle is used to relate structure and function in these tissues.

FIRST YEAR

Bio 502. Physiology

This course integrates and extends the basic principles of cell biology and physiology to the functions of the major organ systems of the body, i.e., muscle, cardiovascular, renal, respiratory, gastrointestinal and endocrine. Credit 6 units.

Bio 5061. Cell Biology

A course covering fundamental aspects of cell organization and physiology. The goal is to develop an understanding of fundamental cellular processes such as transport, secretion, motility, recognition, cell-matrix interaction, and to prepare students for the study of physiology. Credit 3 units.

RESEARCH

Bio 590. Research Opportunities

The department offers a variety of research opportunities, particularly in the following areas: macromolecular structure as studied by X-ray crystallography; synthesis and biological activities of polypeptides; reconstitution of membrane transport; lysosomes and intracellular transport; neurophysiology, including nerve membrane, muscle, synaptic transmission, sensory systems (especially auditory and visual), electron microscopy of neural tissues, and biochemical regulation in neurons; circulation; respiration; renal physiology; and the application of computer sciences to physiological problems.

Plasma markers of myocardial infarction and reperfusion; metabolism of creatine kinase isoenzymes; mechanisms of delayed thrombolysis and recurrent arterial thrombosis. *Dr. Dana Abendschein*

Control of cell-to-cell signaling and cellular proliferation by receptors, G proteins, and protein kinases; molecular genetics, physiology, and biochemistry are the primary techniques. *Dr. Kendall J. Blumer*

The regulation of receptor-mediated ingestion by professional phagocytes. The mechanisms of signal transduction via a class of molecules known as integrins which act as receptors for extracellular matrix and potentially as organizers of cytoskeletal-membrane interaction in these cells.
Dr. Eric J. Brown

Evaluation of the effect of new technology on infant mortality; public policy and biologic mechanisms related to surfactant replacement therapy.
Dr. F. Sessions Cole

The role of actin polymerization and actin-binding proteins in cell motility, using a variety of techniques in molecular and cell biology. *Dr. John A. Cooper*

Cell and molecular biology of the mammalian vacuolar proton pump. Expression of H^+ATPase in mammalian kidney development and during macrophage differentiation. *Dr. Stephen L. Gluck*

Cell Biology and biochemistry of prion proteins, which are involved in the pathogenesis of several unusual neurodegenerative diseases of humans (Creuzfeldt-Jakob disease, kuru) and animals (scrapie). Physiological functions of endogeous prion proteins. Endocytic targeting of glycolipid-anchored proteins. Cellular trafficking and posttranslational processing of mutuant prion proteins. *Dr. David Harris*

Development of new methods for visualizing cells and molecules in three dimensions by means of electron microscopy, and for capturing macromolecular mechanisms through rapid freezing techniques. *Dr. John E. Heuser*

Excitatory amino acid receptors and synaptic transmission in the central nervous system.
Dr. James Huettner

G protein-mediated signal transduction. Covalent lipid modifications of signaling proteins. Biology and enzymology of protein palmitoylation.
Dr. Maurine Linder

Studies of protein structure and function. Current research interest focuses on proteins involved in electron transfer interactions, and oxidation-reduction reactions. Methods employed include X-ray diffraction, molecular modeling and site-directed mutagenesis. *Dr. F. Scott Mathews*

Understanding the complex process of extracellular matrix assembly and organization, including studying the intracellular pathways used to transport matrix components to the cell surface and identifying helper or accessory proteins that facilitate trafficking and matrix assembly. Cell-matrix interactions in development and cellular mechanisms associated with connective tissue remodeling in vascular disease and heritable diseases of connective tissue.
Dr. Robert Mecham

Structure and function of cation transport proteins. Molecular biology of the Na,K-ATPase. Expression of Na,K-ATPase in insect cells using baculovirus. Characterization of the polarized sorting of plasma membrane proteins in epithelia. *Dr. Robert Mercer*

Patch clamp characterization of ion channels involved in stimulus secretion coupling in neurons and endocrine cells (e.g. ATP sensitive K^+ channels, voltage-sensitive Ca^{2+} channels, stretch activated cation channels). Fluorescence imaging of cytosolic Ca^{2+} in these cells. *Dr. Stanley Misler*

Molecular biology of the mammalian glucose transporter. Gene structure, biosynthesis and regulation. Expression of transfected cDNA in foreign cells. Mechanism of insertion of proteins into the rough endoplasmic reticulum membrane.
Dr. Mike Mueckler

Roles and regulation of ATP-sensitive K^+ and other ion channels particularly in the heart. Cloning and expression of ion channels in vertebrate and invertebrate systems. *Dr. Colin Nichols*

Cell-cell and cell-substrate interactions in the early development of mammalian cerebral cortex. Organotypic slice culture assays, light- and electron-microscopic immunohistochemistry, and time-lapse video recording are used to study the role of cell surface and extracellular matrix molecules in neuronal migration and axonal elongation.
Dr. Alan L. Pearlman

Cellular biochemistry of genetic α1-antitrypsin gene expression; characterization of a cell surface receptor for amyloid-ßpeptide and its role in Alzheimer's disease; regulation of gene expression during the host response to inflammation.
Dr. David H. Perlmutter

Models for brain angiogenesis and blood flow.
Dr. Carl M. Rovainen

Molecular mechanisms and regulation of acidification and ion transport by intracellular vesicles.
Dr. Paul Schlesinger

Study of the physiologic basis of human neutrophil function: the role of ion movements in the cellular responses to chemotactic factors and other stimuli.
Dr. Louis Simchowitz

Macrophage Cell Biology - Mechanism of receptor internalization and recycling. Physiologic role of receptors which recognize sugar residue on proteins and other cells. Receptor-mediated endocytosis and the reconstitution of vesicular transport in broken cell preparations. *Dr. Philip D. Stahl*

Computer-based acquisition and analysis of biologic signals via digital signal processing techniques for quantitative biomedical imaging.
Dr. Lewis J. Thomas, Jr.

Analysis of nuclear pore complex structure and function in nucleocytoplasmic communication, by molecular, genetic, cell biologic, and biochemical means. *Dr. Susan Wente*

Synaptic structure and function; regulation of synaptic strength at the neuromuscular junction and in organotypic brain slice cultures.
Dr. Robert S. Wilkinson

ELECTIVES

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

Bio 459. Vision

Bio 5062. Central Questions in Cell Biology

Bio 5063. Molecular Cell Biology

Bio 5111. Intracellular Transport of Macromolecules in Animal Cells

Bio 5132. Cell Motility and Cytoskeleton Journal Club

Bio 5134. Topics in Cell Motility and Cytoskeletal Function

Bio 559. Nerve, Muscle, and Synapse

Bio 567. Advanced Tutorials

Note—The number preceding the course title indicates that the course carries credit in the Graduate School of Arts and Sciences. See course descriptions in the Graduate Training section of this catalog.

Faculty

Edward Mallinckrodt, Jr. Professor and Head of Department

Philip D. Stahl, Ph.D., West Virginia University, 1967.

Professors Emeriti

Carlton C. Hunt, M.D., Cornell University, 1942. (See Department of Neurology and Neurological Surgery.)

Stanley Lang, Ph.D., The University of Chicago, 1953.

Lecturer

Albert Roos, M.D., University of Groningen, 1940. (See Department of Anesthesiology.)

Professors

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

Eric J. Brown, M.D., Harvard University, 1975. (See Department of Medicine.)

George J. Broze, Jr., M.D., University of Washington, 1972. (See Department of Medicine.)

Harold Burton, Ph.D., University of Wisconsin, 1968. (See Department of Anatomy and Neurobiology.)

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

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

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

John E. Heuser, M.D., Harvard University, 1969.

F. Scott Mathews, Ph.D., University of Minnesota, 1959. (See Department of Biochemistry and Molecular Biophysics.)

Robert P. Mecham, Ph.D., Boston University, 1976. (See Department of Medicine.)

Charles E. Molnar, Sc.D., Massachusetts Institute of Technology, 1966. (Also Computer Systems Laboratory.)

Alan L. Pearlman, M.D., Washington University, 1961. (See Department 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 Department of Neurology and Neurological Surgery.)

Research Professor

Una S. Ryan, Ph.D., Cambridge University, 1968. (See Departments of Medicine and Surgery.)

Associate Professors

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

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

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

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

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

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

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

Lewis J. Thomas, Jr., M.D., Washington University, 1957. (See Department of Anesthesiology and Biomedical Computer Laboratory.)

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

Research Associate Professor

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

Assistant Professors

Stuart R. Adler, M.D., Ph.D., Duke University, 1982. (See Department of Medicine.)

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.

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

Robert J. Fallon, M.D., Ph.D., Columbia University, N.Y., 1980. (See Department of Pediatrics.)

Jeffrey Gidday, Ph.D., University of Virginia, 1986. (See Department of Neurology and Neurological Surgery.)

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

James E. Huettner, Ph.D., Harvard University, 1987.

Maurine Linder, Ph.D., University of Texas, Dallas, 1987.

Gregory D. Longmore, M.D., McGill University, 1983.

James G. McNally, Ph.D., The University of Chicago, 1983. (See Institute for Biomedical Computing.)

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

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

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

Clay Semenkovich, M.D., Washington University, 1981. (See Department of Medicine.)

Thomas H. Steinberg, M.D., New York University, 1978. (See Department of Medicine.)

Susan R. Wente, Ph.D., University of California, Berkeley, 1988.

Research Assistant Professors

Michael Chua, Ph.D., Australian National University, 1986.

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

Elaine Davis, Ph.D., McGill University, 1992.

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

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

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 Medical School.

The Department of Genetics offers a broad range of training opportunities in virtually all major areas of modern genetics. Numbered among the faculty are world leaders in genetic mapping, new methods of DNA manipulation and cloning, developmental genetics, neurogenetics, immunogenetics, human genetics, and population and evolutionary genetics. In addition to opportunities in human genetics, research opportunities with experimental organisms include genetic studies with the mouse, fruit flies, nematodes, yeast and bacteria.

Many advanced courses and seminars are offered that focus on such subjects as the genetics of inherited disease, gene expression, genetic mapping, molecular genetics, developmental genetics, microbial genetics, immunogenetics, and population and evolutionary genetics. Extraordinary opportunities for research training and experience are available in all of these areas and at all levels. The programs are tailored to meet the needs of medical students, graduate students, and both M.D. and Ph.D. postdoctoral students pursuing advanced training in biomedical research.

FIRST YEAR

Molecular Genetics

The course is divided into halves. The first half focuses on the mechanisms of regulation of gene expression in eukaryotes. This includes discussions of the structure of DNA and its means of replication, the organization and packaging of eukaryotic genomes, chromatin structure and the nucleosome, the organization of polymerase II class genes, the processing of their primary transcripts, and the molecular basis for transcriptional and translational regulation including the use of transgenic mice to study cell-specific gene regulation. The second half focuses on how these concepts can be applied to an understanding of medical genetics. Topics covered include principles of Mendelian genetics, the molecular basis for various inborn errors of metabolism -- their diagnosis and prenatal screening, the genetics of cancer, and finally, current strategies for mapping and characterizing the human genome. *Drs. Hansen (Genetics), Gordon (Molecular Biology and Pharmacology), and Staff*

RESEARCH

Bio 590. Research Opportunities

Molecular genetics, gene cloning, genome mapping. *Dr. Robert Waterston* (Genetics), *Dr. Mark Johnston* (Genetics), *Dr. Richard Wilson* (Genetics), *Dr. Douglas Berg* (Molecular Microbiology), *Dr. Timothy Ley* (Surgery), *Dr. Peter Rotwein* (Medicine), *Dr. David Schlessinger* (Molecular Microbiology), *Dr. Richard Todd* (Psychiatry), *Dr. Pui Kwok* (Medicine), *Dr. Paul Goodfellow* (Surgery), *Dr. David States* (Institute for Biomedical Computing)

Human linkage studies. *Dr. Helen Donis-Keller* (Surgery), *Dr. Daniela Gerhard* (Genetics), *Dr. Paul Goodfellow* (Surgery)

Developmental genetics, neurogenetics. *Dr. Robert Waterston* (Genetics), *Dr. Clarissa Cheney* (Genetics), *Dr. Tim Schedl* (Genetics), *Dr. Ian Duncan* (Biology), *Dr. J. Mark Petrash* (Ophthalmology and Visual Sciences), *Dr. Steve Skolnick* (Ophthalmology and Visual Sciences), *Dr. Lawrence Salkoff* (Anatomy and Neurobiology)

Immunogenetics. *Dr. Ted Hansen* (Genetics), *Dr. Janet M. Connolly* (Genetics), *Dr. David Chaplin* (Medicine), *Dr. Dennis Loh* (Medicine)

Population and evolutionary genetics. *Dr. Stanley Sawyer* (Mathematics), *Dr. Barbara Schaal* (Biology), *Dr. Alan Templeton* (Biology)

Prenatal diagnosis, genetic counseling, cytogenetics. *Dr. S. Bruce Dowton* (Pediatrics), *Dr. James Crane* (Obstetrics and Gynecology), *Dr. Michael Watson* (Pediatrics)

Genetic epidemiology, psychiatric genetics, complex genetic disorders. *Dr. C. Robert Cloninger* (Psychiatry), *Dr. Daniela Gerhard* (Genetics), *Dr. Dabeeru C. Rao* (Biostatistics), *Dr. Theodore Reich* (Psychiatry), *Dr. Brian Suarez* (Psychiatry), *Dr. John Rice* (Psychiatry)

ELECTIVES

Bio 548. Nucleic Acids and Protein Biosynthesis

Fundamental aspects of the structure, biosynthesis, and function of nucleic acids and the biosynthesis of proteins. Emphasis on mechanisms involved in the biosynthetic processes and the regulation thereof. Prerequisites: Bio 337, 449 or equivalent or permission of the instructor. *Dr. Johnston*

Bio 5491. Advanced Genetics

Fundamental aspects of organismal genetics with emphasis on experimental studies that have contributed to the molecular analysis of complex biological problems. Examples drawn from bacteria, yeast, nematodes, fruit flies and mammalian systems. Prerequisite, graduate standing, or permission of instructor. *Drs. Schedl, Johnston and Staff*

Bio 5011. Ethics and Research Science

Exploration of ethical issues research scientists confront on a daily basis. Topics will include: ethics and the genome initiative, student-mentor relationships, collaborators' rights and responsibilities, social issues in science, scientists' role in society, social responsibility and knowledge of misconduct, conflict of interest and confidentiality, and oversight role of institutions. Case study and scenario presentations will provide focus for discussions. *Dr. Donis-Keller and Staff*

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

Faculty

James S. McDonnell Professor of Genetics and Head of Department

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

Professors

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

James M. Cheverud, Ph.D., University of Wisconsin, 1979. (See Department of Anatomy and Neurobiology.)

C. Robert Cloninger, M.D., Washington University, 1970; M.D. (hon.), Umea University Sweden, 1983. (See Department of Psychiatry.)

Susan E. Cullen, Ph.D., Albert Einstein College, 1971. (See Department of Molecular Microbiology.)

Helen Donis-Keller, Ph.D., Harvard University, 1979. (See Departments of Surgery and Psychiatry.)

Ted H. Hansen, Ph.D., University of Michigan, 1975.

George B. Johnson, Ph.D., Stanford University, 1972. (Also Faculty of Arts and Sciences)

Timothy J. Ley, M.D., Washington University, 1978. (See Department of Medicine.)

Theodore Reich, M.D., McGill University, 1963. (See Department of Psychiatry.)

Stanley Sawyer, Ph.D., California Institute of Technology, 1964. (See Division of Biostatistics.) (Also Faculty of Arts and Sciences)

David Schlessinger, Ph.D., Harvard University, 1961. (See Departments of Medicine and Molecular Microbiology.)

Alan R. Templeton, Ph.D., University of Michigan, 1972. (Also Faculty of Arts and Sciences)

Associate Professors

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

James P. Crane, M.D., Indiana University, 1970. (See Departments of Obstetrics and Gynecology and Radiology.)

Alison M. Goate, D. Phil., University of Oxford, 1983. (See Department of Psychiatry.)

Paul Goodfellow, Ph.D., Queens University, 1985. (See Department of Surgery.)

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

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

Dennis Y. Loh, M.D., Harvard University, 1977. (See Departments of Medicine and Molecular Microbiology.)

Barbara A. Schaal, Ph.D., Yale University, 1974. (Also Faculty of Arts and Sciences)

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.)

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

Assistant Professors

Clarissa M. Cheney, Ph.D., University of Pennsylvania, 1979.

Berengere M. de Martinville, M.D., Lyon Medical School, France, 1973. (See Department of Pediatrics.)

S. Bruce Dowton, M.D. (Syd.), University of Sydney, 1994. (See Department of Pediatrics.)

Ian W. Duncan, Ph.D., University of Washington, 1978. (Also Faculty of Arts and Sciences)

Timothy P. Fleming, Ph.D., University of Missouri, 1985. (See Department of Ophthalmology.)

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

Daniela S. Gerhard, Ph.D., Cornell University, 1982. (See Department of Psychiatry.)

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

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

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

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

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

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

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

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

Research Assistant Professors

Janet M. Connolly, Ph.D., George Washington University, 1979.

Terence Featherstone, Ph.D., University of Birmingham, England, 1980.

Richard K. Wilson, Ph.D., University of Oklahoma, Norman, 1986.

Instructor

Raymond D. Miller, Ph.D., University of California, 1977.

JOHN MILLIKEN DEPARTMENT OF MEDICINE

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

Barnes Hospital, *Dr. Atkinson*
House Staff Training Program, *Dr. Goodenberger*
Jewish Hospital, *Dr. Klahr*
House Staff Training Program, *Dr. Lefrak*
Veterans Affairs Medical Center, *Dr. Chase*

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

Bio-organic Chemistry and Molecular Pharmacology, *Dr. Gross*
Bone and Mineral Diseases, *Dr. Avioli*
Cardiovascular Diseases, *Drs. Cain, Wickline*
Dermatology, *Drs. Eisen, Welgus*
Endocrinology and Metabolism, *Drs. Cryer, Avioli*
Gastroenterology, *Drs. Alpers, Stenson*
Hematology, *Drs. Majerus, S. Kornfeld, Deuel*
Immunology and Allergy Diseases, *Dr. Chaplin* (Acting Chief)
Infectious Diseases, *Drs. Medoff, Brown, Little*
Laboratory Medicine, *Dr. Miletich*
Medical Informatics, *Dr. Kahn*
Molecular Oncology, *Dr. Korsmeyer*
Renal Diseases, *Drs. Hammerman, Hruska*
Division of Pulmonary and Critical Care Medicine, *Drs. Holtzman, Senior*
Rheumatology, *Dr. Simchowitz*

Instruction in Medicine is provided during all four years of the medical curriculum, beginning with human genetics and an introductory course in the first year. Teaching in the second year has two main objectives: the correlation of the basic sciences with clinical aspects of disease and training in the technical methods of physical examination and laboratory diagnosis. By the beginning of the third year, the student is ready for supervised clinical study of individual patients. A clinical clerkship of 12 weeks, divided into two six-week periods, is served by third-year students on the medical services of the department. In the final year, students may elect a subinternship in general medicine and of a series of elective courses in the medical specialties.

FIRST YEAR

Clinical Medicine I

This is a course in interviewing technique and medical history taking. The primary goal is acquisition of fundamental interpersonal and clinical data collecting/recording skills which the students will be called upon to adapt to diverse situations in their careers. Initially students observe their instructors with patients, then they go to the university affiliated hospitals on their own. Videotapes of student-patient interviews are critiqued extensively by instructors in the small group setting. Preparation for and attendance at clinicopathological conferences expands the clinical vocabulary and basic knowledge base.
Dr. Abbey and Staff

SECOND YEAR

Teaching by the Department of Medicine is designed to (1) prepare students for the transition from the preclinical sciences to the study of the sick patient at the bedside, (2) help them analyze the clinical manifestations of disease in terms of the responsible mechanisms, and (3) introduce them to the techniques of examination which are used regularly on all clinical services. This instruction is undertaken jointly with members of other clinical departments and is coordinated with subject matter presented by the Department of Pathology.

Pathophysiology

The major areas of clinical medicine are presented in detail to illustrate the application of biochemical, physiological, and anatomical information to the understanding of pathological states. Cardiovascular, renal, neurological, gastrointestinal, pulmonary, hematological, metabolic, nutritional, and developmental diseases are discussed. Emphasis is placed on the use of fundamental information in approaching clinical problems as a way of thinking that prepares the student for a lifetime of medicine, during which new information will constantly be acquired.
Department of Medicine Staff

Clinical Medicine II

This course continues the development of medical history taking skills in conjunction with techniques of the physical examination. Further emphasis will be placed on written 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. *Dr. Abbey and Staff*

THIRD YEAR

General Medicine

Supervised study of patients on the general medical teaching services of Barnes Hospital, Jewish Hospital, and St. Louis Veterans Hospital. Students are assigned as clinical clerks to the patients admitted to these services. Teaching is provided by the chief of service, attending physicians, house officers, consultants, chief residents, and at regularly scheduled conferences. Formal instruction is given in medical therapeutics and laboratory medicine during the clerkship. Students serve for six weeks each on two of the four services. *Drs. Atkinson, Chase, Klahr and Staff*

Clinical Pathological Conference

The clinical course, laboratory and radiologic studies, and pathological findings of a patient are discussed at a weekly conference by members of the Departments of Medicine, Pathology and Radiology. *Dr. Atkinson and Medical Staff, Dr. Dehner and Pathology Staff*

FOURTH YEAR ELECTIVES

Medical Subinternship

Medical subinternships, six weeks in length, are offered to a limited number of students on the following medical services: Barnes Hospital Blue and Red Services, Jewish Hospital and St. Louis Veterans Affairs Hospital. Duties and responsibilities, including nights on call, are those of an intern, with the proviso that requirements of Missouri state law must be met (e.g., orders must be countersigned by a licensed physician, etc.). The workload is lighter than that for interns to insure ample time for learning. Instruction and supervision will be provided by the appropriate chief of service, attending physicians, consultants, and house officers. Attendance at scheduled teaching conferences is required. The subinternship is especially valuable to students who plan to enter residencies in internal medicine, family medicine, or a preliminary internship before residency in another specialty. However, it offers valuable practical experience in preparation for any clinical residency. *Drs. Atkinson, Chase, Klahr and Staff*

Clinical Pathological Conference

Thursday, 12-1 p.m., September to June. *Dr. Atkinson and Medical Staff, Dr. Dehner and Pathology Staff*

Arthritic and Rheumatic Diseases

(A) Clinical Rheumatology. Barnes, Jewish, and VA, four weeks, all day. Students will participate in consultative service and clinic and inpatient practices. Laboratory experience also available. *Dr. Shuman and Staff*

(B) Research.

1. Analysis of intracellular signaling events involved with human B cell proliferation and subpopulation selection induced by different cytokines. *Dr. Ambrus*

2. Studies related to complement deficiency states and immunogenetics of complement proteins in humans and animals; biochemistry, and molecular biology of complement receptors and complement regulatory proteins. *Drs. Atkinson, Ogelsby*

3. Ongoing projects include analysis of the triggering mechanisms involved in lupus nephritis, investigations on the role of leukocytes in glomerular inflammation and dysfunction, and efforts to detail the role and regulation of arachidonate in macrophage function. *Dr. Lefkowith*

4. Opportunities exist for basic research aimed at understanding the physiology of human neutrophil function: specifically, the role of intracelluar pH, chloride channels, and other anion transport processes in the regulation of phagocytosis, chemotoxis, degranulation, an superoxide radical generation. *Dr. Simchowitz*

Bio-organic Chemistry and Molecular Pharmacology

Research Elective. Lipid mediators of signal transduction in the cardiovascular system. Characterization of regulatory mechanisms responsible for the liberation of lipid second messengers during cellular activation. *Dr. Gross*

Cardiovascular Disease

(A) Cardiology Consult Service - Jewish Hospital. Six weeks. Students will receive intensive training in clinical electrocardiology and a broad exposure to consultative cardiology. Emphasis will also be placed on non-invasive techniques for evaluating cardiac disease. *Drs. Wickline, Rich, Kleiger, Krone and Staff*

(B) Cardiac Catheterization and Hemodynamics. Highly specialized elective. Four weeks. Students will attend cardiac catheterization procedures and conferences; will perform complete "workups" of patients in preparation for catheterization, etc.; and will observe all hemodynamic and angiographic procedures. *Dr. Ludbrook and Staff*

(C) Cardiac Arrhythmias and Clinical Electrophysiology. Jewish Hospital. Provides the student with exposure and teaching in the diagnosis and treatment of complex rhythm disturbances. *Dr. Rottman*

(D) Cardiology/CCU. Jewish Hospital. Students will be introduced to cardiac graphics, electrocardiography, echocardiograms, and other non-invasive tests, then rotate through CCU as a subintern. Students are expected to perform initial evaluation and formulate management plan under resident's guidance, make brief oral presentations to CCU attendings. Night call every fourth night. *Dr. M. Rich*

(E) In-Patient Cardiology. Barnes Hospital. Students will participate as members of Barnes Cardiology, a comprehensive cardiology team who sees a large population of cardiac patients and follows them through all aspects of their in-hospital care. Emphasis placed on physical examination and the interpretation of modern cardiac diagnostic tests in clinical decision making. *Drs. Barzilai, Braverman, Reiss and Torres*

(F) Exercise Physiology. Barnes Hospital. Students will participate in the performance and interpretation of exercise testing, measurement of oxygen uptake and cardiac output, and management of patients undergoing exercise training. *Dr. Ehsani.*

(G) Clinical Electrophysiology and Pacing. Barnes Hospital. Students will have a broad exposure to the diagnosis and management of supraventricular and ventricular tachyarrhythmias and bradyarrhythmias. The diagnostic evaluation will include interpretation of the electrocardiogram, ambulatory ECG monitoring, tilt-table testing, signal-averaged electrocardiography, and invasive electrophysiologic testing. Treatment modalities include antiarrhythmic drugs, radiofrequency catheter ablation, implantable cardioverters and defibrillators, and sophisticated pacemakers. *Drs. Cain, Lindsay and Smith.*

(H) Cardiac Echocardiography. Barnes Hospital. Ultrasonic assessment of cardiac structure and function. Students will participate in the performance and interpretation of echocardiograms, including Doppler color flow imaging, stress echocardiography with dobutamine infusion for exercise, and transesophageal imaging modalities; 30-40 studies are performed daily; direct apprenticeship will be provided to learn about hemodynamics via noninvasive ultrasonic techniques. *Dr. Perez and Staff*

(I) Sub-internship in Cardiac Intensive Care Unit. Barnes Hospital. Selected highly motivated students may participate in a sub-internship in the Cardiac Intensive Care Unit. Students will function as interns supervised by second year medical residents and will be involved in the admission and management of patients with acute cardiac disease. Students will be expected to take call with a supervising resident every third night and admit at least one patient on each call day. Students will be responsible for the presentation of patients on attending rounds and the management of patients that are admitted. In addition, teaching in the CCU will include presentation of patients once a week to senior cardiology staff in a professor's rounds format. *Drs. Eisenberg and Winters*

(J) Research. Minimum of 12 weeks, all days.

1. Characterization of myocardial blood flow and metabolism during ischemia and reperfusion, development of strategies which enchance myocardial function by altering intermediary metabolism, and development of mathematical models and radiopharmaceuticals for use with positron emission tomography (PET). *Dr. Bergmann*

2. Research in area of gene regulation. Working with the M and B creatine kinase genes that are regulated during development of skeleton muscle and myocardium, currently elucidating the mechanisms by which the plasminogen activator inhibitor type-1 gene is regulated by specific growth factors. *Dr. Billadello*

3. Delineation of mechanisms responsible for clinical arrhythmias. Improved identification of patients at risk for developing sudden cardiac death. Evaluation of new antiarrhythmic agents and pacing devices. *Dr. Cain*

4. Determination of factors contributing to the development of atherosclerotic lesions including novel mechanisms of lipoprotein oxidation, the present and function of receptors for oxidized lipoproteins, and the role of the immune system as it pertains to oxidative processes and regulation of lipoprotein receptors. *Dr. Daugherty*

5. Physiology adaptations to exercise training in ischemic heart disease and effective exercise training on age-related deterioration in cardiovascular function. *Dr. Ehsani*

6. Characterization of the role of the coagulation and fibrinolytic system and complications of coronary and peripheral atherosclerotic vascular disease. The student will be exposed to techniques involved in study and coagulation of fibrinolytic proteins both in basic and clinical trials. Opportunities are available as well for involvement in ongoing clinical research involving measurement of coagulant and fibrinolytic markers in a wide variety of patients including those with coronary artery disease, coagulation abnormalities, and peripheral vascular disease. *Dr. Eisenberg.*

7. Delineation of the molecular genetic basis of inherited forms of cardiomyopathy and sudden death. Student will learn a variety of techniques used to detect mutations in genes that cause dilated and hypertrophic cardiomyopathy. Mutations will be correlated with the severity of the cardiomyopathy in a given individual as determined by clinical evaluation and several diagnostic modalities including echocardiography and cardiac positron emission tomography. *Dr. Kelly*

8. Hemodynamics, myocardial mechanics, and ventricular function (cardiac catheterization). *Dr. Ludbrook*

9. Ultrasonic assessment of cardiac structure and function including Doppler color flow imaging, and transesophageal imaging. *Dr. Perez*

Dermatology

(A) Clinical Clerkship. Students participate in outpatient care. Stress is placed on the dermatologic variations normally encountered, identification of common skin diseases, dermatologic clues to systemic disease, etc. Instruction is given in cutaneous histopathology and clinical mycology. *Dr. Eisen and Staff*

(B) Research. Minimum of 12 weeks, all day.

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

2. Role of secreted extracellular matrix metalloproteases in tissue remodeling. Structure and function of metalloproteases. *Dr. G. Goldberg*

3. Biochemical studies on the control of cellular differentiation of the medically important systemic mycotic agents in particular Histoplasma capsulatum. *Dr. Kobayashi*

4. Automated genetic mapping. Projects are directed toward automation in the many areas of molecular genetics. Specifically, we are developing ways to detect DNA sequence variations efficiently, generating genetic markers that can be typed rapidly, and studying large populations with these markers using automated methods. Opportunities to apply these methods to human diseases are available. *Dr. Kwok*

5. The mechanisms which cause metabolites of arachidonic acid to be produced after sunburn (ultraviolet injury) are being examined. The current emphasis is on the signal transduction pathway by which arachidonic acid release after ultraviolet light exposure occurs and the effect this process has on cell differentiation. *Dr. Pentland*

6. Enzymology and regulation of extracellular neutral proteases (matrix metalloproteinases). Enzymology includes cleavage site analysis, comparative kinetics, and development of inhibitors, as well as attempting crystallization. Regulation presently focuses on comparisons between different cellular environments, particularly emphasizing free-floating collagen matrices vs. cells cultured in monolayers. Investigating integrin-mediated regulation of matrix metalloproteinases in both normal and transformed cells. *Dr. Seltzer*

Emergency Medicine

Four weeks, Jewish Hospital. Senior student functions as member of E.D. staff, evaluating and treating patients in the E.D. Emphasis on Internal Medicine patients, minor Surgery, and Gynecology cases. *Dr. Zwemer*

Gastroenterology

(A) Clinical Gastroenterology. Four weeks, all day. Students participate in the study of patients with a spectrum of digestive diseases, have responsibility for patients on whom consultations have been requested, observe biopsy, endoscopic and intubation techniques, and participate in the conferences and clinics run by the Division. *Drs. Clouse and Zuckerman*

(B) Research. Minimum of 12 weeks, all day.

1. Cell biology of polarized small intestinal epithelium; synthesis and secretion of intestinal proteins; regulation by dietary and hormonal factors in vivo and in cultured intestinal cells. Emphasis will be on unique secretory and transcellular pathways of alkaline phosphatase and cobalamin binding proteins. *Dr. Alpers*

2. Clinical applied research on viral hepatitis. Emphasis is placed on applying current immunological methodology to clinical and investigative studies of important and yet unanswered problems in the field of hepatitis, both acute and chronic. *Dr. Lissoos* (Acting)

3. Human cellular immunology; effect of cytokines and peptides on normal human peripheral blood, tonsillar and splenic B cells; immunoregulation of intestinal B and T lymphocytes; transgenic mouse studies targeting cytokines to the intestine and liver; immune development in the intestine. *Dr. Peters*

General Internal Medicine

(A) Clerkship in Primary Care in General Internal Medicine is designed to provide the student with firsthand experience in general internal medicine practice in a model ambulatory care setting, the Health Key Medical Group of St. Louis. The major component of the clerkship is direct patient care under the supervision of senior internists who are members of the group. *Dr. Scott Anderson and Staff*

(B) Clerkship in General Internal Medicine in a small community without medical subspecialists (Keokuk, IA). Emphasis during preceptorship will be on ambulatory care. Students will work with three internists. Exposure will include consultations from general surgeons and family practitioners and other responsibilities of the general internal medicine group including treadmill exercise testing, echocardiograms, Holter Monitor analysis and interpretation, etc. Students will also have direct inpatient care responsibility including evaluation and treatment of admissions to the CCU. *Drs. Austin, Davis and Hakes*

(C) Medicine Clinic Outpatient Experience. Four half-day sessions in General Internal Medicine and two half-day sessions in a Medicine Specialty. A new

clinic patient will be assigned to each student for workup, followed by presentation to the Attending Physician and Medical Resident/Fellow who will follow the patient after the student has finished the rotation. Discussion of each case will include diagnosis, further workup, therapy and follow-up care. *Dr. Levitt*

(D) Primary Care Medicine. Students will gain confidence in the ability to deliver first-contact as well as ongoing care to ambulatory adult patients of all ages. Students will work with a more diverse range of patients than those encountered in most in-hospital rotations, thus providing a solid foundation for residency and future practice. Experiences will include office gynecology, rheumatology, geriatrics, patient education, the walk-in clinic, and other areas of interest to the student. No night or weekend duty. *Dr. Wren*

Clinical Geriatrics

Six weeks or four weeks, all day. Students will receive instruction in the principles and practice of geriatric medicine. Students will participate in the care of nursing home patients, the inpatient consultation service, and outpatient assessment clinic. Didactic lectures and clinical conferences will provide exposure to a wide variety of clinical and research topics. *Drs. Binder, Birge and Carr*

Hematology and Oncology

(A) Clinical Hematology. Six weeks, all day. Students receive intensive instruction in morphology, specialized diagnostic techniques, and management of patients with hematologic and coagulation disorders. Two separate clerkships are offered. *Drs. S. Kornfeld, Majerus*

(B) Clinical Oncology. Cochran VA Hospital. Four weeks, all day. Students receive major exposure to management of non-small cell and small cell lung cancer and of carcinoma of the colon, prostate, head, and neck. General oncological topics such as pain management, hypercalcemia of malignancy, malignant effusions, and neurooncology will be treated. A wide variety of hematological disorders will also be encountered. *Drs. Abbey, Hickman*

(C) Clinical Medical Oncology Consultation Service. Barnes and Jewish Hospital. Six weeks, all day. Students will participate on the inpatient consultation service. Emphasis will be given to the work-up and initial management of patients with newly diagnosed cancers. *Dr. Mortimer*

(D) Clinical Medical Oncology Outpatient Service. Barnard Cancer Center. Six weeks, all day. Students will evaluate new patients and participate in the follow-up care of patients actively being treated for cancer. Schedules site-specific interdisciplinary conferences with surgery and radiation therapy for head and neck cancers, breast, thoracic, gastrointestinal and genitourinary cancers. *Dr. Mortimer*

(E) Research. Minimum of 12 weeks, all day.

1. Biochemistry, molecular biology of growth factors and their regulation, mechanisms of transformation and roles of growth and development. *Dr. T. Deuel*

2. Biochemistry of mammalian cell surfaces; synthesis, processing and sorting of glycoproteins, including lysosomal enzymes. *Drs. R. Kornfeld, S. Kornfeld*

3. Biochemistry of platelets, regulation of lipid metabolism in tissue culture; mechanism of platelet thrombus formation. *Dr. Majerus*

4. Biochemical studies of interactions of plasma protease inhibitors with coagulation proteases. *Dr. Tollefsen*

Hypertension

(A) Clinical: VA Medical Center. The student(s) will have an opportunity to develop familiarity with the clinical indications, utilization, dosing strategy, and contraindications with regard to the currently available antihypertensive medications while acquiring hands-on skill in the management of hypertension and its complications. *Dr. Dagogo-Jack*

(B) Research: Individualized research projects, participation in community hypertension programs, and collaborative research involving hemodynamic autoregulation, new drug evaluation in double-blind protocols and basic research in molecular genetics and vascular biology. *Drs. Dagago-Jack, Perry*

Immunology

(A) Allergy and Clinical Immunology. Students will participate in the allergy consult service at Barnes and Jewish Hospitals. They will be primary consult on a team and present patients to allergy fellows on call and the Attending Physician. In addition, they will participate in other ongoing teaching activities in the division. *Dr. H. J. Wedner and Staff*

(B) Research. Minimum of 12 weeks, full-time.

1. Molecular and cellular biology of IL-1, and structure and function of the HLA complex. *Dr. D. Chaplin*

2. Molecular biology of antigen specific T-cell receptor. *Dr. Loh*

3. Biochemistry and molecular biology of molecules important in immediate hypersensitivity. *Dr. C. Parker*

4. Biology of Pollen of Fungal Allergies. Studies designed to characterize allergens from oak pollen and the spores of Epicoccum Nigrum, a common allergenic mold. *Dr. Wedner*

5. Psychosocial aspects of asthma. *Dr. Wedner*

Infectious Disease

(A) Clinical Infectious Diseases. Fundamentals of evaluating clinical problems in infection and formulating plans for workup and therapy. Students see consultations in infectious diseases in every part of Barnes and Jewish hospitals under supervision of faculty member. They work closely with medical residents and infectious disease fellows, follow own patients and play an important role in their management. *Dr. Medoff*

(B) Clinical AIDS. Study of treatment of HIV infection and associated opportunistic infections at Washington University AIDS Clinical Trial Unit. *Dr. Powderly*

(C) Research.

1. Investigations into the molecular mechanism for regulation of the function of phagocytic cells. *Dr. Eric Brown*

2. The molecular biology of varicella-zoster virus. Varicella-zoster virus infection, latency, and oncogenicity. *Dr. Gelb*

3. Research focuses on the biochemistry of parasitic diseases. The organisms being studied include a protozoan which causes malaria, Plasmodium falciparum, and a helminth which causes ascariasis, Ascaris suum. *Dr. Goldberg*

4. Study of DNA replication in Herpes viruses, particularly Herpes simplex virus (HSV), overexpressed essential HSV replication gene in variety of heterologous systems and study of the role of the products of these genes in replication process by using genetic and biochemical methodologies. *Dr. Paul Olivo*

5. Intercellular communication in macrophages, membrane transporters of macrophages, purinergic receptors and the role of extracellular nucleotides in macrophage function. *Dr. Steinberg*

6. Research 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 both mucosal immunity to the dsRNA non-enveloped reoviruses and pathogenesis and latency of the much more complex dsDNA enveloped murine cytomegalovirus. *Dr. Virgin*

7. Disease mechanisms and recombinant vaccine development in the protozoan parasite *Entamoeba histolytica*. *Dr. Stanley, Jr.*

8. Research on parasitic disease (filariasis and river blindness) emphasizes development of improved diagnostic methods and studies of protective immunity. *Dr. Weil*

Laboratory Medicine

(A) Clinical Laboratory Medicine. Elective is designed to teach the student how the vast array of clinical assays are used in the diagnosis of disease and how the tests are actually performed in the clinical laboratory. *Dr. Miletich*

(B) Research.

1. Studies on the control of cellular differentiation of the medically important systemic mycotic agents in particular Histoplasma capsulatum. *Dr. Kobayashi*

2. Development and use of monoclonal antibodies to cardiac proteins for improved diagnosis of myocardial infarction. *Dr. Ladenson*

3. Investigation of a group of membrane proteins that utilize phosphatidylinositol as their mode of membrane anchoring. Research projects utilize cellular and molecular biological approaches to study the structure and function of this class of membrane proteins with emphasis on their role in cell activation. *Dr. Lublin*

4. Laboratory interested in changes in the pattern of gene expression which occur during development of mammalian nervous system. Attention focused on trophic hormone, nerve growth factor (NGF), an agent which is critical for the survival and differentiation of sympathetic neurons. *Dr. Milbrandt*

5. Systematic study of the regions of the factor X molecule that mediate cellular and molecular interactions using a variety of traditional and novel cellular and molecular biological approaches, with particular emphasis on expression of recombinant proteins. *Dr. Miletich*

6. Study of antigen-driven B cell development by characterizing antibody response to H. influenza type b and by investigating B cell maturation, nature of T and B cell interaction, and cytokines operative in germinal centers of lymph nodes. *Dr. Nahm*

7. Analytical techniques and theoretical concepts underlying the field of medical decision analysis are investigated. *Dr. Parvin*

8. Research is aimed at defining the molecular mechanisms of cell-cell and cell-substrate adhesion. Investigations are centered on structure and function, and regulation of adhesion receptor molecules in platelet function, development and malignancy. *Dr. Santoro*

9. Phospholipid-derived mediators and insulin secretion. The study of the process of glucose-induced insulin secretion by isolated pancreatic islets from rat and man. Focus on involvement of phospholipid-derived mediators in this signal transduction process. Involves gas chromatography-mass spectrometry. *Dr. Turk*

10. Alternatives to blood: blood conservation and transfusion practice. Pharmacologic interventions, interventional hematology: photopheresis, peripheral stem cell pheresis. *Dr. Goodnough*

11. Physical mapping of human chromosomes, identification of genes involved in human disease, large-scale sequencing of human DNA, and development of technologies and approaches for genome analysis. *Dr. Green*

12. Development and evaluation of diagnostic microbiology tests, particularly in the areas of septicemia and antimicrobial resistance. *Dr. Murray*

Medical Informatics

Research seminar series concerning literature surveys and medical informatics research conducted by the Division of Medical Informatics. *Dr. Frisse and Staff*

Endocrinology, Diabetes and Metabolism

(A) Clinical Clerkship. Students see inpatients and outpatients with endocrine and metabolic disease and participate in the rounds and conferences of the Division. *Dr. Cryer and Staff*

(B) Research.

1. Studies of the physiology and pathophysiology of metabolic regulation in normal humans and patients with diabetes mellitus. *Dr. Cryer*

2. Major focus on understanding disorders of human growth with studies of growth hormone, the serum GH binding protein, the GH receptor, the insulin-like growth factors (IGFs), IGF binding protein, IGF action on fibroblasts. *Dr. Daughaday*

3. Regulation of plasma and body cholesterol levels studied in patients with atherosclerosis and hyperlipidemia. Whole body cholesterol metabolism and lipoprotein receptor structure, function and modification is investigated. *Dr. Ostlund*

4. Studies of genetic susceptibility to diabetes in man and experimental animal models through recombinant DNA techniques. *Dr. Permutt*

5. Molecular biology of growth hormone action; regulation of gene expression of members of the insulin-like growth factor family of peptides; growth factor action during cellular differentiation and development. *Dr. Rotwein*

Bone and Mineral Metabolism

(A) Jewish Hospital, Barnes Hospital, St. Louis Children's Hospital, the Veterans Affairs Medical Center and the Shriner's Hospital for Crippled Children. Designed to acquaint students with clinical radiological and pathological manifestations of metabolic bone disease, disorders of calcitropic (parathyroid hormone, vitamin D, calcitonin) hormone metabolism and activity, and to the current therapeutic concepts in skeletal disorders. *Drs. Avioli, Civitelli, Diemer, Pacifici, Whyte*

(B) Research.

1. Studies on bone cell differentiation, growth and metabolism in human cell models. Oncogenes in osteoblast differentiation and function. Role of cell adhesion and extracellular matrix in bone cell physiology. *Drs. Avioli, Cheng, Rifas*

2. Studies combine clinical, biochemical, molecular, genetic, and cell biological approaches to investigating the pathophysiology of heritable disorders of bone metabolism. The role of alkaline phosphatase in normal and aberrant mineralization. *Drs. Fedde, Whyte*

3. Mechanism of action of estrogen in bone with emphasis on the effects of estrogen on the local production of cytokines. Integrin receptors-mediated interactions between bone matrix proteins and bone cells and their effects on the production of cytokines and cytokine antagonists. *Dr. Pacifici*

4. Cell-cell communication in bone cell physiology, with emphasis on the function and regulation of gap junctions, and the role of cell-cell adhesion molecules. Modulation of intercellular communication in bone by hormones, cytokines, and mechanical factors. Signal transduction of calciotropic hormones. *Dr. Civitelli*

Pharmacology/Medicine

Regulation at a transcriptional and translational level of the cyclo-oxygenase gene(s) by the lymphokines IL-1 and TNF. Isolation and functional organization of the bovine renal Na+/H+ exchanger(s). *Dr. Morrison*

Renal Disease

(A) Clinical Nephrology. Barnes Hospital. Students work with a Renal Fellow evaluating inpatients with acute and chronic renal failure, and electrolyte disorders. They participate in daily rounds with an attending physician, and attend weekly Renal Grand Rounds. *Dr. Hammerman and Staff*

(B) Clinical Nephrology. Jewish Hospital. Students will be provided opportunity to evaluate patients on the renal consultant service, participate in daily clinical nephrology rounds, and participate in combined rounds. *Dr. Hruska and Staff*

(C) Mixed Clinical and Research Electives.

1. Clinical and metabolic studies in patients with renal disease and patients undergoing dialysis treatment. *Dr. Delmez*

2. Opportunity for research in molecular approaches to cellular chloride channels and development of epithelial polarity. *Dr. Edwards*

3. Students will have opportunity to participate in basic research on molecular biology of proton pumps and proton transport by the kidney. *Dr. Gluck*

4. Role of atriopeptin (AP) in cardiovascular, fluid and electrolyte homeostasis. Students would become skilled in animal handling, cell culture, low and high pressure chromatography, immunoassays, RNA and DNA analysis hybridization and intimate knowledge of peptide biochemistry and renal physiology. *Dr. Greenwald*

5. Studies focusing on the role of the renal proximal tubule in vitro as an antigen presenting cell for CD4+T cells. *Dr. Hagerty*

6. Studies characterizing synthesis of polypeptide growth factors in renal tissue and the role(s) of polypeptide growth factors in renal development, growth and physiology. *Dr. Hammerman*

7. Matrix protein regulation of bone cell function. The nature of osteopontin/$a_v ß_3$ mediated signal generation through c-*src*, P13 kinase and PLC_{γ}. *Dr. Hruska*

8. Studies of the role of calcitropic hormones in vascular pathobiology. *Dr. Hruska*

9. Mechanisms involved in progression of renal disease. Methodology to assess renal function and prevent progression of renal disease in experimental animal models. *Dr. Klahr*

10. Hormonal modulation of renal metabolism and the pathophysiological consequences of urinary tract obstruction, including mechanisms of renal fibrosis and development of renal disease. *Dr. Klahr*

11. Role of ion channels in stimulus-secretion coupling in pancreatic islet ß-cells; role of ion channels in volume regulation by neurons and glial cells. *Dr. Misler*

12. Mechanisms of matrix protein expression, machrophage infiltration and nitric oxide synthesis regulation in normal and diseased kidney. *Dr. Morrissey*

13. Studies investigate the interrelationships between vitamin D metabolites and parathryoid metabolism. Research projects include pathogenesis of secondary hyperparathyroidism. Studies on calcium binding protein (calbindin 9k) and calcium transport. *Dr. Slatopolsky*

Pulmonary and Critical Care

(A) Barnes Hospital, four or six weeks. Students will acquire skills in the pulmonary function laboratory, follow patients with pulmonary diseases, attend regular pulmonary conferences. *Dr. Holtzman and Staff*

(B) Jewish Hospital, four or six weeks. Students will work up and follow both in-hospital and clinic patients, interpret pulmonary function tests, assist in procedures, participate in teaching conferences and rounds. *Drs. Senior, Lefrak and Staff*

(C) VA Hospital, four weeks. Evaluation and management of common respiratory disorders such as chronic obstructive lung disease, lung cancer, tuberculosis. Preoperative evaluations, fiberoptic bronchoscopy, pulmonary function and chest radiograph interpretation, and ventilator management. *Dr. C. Daughaday*

(D) Medical Intensive Care (four weeks). Opportunity to gain experience in acute, primary care medicine of the critically-ill patient. Work up patients with the MICU team. *Dr. Schuster*

(E) Research Electives.

1. Mechanisms of asthma. Students will be introduced to biochemical and clinical studies of patients with asthma aimed at understanding the mechanisms of the disease and goals for the development of new treatment strategies. *Dr. Holtzman*

2. Positron emission tomographic studies of acute lung injury. Students will be introduced to large animal models of acute lung injury and techniques involving positron emisssion tomography, nuclear medicine and pulmonary physiology. *Dr. Schuster*

Section of Applied Physiology

(A) Clinical Elective. Exercise in Medicine and Preventive Medicine. Six weeks, all day. Students will participate as members of Applied Physiology Section's clinical team, doing exercise-testing, with measurement of oxygen uptake and cardiac output, and metabolic studies; and working with patients with coronary artery disease, diabetes, and/or hypertension who are undergoing exercise-training as part of their treatment. *Drs. Ebsani, Holloszy, W. Martin*

(B) Research Elective. Physiology and Biochemistry of Exercise. Research deals with the acute and chronic responses to exercise. Areas include biochemical adaptations in muscle in response to endurance exercise; cardiac adaptations to increased work load; the serum triglyceride lowering effect of exercise; the biochemical basis of muscle fatigue and the insulin-like effect of exercise. *Drs. Holloszy and Ebsani*

Section of Lipid Research

(A) Role of oxidative protein and lipid damage in pathogenesis of atherosclerosis mechanisms for generation of oxygen and carbon-centered free radicals. *Dr. Heinecke*

(B) Molecular genetics and pathophysiology of low LDL syndromes. Dietary and hormonal regulation of apolipoprotein production using cell biology and molecular techniques. Effect of exercise on lipoprotein levels, compositions and kinetics. *Dr. Schonfeld*

(C) Biochemistry and molecular biology of enzymes involved in fatty acid metabolism, specifically, lipoprotein lipase and fatty acid synthase; regulation of gene expression in human adipose tissue and skeletal muscle by exercise and diet; targeted inactivation of genes associated with adipocyte differentiation. *Dr. Semenkovich*

Faculty

Adolphus Busch Professor and Chairman of Department

John P. Atkinson, M.D., University of Kansas, 1969. (See Department of Molecular Microbiology.)

John E. and Adaline Simon Professor and Vice-Chairman of Department

Saulo Klahr, M.D., Universidad Nacional de Colombia, 1959.

Professors Emeriti

Elmer B. Brown, M.D., Washington University, 1950. (See Administration.)

Hugh Chaplin, Jr., M.D., Columbia University, 1947. (See Department of Pathology.)

Irene E. and Michael M. Karl Professor of Endocrinology and Metabolism

William H. Daughaday, M.D., Harvard University, 1943.

Virginia Minnich, M.S., Iowa State College, 1938.

H. Mitchell Perry, Jr., M.D., Washington University, 1946.

John A. Pierce, M.D., University of Arkansas, 1948.

Edward H. Reinhard, M.D., Washington University, 1939. (See Department of Radiology.)

Robert E. Shank, M.D., Washington University, 1939.

Professors

David H. Alpers, M.D., Harvard University, 1960.

Sydney M. and Stella H. Shoenberg Professor

Louis V. Avioli, M.D., Yale University, 1957.

Clifton A. Baile, Ph.D., University of Missouri, 1965. (Adjunct Professor of Nutrition in Medicine.)

John P. Boineau, M.D., Duke University, 1959. (See Department of Surgery.)

Eric J. Brown, M.D., Harvard University, 1975. (See Department of Cell Biology and Physiology and Department of Molecular Microbiology.)

George J. Broze, Jr., M.D., Washington University, 1972.

Michael E. Cain, M.D., George Washington University, 1975.

Lewis R. Chase, M.D., Harvard University, 1964. (Chief, Washington University Medical Services, Cochran V.A. Hospital)

Ray E. Clouse, M.D., Indiana University, 1976.

Philip E. Cryer, M.D., Northwestern University, 1965. (Also Clinical Research Center)

William H. Danforth, M.D., Harvard University, 1951. (See Administration.)

Lewis T. and Rosalind B. Apple Professor of Oncology in Medicine

Thomas F. Deuel, M.D., Columbia University, 1961. (See Department of Biochemistry and Molecular Biophysics.)

Ali A. Ehsani, M.D., Tehran University, 1965. (See Irene Walter Johnson Institute of Rehabilitation.)

The Winfred A. and Emma R. Showman Professor of Dermatology

Arthur Z. Eisen, M.D., University of Pennsylvania, 1957. (Dermatology)

Edward M. Geltman, M.D., New York University, 1971. (See Department of Radiology.)

Jeffrey I. Gordon, M.D., The University of Chicago, 1973. (See Department of Biochemistry and Molecular Biophysics and Department of Molecular Biology and Pharmacology.)

Richard W. Gross, M.D., New York University, 1976; Ph.D., Washington University, 1982. (See Department of Cell Biology and Pharmacology.) (Also Department of Chemistry.)

Chromalloy Professor of Renal Diseases in Medicine

Marc R. Hammerman, M.D., Washington University, 1972. (See Department of Cell Biology and Physiology.)

John O. Holloszy, M.D., Washington University, 1957.

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.

Allan S. Jaffe, M.D., University of Maryland, 1973.

M. Kenton King, M.D., Vanderbilt University, 1951. (See Administration.)

Distinguished University Professor of Medicine

David M. Kipnis, M.D., University of Maryland, 1951. (See Administration.)

Robert E. Kleiger, M.D., Harvard University, 1960.

George S. Kobayashi, Ph.D., Tulane University, 1963. (Microbiology) (See Department of Molecular Microbiology.)

Rosalind H. Kornfeld, Ph.D., Washington University, 1961. (Biochemistry) (See Department of Biochemistry and Molecular Biophysics.)

Stuart A. Kornfeld, M.D., Washington University, 1962. (See Department of Biochemistry and Molecular Biophysics.)

Stanley J. Korsmeyer (Howard Hughes Medical Institute Investigator in Medicine), M.D., University of Illinois, 1976. (See Department of Molecular Microbiology.)

Ronald Krone (John E. Simon Scholar in Medicine), M.D., The University of Chicago, 1966.

Jack H. Ladenson, Ph.D., University of Maryland, 1971. (Clinical Chemistry) (See Department of Pathology.)

Stephen S. Lefrak, M.D., State University of New York, Downstate, 1965. (See Administration.)

Timothy J. Ley, M.D., Washington University, 1978. (See Department of Genetics.)

J. Russell Little, Jr., M.D., University of Rochester, 1956. (See Department of Molecular Microbiology.)

Dennis Y. Loh (Howard Hughes Medical Institute Associate Investigator in Medicine), M.D., Harvard University, 1977. (See Department of Genetics and Department of Molecular Microbiology.)

Philip A. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Radiology.)

Kenneth Ludmerer, M.D., The Johns Hopkins University, 1973.

Vice Chairman Financial Affairs, Department of Internal Medicine

Philip W. Majerus, M.D., Washington University, 1961. (See Department of Biochemistry and Molecular Biophysics.)

Robert P. Mecham, Ph.D., Boston University, 1976. (See Department of Cell Biology and Physiology.)

Vice Chairman Hospital and Clinical Affairs, Department of Internal Medicine

Gerald Medoff, M.D., Washington University, 1962. (See Department of Molecular Microbiology.)

Jeffrey D. Milbrandt, M.D., Washington University, 1978; Ph.D., University of Virginia, 1983. (See Department of Pathology.)

Joseph P. Miletich, M.D., Ph.D., Washington University, 1979. (See Department of Pathology.)

Thalachallour Mohanakumar, Ph.D., Duke University, 1974. (See Departments of Pathology and Surgery.)

Aubrey R. Morrison, M.B., B.S., University of London, 1970. (See Department of Molecular Biology and Pharmacology.)

Patrick R. Murray, Ph.D. , University of California, 1974. (Clinical Microbiology) (See Department of Pathology.)

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

J. Evan Sadler, (Howard Hughes Medical Institute Associate Investigator in Medicine), Ph.D., Duke University, 1978; M.D., 1979. (See Department of Biochemistry and Molecular Biophysics.)

Julio V. Santiago, M.D., University of Puerto Rico, 1967. (See Department of Pediatrics.)

Samuel A. Santoro, M.D., Ph.D.,Vanderbilt University, 1979. (See Department of Pathology.)

David Schlessinger, Ph.D., Harvard University, 1960. (Microbiology) (See Department of Molecular Microbiology.)

William B. Kountz Professor of Medicine

Gustav Schonfeld, M.D., Washington University, 1960.

Dorothy R. and Hubert C. Moog Professor in Pulmonary Medicine

Robert M. Senior, M.D., George Washington University, 1961.

Barry A. Siegel, M.D., Washington University, 1969. (See Department of Radiology.)

Vice Chairman Research Affairs, Department of Internal Medicine

Louis 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.)

Howard G. Welgus, M.D., Washington University, 1977. (Dermatology)

Michael P. Whyte, M.D., State University of New York, Downstate, 1972.

Research Professors

Joseph J. H. Ackerman, Ph.D., Colorado State University, 1977. (Chemistry)

Edwin B. Fisher, Jr., Ph.D., State University of New York, 1972. (Psychology) (See Department of Psychology.)

Irene E. Karl, Ph.D., University of Wisconsin, 1940.

James G. Miller, Ph.D., Washington University, 1969. (Also Faculty of Arts and Sciences.)

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

Benjamin Schwartz, M.D., Ph.D., Albert Einstein College of Medicine, 1972.

Professors Emeriti (Clinical)

Ralph V. Gieselman, M.D., Washington University, 1947.

Paul O. Hagemann, M.D., Washington University, 1934.

Morris D. Marcus, M.D., Washington University, 1934. (Dermatology)

Ernest T. Rouse, Jr., M.D., Washington University, 1943.

Franz U. Steinberg, M.D., University of Berne, 1938. (See Department of Surgery.)

Professors (Clinical)

Benjamin A. Borowsky, M.D., Washington University, 1958.

I. J. Flance, M.D., Washington University, 1935.

Bernard T. Garfinkel, M.D., Washington University, 1948.

Neville Grant, M.D., Columbia University, 1954.

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.

Norman P. Knowlton, Jr., M.D., Harvard University, 1945.

Philip E. Korenblat, M.D., University of Arkansas, 1960.

Marvin E. Levin, M.D., Washington University, 1951.

Joseph Levitt, M.D., Washington University, 1949.

Virgil Loeb, Jr., M.D., Washington University, 1944.

Charles C. Norland, M.D., Washington University, 1959.

G. Charles Oliver, M.D., Harvard University, 1957.

Robert C. Packman, M.D., Washington University, 1956.

Robert Paine, M.D., Harvard University, 1944.

Llewellyn Sale, Jr., M.D., Washington University, 1940.

Burton A. Shatz, M.D., Washington University, 1943.

Professors (Visiting)

Dennis M. Bier, M.D., New Jersey College of Medicine, 1966. (See Department of Pediatrics.)

Donald G. Davies, Ph.D., The Johns Hopkins University, 1970.

Professors (Adjunct)

Bernard B. Davies, M.D., University of Pittsburgh, 1961.

Burton E. Sobel, M.D., Harvard University, 1962.

Associate Professors

Elliot E. Abbey, M.D., New York University, 1975. (Clinical Academic)

Julian L. Ambrus, M.D., Jefferson Medical College, 1979.

Benico Barzilai, M.D., University of Illinois, 1978.

Steven R. Bergmann, M.D., Washington University, 1985. Ph.D., Hahnemann Medical College, 1977; (Medical Physiology)

Joseph Billadello, M.D., Georgetown University, 1978.

Stanley J. Birge, Jr., M.D., Washington University, 1963.

David D. Chaplin (Howard Hughes Medical Institute Associate Investigator), M.D., Ph.D., Washington University, 1980. (See Department of Molecular Microbiology and Department of Genetics.)

William E. Clutter, M.D., Ohio State University, 1975. (Also Clinical Research Center.)

Carlos C. Daughaday, M.D., Washington University, 1971. (Clinical Academic)

Douglas C. Dean, Ph.D., University of Kansas, 1981. (See Department of Cell Biology and Pharmacology.)

James A. Delmez, M.D., University of Rochester, 1973.

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.

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

Mark E. Frisse, M.D., Washington University, 1978. (See Biomedical Computing.)

Lawrence D. Gelb, M.D., Harvard University, 1967. (See Department of Molecular Microbiology.)

Stephen J. Giddings, Ph.D., Dartmouth, 1973; M.D., University of Rochester, 1976.

Stephen L. Gluck, M.D., University of California, 1977. (See Department of Cell Biology and Physiology.)

Anne C. Goldberg, M.D., University of Maryland, 1977.

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.)

Gregory A. Grant, Ph.D., University of Wisconsin, 1975. (Dermatology) (See Department of Biochemistry and Molecular Biophysics.)

Samuel B. Guze, M.D., Washington University, 1945. (See Department of Psychiatry.)

Scot G. Hickman, M.D., Washington University, 1970. (Clinical Academic)

Michael J. Holtzman, M.D., Northwestern University, 1975.

Anthony Kulczycki, Jr., M.D., Harvard University, 1970. (See Department of Molecular Microbiology.)

James B. Lefkowith, M.D., The Johns Hopkins University, 1979. (See Department of Molecular Biology and Pharmacology.)

Ellen Li, Ph.D., M.D., Washington University, 1980. (See Department of Biochemistry and Molecular Biophysics.)

Bruce Lindsay, M.D., Jefferson Medical College, 1977.

Douglas M. Lublin, Ph.D., Stanford University, 1976; M.D., University of California, Los Angeles, 1982. (See Department of Pathology.)

Susan B. Mallory, M.D., University of Texas, Galveston, 1974. (Dermatology) (See Department of Pediatrics.)

Stanley Misler, M.D., Ph.D., New York University, 1977. (See Department of Cell Biology and Physiology.)

Joanne E. Mortimer, M.D., Loyola University Stritch School of Medicine, 1977.

Moon H. Nahm, M.D., Washington University, 1974. (See Department of Pathology.)

Richard E. Ostlund, Jr., M.D., University of Utah, 1970.

Roberto Pacifici, M.D., Perugia University School of Medicine, Perugia, Italy, 1981.

Curtis A. Parvin, Ph.D., University of Minnesota, 1980. (Clinical, Computer Science) (See Department of Pathology and Division of Biostatistics.)

Alice Pentland, M.D., University of Michigan, 1978. (Dermatology) (See Department of Molecular Biology and Pharmacology.)

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, Chicago, 1979

Jeffrey E. Saffitz, Ph.D., Case Western Reserve University, 1977; M.D., 1978. (See Department of Pathology.)

Daniel P. Schuster, M.D., Yale University, 1976.

Deborah Shure, M.D., Albert Einstein University, 1973.

Isaias Spilberg, M.D., University of San Marcos, 1963.

Samuel L. Stanley, Jr., M.D., Harvard University, 1980. (See Department of Molecular Microbiology.)

Gregory A. Storch, M.D., New York University, 1973. (See Departments of Pediatrics and Psychiatry.)

Alan J. Tiefenbrunn, M.D., Washington University, 1974. (See Department of Radiology.)

Elbert P. Trulock III, M.D., Emory University, 1978.

Peter G. Tuteur, M.D., University of Illinois, 1966.

H. James Wedner, M.D., Cornell University, 1967.

Gary J. Weil, M.D., Harvard University, 1975. (See Department of Molecular Microbiology.

Alan N. Weiss, M.D., Ohio State University, 1966.

Samuel A. Wickline, M.D., University of Hawaii, 1980.

David Windus, M.D., Creighton University, 1978.

Gary R. Zuckerman, D.O., Kansas City College of Osteopathic Medicine, 1963.

Research Associate Professor Emerita

Norma Fletcher, Ph.D., University of Copenhagen, 1965.

Research Associate Professors

Dana R. Abendschein, Ph.D., Purdue University, 1978. (See Department of Cell Biology and Physiology.)

H. Dieter Ambos, C.E.E., Washington University, 1973. (See Biomedical Computing.)

Alex J. Brown, Ph.D., University of Tennessee, 1982.

Thomas G. Cole, M.D., University of Missouri, 1974; Ph.D., 1980. (See Department of Biochemistry and Molecular Biophysics.)

Osami Kanagawa, M.D., Okayama University, 1974; Ph.D., 1978. (See Department of Pathology.)

Elaine S. Krul, Ph.D., McGill University, 1982.

Kenneth B. Schechtman, Ph.D., Washington University, 1978. (See Division of Biostatistics and Institute for Biomedical Computing.)

Associate Professors Emeriti (Clinical)

Grace E. Bergner, M.D., Washington University, 1943.

Janina M. Brajtburg, Ph.D., University of Lodz, 1968.

Mary L. Parker, M.D., Washington University, 1953.

Associate Professors (Clinical)

Gail A. Ahumada, M.D.,University of California, San Diego, 1972.

Jack Barrow, M.D., Washington University, 1946.

William G. Bowen, M.D., University of North Carolina, 1974.

Robert M. Bruce, M.D.,University of Minnesota, 1968.

J. William Campbell, M.D., Washington University, 1977.

John S. Daniels, M.D., University of Arkansas, 1974.

Arnold Dankner, M.D., Washington University, 1947.

John D. Davidson, M.D., Washington University, 1972.

Russell E. Eggebrecht, M.D., Washington University, 1971.

Lewis C. Fischbein, M.D., Washington University, 1974.

Arthur H. Gale, M.D., University of Missouri, 1959.

Siddhesh Gowda, M.B., B.S., Medical College Bellary Mysore, 1969.

John M. Grant, M.D., Washington University, 1954.

James N. Heins, M.D., University of Louisville, 1961.

Sidney Jick, M.D., Washington University, 1949.

William G. Juergens, Jr., M.D., Washington University, 1961.

Owen S. Kantor, M.D., University of Missouri, 1968.

Robert W. Karr, M.D., University of Texas, 1975.

John J. Kelly, M.D., St. Louis University, 1963.

Morton A. Levy, M.D., Washington University, 1961.

David M. Lieberman, M.D., Vanderbilt University, 1949.

Harvey Liebhaber, M.D., New York University, 1957.

Herbert Lubowitz, M.D., Washington University, 1958.

Alan P. Lyss, M.D., Washington University, 1976.

William E. Magee, M.D., Duke University, 1950.

Robert S. Mendelsohn, M.D., Washington University, 1954.

Paul A. Mennes, M.D., Washington University, 1970.

Edward J. Miller, M.D., St. Louis University, 1962.

Matthew J. Orland, M.D., University of Miami, 1979.

MaryBeth Pereira, M.D., University of California, 1978.

Daniel E. Potts, M.D., Washington University, 1972.

Gary A. Ratkin, M.D., Washington University, 1967. (See Department of Radiology.)

Lester T. Reese, M.D., Tulane University, 1966. (Dermatology)

Joseph F. Ruwitch, Jr., M.D., Washington University, 1966.

Shabbir H. Safdar, M.D., Nishtar Medical College, 1961.

Ali Salimi, M.D., University of Tehran, 1965.

James C. Sisk, M.D., Washington University, 1946. (Dermatology)

Donald A. Skor, M.D., Rush University, 1978.

Ross B. Sommer, M.D., Cornell University, 1949.

Robert M. Taxman, M.D., Washington University, 1964.

J. Allen Thiel, M.D., St. Louis University, 1960.

Stanley M. Wald, M.D., Washington University, 1946.

Alvin S. Wenneker, M.D., Washington University, 1953.

Associate Professor (Adjunct)

Robert E. Kraetsch, M.D., Washington University, 1969.

Associate Professor (Visiting)

Bruno Maresca, Ph.D., University of Naples, Naples, Italy, 1974.

Assistant Professors

Giuseppe Aliperti, M.D., University of Naples, Naples, Italy, 1979.

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.)

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.

Rachel A. Borson, M.D., McGill University, 1979.

Matthew S. Bosner, M.D., University of Texas, Houston, 1983.

Mitchell D. Botney, M.D., Ohio State University, 1984.

Raymond E. Bourey, M.D., Southern Illinois University, 1982.

Alan Braverman, M.D., University of Missouri, Kansas City, 1985.

Daniel C. Brennan, M.D., University of Iowa, 1985.

Steven Brody, M.D., University of Michigan, 1980.

Randy Brown, M.D., Case Western Reserve University, 1979.

David B. Carr, M.D., University of Missouri, 1985.

Andrew C. Chan, M.D., Ph.D., Washington University, 1986.

Mary F. Chan, M.D., University of Alabama, 1986.

Roberto Civitelli, M.D., Siena University, Siena, Italy, 1980.

Steven M. Cohn, M.D., Ph.D., Washington University, 1985.

Patricia L. Cole, M.D., Harvard University, 1981.

Lynn A. Cornelius, M.D., University of Missouri, 1980. (Dermatology)

Daniel W. Coyne, M.D., Case Western Reserve University, 1983.

Samuel E. Dagogo-Jack, M.D., University of Ibadan, 1989.

Victor G. Davila, M.D., University of Puerto Rico, 1981.

William C. Dunagan, M.D., Washington University, 1983.

John C. Edwards, Ph.D., The University of Chicago, 1983; M.D., 1985.

Neil A. Ettinger, M.D., Washington University, 1983.

Bradley A. Evanoff, M.D., Washington University, 1986.

Larry E. Fields, M.D., Harvard University, 1980.

Paula Fracasso, M.D., Ph.D., Yale University, 1984.

Victoria Fraser, M.D., University of Missouri, 1983.

Satoshi Fujii, M.D., Hokkadio University, 1987.

Daniel E. Goldberg, M.D., Ph.D., Washington University, 1985. (See Department of Molecular Microbiology.)

James A. Goldstein, M.D., The University of Chicago, 1976.

Daniel M. Goodenberger, M.D., Duke University, 1974.

Eric D. Green, M.D., Ph.D., Washington University, 1987. (See Department of Pathology.)

James E. Greenwald, Ph.D., Ohio State University School of Medicine, 1980; M.D., 1983. (See Department of Molecular Biology and Pharmacology.)

Robert J. Gropler, M.D., University of Cincinnati, 1981.

David Hagerty, M.D., St. Louis University, 1981.

James R. Hansbrough, Ph.D., Vanderbilt University, 1980; M.D., Washington University, 1983. (See Department of Pediatrics.)

Jay Heinecke, M.D., Washington University, 1981.

Elizabeth Hilliker, M.D., Washington University, 1970.

William E. Hopkins, M.D., The University of Chicago, 1985.

Daniel K. Howard, M.D., University of Wisconsin, Madison, 1987.

George J. Hruza, M.D., New York University, 1982. (Dermatology) (See Department of Surgery and Otolaryngology.)

Mohammad Jahanzeb, M.D., King Edward Medical College, 1986.

Leslie E. Kahl, M.D., Albany Medical College, 1978.

Michael G. Kahn, M.D., University of California, San Diego, 1979; Ph.D., University of California, San Francisco, 1988. (See Biomedical Computing.)

Daniel P. Kelly, M.D., The University of Chicago, 1982.

Joseph L. Kenzora, M.D., University of New Mexico Medical School, 1975.

Marin N. Kollef, M.D., University of Rochester School of Medicine, 1983.

Sandor J. Kovacs, Ph.D., California Institute of Technology, 1977; M.D., University of Miami, 1979.

Pui-Yan Kwok, M.D., The University of Chicago, 1987. (Dermatology)

John M. Lasala, Ph.D., St. Louis University, 1979; M.D., University of Connecticut, 1983.

Marc S. Levin, M.D., Columbia College of Physicians and Surgeons, 1981.

Michael B. Lippman, M.D., State University of New York, 1977. (Clinical Academic)

Gregory D. Longmore, M.D., McGill University, 1983. (See Department of Cell Biology and Physiology.)

Robinna G. Lorenz, M.D., Washington University, 1990. (See Department of Pathology.)

Janet B. McGill, M.D., Michigan State University, 1979. (See Department of Pediatrics.)

Robert C. McKnight, M.D., Washington University, 1961. (See Department of Radiology.)

Ann Martin, M.D., Case Western Reserve University, 1981. (Dermatology)

Wade H. Martin III, M.D., University of Kansas, 1977.

Stephen B. Miller, M.D., University of Missouri, Kansas City, 1983.

Scott M. Nordlicht, M.D., State University of New York, Downstate, 1973.

Paul D. Olivo, M.D., University of Florida, 1981; Ph.D., 1982.

William C. Parks, Ph.D., Medical College of Wisconsin, 1982.

Anders V. Persson, Ph.D., University of Colorado, 1977; M.D., University of Miami School of Medicine, 1983.

John D. Pfeifer, Ph.D., University of California, 1987; M.D., 1988. (See Department of Pathology.)

Joel Picus, M.D., Harvard University, 1984.

Richard A. Pierce, Ph.D., Rutgers University, 1990. (Dermatology)

Steven M. Pogwizd, M.D., Washington University, 1981.

Katherine Ponder, M.D., Washington University, 1983. (See Department of Biochemistry and Molecular Biophysics.)

Craig K. Reiss, M.D., University of Missouri, Kansas City, 1983.

Calixto Romero, M.D., The University of Chicago, 1970.

Marcos Rothstein, M.D., University of Zulia, 1974.

Jeffrey N. Rottman, M.D., Columbia University, New York, 1982.

Deborah C. Rubin, M.D., Albert Einstein College of Medicine, 1981.

Dan Schuller, M.D., University Nacional Autonoma de Medicine, 1985.

Clay Semenkovich, M.D., Washington University, 1981. (See Department of Cell Biology and Physiology.)

Steven Shapiro, M.D., The University of Chicago, 1983.

Marc E. Shelton, M.D., Vanderbilt University, 1984.

Sherry Shuman, M.D., Wayne State University, 1982.

Joseph M. Smith, M.D., Harvard University, 1987.

Thomas H. Steinberg, M.D., New York University, 1978. (See Department of Cell Biology and Physiology.)

Frank W. Torres, M.D., University of California, San Francisco, 1983.

Serguei Troianovski, Ph.D., All-Union Cancer Research Centre, Moscow, 1981.

Herbert W. Virgin IV, M.D., Ph.D., Harvard University, 1985. (See Departments of Pathology and Molecular Microbiology.)

Oksana Volshteyn, M.D., Minsk State Medical Institute, 1976. (See Department of Neurology.)

Alison I. Whelan, M.D., Washington University, 1986.

Heather M. White, M.D., University of Texas, Houston, 1985.

Kenneth Winters, M.D., Washington University, 1980.

Megan Wren, M.D., Washington University, 1985.

Bulent Zaim, M.D., Lausanne School of Medicine, Switzerland, 1983.

Research Assistant Professor Emeritus

Ida K. Mariz, A.B., Washington University, 1940.

Research Assistant Professors

Thomas W. Allen, Ed.D., Harvard University, 1966. (Education) (See Graduate Institute of Education.)

Cynthia L. Arfken, Ph.D., Yale University, 1985. (See Biostatistics.)

Kenneth R. Boschert, D.V.M., Mississippi State University, 1984. (Comparative Medicine)

Ivan E. Collier, Ph.D., Florida State University, 1980.

Michael R. Courtois, M.A., University of Missouri, 1979.

Alan Daugherty, Ph.D., University of Bath, England, 1982.

Adriana Dusso, Ph.D., University of Rosari, Argentina, 1985.

Kenton N. Fedde, Ph.D., The University of Chicago, 1983.

David A. Ford, Ph.D., University of Missouri, 1984.

Stephen Gaioni, Ph.D., Princeton University, 1976.

Eric A. Gulve, Ph.D., Harvard University, 1987.

Debra L. Haire-Joshu, M.D., Southern Illinois University, 1978.

Dennis E. Hourcade, Ph.D., Harvard University, 1978.

Fong Fu Hsu, Ph.D., University of Utah, 1986.

Wendy M. Kohrt, Ph.D., Arizona State University, Tempe, 1986.

Malgorzata Krych, Ph.D., Polish Academy of Sciences, 1982.

Yue-Sheng Li, M.D., Fujian Medical College, 1982.

Thomas J. McCarthy, D.V.M., University of Illinois, 1985.

Joanne Markham, M.D., Washington University, 1973.

Sasanka Ramanadham, Ph.D., Texas Tech University Health Center, 1985.

Mitchell G. Scott, Ph.D., Washington University, 1982. (Clinical) (See Department of Pathology.)

Jo L. Seltzer, Ph.D., Washington University, 1969. (Dermatology)

Allan Sheppard, Ph.D., Sydney University, 1988.

Robert J. Spina, Ph.D., University of Pittsburgh, 1987.

Raj Ajit Srivastava, Ph.D., Gorakhpur University, India, 1983.

Alexander Strongin, Ph.D., All Union Research Institute, Moscow, 1973.

Kathryn A. Yamada, Ph.D., Georgetown University, 1982.

Kevin E. Yarasheski, Ph.D., Kent State University, 1986.

Hsiu-Jeng Yeh, M.D., Sun Yot Sen, China, 1953.

Research Assistant Professors (Adjunct)

Ross C. Brownson, Ph.D., Colorado State, 1985.

Mary Anne Della-Fera, V.M.D., University of Pennsylvania, 1979; Ph.D., 1980.

Grace S. Lo, Ph.D., University of Texas, Austin, 1976.

Carol L. McLaughlin, Ph.D., University of Pennsylvania, 1981.

Assistant Professors Emeriti (Clinical)

Louis F. Aitken, M.D., Washington University, 1927.

Morris Alex, M.D., Washington University, 1943.

Greta Camel, M.D., University of Wisconsin, 1949.

Duane E. Cozart, M.D., Medical College of Virginia, 1959.

William K. Hall, M.D., Washington University, 1942. (Dermatology)

James H. Hutchinson, Jr., M.D., University of Arkansas, 1945.

Robert C. Kingsland, M.D., Washington University, 1937.

Warren Lonergan, M.D., Vanderbilt University, 1941.

Harold K. Roberts, M.D., Ohio State University, 1939.

Samuel Schechter, M.D., Washington University, 1941.

Assistant Professors (Clinical)

Charles C. Abel, M.D., Washington University, 1956.

Howard J. Aylward, Jr., M.D., Vanderbilt University, 1970. (See Medical Care Group.)

Om P. Bahl, M.R.C.P., University of Edinburgh, 1960.

Robert W. Barton, M.D., Ph.D., The University of Chicago, 1967.

Michael A. Berk, M.D., Indiana University, 1979.

Aaron M. Bernstein, M.D., Chicago Medical School, 1952.

F. Douglas Biggs, M.D., Washington University, 1972.

Aaron Birenbaum, M.D., Washington University, 1948.

Clifford A. Birge, M.D., Washington University, 1961.

Benje Boonshaft, M.D., Washington University, 1961.

Leslie M. Brandwin, M.D.,St. Louis University, 1971.

Francis J. Catanzaro, M.D., Washington University, 1948.

Philip Comens, M.D., Washington University, 1951.

Ralph Copp, Jr., M.D., Washington University, 1952.

Stephen R. Crespin, M.D., Harvard College, 1965.

Rand E. Dankner, M.D., Baylor College of Medicine, 1978.

Vincent R. deMello, M.B., B.S., Seth G.S. Medical College, 1964.

John T. Ellena, M.D., Southern Illinois University, Springfield, 1985.

James Etzkorn, M.D., St. Louis University, 1973.

Linda A. Fisher, M.D., Harvard University, 1975.

Arnold M. Goldman, M.D., Washington University, 1959.

Benjamin M. Goldstein, M.D., Washington University, 1964.

David A. Goran, M.D., Washington University, 1976.

Charlene Gottleib, M.D., Washington University, 1972.

Guner B. Gulmen, M.D., Hacettepe University, 1969.

Paul F. Hintze, M.D., University of Utah, 1978.

Bernard Hulbert, M.D., University of Wisconsin, 1941.

Morris Joftus, M.D., University of Illinois, 1967.

Robert L. Kaufman, M.D., Washington University, 1963.

Donald K. King, M.D., The Johns Hopkins University, 1970.

John H. Kissel, M.D., Harvard University, 1971.

Micki Klearman, M.D., Washington University, 1981.

Ralph F. Kuhlman, M.D., University of Illinois, 1964. (Also Student Health Service)

Jerrold J. Lander, M.D., Washington University, 1968.

Steven A. Lauter, M.D., Wayne State University, 1971.

Douglas R. Lilly, M.D., Washington University, 1956.

Carl A. Lyss, M.D., Washington University, 1956.

Jay M. Marion, M.D., Vanderbilt University, 1977.

Jay P. Marshall II, M.D., University of Missouri, 1972.

Thomas F. Martin, M.D., St. Louis University, 1965.

J. Roger Nelson, M.D., Washington University, 1953.

Leonard N. Newmark, M.D., Washington University, 1963.

David W. Ortbals, M.D., Washington University, 1970.

Deborah Parks, M.D., University of Louisville, 1982.

James C. Peden, Jr., M.D., Washington University, 1955.

William J. Phillips, M.D., Washington University, 1963.

Anne Pittman, M.D., St. Louis University, 1985.

Vincent J. Proskey, M.D., Marquette University, 1964.

Leon R. Robison, M.D., Case Western Reserve University, 1968.

Scott R. Sale, M.D., St. Louis University, 1976.

Robert J. Saltman, M.D., Washington University, 1980.

Robert J. Schneider, M.D., The Johns Hopkins University, 1976.

Bernard L. Shore, M.D., Washington University, 1977.

Robert Shuman, M.D., University of Missouri, 1981.

Rand W. Sommer, M.S., Washington University, 1980.

William F. Southworth, M.D., Washington University, 1975.

Alan R. Spivack, M.D., St. Louis University, 1964.

Linda G. Stanton, M.D., Boston University, 1979.

Paul M. Stein, M.D., St. Louis University, 1971.

Kongsak Tanphaichitr, M.D., Siraraj Hospital Medical School, 1970.

J. Regan Thomas, M.D., University of Missouri, 1972. (Dermatology) (See Department of Otolaryngology.)

Jeffrey Tillinghast, M.D., Washington University, 1980.

Albert L. Van Amburg III, M.D. Washington University, 1972.

Elliot A. Wallach, M.D., St. Louis University, 1945. (Dermatology)

James W. Walsh, M.D., Washington University, 1954.

Leonard B. Weinstock, M.D., University of Rochester, 1981.

Gerald A. Wolff, M.D., Washington University, 1961.

John A. Wood, M.D., Oklahoma University, 1968.

Herbert B. Zimmerman, M.D., Washington University, 1951.

Assistant Professor (Adjunct)

Vijaykumar Baragi, Ph.D., Auburn University, 1984.

Assistant Professors (Visiting)

Grigori A. Bannikov, Ph.D., All-Union Cancer Research Centre, Moscow, 1973.

Wenying Cui, M.D., Beijing Medical College, 1961.

Roslyn Sykes, Ph.D., St. Louis University, 1984.

Instructors

Matthew A. Arquette, M.D., Washington University, 1986.

Chandra Aubin, M.D., University of Missouri, 1983.

Michael Berkoben, M.D., University of Pennsylvania, 1986.

Keith Bernstein, M.D., University of Missouri, Kansas City, 1987.

Ellen F. Binder, M.D., Washington University, 1981.

Lawrence Brown, M.D., Washington University, 1990.

Thomas J. Chambers, M.D., Harvard University, 1982.

Ken Chiu, M.D., Taipai Medical College, 1983.

Kent Cohen, M.D., Emory University, 1986. (See Department of Surgery.)

Karl J. Crossen, M.D., University of South Alabama, 1981.

Thomas DeFer, M.D., University of Missouri, Columbia, 1989.

Judith A. Dibble, M.D., Washington University, 1986.

Kathryn M. Diemer, M.D., University of Missouri, Kansas City, 1985.

Anupma Dixit, Ph.D., University of West Indies, 1987.

Laura L. Dugan, M.D., Ohio State University, 1987. (See Department of Neurology.)

Micha Feinberg, M.D., Sacker School of Medicine, Israel, 1985.

Carl J. Fichtenbaum, M.D., University of Missouri, 1985.

Karen E. Forsman, Rush Medical College, 1981. (Dermatology)

John Frattini, M.D., Washington University, 1986.

David Gailani, M.D., University of Illinois, 1984.

Joseph Gatewood, M.D., The University of Chicago, 1970. (See Department of Surgery.)

Susan B. Glick, M.D., The University of Chicago, 1990.

Jerry L. Goddard, M.D., Tulane University, 1970.

Michael Goldmeier, M.D., Ohio State University, 1986.

Irene L. Graham, M.D., Baylor College of Medicine, 1982.

Marvin Grieff, M.D., McGill University, 1986.

Carolyn Haase, M.D., University of Missouri, 1987. (See Department of Surgery.)

David Hagerty, M.D., St. Louis University, 1981.

Timothy J. Henekl, M.D., Washington University, 1988.

Elizabeth Hilliker, M.D., Washington University, 1970. (See Department of Surgery.)

Daniel K. Howard, M.D., University of Wisconsin, 1987.

Luciann Hruza, M.D., Boston University, 1988.

David A. Katzman, M.D., St. Louis University, 1991.

Ingrid M. Keleti, M.D., Baylor College, 1987.

Steven C. Klein, M.D., Harvard University, 1983.

Kenneth Kovach, M.D., Texas Tech University, 1986.

Howard Kurz, M.D., New York Medical College, 1984.

Linda Lawrence, M.D., Temple University School of Medicine, 1988.

Frederik Lindberg, M.D., Umea University, 1987.

Trevor Lissoos, M.D., University of Witwatersrand, South Africa, 1983.

Daniel C. Link, M.D., University of Wisconsin-Madison, 1985.

Dwight Look, M.D., University of Missouri, 1985.

Angel Lopez-Candales, M.D., University of Puerto-Rico, 1986.

Elizabeth McGuire, M.D., Jefferson Medical College, 1980.

Naresh Mody, Ph.D., M.D., Universidad Autonoma de Cd Juarez Cd, Mexico, 1985.

Hector Molina-Vincenty, M.D., University of Puerto Rico, 1985.

Edward B. Morgan, M.D., St. Louis University, 1970.

Lavinia Negrea, M.D., Institute of Medicine, Romania, 1983.

John J. O'Brien, M.D., University of Missouri, Columbia, 1981.

Teresa J. Oglesby, M.D., University of South Alabama, 1980.

Michael H. O'Shea, M.D., University of Rochester, 1986.

Kenneth J. Phillips, M.D., Medical College of Wisconsin, 1986.

Joseph Primrose, M.D., University of Illinois, 1968.

Patricia Quinley, M.D., University of Illinois, Chicago, 1989.

Dino Recchia, M.D., University of Michigan, 1988.

Alvaro A. Reyes, M.D., National University, Columbia, 1982.

Glenn Rosen, M.D., University of Pennsylvania, 1983.

David Schleinkofer, M.D., Washington University, 1989.

Jay R. Seltzer, M.D., University of Missouri, 1987.

Anil Shah, M.D., Guiarat University, India, 1982.

Arik Shakir, M.D., Madras Medical College, 1982.

Vickie R. Shannon, M.D., Washington University, 1983.

John P. Sheehan, Jr., M.D., University of Missouri, 1985.

William D. Staatz, M.D., University of Edinburgh, 1976. (See Department of Pathology.)

John F. Walsh, M.D., Boston University, 1987.

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

Lynn K. White, M.D., Harvard University, 1984.

Julie Wiehl, M.D., St. Louis University, 1983.

Karen Winters, M.D., Southern Illinois University, Carbondale, 1983.

Frank L. Zwemer, Jr., M.D., University of Southern California, 1983.

Research Instructors

Ramaswamy Chandrashekar, Ph.D., University of Bombay, India, 1988.

May Mei Chen, B.S., Baker University, 1963.

Su-Li Cheng, Ph.D., University of Louisville, 1978.

Ronald L. Gingerich, Ph.D., Indiana University, 1975. (See Department of Pediatrics.)

Xianlin Han, Ph.D., Washington University, 1990.

Ellen B. Heath-Monnig, Ph.D., Case Western Reserve University, 1981.

Pilar Herrero, M.S., Vanderbilt University, 1984. (Cardiology.)

Cheryl A. Houston, M.S., St. Louis University, 1990.

Norma J. Janes, M.S., State University of Iowa, 1964. (Also Clinical Research Center.)

Rajendra Krishnan, Ph.D., University of Madras, India, 1990.

Marylen L. Mann, M.A., Washington University, 1959.

Daniel R. Martin, M.S., University of Missouri, St. Louis, 1985.

Terrence E. Riehl, Ph.D., Ohio University, 1980.

Leonard Rifas, M.S., University of Missouri, 1973.

Sharon A. Rogers, M.S., Southern Illinois University, 1983.

Marina Savenkova, Ph.D., Byelorussian Academy of Sciences, 1986.

Richard Seip, Ph.D., University of Virginia, 1990.

Suresh D. Shah, M.S., St. Louis University, 1972. (Also Clinical Research Center)

Carol Stubblefield, MSN, St. Louis University, 1982.

Linda K. Sussman, Ph.D., Washington University, 1983.

Yukio Tanizawa, M.D., Yamaguchi University, 1987.

Teresa Tessner, Ph.D., Bowman Gray University, 1984.

Sheryl R. Torr-Brown, Ph.D., University of London, 1991. (Cardiology)

Bakula L. Trivedi, M.S., Gujarat University, India, 1961.

Tian Xia, Ph.D., Medical College of Pennsylvania, 1989.

John D. York, Ph.D., Washington University, 1993.

Research Instructor (Visiting)

Carlos Aguilar-Salinas, M.D., Universidad Nacional Autonoma de Medicine, 1986.

Ai Y. Lim-Lee, Ph.D., Seoul National University, 1991. (Dermatology)

Instructors Emeriti (Clinical)

Edward W. Cannady, M.D., Washington University, 1931.

Benjamin H. Charles, M.B., Ch.B., University of Edinburgh, 1934.

Axel R. Gronau, M.D., University of Naples, 1935.

J. Ted Jean, M.D., Washington University, 1928.

Richard W. Maxwell, M.D., The University of Chicago, 1937.

Arlen E. Morrison, M.D., Washington University, 1958.

Lamar H. Ochs, M.D., Washington University, 1944.

Hugh R. Waters, M.D., Washington University, 1945.

Herbert C. Wiegand, M.D., Washington University, 1943.

Instructors (Clinical)

Barry K. Abramson, M.D., University of Miami, 1985.

Ingrid R. Albert, M.D., Albert Einstein College of Medicine, 1971. (Dermatology)

Jorge M. Alegre, M.D., San Marcos University, 1965.

Frank K. Anderson, M.D., Northeastern University School of Medicine, 1980. (See Health Key Medical Group.)

Scott J. Anderson, Ph.D., Duke University, 1981; M.D., 1982. (See Health Key Medical Group.)

Jerome M. Aronberg, M.D., Washington University, 1971. (Dermatology)

Milton F. Austin, M.D., Yale University, 1980.

James G. Avery, M.D., University of Tennessee, 1990.

Fred J. Balis, M.D., Washington University, 1989.

David Ban, M.D., University of Oregon, 1980.

Frederick D. Bauschard, M.D., University of Pittsburgh, 1968. (Dermatology)

Daniel B. Bauwens, M.D., Washington University, 1975.

Richard C. Bell, M.D., Washington University, 1988. (Dermatology)

William W. Benedict, M.D., Washington University, 1975.

Laurence A. Berarducci, M.D., Wayne State University, 1985.

Susan Berdy, M.D., St. Louis University, 1984.

Stanley I. Biel, M.D., University of Illinois, 1978.

Gail L. Birkenmeier, M.D., Washington University, 1987.

Joyce E. Boehmer, M.D., University of Missouri, 1979. (See Health Key Medical Group.)

Dee C. Boswell, M.D., University of Illinois, 1963.

Scott A. Brodarick, M.D., University of Illinois, 1975.

Jeffrey S. Brooks, D.P.M., New York College of Podiatric Medicine, 1974. (Podiatry)

Kathleen S. Brunts, M.D., St. Louis University, 1981. (See Health Key Medical Group.)

John M. Cary, M.D., St. Louis University, 1958.

Duck Sung Chun, M.D., Seoul National University College of Medicine, 1969.

Kathleen M. Cizek, M.D., The University of Chicago, 1990.

Frank Cohen, M.D., University of Toronto, 1939.

Charles Crecelius, Ph.D., St. Louis University, 1984; M.D., 1984.

Robert B. Cusworth, M.D., University of Rochester, 1974.

Wilson L. Davis, Jr., M.D., University of Iowa College of Medicine, 1978.

Thomas A. Dew, M.D., University of Arkansas, 1967.

Jacquelyn M. Dilworth, M.D., Howard University, 1983. (Dermatology)

Thomas D. Doerr, M.D., The University of Chicago, 1983. (See Health Key Medical Group.)

Irl J. Don, M.D., Washington University, 1972. (See Health Key Medical Group.)

James W. Donnelly, Washington University, 1986. (Dermatology)

Preston M. Dunnmon, M.D., Duke University, 1984.

Royal J. Eaton, M.D., University of Missouri, 1964.

James H. Epstein, M.D., Washington University, 1969.

Carol F. Evers, M.D., Brown University, 1977.

Michael J. Fedak, M.D., University of Missouri, 1982. (See Health Key Medical Group.)

David Feldman, M.D., Washington University, 1943.

Norman Fishman, M.D., Columbia College of Physicians and Surgeons, 1974.

B. Todd Forsyth, M.D., Washington University, 1947.

Daniel Gaitan, M.D., University of Mississippi, 1986.

Kathleen M. Garcia, M.D., Harvard University, 1980.

William M. Gee, M.D., Washington University, 1981.

Kenneth W. Gentsch, M.D., Washington University, 1958.

Connie F. Gibstine, M.D., University of Missouri, 1980. (Dermatology)

Laura Dyer Grady, M.D., Washington University, 1989. (Dermatology)

Ronald K. Grady, M.D., Washington University, 1966.

C. Bruce Graves, M.D., Washington University, 1988.

Mark H. Gregory, M.D., University of Vermont College of Medicine, 1986.

Jitendra K. Gupta, M.B., B.S., King George Medical College, 1964.

Thomas E. Hakes, M.D., University of Iowa College of Medicine, 1978.

Anne Herron, M.B., B.Ch., Dublin University, 1965.

William E. Hinkley, M.D., Harvard University, 1969.

Sandra S. Hoffman, M.D., University of Kansas, 1976.

Bruce J. Hookerman, M.D., St. Louis University, 1968. (Dermatology)

Barbra A. Horn, M.D., Washington University, 1982.

John W. Hubert, M.D., Washington University, 1975.

Daryl L. Jacobs, M.D, Washington University, 1983.

Myron H. Jacobs, M.D., Louisiana State University, 1969.

Steven Jacobson, M.D., St. Louis University, 1985.

Amy Joseph, M.D., Vanderbilt University, 1986.

Renee J. Kanan, M.D., Washington University, 1986.

David Kelley, M.D., Howard University, 1980.

Naeem Khan, M.D., Khyber Medical College, 1973.

Linda M. Klutho, M.D., University of Missouri, 1984.

Kevin L. Konzen, M.D., University of Illinois, 1984.

Alex H. Kosloff, M.D., St. Louis University, 1980.

Roop Lal, M.D., Osmania Medical College, India, 1975.

Daniel K. Lane, M.D., Washington University, 1959. (Dermatology)

Howard S. Lite, M.D., University of Missouri, 1983.

Roberta Loeffler, M.D., Washington University, 1984.

Beverly A. Logan-Morrison, M.D., Washington University, 1982.

James F. Loomis, Jr., M.D., University of Arkansas, 1985.

Dan William Luedke, M.D., Baylor, 1971.

Michael E. McCadden, M.D., Vanderbilt University, 1982. (Dermatology)

Oliver McKee, M.D., Royal College for Surgeons, Ireland, 1981. (Dermatology)

Gerald M. Mahon, M.D., University of Texas, Dallas, 1983. (See Health Key Medical Group.)

Susan M. Manns-Rizzo, M.D., St. Louis University, 1984. (See Health Key Medical Group.)

David M. Margolis, M.D., University of Manitoba, 1971.

David B. Marrs, M.D., University of Texas Southwestern Medical School, 1978. (Dermatology)

Jerald Maslanko, M.D., Emory University, 1975. (See Health Key Medical Group.)

Henry E. Mattis, M.D., Washington University, 1975.

Charles W. Miller, M.D., Washington University, 1972. (Dermatology)

Austin F. Montgomery, M.D., University of Pittsburgh, 1954.

John E. Nester, M.D., University of Illinois, Chicago, 1985.

G. Patrick O'Donnell, M.D., Autonomous University of Guadalajara, 1977.

Robert F. Onder, Jr., M.D., Washington University, 1987.

S. Michael Orgel, M.D., St. Louis University, 1965.

Robert F. Owen, M.D., Yale University, 1952.

Amanullah K. Pathan, M.D., Liaquat Medical College, 1969.

Rebecca D. Peck, M.D., Washington University, 1986. (Dermatology)

Lee S. Portnoff, M.D., Washington University, 1978. (Dermatology)

John A. Powell, M.D., University of Michigan, 1971. (Dermatology.)

David Prelutsky, M.D., St. Louis University, 1979.

William R. Reilly, M.D., University of Illinois, 1980.

Lisa B. Ring, M.D., Washington University, 1980. (Dermatology)

Garry C. Robben, M.D., St. Louis University, 1962.

Ernest T. Rouse III, M.D., Washington University, 1971.

Kenneth J. Rybicki, M.D., Ph.D., University of Texas, Southwestern Medical School, 1987.

Mehrdad Saeed-Vafa, M.D., Ferdowsi University, 1973.

Lawrence E. Samuels, M.D., Washington University, 1976. (Dermatology)

Guadalupe Sanchez, M.D., Ph.D., Duke University, 1980. (Dermatology)

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)

Kenneth E. Shafer, M.D., St. Louis University, 1979.

Anil S. Shah, M.D., Smt. N.H.L. Medical College, Agnedabad, India, 1978.

Atul S. Shah, M.B., B.S., Medical College of India, 1980.

Bharat J. Shah, M.B., B.S., Guharat University, 1973.

John B. Shapleigh II, M.D., Washington University, 1946.

Gerald S. Shatz, M.D., Washington University, 1974.

Carol M. Simmons, M.D., Washington University, 1979.

Raymond Smith, M.D., University of Virginia, 1984.

Allen D. Soffer, M.D., University of Missouri, Kansas City, 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 Medical Group.)

William M. Thomson, M.D., The Johns Hopkins University, 1973.

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 Medical Group.)

David J. Tucker, M.D., St. Louis University, 1981.

Dolores R. Tucker, M.D., Washington University, 1974. (Dermatology)

John H. Uhlemann, M.D., Washington University, 1971. (Dermatology)

Stanley G. Vriezelaar, M.D., University of Iowa, 1981.

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.

Daniel W. Whitehead, Jr., M.D., Washington University, 1980.

James R. Wiant, M.D., Jefferson Medical College, 1959.

Deborah Wienski, M.D., Tufts University, 1983.

George A. William III, M.D., Medical College of Wisconsin, 1972.

Nancy J. Williams, M.D., University of Kansas, 1987. (See Health Key Medical Group.)

R. Jerome Williams, Jr., M.D., Duke University, 1977. (Also Health Service.)

Wendell Williams, M.D., Baylor College, 1982.

Edward M. Wolfe, M.D., Washington University, 1960. (Dermatology)

James A. Wood, M.D., Washington University, 1949.

Robert E. Ziegler, Ph.D., Duke University, 1980; M.D., 1986. (Dermatology)

Research Associates

Charlene A. Abrams, M.S., Weizmann Institute of Science, 1985.

Juan Carlos Bandres, M.D., Universidad Complutense, 1983.

Coleen Sue Bosch, Ph.D., Washington University, 1988.

Anil Kumar Chauhan, Ph.D., AIIMS, New Delhi, India, 1987.

Lin Cheng, M.A., Wuhan University, 1983.

Janette Coble, M.S., Washington University, 1990.

Lynn B. Dustin, Ph.D., Harvard University, 1990.

Svetlana G. Elberg, M.S., University of Kharkov, 1959.

Michael Engle, Ph.D., St. Louis University, 1976.

Jane Lewis Finch, B.S., Central Missouri State University, 1971.

Robert J. George, Ph.D., University of Texas, 1984.

Marilyn M. Gordon, B.A., Lindenwood College, 1956.

Walter T. Gregory, B.S., St. Louis University, 1960.

Alane Gresham, Ph.D., Univerity of Hawaii, 1992. (Dermatology)

Minxiang Gu, M.D., Shanghai Second Medical University, 1984.

Guang-Jin Im, Ph.D., University of North Carolina, 1992.

Anne B. Jefferson, Ph.D., Stanford University, 1989.

Shigehito Kamimura, M.D., Kawasaki University, 1984; Ph.D., Okayama University, 1991.

Tatiana Karelina, M.D., Institute of Human Morphology, 1984. (Dermatology)

Yasunori Kitamoto, M.D., Kumamoto University, Japan, 1975.

Kun Linda Li, M.D., Sun Yet Sen University, 1982.

Qinglang Li, Institute of Biological Products, 1983.

Xi-Lang Li, Ph.D., Shanghi Institute of Plant Physiology Academia Sinica, China, 1966.

Patricia M. McKevitt, M.S.W., Washington University, 1969.

Hisato Maekawa, M.D., University of Tokyo, 1985; Ph.D., Jichi University, 1992.

Rama Malaviya, Ph.D., Lucknow University, 1987. (Dermatology)

David Mancuso, Ph.D., University of Pittsburgh, 1982.

Keith A. Marrs, M.S., Washington University, 1991.

Mitsuru Matsumoto, M.D., Ehime University, 1983; Ph.D., 1988.

Kun Meng, Ph.D., Bejing Medical University, 1991.

Karen Mullis, Ph.D., University of Alabama, 1990.

Keiko Nakayama, M.D., Tokyo Medical School, 1991.

Susanna Patzold, Ph.D., University of Karlsrut, 1989.

Ann Pawlikowska-Haddal, M.D., Ph.D., Medical Academy of Todz, Poland, 1989.

Betty F. Perry, A.B., Washington University, 1945.

Ding Rong, Ph.D., University of Missouri, 1992.

William T. Roswit, B.A., Washington University, 1973. (Dermatology)

Paul A. Schoening, M.S., University of Minnesota, 1986.

Jeffrey Schorey, Ph.D., University of Texas Health Service Center, 1991.

Christina Sorenson, Ph.D., University of Nebraska, 1989.

Stephen Spooner, M.D., University of Tennessee, Memphis, 1988.

Erik Stabell, M.D., Rush Medical College, 1983.

Chyong-Shwu Su, Ph.D., Georgia State University, 1990.

Sherry A. Steib, B.S., University of Missouri, 1978.

Kairong Tian, M.A., Shandong University, 1986.

Zhang Tonghai, M.D., Tianjun Medical College, 1983.

Linton M. Traub, M.S., University of Witwatersrand, 1987.

Alan D. Waggoner, B.A., University of Missouri, St. Louis, 1984.

Carla J. Weinheimer, B.S., University of Illinois, 1984.

Qungyu Wu, M.D., Suzhou Medical College, 1982.

Jiachun Xue, M.D., Shanghai Medical University, 1983.

John D. York, Ph.D., Washington University, 1993.

Ya-Qun Zhang, B.S., Fudan University, China, 1983.

Mingjie Zhou, Ph.D., Wayne State University, 1991.

Xian-Feng Zhu, M.D., Peking Union Medical College, 1992.

Research Assistants

Kathryn T. Akers, B.S., St. Louis University, 1983. (Dermatology)

Sharon E. Carmody, B.A., Webster College, 1960.

Xi Chen, Ph.D., Washington University, 1993. (Dermatology)

Xianging Chen, Ph.D., University of Houston, 1994.

Howard L. Christopherson, M.S., University of Minnesota, 1953.

Thomas Howard, Sr.

Masahiro Iyori, M.D., Keio University, 1985.

Wei Li, M.D., China Medical University, 1984.

Barry L. Marmer, B.S., University of Cincinnati, 1971. (Dermatology)

Dale F. Osborne, B.S., Louisiana State University, 1971.

Betty F. Perry, A.B., Washington University, 1945.

Debra L. Rateri, B.S., University of Missouri, 1982.

Hirofumi Sawa, M.D., Hokkaido University, Japan, 1990.

John Sloan, Ph.D., Emory University, 1991.

Cynthia Sommers, M.A., University of Michigan, 1986.

Reguina Troianovskaia, Moscow State University, 1983.

Hamideh Zakeri, B.A., University of Missouri, 1990. (Dermatology.)

Min Zhong, M.A., Smith College, 1993.

Assistants (Clinical)

Ana Alvarez-Jacinto, M.D., Santiago De Compostela, Spain, 1981.

William D. Birenbaum, M.D., University of Missouri, 1983.

Steven Cummings, M.D., St. Louis University, 1988.

Marilyn Disch, M.D., University of Kansas, 1988.

George G. Gibbs, M.D., Washington University, 1990.

Nancy Z. Guggenheim, M.D., Brown University, 1980.

Rod E. Hartzel, M.D., Northwestern University, 1985.

Raymond J. Hu, M.D., University of Missouri, 1982.

Robert G. Kopitsky, M.D., Duke University, 1982.

Brent Miller, M.D., Washington University, 1990.

Richard G. Mrad, M.D., St. Louis University, 1985.

John E. Mullins, M.D., Washington University, 1958.

John H. Rice, M.D., University of Missouri, 1980. (See Health Key Medical Group.)

Carol A. Robinson, M.D., University of Missouri, 1985. (See Health Key Medical Group.)

EDWARD MALLINCKRODT DEPARTMENT OF MOLECULAR BIOLOGY AND PHARMACOLOGY

Medical pharmacology is taught as part of the second-year curriculum of medical school. This course elaborates essential concepts in selective toxicity, drug metabolism, and mechanism of action. Detailed mechanisms of drug action in the treatment of a variety of pathological conditions from infection and neoplasia to the regulation of cardiovascular and neurological function are described.

Research in the department emphasizes application of the tools of genetics, molecular and cell biology and bio-organic chemistry to define mechanisms that regulate gene expression, cellular metabolism and differentiation, and to devise ways of modulating these processes in vivo. Students participate with the staff in weekly discussions of recent papers in the literature as well as their own work and that of their colleagues.

SECOND YEAR

Bio 507, 508. Pharmacology

It is the purpose of the pharmacology course, through discussions of existing drugs, to develop general principles which will be applicable as well to drugs of the future. Pharmacology draws heavily on biochemistry, physiology, and microbiology for an understanding of drug action. It looks toward pathology, medicine, and surgery for its uses.

A selection of mini-courses (Special Topics), dealing in depth with more advanced concepts of pharmacology and related topics, is integrated into the medical pharmacology course. Small groups of students regularly meet with the faculty to review and discuss the details and interpretation of original literature articles.

(a) Lectures, conferences, panel discussions.
(b) Laboratory course. Credit 7 units for the year.
Dr. Covey and Staff

RESEARCH

Bio 590.

The facilities of the research laboratories are available to those who wish to carry on an original investigation on problems of their own or on those the faculty is prepared to suggest.

Molecular biology, morphology, and genetics of neural development in the *Drosophila* retina; signal transduction; cell biology of cell-cell interactions. *Dr. Cagan*

Preparation and biochemical characterization of mechanism-based inhibitors of steroid biosynthesis; development of anticonvulsant drugs. *Dr. Covey*

The molecular mechanism of volatile anesthetic action studied both biochemically and by NMR spectroscopy. *Dr. Evers*

Neurochemistry of seizures; neuropharmacology of anticonvulsant and other neurotropic drugs. *Dr. Ferrendelli*

Synthetic organic model systems of membranes, cation and molecule complexes and transporters; synthetic analogs of fatty acids and coenzyme A. *Dr. Gokel*

Analysis of lineage-specific gene expression and axial patterning in the developing and adult gastrointestinal tract of normal, transgenic and chimeric-transgenic mice; gut stem cell biology; genetic and biochemical analysis of protein N-myristoylation. *Dr. Gordon*

Recombinant DNA-site specific mutagenesis and protein chemistry studies of the structure-function relationships in polypeptide neurotoxins which interact with acetylcholine receptors. *Dr. Grant*

Role of peptide hormones in cardiovascular, fluid and electrolyte homeostasis. *Dr. Greenwald*

Molecular regulation of phospholipases involved in signal transduction. *Dr. Gross*

Molecular markers for oxidative damage; biochemical mechanisms of tissue injury by activated white blood cells. *Dr. Heinecke*

Biology of nerve growth factor; neural development and regulation; mechanism(s) of cell death. *Dr. Johnson*

Regulation of cardiac energy metabolic genes during development and in response to physiologic and pathophysiologic stimuli using transgenic mice; molecular genetic basis of cardiomyopathy. *Dr. Kelly*

Mechanism of insulin action; control of protein phosphorylation. *Dr. Lawrence*

Molecular and cellular mechanisms of renal inflammation. *Dr. Lefkowith*

Neurochemistry; regulation of metabolism; quantitative histochemistry; the chemistry of individual human muscle fibers; metabolism of human ova. *Dr. Lowry*

Energy metabolism in hippocampal slices and its response to various stimulants. Implications for control mechanisms and neural-glial interaction. *Dr. McDougal*

Molecular basis of recognition of drugs using NMR, analog synthesis, and computer modeling. *Dr. Marshall*

Synthesis, assembly, and function of synaptic proteins. *Dr. Merlie*

Regulation of prostaglandin endoperoxide gene transcripts by cytokines in the renal mesangial cell. *Dr. Morrison*

Structure, function and regulation of voltage-dependent ion channels; development of "caged" neurotransmitters and second messengers. *Dr. Nerbonne*

The *in vivo* and *in vitro* actions of fibroblast growth factors and their receptors in transgenic mice and embryonic stem cells. Biochemical and genetic analysis of FGF receptor function. *Dr. Ornitz*

Ultraviolet light injury-induced alterations in cellular signal transduction. *Dr. Pentland*

Characterization of the neuroendocrine cellular system. *Dr. Roth*

The molecular basis of cell death in the regulation and function of the immune system. *Dr. Russell*

Receptor cell biology: intracellular pathways of ligands and receptors. *Dr. Schwartz*

Regulation of nuclear genes encoding mammalian mitochondrial proteins. Delineation of molecular defects in human genetic diseases. *Dr. Strauss*

Drug Pharmacology determined using radionuclide imaging techniques (Positron Emission Tomography). *Dr. Welch*

Regulation of gene expression in the cardiovascular system. Developmental biology of the heart. *Dr. Wilson*

ELECTIVES

Descriptions of the following courses are shown in the Division of Biology and Biomedical Sciences:

Bio 509, 510. Current Topics in Pharmacology
Bio 5461. Molecular Recognition

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

Faculty

Alumni Professor and Head of Department

Jeffrey I. Gordon, M.D., The University of Chicago, 1973. (See Department of Medicine.)

Distinguished Professor Emeritus

Oliver H. Lowry, M.D., Ph.D., The University of Chicago, 1937.

Professor Emeritus

F. Edmund Hunter, Jr., M.D., University of Rochester, 1941.

Professors

Irving Boime, Ph.D., Washington University, 1970. (See Department of Obstetrics and Gynecology.)

Peter B. Corr, Ph.D., Georgetown University, 1975. (See Department of Medicine.)

Douglas F. Covey, Ph.D., The Johns Hopkins University, 1973.

James A. Ferrendelli, M.D., University of Colorado, 1962. (See Departments of Neurology and Neurological Surgery and Ophthalmology and Visual Sciences.)

George W. Gokel, Ph.D., University of Southern California, 1971.

Richard W. Gross, M.D., New York University, 1976; Ph.D., Washington University, 1982. (See Department of Medicine.)

Eugene M. Johnson, Jr., Ph.D., University of Maryland, 1970.

David M. Kipnis, M.D., University of Maryland, 1951. (See Department of Medicine.)

David B. McDougal, Jr., M.D., The University of Chicago, 1947.

Garland R. Marshall, Ph.D., Rockefeller University, 1966. (See Department of Biochemistry and Molecular Biophysics and Institute for Biomedical Computing.)

John P. Merlie, Ph.D., University of Pennsylvania, 1973.

Aubrey R. Morrison (Burroughs Wellcome Clinical Pharmacology Scholar), M.B., B.S., University of London, 1970. (See Department of Medicine.)

Alan L. Schwartz, Ph.D., Case Western Reserve, 1974; M.D., 1976. (See Department of Pediatrics.)

Arnold W. Strauss, M.D., Washington University, 1970. (See Department of Pediatrics.)

Michael J. Welch, Ph.D., University of London, 1965. (See Department of Radiology.)

Research Professor

Philip Needleman, Ph.D., University of Maryland, 1964.

Professor (Adjunct)

Edward H. Blaine, Ph.D., University of Missouri, 1970.

Associate Professors

Alex S. Evers, M.D., New York University, 1978. (See Department of Anesthesiology.)

Gregory A. Grant, Ph.D., University of Wisconsin, 1975. (See Department of Medicine.)

John C. Lawrence, Jr., Ph.D., University of Virginia, 1978.

James B. Lefkowith, M.D., The Johns Hopkins University, 1979. (See Department of Medicine.)

Jeanne M. Nerbonne, Ph.D., Georgetown University, 1978.

Alice Pentland, M.D., University of Michigan, 1978. (See Department of Medicine.)

John H. Russell, Ph.D., Washington University, 1974.

Associate Professor (Adjunct)

Daniel P. Getman, Ph.D., University of Minnesota, 1982.

Assistant Professors

Walter A. Boyle III, M.D., University of California, San Francisco, 1977. (See Department of Anesthesiology.)

Ross L. Cagan, Ph.D., Princeton University, 1989.

James E. Greenwald, Ph.D., Ohio State University, 1980; M.D., 1983. (See Department of Medicine.)

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.)

David M. Ornitz, Ph.D., University of Washington, 1987; M.D., 1988.

Kevin A. Roth, M.D., Ph.D., Stanford University, 1985. (See Department of Pathology.)

David B. Wilson, M.D., Ph.D., Washington University, 1986. (See Department of Pediatrics.)

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 also offers a number of advanced courses, primarily designed for graduate students, but open to medical students. Advanced elective research activities are offered by faculty in the Department.

FIRST YEAR

M30 501. Medical Microbiology

The Microbiology course is given in the second semester of the first year and combines topics in general medical microbiology and microbial pathogenesis. The first half of the course focuses on bacterial structure, physiology, and genetics, including lectures on the mechanisms of antibiotic action and resistance. The second half 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.

RESEARCH

Bio 590.

These electives acquaint the student with the analyses that are used in present-day biomedical research, especially at the molecular level. *Staff*

Molecular mechanisms of bacteria-inflammatory cell interactions: Role of fimbrial adhesins in modulating mediator release and bacterial phagocytosis. *Dr. Abraham*

Autoimmunity with an emphasis on the complement system and immune complex processing: functional, genetic, biochemical and molecular approaches. *Dr. Atkinson*

Genome organization and gene function in gastric-pathogen *Helicobacter pylori*. Molecular epidemiology and evolution. *Dr. Berg*

Mechanisms and control of phagocytic function, with particular emphasis on signal transduction from integrins during adhesion and phagocytosis. *Dr. Brown*

Genetics of *Streptococcus pyogenes* and other gram positive bacterial pathogens. Biology of conjugative transposons. Pathophysiology of infections caused by gram positive bacteria. *Dr. Caparon*

Novel genes within the HLA complex. Analysis of cytokine function through targeted mutation *in vivo*. *Dr. Chaplin*

Genetics and molecular biology of *Mycobacterium leprae* and *Mycobacterium tuberculosis*. *Dr. Clark-Curtiss*

Regulation of complement and acute phase protein gene expression, pulmonary immunology, inflammation. *Dr. Colten*

Structure and biosynthesis of antibodies; role of immune system in ocular inflammatory disease. *Dr. Fleischman*

Regulatory effects of the Kupffer cell of the liver on the local and systemic immune response and the induction of tolerance to organ allografts. *Dr. Flye*

Biochemistry and biology of varicella-zoster virus. *Dr. Gelb*

Cellular biochemistry of malaria and parasitic helminths. *Dr. D. Goldberg*

Enzymology of connective tissue remodeling. *Dr. G. Goldberg*

Molecular basis of pathogenicity of *Histoplasma capsulatum* and *Bordetella pertussis*. In vitro models of respiratory tract infections and toxin effects. Biochemical analysis and genetic manipulation of virulence-related phenotypes. *Dr. Goldman*

Molecular biology of *Salmonella*-macrophage interactions. Mechanisms of bacterial resistance to host microbicidal peptides. Evolution of virulence characters. *Dr. Groisman*

Molecular biology of alphaviruses. Alphavirus gene expression vectors. Antiviral drug design. Structure-function of regulatory proteins. *Dr. Huang*

Study of an advanced macromolecular assembly system: the development of adhesive pili in pathogenic bacteria. Analysis of bacterial adhesins and the structural basis of the recognition function of periplasmic immunoglobulin-like chaperones and ushers required for this process. *Dr. Hultgren*

Biochemistry and genetics of macromolecule regulation: mRNA metabolism in bacteria. *Dr. Kennell*

Histoplasmosis; host-parasite interaction and therapeutic strategies. *Dr. Kobayashi*

Molecular genetics of cell growth and differentiation in normal and malignant lymphocytes. *Dr. Korsmeyer*

Molecular biology of the receptors for IgG. Role of bovine IgG in infant colic. Autoimmunity. *Dr. Kulczycki*

Latency and molecular genetics of herpes simplex virus. *Dr. Leib*

Differentiation and function of mononuclear phagocytes. *Dr. Lin*

Colonization-infection relationship of *Staphylococcus aureus* in human hosts and molecular epidemiology of nosocomial infections. *Dr. Little*

Molecular genetics of lymphocyte specific genes using transfection and transgenic mice. *Dr. Loh*

Outer membrane proteins and pili in pathogenesis and immunity to Haemophilus virulence factors. *Dr. Munson*

Molecular mechanisms of bacterial attachment and bacterial sensing of the environment. *Dr. Normark*

Herpes simplex virus (HSV) DNA replication and the interaction of HSV with neuronal cells at the molecular level. *Dr. Olivo*

Cellular immunology: immediate hypersensitivity immunogenetics. *Dr. Parker*

The role of cytokines in immunoregulation and homing of GI and liver in humans and mice including isograft mouse models of disease. *Dr. Peters*

Phagocytic processing of bacterial antigens. Mechanisms of immune response to intravacuolar pathogens such as *Salmonella typhimurium*. *Dr. Pfeifer*

Structure and function of human retroviruses, including HTLV-I, a cause of leukemia, and HIV, the cause of AIDS. The major focus is in studying the regulation of virus infectivity, replication, assembly, tissue tropism, and pathogenicity. *Dr. Ratner*

Molecular genetics of animal RNA viruses (alphaviruses and flaviviruses such as yellow fever virus and hepatitis C virus): replication, packaging, and virus-host interactions; vaccine and antiviral therapeutic strategies. *Dr. Rice*

Mechanisms employed by the intracellular pathogens *Leishmania* and *Mycobacteria* to survive inside and exploit the potentially hostile environment within host phagocytes. *Dr. Russell*

Mapping and gene context of X chromosome, including several disease genes. *Dr. D. Schlessinger*

Interactions between RNA animal viruses and their host cells. Emphasis on maturation and assembly of viral proteins. Development of specific antiviral reagents. *Dr. M. Schlesinger*

Structure and replication of enveloped RNA animal viruses. *Dr. S. Schlesinger*

Biochemistry, molecular and cellular biology and physiology of cytokines and their receptors, especially interferon-gamma and tumor necrosis factor. *Dr. Schreiber*

Antibody response to polysaccharide antigens in children. Genetic and cellular analysis of antibody repertoire. *Dr. Shackelford*

Novel adaptations for intracellular parasitism by *Toxoplasma* including: cell motility and invasion, regulated secretion, and avoidance of host-cell endocytic processing. Development of molecular genetic methods for analysis of virulence determinants in *Toxoplasma*. *Dr. Sibley*

The molecular basis for the interaction between *Haemophilus influenzae* and human epithelium. *Dr. St. Geme*

Understanding *E. histolyhia* pathogenesis at the molecular level. *Dr. Stanley*

Rapid diagnosis of viral disease emphasizing the use of PCR; molecular epidemiology of respiratory syncytial virus. *Dr. Storch*

The control of lymphocyte activation by protein tyrosine dephosphorylation. *Dr. Thomas*

Use of two different viral systems to investigate issues at interface between virology and immunology, particular attention paid to mucosal immunology and immunology of viral latency. *Dr. Virgin*

Protective immunity and immunodiagnosis of parasitic helminth infections. *Dr. Weil*

Molecular immunology studies which include: 1) immune deficiencies; 2) gene regulation; and 3) receptor biology. *Dr. Wetsel*

ELECTIVES

At present the primary enrollees in these courses are students working for a Ph.D. degree in one of the basic sciences. However, these courses are recommended for interested medical students, especially those who may be considering a career in medical research. Emphasis is placed on the organization and function of living systems at the molecular level. The courses combine formal lectures with student-directed seminars. Those courses most relevant to the field of microbiology are listed under the Division of Biology and Biomedical Sciences.

Bio 5221. Molecular Basis of Microbial Pathogenesis

Primarily for graduate and MSTP students, this seminar course involves discussion of current research on pathogenic microorganisms and their virulence determinants. Emphasis on new research strategies (examining the cellular and molecular basis) of host-pathogen interactions. One and one half class hours per week, 1 unit credit. *Dr. Sibley*

Bio 5392. Molecular Microbiology and Pathogenesis

The first half of this course focuses on prokaryotic physiology and genetics, with special attention to recent discoveries in gene regulation and protein processing. The second half is devoted to microorganisms that cause disease, with emphasis on the molecular interactions between pathogen and host. This is a lecture-based course with weekly discussions of primary research literature. 3 class hours per week, 3 units credit. *Drs. Goldman, Munson*

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

Faculty

Associate Professor and Interim Head of Department

Charles M. Rice, Ph.D., California Institute of Technology, 1981.

Professors

John P. Atkinson, M.D., Kansas University, 1969. (See Department of Medicine.)

Alumni Professor in Molecular Microbiology

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

Eric J. Brown, M.D., Harvard University, 1975. (See Department of Cell Biology and Physiology and Department of Medicine.)

Harvey R. Colten, M.D., Case Western Reserve University, 1963. (See Department of Pediatrics.)

Susan E. Cullen, Ph.D., Albert Einstein College of Medicine, 1971. (See Department of Genetics.)

M. Wayne Flye, M.D., University of North Carolina, 1967; Ph.D., Duke University, 1980; M.A. (hon.), Yale University, 1985. (See Department of Surgery.)

David E. Kennell, Ph.D., University of California, 1959.

George S. Kobayashi, Ph.D., Tulane University, 1963. (See Department of Medicine.)

Stanley J. Korsmeyer, M.D., University of Illinois, 1976. (See Department of Medicine.)

J. Russell Little, Jr., M.D., University of Rochester, 1956. (See Department of Medicine.) (Jewish Hospital)

Dennis Y. Loh, M.D., Harvard University, 1977. (See Departments of Genetics and Medicine.)

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.)

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, Doctor of Medical Science, University of Umea, Sweden, 1971.

Professor (Adjunct)

Joseph M. Davie, Ph.D., Indiana University, 1966; M.D., Washington University, 1968.

Associate Professors

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

Julian B. Fleischman, Ph.D., Harvard University, 1960.

Lawrence D. Gelb, M.D., Harvard University, 1967. (See Department of Medicine.)

William E. Goldman, Ph.D., University of North Carolina, 1980.

Henry V. Huang, Ph.D., California Institute of Technology, 1977.

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.)

Robert S. Munson, Ph.D., University of Connecticut, 1976. (See Department of Pediatrics.)

Marion G. Peters, MB.,B.S., Melbourne University, 1972. (See Department of Medicine.)

David G. Russell, Ph.D., London University, 1982.

Penelope G. Shackelford, M.D., Washington University, 1968. (See Department of Pediatrics.)

Samuel H. Speck, Ph.D., Northwestern University, 1980. (See Department of Pathology.)

Samuel L. Stanley, Jr., M.D., Harvard University, 1980. (See Department of Medicine.)

Gregory A. Storch, M.D., New York University, 1973. (See Department of Pediatrics.)

Matthew L. Thomas, Ph.D., University of Utah, 1981. (See Department of Pathology.)

Gary J. Weil, M.D., Harvard University, 1975. (See Department of Medicine.)

Research Associate Professor

Josephine E. Clark-Curtiss, Ph.D., Medical College of Georgia, 1974.

Associate Professor (Adjunct)

Martin L. Bryant, Ph.D., University of Southern California, 1977; M.D., 1982.

Assistant Professors

Soman N. Abraham, Ph.D., University of Newcastle Upon Tyne, England, 1981. (See Department of Pathology.)

Michael G. Caparon, Ph.D., University of Iowa, 1985.

Daniel E. Goldberg, M.D., Ph.D., Washington University, 1985. (See Department of Medicine.)

Eduardo A. Groisman, Ph.D., The University of Chicago, 1986.

Scott J. Hultgren, Ph.D., Northwestern University, 1987.

David A. Leib, Ph.D., University of Liverpool, 1986. (See Department of Ophthalmology and Visual Sciences.)

Paul David Olivo, M.D., University of Florida, 1981; Ph.D., 1982. (See Department of Medicine.)

John D. Pfeifer, Ph.D., University of California, 1987; M.D., 1988. (See Department of Pathology.)

Joseph W. St. Geme, M.D., Harvard University, 1984. (See Department of Pediatrics.)

L. David Sibley, Ph.D., Louisiana State University, 1985. (See Department of Molecular Microbiology.)

Herbert W. Virgin IV, M.D., Ph.D., Harvard University, 1985.

Rick A. Wetsel, Ph.D., University of Texas, 1982. (See Department of Pediatrics.)

Research Assistant Professors

Bernard Brownstein, Ph.D., University of California, 1968.

Gregory I. Goldberg, Ph.D., Weizmann Institute of Science, 1977. (See Department of Medicine.)

Instructors

Ramaswamy Chandrashekar, Ph.D., University of Bombay, 1987.

Linda G. Eissenberg, Ph.D., University of North Carolina, 1982.

Research Instructors

Anand K. Srivastava, Ph.D., Banaras Hindu University, 1986.

Barbara G. Weiss, Ph.D., Washington University, 1964.

DEPARTMENT 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 Department of Neurology and Neurological Surgery presents the course in Pathophysiology of Nervous System Disorders. The course emphasizes how knowledge derived from basic or clinical investigations leads to improvements in clinical care. The Department also participates in the Clinical Medicine course, providing lectures, demonstrations and teaching exercises with patients in neurological physical diagnosis. In the third year, a three-week clerkship in Neurology and a one-week clerkship in Neurological Surgery introduce students to the clinical care of patients with diseases of the nervous system. Questions pertaining to neurorehabilitation and ethical issues in management of neurological problems are also addressed. In the fourth year, there are opportunities for many varieties of advanced clinical or research experience.

Several Divisions exist within Neurology and Neurological Surgery:
James L. O'Leary Division of Experimental Neurology and Neurological Surgery: *Dr. Woolsey* (Director)

Division of Neuropsychology: *Dr. Petersen* (Director), *Drs. Corbetta, Deuel, Miezin, Shulman*

Division of Pediatric Neurology: *Dr. Rothman* (Director), *Drs. Bourgeois, Brunstrom, Connolly, Deuel, Dodge, Dodson, Kornberg, Neil, Noetzel, Prensky, Thurston, Yamada*

Division of Pediatric Neurosurgery: *Drs. Park, Kaufman*

Division of Rehabilitation: *Dr. Volshteyn* (Director), *Drs. Paczynski, Sunwoo, Thach*

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. Almli, Chen, Clifford, Cross, Dacey, DeWitte, Diringer, Dugan, Gidday, Goldberg, Gutmann, Hsu, Park, Rothman, Snider, Trotter, Yamada, Yu*

Cerebrovascular Disease Section: *Dr. Hsu* (Director), *Drs. Diringer, Goldberg, Powers*

Clinical Neurophysiology Section: *Miller and Yee* (Section Co-Heads)

EEG: Sleep and Evoked Potentials:*Miller, Bourgeois, Duntley, Prensky, Snyder, Yamada*

EMG: *Yee, Al-Lozi, Connolly, Elliott, Lopate*

Dementia and Aging Section: *Dr. Berg* (Director), *Drs. Balota, Buckles, Clifford, Coats, Cohen, Deuel, Edwards, Hosto, Johnson, Koepke, LaBarge, Morris, Storandt, Wittenborn*

Epilepsy and Clinical Neuropharmacology Section: *Dr. Ferrendelli* (Director), *Drs. Bourgeois, Clifford, Dodson, Goldring, John Miller, Park, Rothman, Silbergeld, Yamada*

Functional Neuroanatomy Section: *Dr. Raichle* (Director), *Drs. Carl, Corbetta, Larson, Miezin, Perlmutter, Petersen, Powers, Shulman, Snyder, Tempel, Videen*

Movement Disorders Section: *Dr. Perlmutter* (Director), *Drs. Landau, Tempel*

Neuroclinical Intensive Care Section: *Dr. Diringer* (Director), *Drs. Goldberg, Hsu, Janice Miller, Paczynski, Powers*

Neurodevelopment Section: *Dr. Pearlman* (Director), *Drs. Brunstrom, Deuel, Elliott, Konstantinidou, Noetzel, Rothman, Snider, Woolsey*

Neuroimmunology Section: *Dr. Trotter* (Director), *Drs. Cross, Racke*

Neuromuscular Diseases Section: *Dr. Pestronk* (Director), *Drs. Al-Lozi, Connolly, Elliott, Ms. Florence, Drs. Hunt, Konstantinidou, Kornberg, Lopate, Snider, Yee*

Neurorehabilitation Section: *Dr. Thach* (Director), *Baum, Deusinger, Dromerick, Lux, Sahrmann, Schieber, Sunwoo, Volshteyn*

Areas of Neurosurgical specialization include:
Epilepsy Surgery, *Drs. Goldring, Silbergeld*
Cranial Base Surgery, *Dr. Grubb*
Pituitary Surgery, *Dr. Coxe*
Neuro-oncology, *Drs. Rich, Silbergeld, Dacey*
Pediatric Neurosurgery, *Drs. Coxe, Park, Kaufman*
Cerebrovascular Surgery, *Drs. Dacey, Grubb, Rich*
Spinal Neurosurgery, *Dr. Vollmer*

SECOND YEAR

Neurological Pathophysiology and Introduction to Clinical Neurology and Neurological Surgery

Lectures, demonstrations, and case conferences covering disease mechanisms. *Dr. Pearlman and Neurology-Neurosurgery Staff*

Neurological Examination in Clinical Diagnosis

(Part of interdepartmental course in clinical diagnosis)
Lectures, demonstrations, and practice examinations of neurological patients. *Dr. Pearlman and Staff*

THIRD YEAR

Neurology Clerkship

A full-time, three-week clerkship is provided on the neurology services at Barnes and St. Louis Regional Medical Center. Patients are assigned to students who evaluate and follow them with the resident staff and discuss them regularly in conferences with the senior neurological staff. Students also work in the neurology clinic under staff supervision. *Dr. Choi and Staff.*

Neurosurgical Clerkship

During a one-week, full-time clerkship on the neurosurgery service, the third year student learns: (1) how to evaluate the comatose or head-injured patient, (2) about clinical presentation, diagnostic work-up and treatment of cervical and lumbar disc disease, (3) how to evaluate and treat patients with hemorrhagic and ischemic stroke. *Dr. Dacey and Staff.*

FOURTH YEAR ELECTIVES

Research

A six- to twelve-week elective is available in many areas such as neuroanatomy, neurophysiology, cerebral metabolism and circulation, neurochemistry, neuropharmacology, etc. Facilities are available for qualified students in any year to undertake original research in the laboratories of the department or in the clinics and wards. *Drs. Dacey, Choi, and Staff*

Neurology Subinternship, Consult Neurology, Aging and Dementia

One Subinternship is available at Barnes and one at St. Louis Regional Medical Center. Both have assignments similar to those of interns while meeting the legal restrictions of the State of Missouri. The consult elective at Barnes Hospital involves close collaboration with the consult resident and senior staff. An elective in the clinical aspects of aging and dementia focuses on the clinical assessment and practical management of the elderly patient. *Drs. Choi, Clifford, Morris and Staff*

Clinical Neurosurgery

The goal of the six-week clerkship at Barnes Hospital is to provide an overview of neurological surgery. Responsibilities include patient workup, pre- and post-operative care, and attendance at selected neurosurgical operations. Daily teaching rounds are held with a member of the attending staff. Students also work in the Neurosurgical Clinic and attend the weekly staff conferences. *Dr. Dacey and Staff*

Staff Conferences

Students are invited to attend the Conjoint Neurological Conference (neuropathology, neuroradiology, medical neurology, pediatric neurology, and neurological surgery) held on Wednesday at 3:30 p.m. in the West Pavilion Auditorium. The format of the conference includes clinical presentations, symposia, and CPCs. Neurosurgery Grand Rounds are held weekly at 7:15 a.m. on Wednesday in the Neurosurgery conference room, second floor, McMillan Hospital. Case Management Conference is held every Monday at 5:00 p.m. in Scarpellino Auditorium. Professor's rounds in Neurosurgery are held at 8:00 a.m. on Saturday in 506 McMillan. Regular research conferences on various topics are held throughout the week.

Faculty

Co-Heads of Department

Dennis W. Choi,
Ralph G. Dacey, Jr.

NEUROLOGY

Andrew B. and Gretchen P. Jones Professor of Neurology and Head

Dennis W. Choi, M.D., Ph.D., Harvard University, 1978.

Seay Professor of Clinical Neuropharmacology

James A. Ferrendelli, M.D., University of Colorado, 1962. (See Neurological Surgery, Department of Molecular Biology and Pharmacology, and Department of Ophthalmology and Visual Sciences.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prensky, M.D., New York University, 1955. (See Department of Pediatrics.)

Ernest and Jane G. Stein Professor of Development Neurology

Steven M. Rothman, M.D., State University of New York, Upstate, 1973. (See Department of Anatomy and Neurobiology and Department of Pediatrics.)

August A. Busch, Jr., Professor Emeritus of Neurological Surgery and Lecturer

Henry G. Schwartz, M.D., The Johns Hopkins University, 1932.

Professors Emeriti

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.)

Professor Emeritus

Philip R. Dodge, M.D., University of Rochester, 1948. (See Department of Pediatrics.)

Professors

Harish C. Agrawal, Ph.D., Allahabad University, 1964. (Neurochemistry) (See Departments of Pathology and Pediatrics.)

Leonard Berg, M.D., Washington University, 1949.

Blaise F. D. Bourgeois, M.D., University of Geneva, 1971. (See Department of Pediatrics.)

Ruthmary K. Deuel, M.D., Columbia College of Physicians and Surgeons, 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.

Carlton C. Hunt, M.D., Cornell University, 1942. (Neurophysiology)(See Department of Cell Biology and Physiology) (Also Neurological Surgery.)

William M. Landau, M.D., Washington University, 1947.

Alan L. Pearlman, M.D., Washington University, 1961. (See Department of Cell Biology and Physiology.)

Alan Pestronk, M.D., The Johns Hopkins University, 1970. (See Pathology.)

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

Martha Storandt, Ph.D., Washington University, 1966. (Psychology)(See Department of Psychology.)

W. Thomas Thach, Jr., M.D., Harvard University, 1964. (See Departments of Anatomy and Neurobiology.)

Thomas A. Woolsey, M.D., The Johns Hopkins University, 1969. (George H. and Ethel R. Bishop Scholar in Neuroscience in Neurology and Neurological Surgery.) (Neuroscience) (See Neurological Surgery and Department of Anatomy and Neurobiology, and Department of Cell Biology and Physiology.)

Research Professor

Kenneth B. Larson, Ph.D., Massachusetts Institute of Technology, 1964. (See Institute for Biomedical Computing.)

Professors (Clinical)

Herbert E. Rosenbaum, M.D., University of Oregon, 1949.

E. Robert Schultz, M.D., Washington University, 1955. (See Department of Psychiatry.)

Stuart Weiss, M.D., Washington University, 1954.

Associate Professor Emeritus

Lawrence A. Coben, M.D., Case Western Reserve University, 1954.

Associate Professors

David B. Clifford, M.D., Washington University, 1975. (St. Louis Regional Hospital)

Warren E. Lux, M.D., New York University, 1970.

John C. Morris, M.D., University of Rochester, 1974. (Jewish Hospital) (See Department of Pathology.)

Michael J. Noetzel, M.D., University of Virginia, 1977. (See Department of Pediatrics.)

Joel S. Perlmutter, M.D., University of Missouri, 1979. (See Department of Radiology.)

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

William J. Powers, M.D., Cornell University, 1975. (See Department of Radiology.)

Shirley A. Sahrmann, Ph.D., Washington University, 1973. (Neurophysiology) (See Department of Cell Biology and Physiology and Program in Physical Therapy.)

William D. Snider, M.D., University of North Carolina Medical School, 1977.

John L. Trotter, M.D., Washington University, 1969. (Gordon R. and Thelma B. Coates Scholar in Neurology)

Research Associate Professor

Lyndon S. Hibbard, Ph.D., Michigan State University, 1977. (Neuroscience Imaging) (See Institute for Biomedical Computing.)

Associate Professors (Clinical)

Joseph T. Black, M.D., State University of New York, Upstate, 1965.

Joseph M. Dooley, Jr., M.D., St. Louis University, 1958.

Walter Lemann, M.D., Tulane University, 1979.

Richard S. Sohn, M.D., The University of Chicago, 1968.

Research Scientist

Francis Miezin, M.S., University of Wisconsin, 1972.

Gordon L. Shulman, Ph.D., University of Oregon, 1979. (Neuropsychology) (See Department of Psychology.)

Assistant Professors

Janet Duchek Balota, Ph.D., University of South Carolina, 1982. (See Program in Occupational Therapy.)

Debra A. Barrett, M.D., Yale University, 1979. (See Department of Ophthalmology.)

M. Carolyn Baum, M.A., Webster College, 1979. (See Program in Occupational Therapy.)

Anne M. Connolly, M.D., Indiana University, 1984.

D. Anne Cross, M.D., University of Alabama, 1980.

Michael N. Diringer, M.D., University of Kentucky, 1982.

Alexander W. Dromerick, M.D., University of Maryland, 1986.

Dorothy F. Edwards, Ph.D., Washington University, 1980. (See Program in Occupational Therapy.)

Mark P. Goldberg, M.D., Columbia University College of Physicians and Surgeons, 1984.

David H. Gutmann, M.D., Ph.D., University of Michigan, 1986. (See Departments of Genetics and Pediatrics.)

John W. Miller, M.D., University of Illinois, 1977; Ph.D., 1981.

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.

Marc H. Schieber, M.D., Ph.D., Washington University, 1982. (See Department of Anatomy and Neurobiology.)

Abraham Zvi Snyder, Ph.D., The Rockefeller University, 1977; M.D., State University of New York at Buffalo, 1981.

Oksana Volshteyn, M.D., Minsk State Medical Institute, Minsk, USSR, 1976. (See Department of Medicine.)

J. Richard Wittenborn, Jr., M.D., Washington University, 1973.

Kelvin A. Yamada, M.D., Baylor College, 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

Virginia D. Buckles, Ph.D., University of Wisconsin, Madison, 1981.

Qiang Chen, M.D., Jinan University, 1985; Ph.D., Columbia University, 1990.

Michael Chua, Ph.D., University of New South Wales, 1986.

Julaine Florence, M.H.S, Washington University, 1983.

Kathleen Mann Koepke, Ph.D., University of North Carolina, 1983. (Psychology)

Emily A. LaBarge, M.Ed., University of Missouri, 1980; Ed.D. 1990. (See Department of Psychology.)

Tom O. Videen, Ph.D., University of Washington, 1981. (Neurophysiology) (See Department of Radiology.)

Jian Xu, Ph.D., Shanghai Institute of Materia Medica, Chinese Academy of Sciences, 1991.

Shan Ping Yu, M.D., Ph.D., Capital Institute of Medicine, Beijing, 1979.

Assistant Professor Emeritus (Clinical)

William B. Hardin, M.D., University of Texas, Galveston, 1957.

Assistant Professors (Clinical)

Denis I. Altman, M.B., University of the Witwatersrand, 1975. (See Department of Pediatrics.)

Garrett C. Burris, M.D., University of Southwestern Louisiana, 1968. (See Department of Pediatrics.)

Richard J. Ferry, M.D., St. Louis University, 1962.

Joseph Hanaway, M.D., McGill University, 1960.

J. Michael Hatlelid, M.D., Washington University, 1977.

Robert P. Margolis, M.D., St. Louis University, 1975.

David F. Mendelson, M.D., Indiana University, 1948.

David M. Reisler, M.D., Washington University, 1961.

James R. Rohrbaugh, M.D., Ohio State University, 1974. (See Department of Pediatrics.)

Eli R. Shuter, M.D., Washington University, 1960.

Howard I. Weiss, M.D., Tulane University, 1972.

Instructor Emeritus

Robert J. Mueller, M.D., Washington University, 1936.

Instructors

Muhammad Tahar Al-Lozi, M.D., King Edward Medical College, Pakistan, 1980.

Gregory M. Blume, M.D., University of Kansas, 1989.

Janice E. Brunstrom, M.D., Medical College of Virginia, 1987. (See Department of Pediatrics.)

Laura L. Dugan, M.D., Ohio State University, 1987.

Stephen P. Duntley, M.D., University of Washington, 1988.

Jeffrey L. Elliott, M.D., Washington University, 1988.

Aphrodite D. Konstantinidou, M.D., Aristotelian University of Thessaloniki, Greece, 1986.

Andrew J. Kornberg, M.D., Monash University, Melbourne, 1983. (See Department of Pediatrics.)

Glenn Lopate, M.D., Ohio State University, 1987.

Janice A. Miller, M.D., Eastern Virginia Medical School, 1990.

Richard P. Paczynski, M.D., Mayo Medical School, 1989.

Joy B. Snider, M.D., Ph.D., University of Texas Southwestern Medical School, 1986.

In-Sook Sunwoo, M.D., Woo Sok University, 1959. (See Department of Medicine.)

Kun Xu, M.D., Zhongshan Medical University, 1978.

Research Instructors

Juanita Carl, M.A., Washington University, 1962.

Mary A. Coats, B.S.N., Southern Illinois University Edwardsville, 1980.

Maurizio Corbetta, M.D., University of Pavia, 1985.

Terri L. Hosto, M.S.W., University of Michigan, 1986.

Susan Leon, M.S.N., St. Louis University, 1991.

Lee W. Tempel, M.D., University of Washington, 1981.

Instructors (Clinical)

Sylvia Awadalla, M.D., Ohio State University, 1985.

James S. Bonner, M.D., University of Missouri, 1980. (See Department of Pediatrics.)

David J. Callahan, M.D., Washington University, 1986. (See Department of Pediatrics.)

Bennett D. Frank, M.D., Ph.D., Baylor College of Medicine, 1988.

Gerlyn Friesenhahn, M.D., The University of Texas Health Science Center, 1986.

James M. Goldring, Ph.D., Washington University, 1977; M.D., 1986.

John F. Mantovani, M.D., University of Missouri, 1974. (See Department of Pediatrics.)

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.

Julie Thompson-Dobkin, D.O., Chicago College of Osteopathic Medicine, 1983.

Devin D. Zimmerman, M.D., University of Michigan, 1986.

NEUROLOGICAL SURGERY

Professor and Head

Ralph G. Dacey, Jr., M.D., University of Virginia, 1974.

August A. Busch, Jr., Professor Emeritus and Lecturer

Henry G. Schwartz, M.D., The Johns Hopkins University, 1932.

Professor Emeritus

Sidney Goldring, M.D., Washington University, 1947.

Professors

William S. Coxe, M.D., The Johns Hopkins University, 1948.

James A. Ferrendelli, M.D., University of Colorado, 1962. (See Neurology and Department of Pharmacology and Department of Ophthalmology and Visual Sciences.)

Mokhtar Gado, DMRE, Cairo University, 1960. (See Department of Radiology.)

Herbert Lourie Professor of Neurological Surgery

Robert L. Grubb, Jr., M.D., University of North Carolina, 1965. (See Department of Radiology.)

Carlton C. Hunt, M.D., Cornell University, 1942. (See Neurology and Department of Cell Biology and Physiology.)

Tae Sung Park, M.D., Yonsei University, 1971.

Thomas A. Woolsey, The Johns Hopkins University, 1969. (Ethel R. and George H. Bishop Scholar in Neuroscience) (See Neurology and Department of Anatomy and Neurobiology and Department of Cell Biology and Physiology.)

Associate Professors

Keith M. Rich, M.D., Indiana University, 1977. (See Department of Anatomy and Neurobiology.)

Rene Tempelhoff, M.D., University of Lyon, France, 1984. (See Department of Anesthesiology.)

Research Associate Professor

Jack R. Engsberg, Ph.D., University of Iowa, 1985.

Assistant Professors

Debra A. Barrett, M.D., Yale University, 1979. (See Departments of Ophthalmology and Neurology.)

Andreas H. Burkhalter, Ph.D., University of Zurich, 1977. (See Department of Anatomy and Neurobiology.)

Michael N. Diringer, M.D., University of Kentucky, 1982. (See Neurology.)

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.)

Bruce A. Kaufman, M.D., Case Western Reserve University, 1982.

Daniel L. Silbergeld, M.D., University of Cincinnati, 1984.

Dennis G. Vollmer, M.D., University of Texas, 1979.

Research Scientist

Gary W. Harding, M.S.E., University of Washington, 1983.

Research Assistant

Ernesto Delarosa Gonzales, B.S.N., 1981.

Research Associate

Hans H. Dietrich, Ph.D., Ruhr University, 1986.

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

The student's involvement in obstetrics and gynecology consists of a thorough exposure to the basic concepts in reproductive biology and an active participation in the delivery of medical care to women with gestations normal or at risk, congenital anomalies of the pelvic viscera, structural disorders secondary to difficult childbirth, reproductive endocrinopathies and infertility, and gynecologic malignancies. The third-year clerkship is conducted at Barnes Hospital, Jewish Hospital, and St. Louis Regional Medical Center. Fourth-year electives may be taken at Barnes Hospital or in the many affiliated hospitals in St. Louis. Regularly held conferences in reproductive endocrinology, maternal-fetal medicine, OB-GYN pathology, and gynecologic oncology supplement the student's education.

SECOND YEAR

Second-year students are introduced to obstetrics and gynecology with lectures in reproductive biology which apply the pelvic anatomy and physiology taught in the first year, physiology of tubal transport and ovarian control, myometrial function, placental perfusion, steroidogenesis, genetics, and prenatal diagnosis.

THIRD YEAR

Comprehensive study of the reproductive health needs of women is the focus of the six-week curriculum. Opportunity for supervised active participation is emphasized in out-patient clinics, out-patient surgery, pre- and post-operative surgical management, routine and high risk obstetrics, and care of the infertile and oncology patient. Students are assigned to two clinical rotations at either Barnes, Jewish, or Regional Medical Center. Teaching is provided by the faculty and housestaff. Students participate in all teaching conferences offered by the department, as well as attend a core curriculum lecture series. Student assessment is based on the two clinical rotations and a written examination.

FOURTH YEAR

Fourth-year students wishing to take an externship or research elective can choose from a variety of courses:

Ob-Gyn Subinternships

(A) Endocrinology-Infertility Subinternship. In the office and hospital, the extern participates in the study and treatment of women with reproductive endocrine disorders and infertility. The extern presents patients in conferences, has assigned reading, and obtains experience in the techniques of steroid and gonadotropin quantitation as well as various manipulative procedures. *Dr. Gast*

(B) Pathology Subinternship. The elective elucidates the principles of anatomic pathology as applied to operative material in obstetrics and gynecology. The extern examines gross and microscopic specimens in the Ob-Gyn Pathology Laboratory and reviews pertinent literature with a senior pathologist. *Dr. Gersell*

(C) Gyn Oncology Subinternship. This elective concerns itself with the diagnosis and treatment of malignant tumors of the female reproductive tract. The extern is involved in all aspects of the care of women with gyn malignant tumors. This experience will include the surgical treatment, radiation therapy, and chemotherapy. *Dr. Mutch*

(D) Maternal-Fetal Medicine Subinternship. The subintern participates in the care of women with gestations at risk (e.g., diabetes, hypertension, renal disease, hematologic abnormalities, preterm labor, etc.). Antepartum evaluation and monitoring of the pregnant woman and her fetus are emphasized. *Dr. Holcomb*

(E) Ob-Gyn Preceptorship. Students who participate in this preceptorship spend six weeks with a clinical faculty member who is in private practice. They accompany the physician in the office, make hospital rounds and operate with their preceptors at Barnes, Jewish, and other community hospitals. The student becomes familiar with the experiences of the private practitioner. *Dr. Schreiber*

(F) Obstetric Anesthesiology. In this clinical elective, students receive instruction in the fundamentals of obstetric pain relief and newborn infant management and resuscitation. The pharmacology of sedatives, tranquilizers, narcotics, local anesthetics, inhalation, and intravenous drugs is demonstrated by practical application, emphasizing fetal-maternal implications in the management of labor. Special local anesthetic blocks such as caudal, lumbar epidural, and saddle spinal. Experience is also gained in the management of general anesthesia for minor gynecologic procedures such as postpartum tubal ligations. *Anesthesia Staff*

(G) Perinatal Medicine Subinternship at St. Louis Regional Medical Center. The subintern is provided

with practical experiences and theoretical aspects of the high risk pregnancy, and an opportunity to explore a chosen aspect of the field in depth. The subintern will be assigned patients for initial evaluation and continuing care on the inpatient antepartum service and outpatient High Risk Clinic. The subintern will also be involved in the prenatal testing laboratory. The elective will provide experience in medical and obstetrical complications (e.g., diabetes, hypertension, renal diseases, Rh disease, tocolysis). *Dr. Staisch*

(H) OB/GYN Outpatient Care Subinternship. This experience is designed to acquaint the subintern with the diagnosis and care of outpatients. While primarily located in the Gynecology Clinic and Outpatient Surgery unit, it should provide a more general overview of how to evaluate, diagnose, and provide definitive treatment (both medical and surgical) without hospital admission. The subintern will spend three to four mornings weekly participating in outpatient surgery under the supervision of staff and house staff, and three or four additional half-days in the clinic and private offices, primarily participating with attending staff. Mornings should provide an understanding of mechanisms utilized in providing surgical care to outpatients, while afternoons should introduce the student to both the style and substance of office care. *Dr. McAlister*

(I) Pediatric and Adolescent Gynecology Subinternship. This highly specialized elective is suggested for students who have a special interest in pediatrics or gynecology. The subintern will participate in the initial evaluation and ongoing care of the pediatric and adolescent gynecology patient. The subintern will participate in the outpatient clinic as well as inpatient, emergency room, and operating room experiences. Topics such as menstrual disorders, congenital anomalies, and contraceptive counseling will be stressed. *Dr. Merritt*

Research Electives

(A) Regulation of Placental Hormone Synthesis. The laboratory is interested in the biosynthesis and assembly of multisubunit hormones of the placenta and pituitary. These interests can be divided into two general categories: (1) elucidating the mechanism of several post-translational reactions in the assembly and secretion of newly synthesized hormonal subunits, and (2) studies of the factors governing the expression of several placental and pituitary hormone genes. The approaches to these problems involve the use of site-directed mutagenesis and transgenic animals. Students will be concerned with concepts and techniques of molecular biology as applied to the above research. *Dr. Boime*

(B) Sperm Biochemistry and Andrology. Research is performed in sperm biochemistry, including both the study of the molecular mechanisms used by sperm to penetrate the ova and male andrology. Short-range projects could include toxicology of sperm and sperm-egg association, characterization of several acrosomal proteinases, etc. *Dr. Polakoski*

(C) Bio-Organic Chemical Endocrinology. Estrogen and progesterone control of the development and function of the female reproductive system. Laboratory research is focused on the biosynthesis, transport, and mechanism of hormones with emphasis on the interactions between steroid hormones and macromolecules. New steroid hormone analogs are synthesized and tested for these studies. Also, new potential drugs for treating human ovarian cancer are synthesized and tested *in vitro* and *in vivo*. *Dr. Sweet*

Faculty

Professor and Head of Department

James R. Schreiber, M.D., The Johns Hopkins University, 1972.

Professors Emeriti

James C. Warren, M.D., University of Kansas, 1954; Ph.D., University of Nebraska, 1961. (See Department of Biochemistry and Molecular Biophysics.)

Walter G. Wiest, Ph.D., University of Wisconsin, 1952.

Professors

Irving Boime, Ph.D., Washington University, 1970. (See Department of Pharmacology.)

H. Marvin Camel, M.D., Creighton University, 1950.

James P. Crane, M.D., Indiana University, 1970. (See Departments of Genetics and Radiology.)

Ernst R. Friedrich, M.D., University of Heidelberg, 1954.

Kenneth L. Polakoski, Ph.D., University of Georgia, 1972.

Ronald C. Strickler, M.D., University of Toronto, 1967.

Frederick Sweet, Ph.D., University of Alberta, 1968.

Professors Emeriti (Clinical)

A. Norman Arneson, M.D.,Washington University, 1928. (See Department of Radiology.)

John E. Hobbs, M.D., Washington University, 1927.

Frank B. Long, Jr., M.D., Washington University, 1947.

William H. Masters, M.D., University of Rochester, 1943. (See Department of Psychiatry.)

Melvin A. Roblee, M.D., Washington University, 1925.

Professors (Clinical)

Robert Burstein, M.D., Washington University, 1948.

Associate Professor Emeritus

George J. L. Wulff, Jr., M.D., Washington University, 1933.

Associate Professors

Michael J. Gast, M.D., Ohio State University, 1975; Ph.D., Washington University, 1981.

Deborah J. Gersell, M.D., Washington University, 1975. (See Department of Pathology.)

Asko I. Kivikoski, M.D., University of Turku, 1958; D.Sc., 1967.

Diane F. Merritt, M.D., New York University, 1976.

David G. Mutch, M.D, Washington University, 1980.

D. Michael Nelson, M.D., Ph.D., Washington University, 1977.

Jacques Sauvage, M.D., University of Liege, 1957.

Klaus J. Staisch, M.D., Free University of Berlin, 1966.

Associate Professors Emeriti (Clinical)

Robert S. Goell, M.D., Washington University, 1960.

James Pennoyer, M.D., University of Rochester, 1939.

Associate Professors (Clinical)

S. Michael Freiman, M.D., Washington University, 1955.

Andrew E. Galakatos, M.D., University of Missouri, 1965.

J. Barlow Martin, M.D., Washington University, 1955.

Marvin Rennard, M.D., Washington University, 1952.

Lee A. Rigg, M.D., Washington University, 1971.

Eugene D. Taylor, M.D., Howard University, 1954.

Assistant Professors

Stuart R. Adler, M.D., Ph.D., Duke University, 1982. (See Department of Cell Biology and Physiology.)

Jeffrey M. Dicke, M.D., Ohio State University, 1978.

Diana L. Gray, M.D., University of Illinois, 1981.

Rebecca P. McAlister, M.D., University of Kentucky, 1979.

Randall R. Odem, M.D., University of Iowa, 1981.

Lisa M. Olson, Ph.D., University of Illnois, 1986.

Michael J. Paul, M.D., Northwestern University, 1980.

Janet S. Rader, M.D., University of Missouri, 1983.

Yoel Sadovsky, M.D., Hebrew University, 1985.

Daniel B. Williams, M.D., University of Missouri, Kansas City, 1985.

Research Assistant Professors

Gary L. Murdock, Ph.D., Medical University of South Carolina, 1976.

James L. Thomas, Ph.D., University of Alabama, 1981.

Assistant Professors Emeriti (Clinical)

William Berman, M.D., Washington University, 1935.

Willard C. Scrivner, M.D., Washington University, 1930.

Mitchell Yanow, M.D., Washington University, 1941.

Assistant Professors (Clinical)

Robert L. Becker, M.D., Washington University, 1969.

Bruce L. Bryan, M.D., Washington University, 1977.

Shih-Chung Chang, M.D., Chung-Shan Medical College, 1968.

Robert S. Cohen, M.D., State University of New York, 1962.

Ira C. Gall, M.D., University of Cincinnati, 1951.

C. Richard Gulick, M.D., University of Rochester, 1971.

Richard A. Hartman, M.D., University of Missouri, 1978.

Randall L. Heller, Jr., Ph.D., University of Missouri, 1968; M.D., University of Texas, 1976.

Darwin C. Jackson, M.D., Washington University, 1976.

Jacob Klein, M.D., Jefferson Medical College, 1968.

Justin F. Kraner, M.D., University of Michigan, 1949.

David J. Levine, M.D., Autonomous University of Guadalajara, 1976.

Carolyn M. Martin, M.D., Washington University, 1976.

Nathaniel H. Murdock, M.D., Meharry Medical College, 1963.

Jorge Pineda, M.D., National University of Honduras, 1972.

Jonathan R. Reed, M.D., Meharry Medical College, 1965.

Chotchai Srisuro, M.D., Faculty of Medical Sciences, 1967.

M. Bryant Thompson, M.D., University of California, 1961.

Albro C. Tobey, M.D., Trinity College, University of Dublin, 1972.

Randall W. Tobler, M.D., Washington University, 1984.

J. Leslie Walker, M.D., University of Tennessee, 1960.

Instructors

Lisa M. Adler, M.D., The University of Chicago, 1987.

Jan L. Albrecht, M.D., St. Louis University, 1989.

Steven R. Allen, M.D., Washington University, 1984.

Robert H. Ball, M.D., Oxford University, 1985.

Lisa M. Bernhard, M.D., Louisiana State University, 1985.

Jane E. Corteville, M.D., Washington University, 1983.

Khaled I. Dibbs, M.D., The American University of Beirut, 1989.

N. Edward Dourron, M.D., Medical College of Georgia, 1990.

Thomas J. Herzog, M.D., University of Cincinnati, 1986.

William L. Holcomb, Jr., M.D., Indiana University, 1975.

John D. Isaacs, M.D., University of Mississippi, 1989.

Edward R. Kost, M.D., F. Edward Herbert School of Medicine, 1989.

Lorraine A. Milio, M.D., Rush Medical College, 1981.

Kelle H. Moley, M.D., Yale University, 1988.

Dorothea J. Mostello, M.D., The Johns Hopkins University, 1982.

Jodie Rai, M.D., University of Illinois, Chicago, 1988.

Jaye M. Shyken, M.D., University of Missouri, 1980.

Andrea L. Stephens, M.D., UCLA, 1987.

Instructor Emeritus (Clinical)

Theodore Merrims, M.D., Washington University, 1954.

Instructors (Clinical)

John K. Appelbaum, M.D., Washington University, 1984.(See Health Key Medical Group.)

Frederick V. Behm, M.D., University of Kansas, 1989.

James E. Belcher, M.D., Washington University, 1976.

Joe E. Belew, M.D., St. Louis University, 1957.

Scott W. Biest, M.D., University of Missouri, Kansas City, 1989.

Kathryn L. Botney, M.D., Washington University, 1984.

Joseph C. Boveri, M.D., St. Louis University, 1959.

Joseph F. Boveri, M.D., University of Missouri, Kansas City, 1985.

Lawrence V. Boveri, M.D., University of Missouri, Kansas City, 1988.

Craig W. Boyd, M.D., University of Illinois, Peoria, 1983.

Robert J. Brown, M.D., Washington University, 1983.

Christine M. Cernik, M.D., Rush University, 1983.

Ronald J. Chod, M.D., University of Texas, Dallas, 1983.

Catherine L. Dean, M.D., University of Missouri, Kansas City, 1983.

Michelle R. de Vera, M.D., Washington University, 1989.

Russell B. Dietrich, M.D., University of Illinois, 1970.

Josiah O. Ekunno, M.D., University of Ibadan, Nigeria, 1971.

Renee D. Ewing, M.D., Southern Illinois University, 1984.

Cathleen R. Faris, M.D., University of Kansas, 1982.

Carol A. Graham, M.D., Northwestern University, 1989.

Joseph Hazan, M.D., Ege University Medical School, Turkey, 1971.

Godofredo M. Herzog, M.D., Washington University, 1957.

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.

Mark J. Jostes, M.D., University of Missouri, 1981.

Daniel S. McDonald, M.D., University of Missouri, 1989.

Darryl N. McKinney, M.D., Washington University, 1980.

Theodore M. Meiners, M.D., Washington University, 1948.

Jerry N. Middleton, M.D., Washington University, 1963.

Sam Momtazee, M.D., Shiraz Medical School, 1961.

Alvaro Mora, M.D., Antioquia University.

Gerald Newport, M.D., Washington University, 1953.

Joseph D. O'Keefe, M.D., Washington University, 1950.

Anthony C. Pearlstone, M.D., Washington University, 1985.

Carlton S. Pearse, M.D., Washington University, 1978.

Louis T. Riley, M.D., University of Kentucky, 1980.

Chinda Rojanasathit, M.D., Siriraj Medical School, 1967.

Jerome D. Sachar, M.D., University of Missouri, 1979.

Kevin B. Schaberg, M.D., Washington University, 1966.

Daniel J. Semenoff, M.D., St. Louis University, 1963.

D. Elan Simckes, M.D., Hebrew University, 1989.

John A. Stopple, M.D., University of Wisconsin, 1969.

Jean A. Thomas, M.D., Faculte de Medecine et de Pharmacie d'Haiti, 1972.

Daniel G. Wagner, M.D., St. Louis University, 1989.

Gary M. Wasserman, M.D., University of Missouri, Kansas City, 1980.

Mark S. Wasserman, M.D., University of Missouri, Kansas City, 1984.

David L. Weinstein, M.D., St. Louis University, 1985.

Parker H. Word, M.D., Howard Medical School, 1944.

Research Instructors

Rita Basuray, Ph.D., University of Illinois, 1983.

Roger D. Johnson, Ph.D., University of Tennessee, 1990.

DEPARTMENT OF OPHTHALMOLOGY AND VISUAL SCIENCES

Instruction begins in the second year with examination of the eye and a series of lectures on various aspects of ocular disease. During the third year, students are assigned to an ophthalmology clerkship for one week. In the fourth year, six-week and twelve-week clinical or research electives are offered.

SECOND YEAR

Introduction to clinical ophthalmology begins in the second year with a lecture and practicum (peer exam) on taking an ocular history and performing an ocular exam. Emphasis is on the use of the ophthalmoscope. Additionally, during the second year, there is a series of lectures on various aspects of ocular disease. The emphasis is on ocular manifestations of common systemic diseases, e.g. diabetic retinopathy, hypertensive retinopathy, optic neuritis, papilledema, Grave's ophthalmopathy, etc., as well as common eye diseases, e.g. cataracts and glaucoma. This series of lectures is presented as case problems on which students work prior to the lecture. This "problem-solving" approach has proved to be more successful and more informative than the strict didactic lecture approach. *Dr. M. Smith and Staff*

THIRD YEAR

In the third year, students spend one week in the outpatient eye clinic examining patients with ophthalmology residents. During this week, the students have discussion sessions on various topics with members of the faculty, e.g., differential diagnosis of the "red eye," how to interpret an ophthalmologic consult note, how to handle an ocular emergency in the emergency room (chemical burns, etc.). During this one week, there is again emphasis on the use of the ophthalmoscope, and a problem solving case history-photo album is worked on by the students. *Dr. M. Smith and Staff*

FOURTH YEAR ELECTIVE

The fourth year is a clinical clerkship geared to the student who plans to enter the specialty of ophthalmology. The student's role is that of an extern in that he/she performs the history and ocular exam on patients in the outpatient clinic and/or the various services within the department, e.g. University Eye Service, glaucoma unit, neuro-phthalmology unit, etc. The student is expected to present cases at rounds and conferences. There are one or two students on each of these services for six or twelve weeks. *Dr. M. Smith and Staff*

RESEARCH ELECTIVES

Molecular mechanisms of cataractogenesis. *Dr. Andley*

Transplantation of retinal pigment epithelium. *Dr. Del Priore*

Ocular immunology. *Dr. Ferguson*

Ocular immunology. *Dr. Er-Kai Gao*

Compliance to medical therapy. *Dr. Gordon*

Visual information processing. *Dr. Grosof*

Computer application to visual fields and to the ocular fundus. *Dr. Hart*

Molecular genetics of the lens. *Dr. Hay*

Immunologic studies of uveitis and retinitis. *Dr. Kaplan*

Genetics of herpes simplex. *Dr. Leib*

Neurobiology research involving the retina. *Dr. Lukasiewicz*

Immunology and molecular virology. *Dr. Pepose*

Molecular genetics and biology of cataracts. *Dr. Petrash*

Ocular biomaterials and drug delivery. Inhibitors of non-enzymatic glycation in diabetes. *Dr. Ravi*

Neurobiology, neurochemistry, neuropharmacology; also glaucoma. *Dr. Romano*

Transplantation and cell biology of retina. *Dr. Silverman*

Visual information processing. *Dr. Scott Steinman*

Strabismus and amblyopia. *Dr. Tychsen*

Biochemistry and pharmacology in glaucoma. *Dr. Wax*

Molecular mechanisms in melanomas. *Dr. Fleming*

Faculty

Professor and Head of Department

Henry J. Kaplan, M.D., Cornell University, 1968.

Professor Emeritus

Bernard Becker, M.D., Harvard University, 1944.

Adolph I. Cohen, Ph.D., Columbia University, 1954. (See Department of Anatomy and Neurobiology.)

Robert A. Moses, M.D., University of Maryland, 1942.

Professors

James A. Ferrendelli, M.D., University of Colorado, 1962. (See Department of Neurology and Neurological Surgery and Department of Molecular Biology and Pharmacology.)

William M. Hart, Jr., Ph.D., University of Maryland, 1970; M.D., 1970.

Michael A. Kass, M.D., Northwestern University, 1966.

Allan E. Kolker, M.D., Washington University, 1957.

Jay S. Pepose, Ph.D., University of California, Los Angeles, 1980; M.D., 1982. (See Department of Pathology.)

Morton E. Smith, M.D.,University of Maryland, 1960. (See Department of Pathology.)

Professor Emeritus (Clinical)

Edward Okun, M.D., University of Vermont, 1956.

Professors (Clinical)

George M. Bohigian, M.D., St. Louis University, 1965.

Robert C. Drews, M.D., Washington University, 1955.

Jack Hartstein, M.D., University of Cincinnati, 1955.

Jack Kayes, M.D., Washington University, 1957.

Benjamin Milder, M.D., Washington University, 1939.

James E. Miller, M.D., Medical College of Alabama, 1949. (See Department of Pediatrics.)

Stephen R. Waltman, M.D., Yale University, 1964.

Associate Professor

Philip L. Custer, M.D., Vanderbilt University, 1978.

Mae Gordon, Ph.D., University of Wisconsin, 1978. (See Division of Biostatistics.)

J. Mark Petrash, Ph.D., University of Texas, Galveston, 1981. (See Department of Genetics.)

Martin B. Wax, M.D., University of Southern California, 1978.

Mitchel L. Wolf, M.D., Albert Einstein College of Medicine, 1968.

Associate Professors Emeriti (Clinical)

Glen P. Johnston, M.D., Washington University, 1956.

Harry D. Rosenbaum, M.D., Washington University, 1934.

Theodore E. Sanders, M.D., University of Nebraska, 1933.

Associate Professors (Clinical)

Neva P. Arribas, M.D., Manila Central University, 1954.

James C. Bobrow, M.D., The Johns Hopkins University, 1970.

Isaac Boniuk, M.D., Dalhousie University, 1962.

Dean B. Burgess, M.D.,University of California, 1967.

Robert M. Feibel, M.D., Harvard University, 1969.

M. Gilbert Grand, M.D., Yale University, 1968.

Stephen A. Kamenetzky, M.D., Washington University, 1970.

Terence G. Klingele, M.D., University of California, 1970.

Harry L. Knopf, M.D., Harvard Medical School, 1967.

Robert Joseph Olk, M.D., Rush Medical College, 1975.

Louis J. Rosenbaum, M.D., Washington University, 1963.

Bernd Silver, M.D., University of Louisville, 1956.

Mitchel L. Wolf, M.D., Albert Einstein College of Medicine, 1968.

Assistant Professors

Usha P. Andley, Ph.D., Jawaharlal Nehru University, 1977. (See Department of Biochemistry and Molecular Biophysics.)

Debra A. Barrett, M.D., Yale University, 1979. (See Department of Neurology and Neurological Surgery.)

Lucian V. Del Priore, M.D., University of Rochester, 1982; Ph.D., Cornell University, 1984. (See Department of Biochemistry and Molecular Biophysics.)

Thomas A. Ferguson, Ph.D., University of Cincinnati, 1982. (See Department of Pathology.)

Timothy P. Fleming, Ph.D., University of Missouri, 1985. (See Department of Genetics.)

Cynthia Z. Kenneally, M.D., University of Missouri, 1982.

David A. Leib, Ph.D., The University of Liverpool, 1986. (See Department of Molecular Microbiology.)

Anthony J. Lubniewski, M.D., University of Florida, 1985.

Gregg T. Lueder, M.D., University of Iowa, 1985. (See Department of Pediatrics.)

Peter D. Lukasiewicz, Ph.D., University of Michigan, 1984. (See Department of Anatomy and Neurobiology.)

Carmelo Romano, Ph.D., Stanford University, 1981. (See Department of Anatomy and Neurobiology.)

Martin S. Silverman, Ph.D., University of California, San Francisco, 1984. (See Central Institute for the Deaf.)

Scott B. Steinman, Ph.D., University of Houston, 1989. (See Department of Anatomy and Neurobiology.)

Lawrence Tychsen, M.D., Georgetown University, 1979. (See Department of Anatomy and Neurobiology and Department of Pediatrics.)

Research Assistant Professors

Nalini S. Bora, Ph.D., All India Institute of Medical Science, 1981. (See Department of Pathology.)

Er-Kai Gao, M.D., Peking Medical College, 1983. (See Department of Pathology.)

David H. Grosof, Ph.D., University of California, Berkeley, 1989.

Regine E. Hay, Ph.D., North Carolina State University, 1974.

Rajkumar V. Patil, Ph.D., National Chemical Laboratory, India, 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)

Stanley C. Becker, Ph.D., Washington University, 1951; M.D., Chicago Medical School, 1955.

Edward F. Berg, M.D., Washington University, 1964.

Ronald C. Bilchik, M.D., Washington University, 1967.

Samuel A. Canaan, Jr., M.D., Meharry Medical College, 1954.

Lawrence A. Gans, M.D., Case Western Reserve University, 1977.

James M. Gordon, M.D., University of Minnesota, 1966.

Kenneth O. Green, M.D., University of Missouri, 1960.

Michael J. Isserman, M.D., Washington University, 1975.

William S. Joffe, M.D., Washington University, 1963.

Robert L. Lamberg, M.D., Washington University, 1976.

Barry D. Milder, M.D., Washington University, 1973.

Duane L. Mitzel, M.D., Washington University, 1977.

Matthew Newman, M.D., Columbia University, 1959.

F. Thomas Ott, M.D., Washington University, 1965.

John C. Perlmutter, M.D., Cornell University Medical College, 1971.

Michael B. Rumelt, M.D., Washington University, 1966.

Matthew A. Thomas, M.D., Harvard Medical School, 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, St. Louis, 1988.

Mary Migneco, O.D., University of Missouri, St. Louis, 1991.

V. Nathan Ravi, M.D., University of Miami, 1988; Ph.D., Virginia Tech, 1980.

Research Instructors

Keith A. Laycock, Ph.D., University of Bristol, 1989.

Judith Kelvin Miller, Ph.D., Washington University, 1986.

Instructor Emeritus (Clinical)

Ruth S. Freedman, M.D., Washington University, 1942.

Maxwell Rachlin, M.D., University of Toronto, 1942.

Instructors (Clinical)

Nevinkumar J. Amin, M.B.B.S., Bombay University, 1966.

William L. Becker, M.D., Washington University, 1987.

Gregg J. Berdy, M.D., St. Louis University, 1983.

Bruce H. Cohen, M.D., The Johns Hopkins Medical School, 1980.

Nicholas N. Colosi, M.D., St. Louis University, 1968.

Bruce S. Frank, M.D., Washington University, 1976.

Paul F. Nichols, M.D., University of California, 1982.

Mickey L. Salmon, M.D., Louisiana State University, 1959.

Steven M. Shields, M.D., Washington University, 1986.

Mark H. Spurrier, M.D., Washington University, 1980.

David F. Williams, M.D., Medical College of Ohio, 1984.

DEPARTMENT OF OTOLARYNGOLOGY

Otolaryngology is presented to students in the second-, third-, and fourth-year classes. A clinical pathologic correlation lecture series is presented to sophomores. In the third year of the medical curriculum, each student spends one week on one of the services in East Pavilion or St. Louis Veterans Administration. During this period there is teaching at the bedside, in the operating room, and in the clinic, supplemented by daily afternoon lectures, grand rounds on Wednesdays, and an introduction to audiology as well as to basic ENT research.

Fourth-year students who show a special interest may take a rotating elective in ENT suited to their interests. Some possibilities include research or clinical work. Ample research facilities and ongoing projects are available. Clinical exposure could include oncologic diseases related to the head and neck, otologic diseases, otoneurology, audiology, or middle-ear surgery.

The postgraduate program in Otolaryngology at Washington University School of Medicine consists of one year of general surgery and one year of research in otolaryngology. Following this, there are four years of otolaryngology. During the clinical years of training, residents rotate on various services, which include the Head and Neck Surgery Service at Barnes Hospital, the ENT Clinic, Otology, Plastic Surgery Service, the Veterans Administration Hospitals, Children's Hospital, Jewish Hospital, and St. Louis Regional Hospital. During that time, the resident serves in all aspects of patient care including the outpatient clinic, inpatient hospital care, and the operating room, as well as the various ENT diagnostic laboratories such as vestibular and audiology. There is an increasing degree of responsibility given to residents as they proceed during the training program, depending upon the year in training and also the resident's personal professional development during this time. Didactic teaching consists of a basic science course during the first year of clinical residency. There is also a temporal bone otology course, as well as a head and neck dissection course. Throughout the year, there are didactic lectures on a weekly basis. These lectures consist of Grand Rounds, Morbidity and Mortality Conference and a series of instructional lectures throughout the year which cover all aspects of otolaryngology. During the clinical years, residents are expected to participate in clinical and/or basic research and to publish papers in peer-reviewed journals and they are expected to make presentations at the lectures or Grand Rounds. They are encouraged to submit papers and to make presentations at regional and national otolaryngology meetings. There is a national course consisting of literature given by the American Academy of Otolaryngology in which residents are expected to participate throughout the year. There is also an In-Training Examination given by the American Academy of Otolaryngology which all residents must take on a yearly basis. Throughout their residency, residents receive training in all aspects of otolaryngology including general otolaryngology, head and neck cancer surgery, microvascular reconstructive techniques, facial plastic surgery, otology and neurotology, pediatric otolaryngology including pediatric endoscopy, allergy and endoscopic nasal sinus surgery.

SECOND YEAR

Otolaryngology and Physical Diagnosis

Clinical pathologic correlative lectures in otolaryngology are given to the entire class. Subjects include ear disease, vertigo, nose, sinus and larynx problems, and head and neck cancer. *Dr. Goebel*

THIRD YEAR

Otolaryngology Clerkship

Practical instruction in diagnosis and treatment. Students rotate on the ENT service. This consists of ENT Outpatient Clinic, in-hospital patients and the operating room. One week. *Dr. Goebel*

FOURTH YEAR ELECTIVES

Clinical Clerkship in Otolaryngology

Six-week rotation includes evaluation of ENT problems presented to specialist for diagnosis and treatment. The student participates in the clinic, hospital and operating room. This also includes time on the Pediatric ENT Service, Audiology Voice Laboratory and Vestibular Evaluation Laboratory. Two students are accepted for each rotation. Students select their own options depending on their needs. *Dr. Thawley*

Practicum in Clinical Audiology

Guidance provided in the administration and interpretation of audiometric tests. Emphasis on defining the severity of auditory dysfunction in addition to identifying sites of pathological processes. Theoretical bases of acoustics, anatomy and physiology, and electronics reviewed as they relate to auditory assessment. Modification of conventional test paradigms and hearing aid procedures covered according to each student's interests and needs. *Dr. Skinner*

Neurotology

Active student participation in the physical exam, advanced testing and management of patients with balance dysfunction. Attend patient clinic two days a week and test patients on ENG, rotary chair and computerized platform three days a week. Research participation welcome with prior arrangements. *Dr. Goebel*

RESEARCH ELECTIVES

Inner ear microanatomy and pathology (light- and electron-microscopy). The effects of various ototraumatic agents (e.g., noise, radiation, etc.) on the structure of the inner ear are determined using light and electron microscopic evaluation of the cochlear tissues. *Dr. Bohne*

Topics in microvascular surgery. *Drs. Fredrickson, Haughey*

Glass microelectrodes, intra- and extra-cellular labels, computers, light and electronmicroscopy are used to study aspects of the central and peripheral vestibular system with an emphasis on vestibular efferents in anesthetized and alert fish and squirrel monkeys. *Dr. Highstein*

Evaluation and treatment methods for disorders of the velopharynx and larynx in children. *Dr. Muntz*

Clinical laboratory diagnosis and research into normal and non-normal speech with special emphasis on voice disorders. Students will become familiar with diagnostic procedures and instrumental techniques. *Dr. Painter*

Computer-based studies of head and neck cancer treatment and results. *Dr. Sessions*

Molecular genetics of head and neck tumors. Molecular biological and immunohistochemical approaches are being used to understand the relationship between the genetic alterations associated with carcinogenesis and the clinical behavior of the resulting tumors. Special attention is directed toward the development of diagnostic/prognostic tools. *Drs. Scholnick, Haughey*

Research in implantable hearing aids. *Drs. Skinner, Fredrickson*

Biochemistry and pharmacology of the inner ear. *Dr. Thalmann*

Advanced testing of the vestibulo-ocular reflex (VOR), rotary chair and headshake testing. Posture control testing utilizing computerized dynamic platform posturography. *Dr. Goebel*

Faculty

Lindburg Professor and Head of Department

John M. Fredrickson, M.D., University of British Columbia, 1957; FRCS(C), 1963; Ph.D. (hon.), Sweden, 1975.

Professors Emeriti

S. Richard Silverman, Ph.D., Washington University, 1942. (Audiology), (Also Central Institute for the Deaf and Faculty of Arts and Sciences)

Malcolm H. Stroud, M.D., Ch.B., University of Birmingham, 1945; L.R.C.P., M.R.C.S., 1946; F.R.C.S., 1949.

Ruediger Thalmann, M.D., University of Vienna, 1954.

Professors

Barbara A. Bohne, Ph.D., Washington University, 1971.

Stephen M. Highstein, M.D., University of Maryland Medical School, 1965; Ph.D., University of Tokyo Faculty of Medicine, 1976. (See Department of Anatomy and Neurobiology.)

John Gail Neely, M.D., University of Oklahoma, 1965.

Colin Painter, Ph.D., University of London, England, 1969.

Allen Sclaroff, D.D.S., Temple University, 1972.

Donald G. Sessions, M.D., Washington University, 1962.

Gershon J. Spector, M.D., University of Maryland, 1964.

Research Professor Emeritus and Lecturer

Donald H. Eldredge, M.D., Harvard University, 1946. (Also Central Institute for the Deaf and Faculty of Arts and Sciences)

Research Professors

Ira J. Hirsh, Ph.D., Harvard University, 1948. (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.

Harold M. Cutler, M.D., Tufts College, 1937.

Morris Davidson, M.D., Indiana University, 1938.

Charles C. Jacobs, M.D., Washington University, 1945.

Associate Professor

Rodney P. Lusk, M.D., University of Missouri, 1977. (See Department of Pediatrics.)

Harlan R. Muntz, M.D., Washington University School of Medicine, 1977. (See Department of Pediatrics.)

Alec N. Salt, Ph.D., University of Birmingham, 1977.

Margaret W. Skinner, Ph.D., Washington University, 1976.

Stanley E. Thawley, M.D., University of Texas Medical Branch, 1967.

Michael Valente, Ph.D., University of Illinois, 1975. (Audiology)

Research Associate Professor

A. Maynard Engebretson, D.Sc., Washington University, 1970.

Associate Professors Emeriti (Clinical)

Guerdan Hardy, M.D., Washington University, 1929.

Robert E. Votaw, M.D., State University of Iowa, 1929.

Associate Professors (Clinical)

Laurence A. Levine, M.D., Albany Medical College of Union University, 1971.

Edward H. Lyman, M.D., Washington University, 1937.

Wayne A. Viers, M.D., University of Oklahoma, 1956.

Joseph W. West, M.D., Duke University, 1944.

Assistant Professors

Joel A. Goebel, M.D., Washington University, 1980.

Bruce H. Haughey, M.B., Ch.B., University of Auckland, 1977.

Randal C. Paniello, M.D., University of Illinois College of Medicine, 1984.

Jay F. Piccirillo, M.D., University of Vermont, 1985.

Brock D. Ridenour, M.D., Tulane University , 1985.

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

Research Assistant Professors

Roanne G. Karzon, Ph.D., Washington University, 1982. (Audiology)

Isolde Thalmann, Ph.D., California Western University, 1982.

Assistant Professors Emeriti (Clinical)

Donald R. Ingram, M.D., University of Illinois, 1956.

Herbert M. Smit, M.D., St. Louis University, 1933.

Assistant Professors (Clinical)

Louis S. Altshuler, D.D.S., Ohio State University, 1945.

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 School of Medicine, 1982.

Dee Jay Hubbard, Ph.D., University of Iowa, 1967. (Speech Pathology)

Timothy N. Kaiser, M.D., Harvard University, 1982.

Philip L. Martin, M.D., St. Louis University, 1968.

Claire Matthews, Ph.D., University of Kansas, 1980. (Speech Pathology)

Margaret G. Peak, Ph.D., Columbia University, 1975. (Audiology)

Supote Phipatanakul, M.D., Chulalongkorn Hospital Medical School, 1965.

Albert F. Ruehl, M.D., St. Louis University, 1973.

Peter G. Smith, Ph.D., Purdue University, 1972; M.D., Medical University of South Carolina, 1976.

J. Regan Thomas, M.D., University of Missouri, 1972.

Lloyd Thompson, M.D., Howard University, 1964.

Instructors

Randall A. Clary, M.D., University of Illinois, 1984. (See Department of Pediatrics.)

Carl F. Ehrlich, M.D., University of Missouri, 1965.

Dennis P. Fuller, Ph.D., St. Louis University, 1982. (Speech Pathology)

Don Gay, D.D.S., University of Tennessee, 1966.

Mark F. Stroble, M.D., University of Missouri, 1985.

Mark Wallace, M.D., Louisiana State University, 1987.

Instructors (Clinical)

Marc B. Abrams, D.D.S., University of Missouri Dental School, 1972.

Gerald Bart, M.B.B.S., Karnatak University, 1963.

Perry J. Bartels, D.D.S., Marquette University, Milwaukee, Wisconsin, 1991.

Phadung Chadaratana, M.D., Mahidol University Medical School, Bangkok, Thailand, 1964.

Sheldon C. Cohen, D.M.D., Southern Illinois University at Alton School of Dental Medicine, 1976.

J. Michael Conoyer, M.D., Vanderbilt University, 1975.

Tamara K. Ehlert, M.D., University of Wisconsin, 1983.

James A. Fernandez, M.D., St. Louis University, 1981.

Jay F. Hauser, D.D.S., University of Iowa, 1988.

George R. Kletzker, M.D., University of Missouri, Columbia, 1984.

Richard Maack, M.D., University of Maryland, 1985.

John W. McKinney, M.D., University of Missouri, 1979.

Michael J. Pernoud, D.D.S., University of Missouri at Kansas City School of Dentistry, 1975.

Harold R. Schreiber, D.D.S., University of Missouri, 1977.

Richard E. Schrick, M.D., University of Missouri, 1977.

Herman Turner, D.D.S., Georgetown University, 1951.

Alan P. K. Wild, M.D., Tulane University, 1983.

Research Instructor Emeritus

Marion P. Bryan, A.B., Washington University, 1931.

Research Instructors

Thomas H. Comegys, B.A., Central Methodist College, 1966.

John E. Demott, M.A., University of Missouri, 1978.

Research Associate

William Clark, Ph.D., University of Michigan 1975. (Also Central Institute for the Deaf)

Research Assistant

Timothy A. Holden, B.S.E., University of Iowa, 1984.

Research Scientist

Gary W. Harding, M.S.E., University of Washington, 1983.

DEPARTMENT OF PATHOLOGY

Modern pathology is concerned with the molecular and ultrastructural basis of disease. Historically, morphologic studies provided the foundations of our concepts of disease, and ultrastructural studies continue to add to our understanding, but modern pathology utilizes virtually all of the tools of basic sciences. 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*
Division of Experimental Pathology and Immunology, *Dr. E. Unanue, Dr. R. Schreiber*
Autopsy Pathology, *Dr. J. Saffitz*
Jewish Hospital/Department of Pathology, *Dr. S. Teitelbaum*
Graduate Program in Immunology, *Dr. R. Schreiber*
Pathology Course/Coursemaster, *Dr. S. El-Mofty*

SECOND YEAR

Bio 515, 516. General Pathology

This course is a comprehensive survey of the biology and morphology of human disease. The year begins with a review of basic mechanisms of disease at the cellular and molecular level. Subsequently, the characteristics of major pathologic entities affecting the organ systems of the human body are presented, employing both lectures and laboratory sessions. In the laboratories, small groups of students directly examine gross and microscopic specimens with the assistance of members of the faculty and housestaff. These exercises reinforce the material presented in lecture and give students an opportunity to acquire the basic skills required for making pathologic diagnoses. *Staff*

THIRD AND FOURTH YEARS

Clinical Pathological Conference

The clinical history and treatment of patients who have died are discussed before the class by the physicians and surgeons of the departments concerned. These conferences afford students an opportunity to interpret the clinical observations in light of the postmortem findings. One hour a week during the year. *Staff*

Laboratory Medicine Conference

One hour each week for twelve weeks during Internal Medicine rotations. Problem cases and general principles of Laboratory Medicine are discussed. *Staff*

Tumor Conference

One hour each week for twelve weeks during the surgery and obstetrics and gynecology clerkships. Problem cases are presented for illustration and discussion of all aspects of neoplastic disease. *Staff*

RESEARCH

Bio 590. Research Opportunities

The department encompasses all the major areas of investigation in experimental pathology, immunobiology, and cell biology. Examples include:

Biochemistry of protein handling in immune induction. *Dr. Allen*

Examination of glycoprotein oligosaccharides and their role in endocytosis and cellular recognition. *Dr. Baenziger*

Collagen metabolism and pulmonary pathology. *Dr. Crouch*

Academic surgical pathology. *Dr. L. Dehner*

Biology and Biochemistry of adhesion molecules. *Dr. M. Dustin*

Major focus on neoplasia of the head and neck; particularly salivary gland tumors and carcinoma of the upper aerodigestive tract. *Dr. S. El-Mofty*

Surgical pathology and cytopathology. *Dr. D. Franquemont*

Surgical pathology and cytopathology. *Dr. W. Geary*

Human genome mapping and molecular genetics. *Dr. E. Green*

Hematopathology. Hematological malignancies. *Dr. J. Hess*

Cell and molecular biology of genitourinary neoplasias. *Dr. P. Humphrey*

The regulation of T cell activation. *Dr. O. Kanagawa*

Renal pathology, pediatric pathology. *Dr. Kissane*

Molecular biology of hematological neoplasia. *Dr. S. Korsmeyer*

Experimental diabetes mellitus, tissue culture of islets, transplantation of islets. *Dr. Lacy*

Development of monoclonal antibodies for assessing isoenzymes. *Dr. Ladenson*

Cell surface complement receptors—structure and function. *Dr. Lublin*

Experimental diabetes: biochemical studies of insulin release mechanisms *in vitro*. *Dr. McDaniel*

Pathology of Alzheimer's Disease. *Dr. McKeel*

Developmental expression of genes regulated by nerve growth factor. *Dr. Milbrandt*

Molecular biology of blood coagulation. *Dr. Miletich*

Use of transgenic mice to examine lymphocyte activation. *Dr. K. Murphy*

Studies on antibiotic susceptibility of aerobic and anaerobic bacteria. *Dr. Murray*

Studies of human IgG subclass expression. *Dr. Nahm*

Statistical theory and computer technology applications in laboratory medicine. *Dr. Parvin*

Immune response to infection. *Dr. J. Pfeifer*

Characterization of the neuroendocrine cellular system. *Dr. K. Roth*

Experimental cardiovascular pathology; structure-function relationships in ischemic heart disease. *Dr. Saffitz*

Biochemical mechanisms of cell-substrate and cell-cell adhesion as manifest by blood platelets. *Dr. Santoro*

Pathogenesis of experimental diabetic autonomic neuropathy. *Dr. Schmidt*

Biochemistry and biology of lymphokines. *Dr. Schreiber*

The role of tyrosine kinases in T cell activation. *Dr. A. Shaw*

Placental transport and surface membrane structure and function. *Dr. C. Smith*

Molecular biology of Epstein-Barr virus. *Dr. S. Speck*

Phenotypic characterization of reactive and neoplastic human cells, primarily using immunohistochemical techniques, with special emphasis on pediatric and soft tissue neoplasms. *Dr. P. Swanson*

Metabolic bone disease. *Dr. Teitelbaum*

The control of lymphocyte activation by protein tyrosine dephosphorylation. *Dr. Thomas*

Arachidonic acid biochemistry and the regulation of insulin secretion. *Dr. Turk*

Immunobiology and immunopathology of lymphocyte-macrophage interactions. *Dr. Unanue*

Structural proteins of intracellular vesicles including coated vesicles. *Dr. E. Ungewickell*

Immunocytochemistry and electron microscopy. *Dr. M. Wick*

Vascular structure and function; pathophysiology of diabetic and ischemic vascular disease. *Dr. Williamson*

Alterations in gene expression in hematopoietic differentiation and malignancy. *Dr. M. Zutter*

ELECTIVES

Advanced Special Pathology

A series of seminars discussing timely selected topics in special pathology of human disease, augmented by illustrative cases and emphasizing clinico-pathologic correlations. Reading lists will be circulated and active discussion is encouraged. If the size of the group makes it practical to do so, each student will prepare and conduct a session on a subject of their choice. *Drs. Dehner, Wick and Kissane*

Autopsy Pathology

A full-time elective held during periods 4-8. Students assist in performing autopsies and participate fully in the activities of the Autopsy Service. Supervision is by faculty and house staff pathologists. Emphasis is placed on the student learning as much gross pathology as possible as a preparation to be a pathologist or to serve as a general background in medical, surgical, and neurologic diseases. Weekly conferences include gross and microscopic neuropathology, specialty pathology conference, two research seminars, CPC and autopsy case review conference. Students will help prepare preliminary and final autopsy reports and will do a clinicopathologic project and present their results to the house staff and attending faculty. *Dr. Saffitz and Staff*

Cell Biology of the Immune System

This is a seminar course on the biology of lymphocytes and macrophages and their interaction in normal and pathological conditions. Some background in Immunology is desirable. The course places emphasis on current research on how macrophages function in regulating the immune system in normal conditions, in infectious diseases, and in autoimmunity. Students will read and discuss two to three papers per session. *Drs. Unanue, Allen, Schreiber and Thomas*

Neuropathology

Clinical pathological correlations of neurological diseases will be investigated by the case study method using current and documented material. Participants will partake in gross neuropathological examinations and will be assigned selected cases for discussion of clinical data and gross and microscopic pathological findings, especially in relationship to evolution and mechanism of disease processes. Topics covered will include vascular, infectious, demyelinating, and neuronal diseases, as well as neoplasms of the nervous system. *Dr. Schmidt*

Clinical Laboratory Medicine
See Department of Medicine. *Dr. Santoro and Staff*

Anatomic Pathology—Jewish Hospital
This elective is designed to reacquaint students who have had some clinical experience with the morphological basis of disease, and to permit them to relearn normal morphological relationships. During the elective students will learn to perform gross autopsy dissections, and will be taught how to select appropriate tissue samples for further microscopic, histochemical, immunofluorescent, and electron microscopy study. Subsequently, they will learn how to perform these procedures under supervision of members of the Anatomic Pathology Staff and how to interpret their results. Following completion of appropriate studies, an in-depth report of clinical pathological correlations will be prepared for each autopsy performed. This elective is considered appropriate for students who intend careers in Internal Medicine, Surgery and Radiology.
Dr. Teitelbaum and Staff

Laboratory Medicine—Jewish Hospital
Intensive elective training in Laboratory Hematology: Includes training in immunohematology, coagulation and special as well as routine laboratory hematology procedures. Emphasis will be placed on laboratory procedures and their relationship with patient diagnosis and management. *Dr. Teitelbaum*

Surgical Pathology—Jewish Hospital
This elective is designed to acquaint students with the discipline of Surgical Pathology and to permit them to develop basic skills in histopathological interpretation. This elective will be offered to only one student/period in order to permit maximum interaction with the Surgical Pathology Staff and House Officers. During the course of the elective, the student will be taught to function as a junior House Officer. The student will participate in the examination and dissection of gross specimens, take operating room calls, learn frozen section diagnosis, and formulate histopathological diagnoses, all in conjunction with members of the Senior Staff. Since the Laboratory of Surgical Pathology at Jewish Hospital processes a broad range of medical biopsy material as well as specimens derived from busy surgical subspecialty practice, the elective is considered desirable for students who plan careers in internal medicine and surgery as well as for those who intend to enter the field of pathology.
Dr. Crouch

Surgical Pathology
Surgical pathology offers an elective for a six-week period under Surgical Pathology I. Students participate fully in activities of the Division of Surgical Pathology and they are responsible for dissection and description of gross specimens and microscopic diagnosis under supervision of the senior staff of the Division. Students attend morning conferences with the Director, surgical and medical grand rounds, tumor and subspecialty conferences. In addition, Surgical Pathology II includes rotations through selected subspecialties: Neuropathology, Hematopathology, Dermatopathology, ENT Pathology, and Gynecologic Pathology. *Drs. Dehner, Wick and Staff*

Obstetrical and Gynecological Surgical Pathology
This 6-week elective offers an intensive experience in Ob-Gyn Pathology involving current surgical material from the Ob-Gyn service. Students will be expected to participate fully in the daily activities in the examination of specimens under the supervision of the senior staff. Slide reviews and conference material will be discussed. Students will attend departmental conferences and the Gyn Tumor Conference. *Dr. Gersell and Staff*

In addition to the above, the department offers several advanced courses in the Division of Biology and Biomedical Sciences. These courses are listed below, but are described in the offerings of the Division of Biology and Biomedical Sciences.

Bio 504. Environmental Pathology
Bio 518, 519. Pathology Research Seminar
Bio 5271, 5272. Topics in Immunology

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

Faculty

Professors Emeriti

Edward Mallinckrodt Professor and Head of Department

Emil R. Unanue, M.D., University of Havana, 1960.

Hugh Chaplin, Jr., M.D., Columbia University, 1947. (See Department of Medicine.)

Ruth Silberberg, M.D., University of Breslau, 1931. (Also Lecturer)

Professors

Paul M. Allen, Ph.D., University of Michigan, 1981.

Jacques U. Baenziger, M.D., Washington University, 1975; Ph.D., 1975. (See Department of Cell Biology and Physiology.)

Edmond C. Crouch, Ph.D., University of Washington, 1978; M.D., 1979.

Louis P. Dehner, M.D., Washington University, 1966.

Gerald Kessler, Ph.D., University of Maryland, 1954.

John M. Kissane, M.D., Washington University, 1952. (See Department of Pediatrics.)

Stanley J. Korsmeyer, M.D., University of Illinois, 1976. (See Department of Medicine.)

Michael Kyriakos, M.D., Albert Einstein College of Medicine, 1962.

Robert L. Kroc Professor

Paul E. Lacy, M.D., Ohio State University, 1948; Ph.D., University of Minnesota, 1955.

Jack H. Ladenson, Ph.D., University of Maryland, 1971. (See Department of Medicine.)

Michael L. McDaniel, Ph.D., St. Louis University, 1970.

Jeffrey D. Milbrandt, M.D., Washington University, 1978; Ph.D., University of Virginia, 1983. (See Department of Medicine.)

Joseph P. Miletich, M.D., Ph.D., Washington University, 1979. (See Department of Medicine.)

Thalachallour Mohanakumar, Ph.D., Duke University, 1974. (See Department of Medicine and Department of Surgery.)

Patrick R. Murray, Ph.D., University of California, 1974. (See Department of Medicine.)

John W. Olney, M.D., University of Iowa, 1963. (See Department of Psychiatry.)

Alan Pestronk, M.D., The Johns Hopkins University, 1970. (See Department of Neurology and Neurological Surgery.)

Jeffrey E. Saffitz, Ph.D., Case Western Reserve University, 1977; M.D., 1978. (See Department of Medicine.)

Samuel A. Santoro, M.D., Ph.D., Vanderbilt Univeristy, 1979. (See Department of Medicine.)

Robert E. Schmidt, M.D., Ph.D., Washington University, 1976.

Alumni Professor of Pathology

Robert D. Schreiber, Ph.D., State University of New York, 1973. (See Department of Molecular Microbiology.)

Carl H. Smith, M.D., Yale University, 1959. (See Department of Pediatrics.)

Morton E. Smith, M.D., University of Maryland, 1960. (See Department of Ophthalmology and Visual Sciences.)

Wilma and Roswell Messing Professor

Steven L. Teitelbaum, M.D., Washington University, 1964.

Mark R. Wick, M.D., University of Wisconsin, 1978.

Joseph R. Williamson, M.D., Washington University, 1958.

Professor (Clinical)

Richard Torack, M.D., Georgetown University, 1952.

Associate Professors

Julian L. Ambrus, M.D., Jefferson Medical College, 1979. (See Department of Medicine.)

Cheryl M. Coffin, M.D., University of Vermont, 1980.

John F. DiPersio, M.D., Ph.D., University of Rochester, 1980. (See Department of Medicine.)

Samir K. El-Mofty, Ph.D., Temple University, 1975.

Deborah J. Gersell, M.D., Washington University, 1975.

Jonathan D. Gitlin, M.D., University of Pittsburgh, 1978. (See Department of Pediatrics.)

Lawrence T. Goodnough, M.D., University of Pennsylvania, 1975. (See Department of Medicine.)

Peter A. Humphrey, M.D., Ph.D., University of Kansas, 1984.

Osami Kanagawa, M.D., Okayama University, 1974; Ph.D., 1978. (See Department of Medicine.)

Douglas M. Lublin, Ph.D., Stanford University, 1976; M.D., University of California, Los Angeles, 1982. (See Department of Medicine.)

Daniel W. McKeel, M.D., University of Virginia, 1966.

Kenneth M. Murphy, Ph.D., The Johns Hopkins University, 1982, M.D., 1984.

Moon H. Nahm, M.D., Washington University, 1974. (See Department of Medicine.)

Jay S. Pepose, Ph.D., University of California, 1980; M.D., 1982. (See Department of 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. (Jewish Hospital)

Samuel H. Speck, Ph.D., Northwestern University, 1980. (See Department of Molecular Microbiology.)

Matthew L. Thomas, Ph.D., University of Utah, 1981. (See Department of Microbiology.)

John W. Turk, M.D., Washington University, 1976; Ph.D., 1976. (See Department of Medicine.)

Ernst J. Ungewickell, Ph.D., Free University, Berlin, 1976.

Associate Professor (Clinical)

Steven L. Leary, D.V.M., Iowa State University, 1971. (See Department of Comparative Medicine.)

Research Associate Professor (Clinical)

Curtis A. Parvin, Ph.D., University of Minnesota, 1980. (See Department of Medicine and Division of Biostatistics.)

Associate Professor (Visiting Staff)

Daniel J. Santa Cruz, M.D., University of Buenos Aires, 1971.

Assistant Professors

Soman N. Abraham, Ph.D., University of Newcastle Upon Tyne, England, 1981.

Morey A. Blinder, M.D., St. Louis University, 1981. (See Department of Medicine.)

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.

Michael L. Dustin, Ph.D., Harvard University, 1990.

Thomas A. Ferguson, Ph.D., University of Cincinnati, 1982. (See Department of Ophthalmology and Visual Sciences.)

Larry E. Fields, M.D., Harvard University, 1980. (See Department of Medicine.)

Jay L. Hess, M.D., Ph.D., The Johns Hopkins University, 1989.

Phyllis C. Huettner, M.D., University of Pennsylvania, 1985.

Helen Liapis, M.D., University of Athens, 1972.

Robinna G. Lorenz, M.D., Ph.D., Washington University, 1990. (See Department of Medicine.)

John C. Morris, M.D.,University of Rochester, 1974. (See Department of Neurology.)

John D. Pfeifer, Ph.D., University of California, San Diego, 1987; M.D., 1988. (See Department of Medicine and Department of Molecular Microbiology.)

Jon R. Ritter, M.D., University of Minnesota, 1988.

Andrey S. Shaw, M.D., Columbia University, 1984.

Paul E. Swanson, M.D., Oregon Health Sciences University School of Medicine, 1984.

Herbert W. Virgin IV, M.D., Ph.D., Harvard University, 1985. (See Department of Medicine and Department of Microbiology.)

Mary M. Zutter, M.D., Tulane University School of Medicine, 1981.

Research Assistant Professors

Nalini S. Bora, Ph.D., All India Institute of Medical Science, 1981. (See Department of Ophthalmology and Visual Sciences.)

Er-Kai Gao, M.D., Peking Medical College, 1983. (See Department of Ophthalmology.)

Timothy L. Ratliff, Ph.D., University of Arkansas, 1977.

Frederick P. Ross, Ph.D., University of Warwick, 1976.

Terry Woodford-Thomas, Ph.D., Virginia Polytech, 1982.

Research Assistant Professor (Clinical)

Mitchell G. Scott, Ph.D., Washington University, 1982. (See Department of Medicine.)

Instructors

Judy E. Grishaber, D.O., College of Osteopathic Medicine and Surgery, 1983. (See Department of Medicine.)

William D. Staatz, Ph.D., University of Edinburgh, 1976.

Research Instructors

Katherine C. Chang, Ph.D., University of Iowa, 1974.

Dorothy J. Fiete, B.S., Marymount College, 1966.

Theresa L. Murphy, Ph.D., The Johns Hopkins University, 1983.

Kathleen C. Sheehan, Ph.D., St. Louis University, 1986.

Research Assistants

Shirley B. Carroll, Gradwohl School of Laboratory Technique, 1955.

C. Joan Fink, B.A., Lindenwood College, 1958.

Katherine E. Frederick, B.S., Bradley University, 1977.

Karen G. Green, B.S., Maryville College, 1978.

Yvonne Landt, B.S., Oregon State University, 1971; M.S., University of Illinois, 1972.

Connie A. Marshall, B.S., Southeast Missouri State University, 1978.

Shirley J. Petzold, A.B., Washington University, 1968; M.S., Case Western Reserve University, 1991.

Santiago Plurad, Ph.D., University of Missouri, 1967.

EDWARD MALLINCKRODT DEPARTMENT OF PEDIATRICS

The primary aim of the teaching program of the Department of Pediatrics is to stimulate interest in developmental biology, especially human growth and development, and to provide the student with a foundation sufficiently comprehensive so that he or she will have an appreciation of clinical pediatric problems regardless of his or her future career choice in medicine.

The major clinical and research facilities are in St. Louis Children's Hospital and the newborn services at Barnes Hospital and Jewish Hospital. St. Louis Children's Hospital is a facility with 235 beds and accepts patients through 21 years of age with all types of medical and surgical problems. Hospital admissions average 11,000 annually. Pediatric Medical Ambulatory activity, including subspecialty and emergency visits, averages about 90,000 visits a year. Nearly 5,000 infants are born annually in the Medical Center.

SECOND YEAR

Students are introduced to pediatrics and to the faculty through a series of lectures and symposia designed to acquaint them with the concepts of human growth and development and the effects of age and maturity on reactions to injury and disease. The unique aspects of the physical examination of the infant and child are presented in the Introduction to Clinical Medicine Course. Members of the faculty are active participants in the Sophomore Pathophysiology Course.

THIRD YEAR

A clerkship of six weeks is scheduled where the student participates in the following:

1. Care of inpatients and outpatients, sharing responsibility with resident physicians.
2. Daily rounds and bedside conferences with house staff and attending physicians.
3. Patient management conferences on basic pediatric problems emphasizing pathophysiologic mechanisms.
4. Weekly grand rounds.
5. Weekly case conference.
6. Weekly professors rounds.
7. Pediatric research conferences.

FOURTH YEAR

This year is devoted to elective time which may be spent according to the individual preferences of the student, who may serve as an intern substitute, in the research laboratory or combine clinical and laboratory work. The following electives are offered:

Cardiology

(A) Clinical Elective—Inpatient. The student works as a subintern and is assigned selected patients on the Pediatric Cardiology ward. *Dr. Strauss and Staff*

(B) Clinical Elective—Outpatient. The student will see patients attending all of the outpatient units including both new referrals and follow-up visits. The student will also be responsible for the interpretation of electrocardiograms, echocardiograms, and 24-hour Holter monitor examinations performed in the cardiology non-invasive laboratory. *Dr. Strauss and Staff*

(C) Clinical Elective: Cardiac Catheterization Laboratory. The student receives an introduction to the hemodynamic evaluation of congenital heart disease, as well as the technology utilized in invasive evaluation. She or he will attend the daily cardiac catheterization laboratory conferences (8:00 a.m.) as well as the weekly combined cardiology/cardiac surgery conference (Wednesday at 7:30 a.m.), observe diagnostic and interventional procedures in the cardiac catheterization laboratory, and learn the basics of acquisition and interpretation of the hemodynamic and angiographic data. She or he will also be introduced to digital imaging and computerized data analysis. The degree of participation in procedures will vary according to the student's interest and aptitude. *Dr. Bridges*

(D) Research.

1. Clinical studies on cardiac transplantation in infants, children, and adolescents. Use of non-invasive imaging techniques (ultrasound, nuclear magnetic resonance) for evaluation and management of congenital heart diseases.
Dr. Canter

2. Screening studies of family members of patients with congenital heart malformations to ascertain genetic influences on the incidence of congenital heart disease. Non-invasive imaging is used for detection. Studies concerning the expression of human cDNA in eukaryotic cells which alter cellular morphology and differentiation. The relationship of genes and cancer. These studies involve cell culture, recombinant DNA, RNA expression, cellular morphology and constitutive cellular morphology and inducible expression vectors. *Dr. J. Grant*

3. Studies concern the biosynthesis of mitochondrial proteins, regulation of the nuclear genes encoding them, and delineation of the molecular basis of human deficiencies in these genes. This research involves recombinant DNA technology, cloning of various DNA fragments and cell biological techniques. *Dr. Strauss*

Clinical Laboratories

(A) Studies concern the mechanism by which glucose increases insulin secretion by pancreatic Beta cells. Of particular interest are the roles of calcium-dependent protein kinases in this mechanism. *Dr. Landt*

(B) Studies investigate the cellular processes underlying the transport of nutrients by the human placental syncytiotrophoblast. Plasma membranes isolated specifically from the maternal- and fetal-facing surfaces and cultured trophoblast cells are used to investigate the transport and metabolism of amino acids and calcium. *Dr. Smith*

(C) Studies dealing with the rapid diagnosis of viral infections. Techniques include immunofluorescence, DNA probes, polymerase chain reaction amplification of DNA/RNA and flow cytometry for detection of viral antigens/nucleic acids. Specific areas of investigation include the evaluation of quantitative virologic parameters in the diagnosis of cytomegalovirus and Epstein-Barr virus infection in solid organ transplant recipients and the application of PCR to the diagnosis of systemic, neurologic, ocular, and congenital infections. *Drs. Storch and Arens*

Endocrinology and Metabolism

(A) Clinical Endocrinology and Metabolism. This elective is designed to include broad clinical experience in pediatric endocrine and metabolic problems. The student has the opportunity to evaluate many pediatric endocrine patients and to see some adult patients during weekly rounds. Emphasis is placed on the practical management of common problems such as diabetes, short stature, thyroid, adrenal and other endocrine and metabolic disorders. The student attends rounds and clinics (endocrine, metabolic, and diabetic) and the joint metabolism seminars and rounds held with the medical service. About four to six patients with varied problems are studied in depth every week-during the elective. *Drs. Santiago, Tollefsen, White, Solomon, Hollander, Marshall, and Staff*

(B) Research.

1. Ongoing research in growth disorders includes the study of children with idiopathic and organic hypopituitarism, gonadal dysgenesis, delayed puberty, and short stature of unknown causes. Laboratory research is aimed at identifying variant forms of growth hormone and the somatomedins which may have decreased biological activity and in employing stable isotope tracer techniques to quantify amino acid and protein kinetics in children with growth failure. *Dr. Bier*

2. Ongoing studies involve implementation of intensive insulin therapy, including insulin pumps, to determine its role in halting or slowing the progression of diabetes complications and the progressive loss of islet cell function in newly-diagnosed diabetic children. Cross-sectional studies of the natural history of diabetes complications, and especially the relationship to puberty are also underway through the Diabetes Registry of the DRTC. *Drs. White and Santiago*

3. This laboratory is engaged in the development and application of biochemical techniques to study the structure and function of oligosaccharide units on glycoproteins. The laboratory is currently investigating the biosynthesis and glycosylation of insulin and insulin-like growth factor I (IGF 1) receptors. *Dr. Tollefsen*

Gastroenterology

(A) Natural history studies of pediatric gastrointestinal illness including Henoch Schonlein purpura, x-linked glycogen storage disease, vitamin E deficiency and nutritional problems in chronic illness. *Drs. Keating, Rothbaum*

(B) Cellular biochemistry of a genetic defect in transport of alpha-1-antitrypsin through the endoplasmic reticulum; biochemical mechanism for liver and lung injury in alpha-1-antitrypsin deficient individuals; cell specific regulation of alpha-1-antitrypsin gene expression in hepatocytes, enterocytes and macrophages; structure and function of a cell surface receptor for antitrypsin complexes and amyloid-ß peptide. *Dr. Perlmutter*

(C) The mechanisms involved in the ontogenic expression of canalicular bile acid transport during development. The cellular biology of signaling of the bile acid transport protein to its appropriate domain and subsequent comparison to signaling of other cell surface specific proteins. *Dr. Sippel*

(D) Transcriptional regulation of the lipolytic proteins, lipase and colipase, is a primary interest. Elements modulating cell-specific expression and secretagogue-regulated expression of these genes are identified by transfecting portions of the gene into cultured cells and then measuring expression of a reporter gene. Additionally, the relationship of lipase

and colipase protein structure to their unique function is being investigated by site-specific mutagenesis of the respective cDNAs. *Dr. Lowe*

General Pediatrics

(A) General Clinical Pediatrics—St. Louis Children's Hospital. The student will be assigned patients on the general pediatric divisions for initial evaluation and continuing care. The student works as an extern and is expected to take night call every third night. Students work directly under the supervision of the senior resident, and teaching rounds are conducted by the faculty. The elective will provide experience in management of many pediatric medical conditions including a wide variety of acute and chronic disorders. Aspects of growth and development, preventive medicine and the use of Medical Center and community resources for promotion of child health will be emphasized. *Dr. Colten and Staff*

(B) Primary Care in General Pediatrics. This elective is designed to provide the student with firsthand experience in general pediatric practice in a model ambulatory care setting, the Health Key Medical Group. The major component of the elective is direct patient care under the supervision of senior physicians who are members of the group. The objective of this elective is to provide the student with the actual experience of serving as a general pediatrician providing comprehensive health services to the families of a typical, broadly-based population receiving care in an alternate delivery system. Health Key Medical Group is a teaching and research multispecialty practice located with an office on the School of Medicine campus. (Two optional alternate facilities are located in St. Louis County.) *Dr. Simons*

Genetics

(A) Clinical Genetics. Students will be exposed to a broad variety of clinical problems encountered in the Division of Medical Genetics. Patients will be seen during inpatient consultation as well as during Genetics Clinic. Emphasis during this rotation will be placed in several areas: (1) learning physical examination skills appropriate for dysmorphic patients; (2) approaches to patients with hereditary metabolic disorders and families with genetic disease; (3) integration of diagnostic laboratory and radiographic studies with clinical information in genetic diseases. *Dr. Dowton and Staff*

(B) Research.

1. Research focuses on the classical and molecular cytogenetics of heritable diseases. Current focuses are several: a) The identification of regions of the genome harboring genes involved in congenital heart disease (CHD). Candidate regions are narrowed down to the smallest region of overlap at the molecular level through the evaluation of patients with chromosomal causes for CHD. b) We collaborate with other labs in the search for genes involved in the development of various cancers. c) We are actively involved in the transition of new types of genetic testing from research to clinical service. *Dr. Watson*

2. Studies include: (a) The molecular regulation of acute phase protein biosynthesis as model of understanding gene transcription. (b) Phenotype-genotype correlation in several heritable disorders including skeletal dysplasias, craniofacial disorders and malformation syndromes. *Dr. Dowton*

3. A variety of clinical research protocols are used to investigate the biochemical basis of inherited human enzymopathies. Disorders under study include phenylketonuria and Gaucher disease for which enzyme replacement therapy is being utilized. *Dr. Steiner*

4. Studies directed toward defining the telomeric structure of chromosome 7q are being pursued. In addition, molecular genetic techniques are being utilized to delineate the cause for inherited skeletal malformation complexes. The role of genes in contiguity with the elastin locus in the pathogenesis of Williams syndrome are also being investigated using a variety of molecular genetic technologies. *Dr. Hing*

Hematology and Oncology

(A) Clinical Hematology and Oncology. During this elective students will see a variety of children with hematologic disorders and malignancies. The student will follow patients in the hematology-oncology outpatient unit, work up inpatient consultations, and attend daily hospital rounds on the hematology-oncology patients. The course also includes formal instruction on interpretation of peripheral blood and bone marrow morphology and teaching rounds and conferences. *Dr. Schwartz and Staff*

(B) Research.

1. Basic cell and molecular biological studies are aimed at elucidation of the structure and function of gap junction proteins. *Dr. Beyer*

2. Research interests include the regulation of cell membrane receptor expression during cell growth and specifically the role of phosphorylation in regulating receptor expression and receptor-mediated endocytosis. *Dr. Fallon*

3. Scientific interests include investigating the regulation of T cell mediated immune responses with specific interests in the mechanisms of tolerance. *Dr. Hayashi*

4. Research interests are directed toward understanding the biology of the Fibroblast Growth Factor family, both in oncogenesis and normal embryogenesis, using molecular and cellular approaches. *Dr. MacArthur*

5. Investigative efforts are aimed at the cell biology of cell surface receptors. Using biochemical approaches, we are dissecting the mechanisms responsible for receptor-mediated endocytosis of nutrients and growth factors. *Dr. Schwartz*

6. Dr. Vietti is P.I. of the Pediatric Oncology Group at WUSM and responsible for the organization and execution of 78 protocol studies in the care for children with cancer. An additional interest is new agent studies in pediatric cancer. *Dr. Vietti*

7. The interplay of graft-vs.-host disease and immune recovery are studied post bone marrow transplantation, utilizing recombinant lymphokine technology, as a means of better understanding the cellular interactions that occur in the developing immune system. *Dr. Wall*

8. Research interests focus on the regulation of gene expression and role of tissue-specific transcription factors in early mammalian development. *Dr. Wilson*

Infectious Diseases

(A) Clinical Infectious Diseases. This elective is designed to introduce students to the clinical aspects of infectious diseases in children. Students will consult on both inpatients and outpatients. Regular daily activities will include evaluation of new patients, work rounds on inpatient consults, microbiology teaching rounds in the bacteriology lab, and teaching rounds with the infectious disease attending. Formal teaching sessions include weekly pediatric infectious disease case conferences, a weekly joint clinical conference with the adult infectious disease group, and a weekly journal club. *Dr. Shackelford and Staff*

1. Surface Antigens and Mechanisms of Virulence of *Haemophilus*. *Haemophilus influenzae* is a cause of meningitis, pneumonia and otitis media. *Haemophilus ducreyi* is a cause of an ulcerative sexually transmitted disease. We are employing recombinant and immunological approaches to determine the mechanism(s) of virulence of these pathogens. We are also interested in understanding immunity to these organisms with the goal of vaccine development. *Dr. Munson*

2. The Development of the Human B Cell Response to Polysaccharide Antigens. These studies concern the maturation in children of the subclass repertoire and clonal diversity of antibodies produced in response to bacterial polysaccharide (PS) antigens. We are examining V region gene expression using human hybridomas specific for *Haemophilus. influenzae* type b. Correlates between antibody structure and function will be examined using chimeric antibodies. *Dr. Shackelford*

3. Rapid Diagnosis of Viral Infections. The molecular diagnostics section of the diagnostic virology laboratory is studying the use of the polymerase chain reaction for the diagnosis of viral infections. Current projects include the detection of herpes simplex virus, cytomegalovirus and JC virus on cerebrospinal fluid and parvovirus B19 in blood and amniotic fluid. Future projects will explore other viral infections that are not easily diagnosed using existing methods. *Drs. Storch, Buller and Staff*

4. Role of Mac-1 (CD11b/CD18) in Phagocytosis and Adhesion. Mac-1 is a membrane glycoprotein involved in phagocytosis and adhesion by neutrophils and monocytes. In addition to ligand binding, Mac-1 is involved in second messenger generation during adhesion related functions. We are investigating the mechanism of Mac-1's role in signal transduction. The results of this work are applicable both to understanding host defense and for the control of neutrophil mediated tissue destruction of inflammatory sites. *Dr. Graham*

5. The molecular mechanism of nontypable *Haemophilus influenzae* pathogenicity. Nontypable *H. influenzae* is an important cause of human respiratory tract diseases and a source of substantial morbidity. We are principally interested in characterizing the bacterial and host cell determinants of *H. influenzae* respiratory tract colonization, an essential early step in the pathogenesis of disease. We anticipate that these studies will assist efforts to develop a strategy for preventing nontypable *Haemophilus* disease and will provide insights into host-parasite interactions in general. *Dr. St. Geme*

Nephrology

(A) Clinical Nephrology. This course is designed to provide the student with a wide exposure to all aspects of pediatric renal disease and an opportunity to explore a desired aspect of the field in depth. The student will be an integral part of the Renal Team and as such will see a large number of both inpatients and outpatients. Students will have an opportunity to follow the courses of patients with acute renal disease as well as those with more chronic problems and will help to plan the evaluation and therapeutic management of these patients. Discussions and rounds with the attending staff and fellows emphasize the relationship between clinical problems and the pathophysiology of the underlying disease. These informal teaching sessions are supplemented by more formal sessions. These include renal attending rounds, renal research rounds, and journal clubs which are conducted weekly in conjunction with the Renal Divisions, Barnes and Jewish Hospitals. Attendance at the weekly pediatric grand rounds and pediatric case conferences is encouraged. Students

will be required to present one or two in-depth reviews of areas of interest to them either in renal physiology or clinical topics. *Dr. B. Cole and Staff*

(B) Research.

1. Major interests of the investigator are the study of glomerular and tubular dysfunction in transplant recipients, and the study of hypertension in children with polycystic kidney disease. *Dr. B. Cole*

2. The laboratory is investigating complement gene expression in the kidney and its role in the pathogenesis of glomerulonephritis. *Dr. Ault*

3. The laboratory investigates regulation of ion transport in renal epithelium, especially during maturation. The goals include identification of cellular mechanisms responsible for adaptation in sodium, potassium, bicarbonate, and water transport. *Dr. Vehaskari*

4. The molecular biology of the H^+ transporter in renal epithelium, especially during tubular development, and its abnormalities in acidosis are being investigated. *Dr. Nelson*

Neurology

(A) Clinical Neurology. The student participates as a full member of the neurology service team and is directly responsible for a proportion of the patients on the service under the direction of the senior resident. If the student so chooses, he/she will have the opportunity to take night call every third or fourth night, during which time he/she is responsible for the medical care of the entire unit, as well as for emergency admissions. The student will also see outpatients one day a week, during which time he/she will be able to evaluate outpatient problems.

Students may also elect to spend their elective on the combined consultation-office service. *Dr. Rothman and Staff*

(B) Research.

1. Research in neuropsychology of higher order motor and spatial functions and related cerebral metabolism. *Dr. Deuel*

2. Pharmacokinetics and pharmacodynamic interactions of anticonvulsant drugs. *Dr. Dodson*

3. The use of NMR for quantitation of cerebral blood flow. The use of NMR to quantitate brain injury in neonates. *Dr. Neil*

4. Biochemistry of cytoskeletal proteins in developing rat brain and spinal cord. *Dr. Noetzel*

5. Physiology and pharmacology of central synaptic transmission; biology of anoxic neuronal injury; imaging calcium and mitochondria in human neurodegenerative diseases. *Dr. Rothman*

6. Physiology of excitatory synaptic transmission in the mammalian central nervous system. *Dr. Yamada*

7. The immunology of peripheral neuropathies in children. *Dr. Connolly*

Newborn Medicine

(A) Clinical Newborn Medicine. The goal of this course is to provide students with responsibility for caring for newborn infants (who range from normal, to acutely ill, to chronically ill) and their families. The physiology of the transition from fetal to extrauterine existence, the pathophysiology of specific diseases, and primary accountability of the student for patient management decisions and procedures will be emphasized. In addition, collaboration with nursing staff and other health care providers in decision-making (especially concerning the viability of individual infants) and family management will be regularly required.

Two students during each rotation will be assigned to the Special Care Nursery at St. Louis Children's Hospital and two students to the Labor and Delivery Services at Barnes and Jewish Hospitals. Students assigned to the St. Louis Children's Hospital Special Care Nursery will also have the opportunity to become involved in the transport of acutely ill infants, while those on the Labor and Delivery Service will routinely be involved in normal newborn care and delivery room management. The student will be expected to rotate patient responsibilities every third night. *Dr. Cole and Staff*

(B) Research.

1. Molecular and cellular regulation of manganese superoxide dismutase in normal cellular differentiation and in malignancy. *Dr. Church*

2. (a) Effects of biologic need and payer source on resource allocation for newborn infants; (b) Effect of surfactant therapy on racial disparities in infant mortality. *Dr. Cole*

3. Biology of pain in the newborn infant including behavioral, physiological, biochemical, and neurodevelopmental outcome variables. *Dr. Porter*

4. Studies include: (a) mechanical and neural mechanisms in regulation of upper airway patency in infants and in an animal model; and (b) pathophysiology of sleep apnea, apneic episodes, and Sudden Infant Death Syndrome in young infants. *Dr. Thach*

5. Histologic and functional characterization of pulmonary ischemia-reperfusion injury by positron emission tomography. *Dr. Hamvas*

6. Regulation of expression of gastrointestinal-specific genes using transgenic mice. *Dr. Hauft*

7. Nutritional needs of pregnant and lactating women. *Dr. Downey*

8. Regulation of Expression of Clara Cell secretory protein in lung. *Dr. Hackett*

9. Understanding clinical presentation of infants with chronic lung disease. *Dr. August*

10. Regulation of glucose transporter localization and function. *Dr. Haney*

11. Developmental regulation of growth factor production and response in different populations of human placental cells. *Dr. Fant*

12. Developmental regulation of expression of unique ileal protein using transgenic mice. *Dr. Crossman*

13. Follow-up and treatment of high risk infants and families. *Dr. Wickline*

Pulmonary Diseases

(A) Genetic regulation and ontogeny of the tissue specific expression of complement genes and acute phase proteins as models of inflammation. *Dr. Colten*

(B) The molecular biology of complement deficiencies and structural analysis of the evolution of complement gene families are investigated. *Dr. Wetsel*

(C) (1) Cellular and molecular mechanisms of regulation of complement synthesis by mediators of inflammation. (2) Clinical studies of patients with asthma aimed at understanding the mechanisms of death due to asthma in children. *Dr. Strunk*

(D) The molecular biology of complement deficiencies: specifically in two human families with deficiency of the second component of complement. *Dr. C. Johnson*

E) (1) Factors contributing to sleep hypoventilation during early infancy; (2) central airway mechanics and control in infancy, particularly airways hysteresis and causes of recurrent cyanosis; (3) suffocation as a mechanism for Sudden Infant Death Syndrome. *Dr. J. Kemp*

F) (1) Uses of flexible fiberoptic bronchoscopy and bronchoalveolar lavage in pediatric lung disease; (2) pediatric sleep disorders and the use of polysomnography; (3) pediatric lung transplantation; (4) ethical issues in the care of chronically ill and/or dying children. *Dr. G. Mallory, Jr.*

Faculty

Harriet B. Spoehrer Professor and Head of Department

Harvey R. Colten, M.D., Case Western Reserve University, 1963; M.A. (hon.), Harvard University, 1978. (See Department of Molecular Microbiology.)

Allen P. and Josephine B. Green Professor of Pediatric Neurology

Arthur L. Prensky, M.D., New York University, 1955.(See Department of Neurology and Neurological Surgery.)

Ernest and Jane G. Stein Professor of Developmental Pediatrics

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

Alumni Professor of Pediatrics

Alan L. Schwartz, Ph.D., Case Western Reserve University, 1974; M.D., 1976. (See Department of Pharmacology.)

Professors Emeriti

John C. Herweg, M.D., Washington University, 1945.

Lawrence I. Kahn (Health Care Research), M.D., Louisiana State University, 1945.

Jean H. Thurston, M.D., University of Alberta, 1941. (See Department of Neurology and Neurological Surgery.)

Professor Emeritus and Lecturer

Philip R. Dodge, M.D., University of Rochester, 1948. (See Department 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 College of Physicians and Surgeons, 1961. (See Department of Neurology and Neurological Surgery.)

W. Edwin Dodson, M.D., Duke University, 1967. (See Department of Neurology and Neurological Surgery.)

Alexis F. Hartmann, Jr., M.D., Washington University, 1951.

James P. Keating, M.D., Harvard University, 1963.

John M. Kissane, M.D., Washington University, 1952. (See Department of Pathology.)

William H. McAlister, M.D., Wayne State University, 1954. (See Department of Radiology.)

J. Neal Middelkamp, M.D., Washington University, 1948.

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

David H. Perlmutter, M.D., St. Louis University, 1978. (See Department of Cell Biology and Physiology.)

Julio V. Santiago, M.D., University of Puerto Rico, 1967. (See Department of Medicine.)

Gary D. Shackelford, M.D., Washington University, 1968. (See Department of Radiology.)

Penelope G. Shackelford, M.D., Washington University, 1968. (See Department of Molecular Microbiology.)

Carl H. Smith, M.D., Yale University, 1959. (See Department of Pathology.)

Thomas L. Spray, M.D., Duke University, 1973. (See Department of Surgery.)

Arnold W. Strauss, M.D., Washington University, 1970. (See Department of Biochemistry and Molecular Biophysics.)

Robert C. Strunk, M.D., Northwestern University, 1968.

Jessie L. Ternberg, Ph.D.,University of Texas, 1950; M.D., Washington University, 1953; Sc.D. (hon.), Grinnell College, 1972. (See Department of Surgery.)

Bradley T. Thach, M.D., Washington University, 1968.

Teresa J. Vietti, M.D., Baylor University, 1953. (See Department of Radiology.)

John B. Watkins, M.D., Case Western Reserve University, 1964.

Michael P. Whyte, M.D., State University of New York, Downstate, 1972. (See Department of Medicine.)

Professor Emeritus (Clinical)

Helen E. Nash, M.D., Meharry Medical College, 1945.

Professors (Clinical)

Gordon R. Bloomberg, M.D., University of Illinois, 1959.

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.)

Frederick D. Peterson, M.D., Washington University, 1957.

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 of Beirut, 1984.

Barbara R. Cole, M.D., University of Kansas, 1967.

S. Bruce Dowton, M.D. (Syd.), University of Sydney, 1994. (See Department of Genetics.)

Robert P. Foglia, M.D., Georgetown University, 1974. (See Department of Surgery.)

Jonathan D. Gitlin, M.D., University of Pittsburgh, 1978. (See Department of Pathology.)

Gary E. Hirschberg, M.D., Hahnemann Medical College, 1972. (See Department of Anesthesiology.)

David M. Jaffe, M.D., The University of Chicago, 1978.

Jacob C. Langer, M.D., University of Toronto, 1980. (See Department of Surgery.)

Benjamin C. P. Lee, M.B.B.S., University of London, 1966. (See Department of Radiology.)

Rodney P. Lusk, M.D., University of Missouri, 1977. (See Department of Otolaryngology.)

Susan B. Mallory, M.D., University of Texas, 1974. (See Department of Internal Medicine.)

Charles B. Manley, Jr. (Genitourinary Surgery), M.D., University of Missouri, 1958. (See Department of Surgery.)

Jeffrey L. Marsh, M.D., The Johns Hopkins University, 1970. (See Department of Surgery.)

Robert S. Munson, Ph.D., University of Connecticut, 1976. (See Department of Molecular Microbiology.)

Michael J. Noetzel, M.D., University of Virginia, 1977. (See Department of Neurology and Neurological Surgery.)

J. Julio Pérez Fontán, M.D., Universidad de Santiago, 1977.

Robert J. Rothbaum, M.D., The University of Chicago, 1976.

Marilyn J. Siegel, M.D., State University of New York, Downstate, 1969. (See Department of Radiology.)

Paul S. Simons, M.D., Washington University, 1967.(See Health Key Medical Group.)

Thomas F. Smith, M.D., University of Virginia, 1974.

Gregory A. Storch, M.D., New York University School of Medicine, 1973. (See Department of Medicine.)

Sherida E. Tollefsen, M.D., Washington University, 1975.

Neil H. White, M.D., Albert Einstein College of Medicine, 1975.

Research Associate Professor

Michael L. Landt (Laboratory Medicine), Ph.D., University of Oregon, 1976. (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.

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.

Elliot F. Gellman, M.D., University of Missouri, 1961.

Gene H. Grabau, M.D., Washington University, 1942.

Marshall B. Greenman, M.D., University of Illinois, 1948.

Kenneth A. Koerner, M.D., Washington University, 1941.

John C. Martz, M.D., Washington University, 1942.

Homer E. Nash, Jr., M.D., Meharry Medical College, 1951.

Steven I. Plax, M.D., University of Missouri, 1961.

Mary A. T. Tillman, M.D., Howard University, 1960.

Assistant Professors

Anna M. August, M.D., University of Alabama, 1986.

Nancy D. Bridges, M.D., New York University, 1985.

Burt I. Bromberg, M.D., University of South Alabama, 1981.

Cheryl M. Coffin, M.D., University of Vermont, 1980. (See Department of Pathology.)

Anne M. Connolly, M.D., Indiana University, 1984. (See Department of Neurology and Neurological Surgery.)

Jeffrey G. Dawson, M.D., University of Louisville, 1982.

Joan C. Downey, M.P.H., M.D., Harvard University, 1985.

Michael E. Fant, M.D., Ph.D., Vanderbilt University, 1980.

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

Brian P. Hackett, Ph.D., Boston University, 1984; M.D., 1986.

Aaron Hamvas, M.D., Washington University, 1981.

Peter M. Haney, Ph.D., Case Western Reserve University, 1984; M.D., 1986.

Sherrie M. Hauft, M.D., University of Texas Medical School, Houston, 1984.

Charles A. C. Johnson, M.B., Ch.B., University of Cape Town, 1975.

James S. Kemp, M.D., Creighton University, 1976.

Robert M. Kennedy, M.D., Medical College of Georgia, 1980.

Mark E. Lowe, M.D., University of Miami, 1984.

Gregg T. Lueder, M.D., University of Iowa. (See Department of Ophthalmology and Visual Sciences.)

George B. Mallory, Jr., M.D., Albert Einstein College of Medicine, 1974.

Harlan R. Muntz, M.D., Washington University, 1977. (See Department of Otolaryngology.)

Jeffrey J. Neil, M.D., Ph.D., Washington University, 1984. (See Department of Neurology.)

R. Mark Payne, M.D., University of Texas, 1983.

Fran L. Porter, Ph.D., Washington University, 1977.

Mabel L. Purkerson, M.D., Medical College of South Carolina, 1956. (See Administration and Department of Medicine.)

Joan L. Rosenbaum, M.D., University of Texas, Houston, 1983.

Joseph W. St. Geme, M.D., Harvard University, 1984.

C. Jeffrey Sippel, Ph.D., St. Louis University, 1980; M.D., 1983.

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.)

Rick A. Wetsel, Ph.D., University of Texas, San Antonio, 1982. (See Department of Molecular Microbiology.)

Karen M. Wickline, M.D., St. Louis University, 1986.

David B. Wilson, M.D., Ph.D., Washington University, 1986. (See Department of Molecular Biology and Pharmacology.)

Kelvin A. Yamada, M.D., Baylor College of Medicine, 1983. (See Department of Neurology and Neurological Surgery.)

Research Assistant Professors

Max Q. Arens, Ph.D., Virginia Polytechnic Institute and State University, 1971.

Aaron J. Moe, Ph.D., Virginia Polytechnic Institute and State University, 1984.

Zhi-Fang Zhang, M.D., Shanghai Second Medical University, 1962.

Assistant Professors Emeriti (Clinical)

Martin Calodney, M.D., New York University, 1936.

Samuel W. Gollub, M.D., Washington University, 1941.

Edith C. Robinson, M.D., The Johns Hopkins University, 1932.

Alfred S. Schwartz, M.D., The Johns Hopkins University, 1936.

Assistant Professors (Clinical)

Denis I. Altman, M.B., B.Ch., University of Witwatersrand, 1975. (See Department of Neurology and Neurological Surgery.)

Patricia J. Amato, M.D., Medical College of Ohio, 1982. (See Health Key Medical Group.)

Jill M. Baer, M.D., University of Kentucky, 1975.

Edward T. Barker, M.D., Washington University, 1957.

Max H. Burgdorf, M.D., Washington University, 1974.

Garrett C. Burris, M.D., Louisiana State University, 1968. (See Department of Neurology and Neurological Surgery.)

John C. Davis, M.D., University of Michigan, 1980.

Tulay Dincer, M.D., Hacettepe University, 1977.

Gerald J. Duling, M.D., St. Louis University, 1959.

Ira J. Friedman, M.D., University of Arkansas, 1960.

Tessa D. Gardner, M.D., Harvard University, 1972.

James A. Gerst, M.D., University of Missouri, 1972.

Santosh Gupta, M.B.B.S., Lucknow University, 1963; D.C.H., University of London, 1966.

J. Larry Harwell, M.D., University of Missouri, 1961.

Robert J. Hoffman, M.D., St. Louis University, 1976.

Nancy E. Holmes, M.D., University of Missouri, 1976.

William L. Johnson, M.D., University of Missouri, 1981. (See Health Key Medical Group.)

Michele E. Kemp, M.D., Washington University, 1981.

Henry L. Knock, M.D., The Johns Hopkins University, 1953.

Norton S. Kronemer, M.D., University of Missouri, 1962.

Jack A. Land, Jr., M.D., University of Mississippi, 1977.

Richard L. Lazaroff, M.D., St. Louis University, 1978.

Thomas C. McKinney, M.D., Washington University, 1980. (See Health Key Medical Group.)

M. Michael Maurer, M.D., Washington University, 1972.

Kevin J. Murphy, M.D., St. Louis University, 1978.

Susan Pittman, M.D., University of Missouri, 1963.

James R. Rohrbaugh, M.D., Ohio State University, 1974. (See Department of Neurology and Neurological Surgery.)

Jerry L. Rosenblum, M.D., Washington University, 1974.

William J. Ross, M.D., Washington University, 1972.

Richard W. Sato, M.D., Washington University, 1977.

Blaine M. Sayre, M.D., Washington University, 1968.

Robert H. Strashun, M.D., New York University, 1982.

Abby L. Wasserman, M.D., The Johns Hopkins University, 1970. (See Department of Psychiatry.)

Zila Welner, M.D., Hebrew University, 1961. (See Department of Psychiatry.)

George T. Wilkins, Jr., M.D., University of Illinois, 1957.

Patricia B. Wolff, M.D., University of Minnesota, 1972. (See Health Key Medical Group.)

Gerald Wool, M.D., Washington University, 1962.

Instructors

Bettina H. Ault, M.D., University of Tennessee, 1984.

David T. Balzer, M.D., St. Louis University, 1985.

Diane M. Bourlier, D.O., University of Health Sciences, 1987.

Douglas W. Carlson, M.D., Southern Illinois University, 1984.

Antonella Circolo, M.D., University of Perugia, 1978.

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

Douglas G. Cottrell, D.O., University of Health Sciences, 1979.

Michael W. Crossman, Ph.D., St. Louis University, 1985; M.D., 1986.

Catherine J. Doty, M.D., University of Missouri, 1989.

Lisa S. Etzwiler, M.D., The Johns Hopkins University, 1985.

Katherine A. Gnauck, M.D., Universite Libre de Bruxelles, 1985.

Irene L. Graham, M.D., Baylor College of Medicine, 1982.

Robert J. Hayashi, M.D., Washington University, 1986.

Anne V. Hing, M.D., Washington University, 1985. (See Department of Surgery.)

Abby L. Hollander, M.D., University of Cincinnati, 1986.

Donald V. Huebener (Dental Medicine), D.D.S., Washington University, 1969. (See Department of Radiology.)

Lynn W. Keene, M.D., University of Florida, 1988.

Fiona H. Levy, M.D., New York Medical College, 1987.

Craig A. MacArthur, M.D., Ph.D., Washington University, 1987.

Janet B. McGill, M.D., Michigan State University, 1979; M.A., Northern Michigan University, 1980.

William A. McManus, M.D., St. Louis University, 1986.

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.

Jean Pappas Molleston, M.D., Washington University, 1986.

Raoul D. Nelson, M.D., Ph.D., Washington University, 1986.

Robert T. Paschall, M.D., University of Tennessee, 1974.

L. Fernando Sanchez-Legrand, M.D., San Carlos University, 1978; Ph.D., Kobe University, 1985.

Angela M. Sharkey, M.D., St. Louis University, 1986.

Robert D. Steiner, M.D., University of Wisconsin, 1987.

Catherine S. Tripp, M.D., Ph.D., Washington University, 1988.

Research Instructors

Richard S. Buller, Ph.D., University of Montana, 1983.

David L. Haviland, Ph.D., University of California, 1987.

Instructors (Clinical)

Bonnie J. Aust, M.D., University of Texas, San Antonio, 1979. (See Health Key Medical Group.)

Arthur Baum, M.D., SUNY, Downstate, 1971.

Susan L. Baumer, M.D., University of Pennsylvania, 1975.

Miriam J. Behar, M.D., The Johns Hopkins University, 1981. (See Health Key Medical Group.)

Robert A. Bergamini, M.D., Albany Medical College, 1978.

Huldah C. Blamoville, M.D., Meharry Medical College, 1965.

Robert J. Bradshaw, M.D., St. Louis University, 1980.

Seth J. Brownridge, M.D., Washington University, 1982.

Tattamangalam P. Chandrika, M.S.B.S., Calicut Medical College, 1973. (See Health Key Medical Group.)

Patrick S. Clyne, M.D., Washington University, 1989.

Janet L. Cranshaw, M.D., Washington University, 1988.

Michael E. Danter, M.D., University of Illinois, 1987.

Ray S. Davis, M.D., University of Louisville, 1978.

David P. Dempsher, M.D., Ph.D., The Johns Hopkins University,1982.

Jay Stuart Epstein, M.D., Emory University, 1983.

Elliott H. Farberman, M.D., St. Louis University, 1973.

Edward B. Fliesher, M.D., St. Louis University, 1978.

Florentina U. Garcia, M.D., University of the Philippines, 1965.

Melanie K. Gilliam, M.D., University of Louisville, 1981.

Dharam P. Goel, M.B.,B.S., All India Institute of Medical Sciences, 1978.

Joseph K. Goldenberg, M.D., University of Missouri, Kansas City, 1980.

Roman E. Hammes, M.D., University of Iowa, 1954.

David E. Hartenbach, M.D., University of Missouri, 1987.

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.

Joseph A. Kahn, M.D., University of Missouri, 1977.

Sheldon Kessler, M.D., St. Louis University, 1951.

Shirley M. Knight, M.D., Washington University, 1980.

Joel S. Koenig, M.D., Vanderbilt University, 1982.

Katherine L. Kreusser, M.D., Indiana University, 1978.

Leland M. Laycob, M.D., University of Missouri, 1968.

Barry Light, Ph.D., University of Missouri, 1977; M.D., 1980.

Robert D. Lins, M.D., University of Missouri, 1969.

David L. Lohmeyer, M.D., University of Missouri, 1977.

John F. Mantovani, M.D., University of Missouri, 1974. (See Department of Neurology and Neurological Surgery.)

Elaine Miller, M.D., Medical College of Alabama, 1949.

Suzanne L. Miller, M.D., University of Illinois, Chicago, 1978.

Alison C. Nash, M.D., Baylor College of Medicine, 1981.

Susan J. Nelson, M.D., Washington University, 1978.

David S. Olander, Ph.D., Washington University, 1967; M.D., 1974.

Jerome H. O'Neil, Jr., M.D., St. Louis University, 1981.

Eugenia M. Pierce, M.D., St. Louis University, 1958.

Juanita C. Polito, M.D., Southwestern University, 1979.

Joseph L. Portnoy, M.D., University of Kansas, 1974.

Robert L. Quaas, M.D., The University of Chicago, 1975.

Mohammad H. Rahman, M.B.B.S., University of Karachi, 1960.

Jesse R. Ramsey, D.O., Texas College of Osteopathic Medicine, 1974.

Emanuel Rashet, M.D., St. Louis University, 1962.

Isabel L. Rosenbloom, M.D., University of Maryland, 1984. (See Health Key Medical Group.)

Martin D. Rudloff, M.D., Washington University, 1981.

Janet M. Ruzycki, M.D., Washington University, 1981.

Howard J. Schlansky, M.D., University of Missouri, Kansas City, 1978.

Seymour M. Schlansky, M.D., Chicago Medical School, 1950.

Paula C. Schlesinger, M.D., Yale University, 1982.

Martin P. Schmidt, M.D., St. Louis University, 1986.

Pamela M. Schuler, M.D., University of Michigan, 1979.

Jeffrey I. Schulman, M.D., University of Kentucky, 1974.

Eleanor M. Shaw, M.D., University of Missouri, 1983.

Nareshkumar Solanki, B.M., B.S., University of Nairobi, 1975.

Robert D. Spewak, M.D., St. Louis University, 1979.

Norman P. Steele, M.D., Indiana University, Indianapolis, 1972.

Anita R. Stiffelman, M.D., New York University, 1987.

M. Anne Street, M.D., University of Illinois, 1976.

Jeanne M. Trimmer, M.D., Northwestern University, 1988.

Garland R. Tschudin, M.D., University of Missouri, 1975.

Roger J. Waxelman, M.D., University of Missouri, 1969.

Marc E. Weber, M.D., University of Tennessee, 1974; J.D., St. Louis University, 1982.

Jeffrey M. Wright, M.D., Washington University, 1979.

Assistants (Clinical)

William S. Adams, M.D., University of Missouri, 1987.

Juli A. Antonow, M.D., University of Minnesota, 1975.

Angela L. Bard, M.D., Indiana University, Indianapolis, 1981.

Earl C. Beeks, Jr., M.D., University of Missouri, 1981.

Marietta O. Belen, M.D., Far Eastern University, 1963.

Jean E. Birmingham, M.D., University of Missouri, 1988.

Carlos Borromeo, M.D., Santo Tomas University, 1960.

Earline A. Brownridge, M.D., University of Missouri, 1982.

David J. Callahan, M.D., Washington University, 1986. (See Department of Neurology and Neurological Surgery.)

Rubilinda Q. Casino, M.D., University of Santo Thomas, 1979.

Anita Chacko, M.D., Kasturba Medical College, 1981.

William T. Chao, M.D., University of Illinois, Chicago, 1979.

Darryl S. Cohen, D.O., Texas College of Osteopathic Medicine, 1981.

Myrto Frangos, M.D., St. Louis University, 1985.

Maurice J. Gabriel, M.D., Universidad de Sevilla, 1970.

John P. Galgani, Jr., M.D., St. Louis University, 1982.

Gary M. Goodman, M.D., University of Wisconsin, 1982.

Rosita J. Guzon, M.D., Manila Central University, 1975.

Richard A. Hack, M.D., University of Missouri, 1988.

Kenneth A. Haller, M.D., Creighton University, 1980.

Thomas P. Harrison, Jr., M.D., University of Missouri, 1979.

Denise R. Johnson, M.D., Loma Linda University, 1984.

Pamela B. Kane, M.D., University of Illinois, 1990.

Robert S. Kebler, M.D., St. Louis University, 1984.

Peter S. Kieffer, M.D., Washington University, 1990.

Benton B. Levie, M.D., Duke University, 1969.

Kenneth C. Levy, M.D., Chicago Medical School, 1988.

Margaret A. Martin, M.D., University of Wisconsin, 1986.

Mary R. Morgan, M.D., Washington University, 1990.

David A. Nile, M.D., St. Louis University, 1981.

Irma I. Ortiz-Arroyo, M.D., University of Puerto Rico, 1985.

Jennifer S. Quinn, M.D., University of Kentucky, 1986.

Habibur Rahman, M.B.,B.S., Dacca University Medical College, 1972.

Catherine R. Remus, M.D., Rush University, 1983.

Carol A. Robinson, M.D., University of Missouri, 1985. (See Health Key Medical Group.)

Joseph Schachter, M.D., Indiana University, 1979.

Margaret A. Schmandt, M.D., St. Louis University, 1987.

Lisa D. Schrock, M.D., University of Missouri, Columbia, 1990.

Martha A. Sewall, M.D., University of Missouri, 1985.

Meenal B. Shah, M.B., B.S., M.G.M. Medical College, 1964.

A. James Shapiro, M.D., Washington University, 1973.

Hsin-Chin Shih, M.D., Kaoshiung Medical College, 1964.

Craig A. Spiegel, M.D., Case Western Reserve University, 1982.

Joan L. Warren, M.D., University of Missouri, Kansas City, 1982.

Elizabeth P. Zachary, M.D., University of Missouri, Kansas City.

DEPARTMENT OF PSYCHIATRY

Instruction in psychiatry is given in the last three years of the medical course. Emphasis is on teaching psychiatry as a medical discipline, including the biological, social, and psychological mechanisms and manifestations of psychiatric illness, as well as psychological reactions to other illnesses. Recognition of current limitations of knowledge combined with an appreciation of what is known leads to a spirit of constructive skepticism. This attitude permits the student to study psychiatry in depth and broadly without preconceived theories.

SECOND YEAR

Introduction to Clinical Psychiatry

This course 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. *Dr. M. Jarvis and Staff*

THIRD YEAR

Psychiatry Clerkship

Students in groups of about 15 spend six weeks on the inpatient services of Barnes and Malcolm Bliss Mental Health Center at St. Louis State Hospital. The diversity of clinical settings for student-patient contact provides exposure to patients suffering from a wide variety of psychiatric disorders. Emphasis is upon developing interviewing and mental status examination skills, diagnostic capabilities for major psychiatric illnesses, and preliminary understanding of pharmacologic and behavioral/psychotherapeutic treatment strategies. *Dr. Drevets and Staff*

FOURTH YEAR

"A" Electives

(A) Outpatient and Community Psychiatry. This is a flexible clerkship tailored to the student's interests. Adult psychiatric patients in the Washington University Psychiatric Clinic present a variety of psychological and interpersonal problems similar to those encountered in the office practice of a psychiatrist, an internist, or a family physician. Students have an opportunity to learn a variety of treatment techniques under supervision. Students also manage patients in a community mental health center located in an inner-city area. There, students see how psychiatry works with social agencies, schools, and other institutions utilizing paramedical personnel in the detection and treatment of mental illness. *Dr. Smith*

(B) Clinical Psychiatry in Barnes Hospital. This is a fourth-year elective providing students with an opportunity to expand their knowledge of inpatient clinical psychiatry by functioning as externs. The student attends all staffing and teaching conferences given to first-year psychiatry residents, takes patients in rotation and shares night call with other first-year residents, approximately every fifth night. Immediate supervision is provided by the inpatient attending. Teaching emphasis is directed toward psychiatric diagnosis, appropriate use of psychopharmacologic agents, personal and family psychotherapeutic intervention, use of community resources and pursuit of the psychiatric scientific literature. *Dr. Rubin*

(C) Child Psychiatry, Children's Hospital Outpatient Clinic. This clerkship in child psychiatry gives students an appreciation of the intricacies of diagnosis and treatment of children and teenagers with psychiatric disorders. The clerkship involves working up a small number of preadolescent as well as adolescent children under the supervision of senior staff members. Didactic teaching is available, as well as individual supervision of patients. Students gain an appreciation of medication and other treatment modalities. They are exposed to the roles of community agencies, such as juvenile court and welfare agencies, with which a child psychiatrist must work. Students also gain appreciation of the roles of nurse, social worker, teacher, and occupational therapist in collaboration with individuals of these disciplines. *Dr. Mattison and Staff*

(D) Psychiatry Consult Service. The fourth year student will work closely with the consult resident and consult attending in the evaluation and treatment of patients referred to the psychiatry consult service. The student attends consultation conferences and may attend inpatient and outpatient teaching conferences in addition to Grand Rounds and Research Rounds. *Dr. Dean*

(E) Clinical Psychiatry in a Community Mental Health Center—Inpatient Services. The senior course will provide the student with the opportunity to become a key medical member of a psychiatric treatment team dealing with the evaluation of patients in the emergency room; selective admissions of certain cases; diagnosis and management of particular patients. Individual supervision will be provided by the Inpatient Director and supervising psychiatrist instructor in charge of the ward that the student is assigned to. The student will participate in the teaching sessions arranged for the first year psychiatric residents in training. *Drs. Wilson and Csernansky*

(F) Substance Abuse Treatment. The rotation gives the student the opportunity to learn about the inpatient treatment of alcohol and licit and illicit drug

abuse. Students will be expected to become familiar with the theoretical basis of Relapse Prevention therapy, the conduct of therapy groups, and the medical complications of substance abuse. *Dr. Compton*

(G) Electroconvulsive Therapy (ECT). The student will be involved in the neuropsychiatric assessment of patients referred for ECT. In addition, the student will receive training in the application of ECT and in the clinical management of patients receiving ECT. The student will be encouraged to review appropriate literature and make clinically-relevant case-oriented presentations. *Dr. Isenberg*

RESEARCH

The Department of Psychiatry has a long and distinguished history of research in the neurobiology, epidemiology and genetic determinants of behavior, basic mechanisms of central nervous system function and psychiatric disturbances. The excellent balance of clinical and biomedical researchers has a strong research focus on alcoholism, drug abuse, behavioral medicine, schizophrenia, affective disorders and other psychiatric disturbances. Studies are currently underway with both human and animal models as well as computer and mathematical modeling. The department has a long-standing commitment to the classification and assessment of psychiatric problems as medical disorders, the development of standarized diagnostic tasks, familial and molecular genetic approaches to understanding the basis of psychiatric syndromes, the epidemiology of drug abuse, alcoholism, affective disorders and schizophrenia and molecular biological approaches to the study of brain-behavior relationships. The Department's research program fosters collaboration within its various sub-units as well as with numerous pre-clinical and clinical departments throughout the medical center. Most of our faculty are interested in providing research opportunities. Below are a few examples:

Our research program focuses on the role of endogenous opioid peptides (EOP) in the control of hypothalamic-pituitary function. We are especially interested in the mechanisms by which EOP influences the release of hypothalamic releasing factors, particularly luteinizing hormone releasing hormone (LHRH), and the role these peptides play in the regulation of spermatogenesis and steroidogenesis in the testes. In addition to our strong interest in the interaction between EOP and the endocrine system, we are also examining the influence of abused substances on neuroendocrine function. Our interests fall into two general areas. First, the effects of substances of abuse administered during the prepubescent period on the onset of puberty and sexual maturation. As an integral part of these studies we are also exploring the hypothesis that the maturation of the EOP system represents the "trigger" for the onset of puberty which has thus far eluded identification. Second, we have observed that treatment of male rats with several abused compounds, such as morphine and alcohol, for a brief period of time followed by a drug free period has adverse effects on their male offspring, particularly with respect to their sexual maturation. The mechanisms underlying these potentially important transgenerational effects of substances of abuse are actively under investigation. Our studies involved many levels of analysis: whole animal pharmacology, tissue culture, in vitro superfusion of various organs, biochemical analyses and a variety of other techniques in molecular biology. *Dr. Cicero*

Our investigations in psychiatric genetics attempt to understand the familial aggregation of the major psychiatric illnesses. We aim to characterize complex mechanisms of transmission and to localize abnormal genes using DNA linkage markers. A broad range of research opportunities are available, such as locating and interviewing families participating in genetic studies and working in a genetics lab. Laboratory techniques include the formation and culture of lymphoblastoid cell lines; DNA extraction; and the detection of DNA polymorphisms. Psychiatric disorders under study include schizophrenia; bipolar manic depressive illness; and alcoholism. *Drs. Cloninger & Reich*

A research program focusing on schizophrenia and related clinical problems operates at several Washington University Medical Center sites, as well as affiliated units at Malcolm Bliss Mental Health Center. This program is focused on testing hypothesis related to the neurochemical, neuroendocrine, and cognitive consequences of neuroanatomical damage linked to schizophrenia. Functional abnormalities of both the monoamines and the excitatory amino acids have been emphasized in recent hypotheses of the pathogenesis of schizophrenia, with special emphasis given to an interaction between dopamine and glutamate pathways within the limbic system. Further, proposed insults to medial temporal brain structures may account for specific cognitive and neuroendocrine findings in these patients. This program encompasses a set of investigations in inpatients and outpatients with schizophrenia, as well as normal subjects, incorporating basal and dynamic assessments of specific neurochemical and neuroendocrine systems, along with symptom and neuropsychological assessments. The effect of glucocorticoids on cognitive performance is studied in normal subjects as well as patients. The development of animal models for the functional neurochemical abnormalities of interest, as well as a variety of neurochemical assays, are performed in Dr. Csernansky's laboratory. *Drs. Newcomer and Csernansky*

There are several NIDA-funded projects pertaining to four broad areas of research: 1) factors leading to AIDS high risk behaviors in drug users, 2) testing the reliability/validity of the substance use disorders, 3) determining comorbidity of antisocial personality disorder, psychiatric diagnosis, and substance abuse, and 4) community outreach programs to bring drug users to treatment. *Dr. Cottler*

WILLIAM GREENLEAF ELIOT DIVISION OF CHILD PSYCHIATRY

The Division of Child Psychiatry offers a varied teaching program for medical students, residents in psychiatry, and fellows in child psychiatry at St. Louis Children's and Barnes Hospitals. Outpatient services are organized through the Child Psychiatry Center located at St. Louis Children's Hospital, and inpatient services are provided through a Barnes 10-bed psychiatric unit. Active consultation with all medical and surgical units of the hospital is also maintained. Trainees are assigned to these various services, where they participate in diagnostic evaluations and see patients in treatment under supervision.

Faculty

Spencer T. Olin Professor and Head of Department

Samuel B. Guze, M.D., Washington University, 1945. (See Department of Medicine.)

Wallace Renard Professor

C. Robert Cloninger, M.D., Washington University, 1970; M.D., (hon.), Umea University, Sweden, 1983. (See Department of Genetics.)

Samuel and Mae S. Ludwig Professor

Theodore Reich, M.D., McGill University, 1963. (See Department of Genetics.)

Professors Emeriti

George E. Murphy, M.D., Washington University, 1952.

Eli Robins, M.D., Harvard University, 1943.

Saul Rosenzweig, Ph.D., Harvard University, 1932. (Medical Psychology) (See Department of Psychology.)

Professors

Theodore J. Cicero, Ph.D., Purdue University, 1968. (Neuropharmacology) (See Department of Anatomy and Neurobiology.)

Helen Donis-Keller, Ph.D., Harvard University, 1979. (Genetics) (See Department of Genetics.)

Richard W. Hudgens, M.D., Washington University, 1956.

Blake W. Moore, Ph.D., Northwestern University, 1952. (Biochemistry) (See Department of Biochemistry and Molecular Biophysics.)

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.)

John P. Rice, Ph.D., Washington University, 1975. (Mathematics) (See Division of Biostatistics.)

Lee N. Robins, Ph.D., Radcliffe College, 1951. (Sociology) (See Faculty of Arts and Sciences.)

Eugene H. Rubin, M.D., Ph.D., Washington University, 1978.

William R. Sherman, Ph.D., University of Illinois, 1955. (Biochemistry) (See Department of Biochemistry and Molecular Biophysics.)

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)

Charles F. Zorumski, M.D., St. Louis University, 1978. (See Departments of Anatomy and Neurobiology.)

Research Professor

Madelon T. Price, Ph.D., Washington University, 1973. (Neurobiology)

Professors Emeriti (Clinical)

Margaret C. L. Gildea, M.D., Yale University, 1936.

Sydney B. Maughs, M.D., Washington University, 1935.

Patricia L. O'Neal, M.D., Washington University, 1948.

Professors (Clinical)

Alex H. Kaplan, M.D., St. Louis University, 1936.

Marcel T. Saghir, M.D., American University of Beirut, 1963.

Associate Professor Emeritus (Clinical)

Edward H. Kowert, M.D., Washington University, 1943.

Associate Professors

Robert M. Carney, Ph.D., Washington University, 1978. (Medical Psychology)

Linda B. Cottler, Ph.D., Washington University, 1987. (Epidemiology)

Gregory B. Couch Associate Professor

John Csernansky, M.D., New York University, 1979.

Alison M. Goate, D.Phil., University of Oxford, 1983. (Genetics)

Andrew C. Heath, D.Phil., University of Oxford, 1983. (Psychology) (See Department of Genetics.)

Barry Hong, Ph.D., St. Louis University, 1982 (Medical Psychology)

Collins E. Lewis, M.D., Harvard University, 1971.

Patrick J. Lustman, Ph.D., Michigan State University, 1980. (Medical Psychology)

Joseph McKinney, M.D., Washington University, 1958.

Bruce L. Nock, Ph.D., Rutgers University, 1980. (Neurobiology) (See Department of Anatomy and Neurobiology.)

Daniel D. Pugh, M.D., Washington University, 1964.

John Rohrbaugh, Ph.D., University of Illinois, 1973. (Psychology)

Elizabeth M. Smith, Ph.D., Washington University, 1978. (Social Work)

Associate Professors (Clinical)

John T. Biggs, Jr., M.D., University of Tennessee, 1968.

Jack L. Croughan, M.D., Kansas University, 1968.

Fred W. Gaskin, M.D., University of Minnesota, 1968.

Robert S. Hicks, M.D., University of Arkansas, 1958.

Wanda M. Lamb, M.D., Washington University, 1948.

Jay L. Liss, M.D., Washington University, 1966.

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 Department of Neurology and Neurological Surgery.)

James B. Smith, M.D., University of Missouri, 1967.

Harold D. Wolff, M.D., State University of Iowa, 1955.

Assistant Professors

Wilson Compton III, M.D., Washington University, 1986.

Jon Dean, M.D., University of Texas, 1987.

Stephen H. Dinwiddie, M.D., Eastern Virginia Medical School, 1982.

Wayne C. Drevets, M.D., University of Kansas, 1983.

Kenneth E. Freedland, Ph.D., University of Hawaii, 1982. (Medical Psychology)

Daniela S. Gerhard, Ph.D., Cornell University, 1982. (See Department of Genetics.)

Keith E. Isenberg, M.D., Indiana University, 1978.

Michael R. Jarvis, Ph.D., University of Illinois, 1982; M.D., Washington University, 1985.

Steven O. Moldin, Ph.D., Yeshiva University, 1988. (Medical Psychology) (See Department of Psychology.)

Elliot Nelson, M.D., University of Illinois, 1986.

John Newcomer, M.D., Wayne State University, 1985.

Carol S. North, M.D., Washington University, 1983.

Yvette Sheline, M.D., Boston University, 1979.

Dragan Svrakic, M.D., Belgrade University, 1978; D.Sc., 1989.

Carol Tershark, Ph.D., Oklahoma State University, 1982. (Medical Psychology)

Paul VanEerdewegh, Ph.D., Washington University, 1982. (Mathematics)

Sean Yutzy, M.D., Eastern Virginia Medical School, 1982.

Research Assistant Professors

Michael Adams, Ph.D., Medical College of Virginia, 1987. (Neuropharmacology)

Kathleen K. Bucholz, Ph.D., Yale University, 1986. (Epidemiology)

Luis A. Giuffra, M.D., Universidad Peruana Cayetano Heredia, 1986; Ph.D., Yale University, 1991.

John W. Haller, Ph.D., University of Missouri, 1991. (Psychology)

Paul P. Hipps, Ph.D., North Dakota State University, 1971. (Biochemistry)

Yukitoshi Izumi, M.D., Yamagata University, 1985; Ph.D., 1989. (Neurobiology)

Rosalind J. Neuman, Ph.D., Washington University, 1981 (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)

Assistant Professors Emeriti (Clinical)

Hyman H. Fingert, M.D., State University of Iowa, 1934.

Reese H. Potter, M.D., Washington University, 1935.

Assistant Professors (Clinical)

Ahmad Ardekani, M.D., Pahlavi University, 1974.

William W. Clendenin, M.D., University of Tennessee, 1963.

Juan C. Corvalan, M.D., Argentina National University, 1965.

Alejandro M. Datuin, M.D., University of Santo Tomas, 1965. (Malcolm Bliss Hospital.)

Mary Davis, M.D., Washington University, 1952.

Plaridel C. Deza, M.D., University of Santo Tomas, 1956. (Malcolm Bliss Hospital)

Terry A. Fuller, M.D., Washington University School of Medicine, 1974.

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.

Scott McCormick, M.D., The University of Chicago, 1985.

James R. Mikolajczak, M.D., St. Louis University, 1972.

Thomas Nowotny, M.D., Washington University, 1985.

Eric J. Nuetzel, M.D., St. Louis University, 1976.

Elizabeth F. Pribor, M.D., St. Louis University, 1985.

James L. Rutherford, M.D., University of Iowa, 1980.

Jo-Ellyn M. Ryall, M.D., Washington University, 1975.

Paul W. Sheffner, M.D., Washington University, 1974.

Reed E. Simpson, M.D., Washington University, 1976. (Malcolm Bliss Hospital.)

Wayne A. Stillings, M.D., Washington University, 1975.

Richard H. Sundermann, Jr., M.D., Washington University, 1979.

Edwin D. Wolfgram, M.D., State University of Iowa, 1959.

Christopher Wuertz, M.D., University of Illinois, 1984.

Instructors

Laura Bierut, M.D., Washington University, 1987.

Kevin Black, M.D., Duke University, 1990.

Nuri Farber, M.D., Washington University, 1989.

Cynthia Florin, M.D., Columbia University, 1984.

Aileen Lee, Ohio State University, 1977. (Medical Psychology)

Research Instructors

Mark Bardgett, Ph.D., University of Missouri, 1991. (Neurobiology)

Michelle Bidaut-Russell, Ph.D., St. Louis University, 1989; Ph.D., University of Bordeaux II, 1980. (Epidemiology)

Robert F. Clark, Ph.D., University of California, Irvine, 1988 (Genetics)

Michael A. Sesma, Ph.D., University of California, Riverside, 1981.

Instructors (Clinical)

Dale J. Anderson, M.D., Washington University, 1979.

Richard H. Anderson, M.D., St. Louis University, 1989; Ph.D., Brigham Young University, 1986.

Scott J. Arbaugh, M.D., St. Louis University, 1985.

David M. Connor, M.D., University of Oklahoma, 1983.

David J. Goldmeier, M.D., Washington University, 1982.

Linda S. Horne, M.D., Ohio State University, 1986.

F. Timothy Leonberger, Ph.D., University of Southern Mississippi, 1986. (Medical Psychology) (Malcolm Bliss Hospital)

Judith A. McGee, Ph.D., St. Louis University, 1979. (Medical Psychology) (Malcolm Bliss Hospital)

Virgil L. Malmberg, M.D., University of Missouri, 1978.

Gregory Mattingly, M.D., Washington University, 1989.

Julie Renner, M.D., Texas Tech University, 1987.

Berette Salazar, M.D., University of New Mexico, 1982.

Instructor (Adjunct)

Deborah Smith, Ph.D., Washington University, 1989. (Epidemiology)

Director of the Division of Child Psychiatry

Blanche F. Ittleson Associate Professor

Richard Mattison, M.D., Cornell University, 1972. (Child Psychiatry)

Professor Emeritus

E. James Anthony, D.P.M., University of London, 1947 (Child Psychiatry); M.D., 1949.

Professors

Barbara Geller, M.D., Albert Einstein College of Medicine, 1964. (Child Psychiatry)

Richard D. Todd, Ph.D., University of Texas, 1977; M.D., 1981 (Child Psychiatry)

Associate Professor

Michele Van Eerdewegh, M.D., Free University of Brussels, 1970 (Child Psychiatry).

Associate Professor (Clinical)

Haruo Kusama, M.D., Washington University, 1965. (Child Psychiatry)

Zila Welner, M.D., Hebrew University Hadassah Medical School, 1961. (Child Psychiatry) (See Department of Pediatrics.)

Assistant Professor Emeritus

Loretta K. Cass Seleski, Ph.D., Ohio State University, 1950. (Medical Psychology)

Assistant Professors

Kelly Botteron, M.D., University of Kansas, 1988. (Child Psychiatry)

David Corwin, M.D., Michigan State University, 1976. (Child Psychiatry)

Barbara Swarzenski, M.D., Case Western Reserve University, 1986 (Child Psychiatry)

Research Assistant Professor

Gwendolyn G. Reich, Ph.D., Washington University, 1978. (Anthropology Child Psychiatry)

Assistant Professors (Clinical)

James E. Edwards, M.D., University of Tennessee, 1962. (Child Psychiatry)

Syed Raza, M.D., University of Karachi Pakistan, 1960. (Child Psychiatry)

Adolfo E. Rizzo, M.D., Buenos Aires University, 1955. (Child Psychiatry)

Jagdish Suri, M.D., King George Medical College, 1964. (Child Psychiatry)

Abby L. Wasserman, M.D., The Johns Hopkins University, 1970. (Child Psychiatry) (See Department of Pediatrics.)

Instructors

John Constantino, M.D., Washington University, 1988. (Child Psychiatry)

Joan Luby, M.D., Wayne State University, 1985. (Child Psychiatry)

Barbara S. Silverstein, M.S.W., Washington University, 1981.

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 three largest and most scientifically sophisticated radiological centers in the world.

The Institute has played a key role in radiological research and the proud tradition of pioneering new radiological techniques for better patient care continues:

- development of cholecystography, the diagnostic test for gallbladder disease
- design and construction of the first cross-sectional X-ray laminagraph
- 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 CT scanners and one of the world's first MR scanners
- interfacing of a minicomputer with a gamma camera, improving accuracy and efficiency of nuclear medicine procedures
- integration of CT and MR scans with three-dimensional technology
- application of modern organic chemistry to the preparation of radiopharmaceuticals used in medical imaging
- measurement of cerebral blood flow and metabolism
- establishment of the region's most comprehensive vascular and interventional radiology center
- application of PET for measuring metabolic activity in relation to blood flow in the heart
- development of a three-dimensional treatment planning program for cancer
- refinement of neurointerventional radiology techniques.

The Institute occupies more than 320,000 total square feet, comprising its own 13-story building with satellite facilities in Barnes, Barnard, Jewish, St. Louis Children's and Wohl hospitals and in the Clinical Sciences Research, Forest Park, and East buildings. The Department provides diagnostic radiology, nuclear medicine, radiation physics, and radiation oncology services for all hospitals in the Washington University Medical Center and at Barnes West County Hospital in St. Louis County.

The first floor of the Institute houses a film library, reception and scheduling areas, consultation viewing rooms, and the 118-seat Scarpellino Auditorium.

Clinical facilities for the Radiation Oncology Center at Barnes Hospital are on the ground and first floors of the Institute, in Barnard Hospital, and in the Barnes Hospital West Pavilion. Additionally, a large, modern radiation oncology facility is at Jewish Hospital. Therapy equipment consists of state-of-the-art Clinac linear accelators: 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 two years. On-line portal imaging and multihead collimation devices are integral components of the Radiation Oncology Center's armamentarium.

MIR clinical facilities are on the second floor (chest radiology, body computed tomography, operating room imaging, and computed radiography); third floor (neuroradiology, angiography, MRI); fourth floor (gastrointestinal and genitourinary radiology); and the fifth floor (MRI and CT body). PET clinical and research facilities are available on the seventh floor. A comprehensive vascular and interventional radiology center occupies the eighth floor. Nuclear medicine is on the ninth floor of the Barnes Hospital West Pavilion. The 10th floor of the West Pavilion houses ultrasonography and outpatient radiology, including a comprehensive Breast Diagnostic Center. Orthopedic X-ray facilities are on the 11th floor of the West Pavilion and in the Wohl Clinic. In the north wing of St. Louis Children's Hospital, the first floor houses a complete pediatric radiology facility offering ultrasound, nuclear medicine, CT, and MRI.

Radiation science facilities, on the sixth floor of the Institute and in the Clinical Sciences Research Building, include a PET imaging system that is supported by a medical cyclotron in Barnard Hospital and a Tandem Cascade Accelerator in the East Building. Additional research facilities are on the third (hyperthermia and brachytherapy) and sixth (physics) floors of Barnard Hospital, the Clinical Sciences Research Building (radiation oncology, radiation sciences, nuclear medicine), and the East Building (electronic radiology, three-dimensional imaging processing, and the Division of Radiology Research). The Clinical Sciences Research Building also houses sophisticated computer facilities that are utilized for clinical, research, and teaching applications. Administrative, teaching, and support functions occupy the ninth through 12th floors of the Institute. The Forest Park Building houses the radiation oncology cancer biology, the oncology data and computer center, and the Radiation Oncology Center's administrative offices.

The Institute has 92 examination rooms for diagnostic radiology, eight CT scanners, four PET scanners, six MR scanners, 16 ultrasound machines, 10 digital vascular imaging systems, and four linear

accelerators. In addition, as part of the Department's community outreach effort, the Institute cosponsors with Barnes Hospital a mobile mammography van that provides screening services at corporate and public sites in the St. Louis metropolitan area.

A major research center, slated for completion in mid-1994, will focus on the development and application of advanced imaging systems, such as MR and PET, for investigations of the brain as well as for functional imaging applications elsewhere in the body. This four-story, freestanding structure will abut the existing East Building and will house research teams interested in functional neuroimaging, imaging physics, contract material development and radiochemistry, and MR spectroscopy.

FIRST YEAR

In their first year, medical students are introduced to radiology in two separate ways. During the first semester of the gross anatomy course, conferences are given by several members of the Radiology staff in the following areas: neuro, chest, cardiac, musculoskeletal, and abdominal radiology. These sessions are arranged to coincide with the particular area of the body being studied in the anatomical dissection classes. Conferences are conducted in small groups giving students an opportunity to relate directly with the radiologists. *Dr. Vannier*

The second form of contact with radiology is a five-week elective seminar. This course seeks to reinforce the first semester anatomy experience by relating previously learned anatomical information to radiographic images. Radiologists from different subspecialties moderate these seminars in which students work in small groups. Each group presents selected radiological topics to the remainder of the students taking the elective. *Dr. Wilson*

SECOND YEAR

Twenty hours of lecture are devoted to an introduction to radiology. The majority of the course is devoted to diagnostic radiology including computed tomography, ultrasound, nuclear medicine, and magnetic resonance. Radiation biology and radiation oncology are also introduced. *Dr. M. Siegel*

ELECTIVES

Research Electives

Opportunities are available to carry out research in the laboratories under the guidance of the staff in the fields of diagnostic radiology, therapeutic radiology, radiation physics, and nuclear medicine.
Dr. Vannier

Summer Oncology Clerkship for First-Year Students

An eight-week summer clerkship program is available for first-year medical students. The students participate in the clinical activities of the Division of Radiation Oncology and are exposed to the fundamental concepts of cancer biology and clinical radiation therapy in a series of lectures, seminars, and case presentation conferences. They have the opportunity to conduct either laboratory research or clinical investigation under the direction of the staff members of the sections of Clinical Radiation Oncology and Cancer Biology. *Dr. Simpson*

FOURTH YEAR ELECTIVES

Clerkship in Radiation Oncology

A four- or six-week elective in which the student has the opportunity to see patients being evaluated and treated in Radiation Oncology. Emphasis is on techniques of cancer diagnosis and localization, selection of therapy, indications for irradiation and techniques on treatment planning, simulation, and irradiation of a variety of tumors. There are several conferences in which the students participate, including new case-planning conferences, a clinical physics conference, a protocol conference, and interdepartmental conferences with the departments of Pediatrics, Obstetrics and Gynecology, Surgery, and Pathology. *Drs. Simpson or Perez*

Diagnostic Radiology Electives

The role of radiology in the solution of clinical diagnostic problems is emphasized in this clerkship. Each student will spend one or two weeks in each of two or three subspecialty sections within the department (abdomen, musculoskeletal, interventional, chest, neuroradiology, nuclear medicine, pediatric radiology, radiation oncology, computed tomography, and Magnetic Resonance Imaging) under the supervision of a senior faculty member. The student will have a chance to observe special procedures and emergency radiological examinations, as well as routine imaging studies. During the clerkship, the student will spend part of one evening reviewing films in the emergency room with the radiology resident on call. Conferences intended to complement the subspecialty approach to radiology round out this experience. *Dr. Wilson*

Clerkships in diagnostic radiology are also offered at Jewish Hospital. *Dr. Lawrence Kotner*

Nuclear Medicine - Clinical

A four- or six-week elective in which the student will be exposed to the full range of radionuclide imaging techniques, including SPECT and PET, and also to radionuclide therapy. In conjunction with the staff, the student will be responsible for planning and interpreting nuclear medicine studies of patients referred to the department. Emphasis is placed on integration of nuclear medicine data with clinical and radiologic findings. There are daily conferences and scan interpretation sessions. Participation in clinical and laboratory research projects may also be arranged if desired. *Dr. B. Siegel*

Nuclear Medicine - Research

Research projects are available in computer applications, evaluation of new radiopharmaceuticals, and clinical studies. Current computer research includes: (1) development of three-dimensional display software for tomographic positron imaging; (2) development of iterative reconstruction algorithms for tomographic data; (3) application of modern image processing techniques to nuclear medicine images. The student can undertake either practical computer problems, including program and hardware development, or more theoretical, mathematically-based projects. Prior training in calculus and some computer experience are essential for the computer-related research. *Dr. Miller*

Research opportunities are available in the nuclear medicine positron emission tomography (PET) facilities. The student will participate in one or several of the ongoing study protocols of the nuclear medicine PET research group, and will be exposed to the basic physical, biochemical, and practical aspects of PET. Current research areas include: (1) basic investigations of novel PET techniques for assessment of tissue perfusion and metabolism; (2) clinical studies of the application of established PET techniques to a variety of disease processes; and (3) clinical evaluation of new PET radiopharmaceuticals. Previous laboratory experience is suggested. *Dr. B. Siegel*

Faculty

Elizabeth E. Mallinckrodt Professor, Head of Department and Director of the Mallinckrodt Institute of Radiology

Ronald G. Evens, M.D., Washington University, 1964. (See Department of Economics.)

Professors

D. Clair Anderson, M.D., Washington University, 1971.

Dennis M. Balfe, M.D., Medical College of Wisconsin, 1975.

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. (Radiation Sciences)

Mokhtar Gado, DMRE, Cairo University, 1960. (See Neurological Surgery.)

Louis A. Gilula, M.D., University of Illinois, 1967.

Robert L. Grubb, Jr., M.D., University of North Carolina, 1965. (Radiation Sciences) (See Department of Neurology and Neurological Surgery.)

E. Mark Haacke, Ph.D., University of Toronto, 1978.

Jay P. Heiken, M.D., Columbia University, 1978.

R. Gilbert Jost, M.D., Yale University, 1969. (Also School of Engineering and Applied Science, Department of Computer Science.)

Daniel K. Kido, M.D., Loma Linda University, 1965.

Philip A. Ludbrook, M.B., B.S., University of Adelaide, 1963. (See Department of Medicine.)

William H. McAlister, M.D., Wayne State University, 1954. (See Department of Pediatrics.)

Bruce L. McClennan, M.D., State University of New York, Upstate, 1967.

Jeffrey L. Marsh, The Johns Hopkins University, 1970. (Radiology Research) (See Departments of Surgery and Pediatrics.)

Michael I. Miller, Ph.D., The Johns Hopkins University, 1983. (Radiology Research) (See Department of Electrical Engineering.)

Thomas R. Miller, Ph.D., Stanford University, 1971; M.D., University of Missouri, 1976.

Gordon W. Philpott, M.D., Washington University, 1961. (Radiation Sciences) (See Department of Surgery.)

Marcus E. Raichle, M.D., University of Washington, 1964. (Radiation Sciences) (See Department of Neurology and Neurological Surgery.)

Henry D. Royal, M.D., St. Louis University, 1974.

Stuart S. Sagel, M.D., Temple University, 1965.

Gary D. Shackelford, M.D., Washington University, 1968. (See Department of Pediatrics.)

Barry A. Siegel, M.D., Washington University, 1969. (See Department of Medicine.)

Marilyn J. Siegel, M.D., State University of New York, 1969. (See Department of Pediatrics.)

Donald L. Snyder, Ph.D., Massachusetts Institute of Technology, 1966. (Radiology Research) (See Department of Electrical Engineering.)

Michel M. Ter-Pogossian, Ph.D., Washington University, 1950. (Radiation Sciences) (See Department of Medicine.)

William G. Totty, M.D., University of Tennessee, 1975.

Michael W. Vannier, M.D., University of Kentucky, 1976. (See Department of Surgery, and Division of Plastic and Reconstructive Surgery.)

Michael J. Welch, Ph.D., University of London, 1965. (Radiation Sciences) (Also Faculty of Arts and Sciences, 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

Steven R. Bergmann, M.D., Washington University, 1985; Ph.D., Hahnemann Medical College, 1977. (See Department of Internal Medicine.)

G. James Blaine III, D.Sc., Washington University, 1974. (See Institute for Biomedical Computing.)

Jeffrey J. Brown, M.D., University of California, San Diego, 1983.

Michael D. Darcy, M.D., Ohio State University, 1979.

Keith C. Fischer, M.D., The Johns Hopkins University, 1971.

Harvey S. Glazer, M.D., Washington University, 1976.

Fernando R. Gutierrez, M.D., University of Valladolid, 1974.

Marshall E. Hicks, M.D., University of Kentucky, 1982.

Charles F. Hildebolt, D.D.S., Ohio State University, 1970; Ph.D., Washington University, 1987.

Rexford L. Hill, M.S., University of Cincinnati, 1966. (Computer Sciences) (Also School of Engineering and Applied Science, Department of Computer Science.)

Lawrence M. Kotner, Jr., M.D., Washington University, 1968.

Benjamin C. P. Lee, M.B., B.S. University of London, 1966.

Robert G. Levitt, M.D., University of California, 1972.

Robert C. McKnight, M.D., Washington University, 1961. (See Department of Medicine.)

William D. Middleton, M.D., Duke University, 1981.

Scott A. Mirowitz, M.D., Washington University, 1985.

Stephen M. Moerlein, Ph.D., Washington University, 1982.

Barbara S. Monsees, M.D., Washington University, 1975.

Christopher J. Moran, M.D., St. Louis University, 1974.

Michael K. Pasque, M.D., University of Oklahoma, 1978. (Radiology Research) (See Department of Surgery.)

Joel S. Perlmutter, M.D., University of Missouri, 1979. (Radiation Sciences), (See Department of Neurology and Neurological Surgery.)

Steven E. Petersen, Ph.D., California Institute of Technology, 1982. (Radiation Sciences) (See Department of Neurology.)

Daniel D. Picus, M.D., The University of Chicago, 1981. (See Department of Surgery.)

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

William J. Powers, M.D., Cornell University, 1975. (Radiation Sciences) (See Department of Neurology and Neurological Surgery.)

William R. Reinus, M.D., New York University Medical School, 1979.

Daniel P. Schuster, M.D., Yale University, 1976. (See Department of Internal Medicine.)

Anthony J. Wilson, M.B., Ch.B., Otago University, 1971.

Franz J. Wippold II, M.D., St. Louis Univerty, 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 School of Medicine, 1948. (Technical Administration)

Assistant Professors

Carolyn J. Anderson, Ph.D., Florida State University, 1990.

Mark M. Bahn, M.D., University of Minnesota, 1981; Ph.D., University of California, Los Angeles, 1988.

Premsri T. Barton, M.D., Mahidol University, Bangkok, Thailand, 1973.

Harold F. Bennett, M.D., Ph.D., University of Illinois College of Medicine, 1988.

Joseph A. Borrello, M.D., University of Michigan, 1983.

Kelly N. Botteron, M.D., University of Kansas, 1988. (Radiation Research) (See Department of Psychiatry.)

James A. Brink, M.D., Indiana University, 1984.

Thomas E. Conturo, M.D., Ph.D., Vanderbilt University, 1989.

DeWitte T. Cross III, M.D, University of Alabama, 1980.

P. Duffy Cutler, Ph.D., University of California, Los Angeles, 1992.

William B. Dawson, M.D., University of Oklahoma School of Medicine, 1973.

Farrokh Dehdashti, M.D., Pahlavi University, 1977.

Jeffrey A. Dobkin, M.D., University of Missouri, Kansas City, 1986.

Steven Don, M.D., Vanderbilt University, 1985.

Wayne C. Drevets, M.D., University of Kansas, 1983. (Radiation Sciences) (See Department of Psychiatry.)

James R. Duncan, M.D., Ph.D., Washington University, 1988.

Edward M. Geltman, M.D., New York University, 1971. (See Department of Medicine.)

Elizabeth L. Gerard, M.D., University of California, San Diego, 1987.

Diana L. Gray, M.D., University of Illinois, 1981. (See Department of Obstetrics and Gynecology.)

Robert John Gropler, M.D., University of Cincinnati, 1981.

John W. Haller, Ph.D., University of Missouri, St. Louis, 1991. (Radiation Research) (See Department of Psychiatry.)

Thomas E. Herman, M.D., The Johns Hopkins University, 1975.

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.

Mary A. Middleton, M.D., Medical College of Wisconsin, 1982.

Tracy L. Roberts, M.D., University of South Carolina, 1986.

Douglas D. Robertson, Jr., M.D., Ph.D., Georgetown University, 1982. (See Department of Surgery.)

Alan E. Schlesinger, M.D., Yale University, 1980.

Yvette I. Sheline, M.D., Boston University, 1979. (Radiation Research) (See Department of Psychiatry.)

Peter E. Shile, M.D., Yale University, 1985.

Richard M. Sloan, M.D., University of Florida, 1989.

Emily L. Smith, M.D., Washington University, 1968.

James E. Stark, M.D., University of South Alabama, 1988.

Sharlene A. Teefy, M.D., University of Hawaii, 1980.

Alan J. Tiefenbrunn, M.D., Washington University, 1974. (See Department of Medicine.)

Thomas M. Vesley, M.D., Mayo Medical School, 1986.

Jerold W. Wallis, M.D., Stanford University, 1981.

Ge Wang, Ph.D., SUNY, Buffalo, 1992.

Darryl A. Zuckerman, M.D., SUNY, Syracuse, 1983.

Research Assistant Professors

Sampathkumaran S. Kondapuram, M.S., McMaster University, 1976. (Nuclear Medicine) (See Department of Medicine.)

Stephen M. Moore, M.S., Washington University, 1984.

Tom O. Videen, Ph.D., University of Washington, 1981. (Radiation Sciences) (See Department of Neurology.)

Assistant Professors (Clinical)

John L. Bardsley, M.D., University of Illinois, 1964.

Edward Cohen, M.D., University of Missouri, 1969.

Enrique Cubillo, M.D., University of Madrid, 1962.

Gene L. Davis, Jr., M.D., University of Virginia, 1972.

James W. Debnam, M.D., University of Louisville, 1962.

Guillermo C. Geisse, M.D., University of Chile, 1965.

Albert M. Hammerman, M.D., Washington University, 1976.

Albert E. Hesker, M.D., University of Missouri, 1964.

Daniel J. Leary, Jr., M.D., Washington University, 1966.

Allan H. McCown, M.D., Washington University, 1964.

Ben R. Mayes, Jr., M.D., Washington University, 1966.

Gary H. Omell, M.D., University of Tennessee, 1967.

Naris Rujanavech, M.D., Faculty of Medicine, Siriraj Hospital, 1972.

Robert F. Scheible, M.D., Washington University, 1972.

Steven L. Solomon, M.D., The University of Chicago, 1985.

Chandrakant C. Tailor, M.B., B.S., Maharaja Sayajirao University of Baroda, 1972.

Assistant Professor (Adjunct)

Christopher G. Ullrich, M.D., SUNY Upstate Medical Center, 1976.

Instructors

Edward E. C. Angtuaco, M.D., University of the East Ramon Magsaysay, Philippines, 1986.

Carlos F. Aquino-Aponte, M.D., University of Puerto Rico, 1985.

Gulab Bhatia, M.S., Southern Illinois University, Edwardsville, 1987.

Gregory R. Cizek, M.D., Washington University, 1990.

Constance S. Courtois, M.D., Medical University of South Carolina, 1985.

Michael G. Crowley, Ph.D., University of Florida, 1982.

Colin P. Derdeyn, M.D., University of Virginia, 1988.

Thomas A. Farrell, M.D., University College, Dublin, Ireland, 1986.;

Glenn Fletcher, Ph.D., Michigan State University, 1981.

Donald F. Frei, Jr., M.D., University of Cincinnati, 1989.

David S. Gierada, M.D., Wayne State University, 1988.

Stephen F. Hatem, M.D., University of Maryland, 1989.

Gregory A. Hatfield, M.D., University of Minnesota, 1983.

Jacqueline C. Hodge, M.D., Yale University, 1986.

Paul Sek-Bin Hsieh, M.D., University of Michigan, 1989.

Linda R. King, M.D., University of Pennsylvania, 1989.

Joseph Krysl, M.D., University of Toronto, 1988.

Dennis L. Lambert, Ph.D., Washington University, 1994. (Diagnostic Radiology) (See Health Administration.)

Charles T. McConnell, Jr., M.D., Ohio State University, 1988.

Kevin W. McEnery, M.D., Georgetown University, 1986.

James D. Matthews, M.D., Medical College of Virginia, 1989.

William B. Mehard, M.D., Medical University of South Carolina, 1990.

Nathan C. Nelson, M.S., University of Colrado, 1993.

Allen B. Oser, M.D., Harvard University, 1988.

Rachel F. Oser, M.D., Indiana University, 1990.

Thomas K. Pilgram, Ph.D., University of California, Berkeley, 1982.

Shawn P. Quillin, M.D., Washington University, 1990.

Vallabhaneni V. Rao, Ph.D., University of Hyderabad, India, 1987.

James V. Rawson, M.D., Tufts University, 1989.

Robert W. Ryerson, M.D., University of Missouri, 1990.

David J. Scherer, M.S., Virginia Polytechnic Institute and State University, 1982.

Janice R. Semenkovich, M.D., Washington University, 1981.

Vijay Sharma, Ph.D., Panjab University, India, 1987.

Cary L. Siegel, M.D., University of Michigan Medical School, 1987.

Keith M. Sterling, M.D., New York Medical College, 1989.

Avinash M. Sud, M.D., University of Tennessee, 1986.

Nitin K. Tanna, M.D., University of Pennsylania, 1990.

David W. Tsai, M.D., University of Missouri, Kansas City, 1989.

Elizabeth P. Vining, Ph.D., Iowa State University, 1984; M.D., University of California, Los Angeles, 1989.

Deborah T. Wadsworth, M.D., University of North Carolina, 1986.

O. Clark West, M.D., Washington University, 1986.

Dennis W. Wulfeck, M.D., Wright State University, 1989.

Research Instructors

Carmen S. Dence, M.S., Florida State University, 1972.

Timothy J. McCarthy, Ph.D., University of Liverpool, 1989.

Sally W. Schwarz, M.S., University of Southern California, 1976.

Celette S. Skinner, Ph.D., University of North Carolina at Chapel Hill, 1991.

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.

Gerald L. Shaikun, M.D., The University of Chicago, 1964.

Gene W. Spector, M.D., Yale University, 1959.

Jerry Tobler, M.D., Yale University, 1983.

Research Associates

David E. Beecher, M.S., Washington University, 1980.

George Chacko, M.B.,B.S., Christian Medical College (Penjab University), India, 1973.

Kim A. Deal, Ph.D., University of Wisconsin, 1993.

David C. Ficke, B.S.E.E., Southern Illinois University, 1974.

Julie A. Fiez, Ph.D., Washington University, 1992.

Maureen J. Fusselman, M.S., St. Louis University, 1978.

Patricia J. Rubin, M.D., Wright State University School of Medicine, 1988. (See Department of Medicine.)

Robert A. Whitman, M.S., Washington University, 1989.

Ming Xu, M.S., University of Tennessee, 1992.

Dmitriy A. Yablonskiy, Ph.D., Institute for Physics and Engineering of the Ukrainian Academy of Sciences, Kharkov, Ukraine, 1981.

Donald T. T. Yapp, B.S., University of Victoria, Victoria, British Columbia, 1987.

Lei Zheng, Ph.D., Case Western Reserve University, 1993.

Research Associates (Adjunct)

Pietro R. Biondetti, M.D., Padova University, Italy, 1977.

Arjun Godhwani, Ph.D., University of Arkansas, 1971.

Research Assistants

Erbil Akbudak, M.S., Washington University, 1992.

Fidelma L. Flannagan, M.B., Ch.B., University College Dublin, 1987.

Nilesh R. Gohel, M.S.E.E., Washington University, 1994.

Gary R. Hoffman, B.A., University of Missouri, 1976.

Menelaos N. Karamichalis, M.S.E.E., Washington University, 1993.

Shantanu V. Kaushikkar, M.S., Case Western Reserve University, 1993.

Frederick G. Kuhns, M.S.E.E., Washington University, 1991.

Yi Li, B.S., University of Science and Technology of China, Hefei, P.R. China, 1991.

Ann Mary MacLeod, B.S., Eastern New Mexico University, 1988.

David L. Melson, B.S.E.E., Washington University, 1993.

Yuming Yin, M.D., Beijing Medical University, 1983.

DIVISION OF RADIATION ONCOLOGY

Professor and Director

Carlos A. Perez, M.D., University of Antioquia, 1960.

Professors

Bahman Emami, M.D., Tehran University, 1968.

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.)

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)

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.

Associate Professors

Andrei Laszlo, Ph.D., University of California, 1981. (Cancer Biology)

Robert J. Myerson, Ph.D., University of California, 1974; M.D., University of Miami, 1980.

Gilbert H. Nussbaum, Ph.D., Harvard University, 1967. (Radiation Physics)

Joseph R. Simpson, Ph.D., The University of Chicago, 1967; M.D., Harvard University, 1973.

Jeffrey F. Williamson, Ph.D., University of Minnesota, 1982. (Radiation Physics)

Associate Professor Emeritus (Clinical)

A. Norman Arneson, M.D., Washington University, 1928. (See Department of Obstetrics and Gynecology.)

Associate Professor (Clinical)

Bruce J. Walz, M.D., Washington University, 1966.

Assistant Professors

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)

Clayton Hunt, Ph.D., The University of Chicago, 1979. (Cancer Biology)

Michael A. Mackey, Ph.D., University of California, San Francisco, 1987. (Cancer Biology)

Eduardo G. Moros, Ph.D., Unviersity of Arizona, Tucson, 1990. (Radiation Physics)

Douglas R. Spitz, Ph.D., University of Iowa, 1984. (Cancer Biology)

Yvonne C. Taylor, Ph.D., University of Toronto, 1981. (Cancer Biology)

Research Assistant Professor

Ryuji Higashikubo, Ph.D., Bowling Green State University, 1978. (Cancer Biology)

Instructors

Kun-san Chao, M.D., Kaohsiung Medical College, 1982.

Yihong A. Cheng, M.S., Washington University, 1987. (Radiation Physics)

Ming-shun Chen, Ph.D., Kansas State University, 1991. (Cancer Biology)

Seymour Fox, Ph.D., University of Oklahoma, 1977. (Computer Sciences)

Russell L. Gerber, M.S., St. Louis University, 1985. (Radiation Physics)

Mary L. Graham, M.D., University of Missouri, Kansas City, 1985.

William B. Harms, Sr., B.S., University of Missouri, 1979. (Radiation Physics)

Eric E. Klein, M.S., University of Massachusetts, 1985.

Henry K. Lee, M.D., Wayne State University, 1985.

Daniel A. Low, Ph.D., Indiana University, 1988. (Radiation Physics)

John W. Matthews, D.Sc., Washington University, 1980. (Computer Sciences) (See Institute for Biomedical Computing.)

Jeff M. Michalski, M.D., Medical College of Wisconsin, 1986.

Daniel F. Mullen, D.D.S., University of Missouri, 1977. (Computer Sciences)

William L. Straube, M.S., Washington University, 1992. (Radiation Physics)

Marie E. Taylor, M.D., University of Washington, Seattle, 1982.

Instructor (Clinical)

Gary A. Ratkin, M.D., Washington University, 1967. (See Department of Medicine.)

Research Associates

Walter R. Bosch, D.Sc., Washington University, 1990. (Radiation Physics)

Rupak K. Das, Ph.D., Ohio University, 1988. (Radiation Physics)

Assen S. Kirov, Ph.D., Sofia University, 1993. (Radiation Physics)

Robert S. Malyapa, M.B.,B.S. University of Madras, 1979 (Cancer Biology); Ph.D., Hiroshima University, 1992.

Robert P. Vanderwaal, Ph.D., University of Illinois, 1993. (Cancer Biology)

Xiafang Zhang, M.D., Shanghai Medical University, 1968. (Cancer Biology)

Yimin Zhu, M.S., Washington University, 1989. (Radiation Physics)

Research Assistants

Weihua He, M.D., Hunan Medical University, 1991. (Cancer Biology)

William D. Wright, B.S., University of California, 1976. (Cancer Biology)

MARY CULVER DEPARTMENT OF SURGERY

The Department of Surgery includes the Divisions of General Surgery, Cardiothoracic Surgery, Pediatric Surgery, Plastic Surgery, Orthopedic Surgery and Urologic Surgery. The formal instruction begins in the third year. For the duration of the 12-week rotation in the Department of Surgery, students are assigned clinical rotations in which they have the opportunity to participate in the care of surgical patients. Students attend daily patient rounds and outpatient clinics as well as scheduled and emergency surgical procedures. Seminars and teaching conferences are scheduled on a regular basis. In the fourth year, students may select a subinternship or a preceptorship elective in the Division of General Surgery. In addition, electives are available in pediatric surgery, transplant surgery, vascular surgery, cardiovascular and thoracic surgery, urologic surgery, and plastic and reconstructive surgery.

THIRD YEAR

Surgical Wards

Six weeks of the 12-week required clinical clerkship in surgery are devoted to General Surgery. For this six-week period, each student is assigned to a rotation at Barnes Hospital, Jewish Hospital, or St. Louis Regional Medical Center. The student is an active participant in the care of assigned patients. Formal conferences consist of case presentations to the faculty, core lectures in surgery, ward rounds, and departmental and divisional rounds. In addition to this six-week general surgery rotation, each student rotates on two surgical specialty services. Each specialty service rotation is of three weeks duration.

FOURTH YEAR

There are opportunities for fourth-year student rotations within each division in the Department of Surgery. The student is encouraged to actively participate in planning his or her fourth-year rotation within the department so that the resources and faculty expertise within the department can be maximally utilized by the student during the rotation. Generally, the minimum duration of a fourth-year rotation in the Department of Surgery is 4 weeks.

General Surgery Subinternship - Barnes Hospital

Each student will be assigned to the general surgery resident ward and will function as a member of the team, sharing most of the duties of an intern. The student will share night call under supervision of the first- and second-year residents in rotation with the two ward interns. In addition, part of the rotation may be taken in the Surgical Intensive Care Unit. The purpose of this portion of the rotation is to familiarize the student with the care of the critically ill surgical patient. Rounds are made every morning with faculty members from the Department of Surgery and a senior surgical resident. Students are encouraged to participate actively in these rounds. They are also encouraged to read about the problems they encounter and to participate as integral members of the team providing care for the patients. *Dr. Wells, Dr. Andriole and Staff*

Jewish Hospital Subinternship

The senior rotation at Jewish Hospital is an extremely flexible program. Within the framework of providing a good background in and experience with surgical diseases, many approaches are allowable. A student may divide the rotation here choosing some time on a specialty or spending all of the rotation as a surgical subintern. *Dr. Philpott and Staff*

St. Louis Regional Medical Center Subinternship

Students work under the supervision of the chief resident in Surgery and are integral members of the surgical team. Ward rounds are made twice daily. Students are assigned new patients for complete history and physical examinations and are expected to formulate a plan of diagnosis and treatment. Students assist in the operating room on their patients as well as at the direction of the chief resident. Students attend the weekly teaching conference at 8:15 a.m. on Tuesdays and the Morbidity and Mortality Conference held on alternate weeks, and attend the General Surgery Conferences at Barnes Hospital as well. Night call is shared with a surgical assistant resident. *Dr. Monafo*

General Surgery Clerkship, Rural Practice

Students work under the supervision of two general surgeons involved in rural practice at the Keokuk Area Hospital, Keokuk, Iowa. Students function under a preceptorship arrangement and are involved in the diagnosis and management of a large variety of patients with general surgery conditions. Patients are followed from their initial office visit through outpatient diagnostic procedures and on to hospital admission for operation. Students are an integral part of the practice of the two general surgeons. Housing is provided across the street from the hospital and food maintenance is covered by the hospital. Keokuk is located approximately three and one-half hours north of St. Louis and is accessible by car. *Dr. Siroospour, Dr. Kinateder*

Preceptorships in General Surgery

The student works with a senior general surgeon within the Division of General Surgery. Student involvement in all aspects of clinical surgery is accomplished by student attendance in the outpatient

office, preoperative patient evaluation, in-hospital patient management, and postoperative outpatient follow-up after discharge in conjunction with the senior general surgeon. The student may plan an individual preceptorship program with a surgeon specializing in an area of particular interest to the student. *Dr. Andriole and Staff*

Transplantation Surgery Elective

The care of transplantation patients requires the integration of multiple diverse medical and surgical disciplines. This elective clerkship in organ transplantation encompasses preoperative cadaveric and living related donor evaluation for adult and pediatric recipients of kidney, liver and pancreatic grafts as well as associated operative procedures in patients with end organ failure. Emphasis is placed on postoperative care, multimodality immunosuppression, management of allograft rejection and organ retrieval and preservation. Basic hepatic, pancreatic and renal physiology, fluid and electrolyte balance, operative techniques and transplantation immunology are stressed. Management of the complications of diabetes, portal hypertension and infectious diseases are a part of the complete management of these patients. This course is designed to offer the student an overview of the field of organ transplantation. The student functions as an integral part of the transplant team and assumes appropriate responsibilities under supervision. A vigorous and varied clinical schedule should be anticipated. An interview is recommended prior to selecting this elective. *Dr. Howard and Staff*

Vascular Surgery Elective

The senior elective in Vascular Surgery offers the medical student the opportunity to become an integral member of the vascular surgery team, comprising three junior level surgery residents, three senior level surgery residents, and six attending surgeons. The student actively participates in the preoperative and postoperative care of patients with a variety of complex medical and vascular problems. The student is actively involved in the operating room for assigned cases and participates in daily teaching rounds as well as two weekly conferences with the attending surgeons. *Dr. Gregorio A. Sicard and Staff*

Pediatric Surgery Elective

The student will fully participate as a member of the house staff team in all aspects of pediatric surgical patient care, including preoperative evaluation, surgery and postoperative care. Daily rounds are made with the resident staff and the attending staff. Participation in general surgery pediatric clinics, emergency room care and weekly teaching conferences (pediatric surgery, pathology and radiology) are encouraged. Students will have the opportunity to undertake clinical investigations, if elective time permits. *Dr. Foglia and Staff*

Plastic and Reconstructive Surgery Elective

The period on plastic surgery may be spent either as a clinical clerk or conducting a basic laboratory project. During the elective, the student can rotate on the six different clinical services or concentrate on a single service. The student will assume an active role in the plastic surgery service and will participate in the total management of a wide variety of surgical problems. The research clerkship can be conducted in the Plastic Surgery laboratory in association with any of our attending staff. A project will be designed with the student prior to his/her rotation on Plastic Surgery so that all the material and methods will be available at the beginning to the rotation. Research projects are ongoing in the following areas: 1) nerve repair and regeneration; 2) wound healing; 3) growth factors; 4) breast implants; 5) head and neck reconstruction; 6) craniofacial deformities; 7) microvascular research; 8) and soft tissue transplantation. *Dr. Weeks and Staff*

Urology Elective

A 6-week clinical clerkship in Pediatric and/or Adult Urology will offer the interested student experience with a spectrum of problems in clinical urology. The student will learn the basic diagnostic procedures and management of surgical and nonsurgical aspects of patient care on the private and ward services under the supervision of the attending staff and house officers. Clinical conferences are held four days per week and pyelogram conferences are held daily. *Dr. Catalona and Staff*

Cardiothoracic Surgery Elective

During the senior elective in Cardiothoracic Surgery, students have the choice of spending the entire rotation in adult cardiac surgery, adult non-cardiac thoracic surgery, or in pediatric cardiac surgery. Alternatively, the rotation can be divided into any combination of the above three sub-rotations. While on the Cardiothoracic Surgery Service, students will round daily with the cardiothoracic surgery house staff, participate in operative procedures of their choice, attend weekly Cardiothoracic Surgery Conferences, as well as the combined Cardiology and Cardiothoracic Surgery Cardiac Catheterization Conference. Students are also encouraged to spend time with the cardiothoracic anesthesia team and the perfusion staff. Active participation in postoperative care in the Cardiovascular Intensive Care Unit and step-down unit is also encouraged. *Dr. Cox, Dr. Rosenbloom and Staff*

Orthopedic Hand Surgery Elective

A clinical elective will be available for a 4-week period, during which time the student will work with attending surgeons primarily at Barnes Hospital. Activities will include participation in the care of hospital patients, participation in inpatient and outpatient procedures, attendance at designated

attending office hours, attendance at designated orthopedic conferences, and dissection of upper extremity anatomical specimens. *Dr. Manske and Staff*

Orthopedic Spine Surgery Elective

This clinical elective is available for a 6-week period. Students will work with attending surgeons and senior residents at Barnes Hospital and St. Louis Children's Hospital. Participation will include evaluation and management of inpatients and outpatients, serving as an assistant on anterior and posterior spinal decompressions and instrumentations. *Dr. Bridwell*

Orthopedic Surgery Elective

This clinical elective is available for 4 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 orthopedic team. *Dr. Strecker*

Clerkships are offered on one of seven orthopedic clinical rotations:
1) Barnes Hospital-Hand (Paul R. Manske, M.D.)
2) Barnes Hospital-Trauma (Clayton R. Perry, M.D.)
3) Barnes Hospital-Reconstructive (Charles J. Sutherland, M.D.)
4) St. Louis Regional Medical Center (Richard Pearson, M.D.)
5) John Cochran VA Hospital (Gary A. Miller, M.D.)
6) St. Louis Children's Hospital (Perry L. Schoenecker, M.D.)
7) St. Louis Shriner's Hospital for Crippled Children (Perry L. Schoenecker, M.D.)

Orthopedic Trauma Elective

Clinical elective available for a four- to six-week period, during which time the student will work in orthopedic trauma primarily at Barnes Hospital and St. Louis Regional Medical Center. Activities will include participation in the care of hospital patients, participation in inpatient and outpatient procedures, attendance at designated orthopedic conferences, and participation in ongoing research projects. *Dr. Perry*

Pediatric Orthopedic Surgery Elective

Clinical elective available for 4 weeks during which time the student will work with attending surgeons primarily at St. Louis Shriner's and Children's hospitals observing and assisting in out- and inpatient clinics. Attendance at and participation in the weekly pediatric orthopedic conference activities are required. *Dr. Schoenecker*

Faculty

Bixby Professor of Surgery, Chairman, Department of Surgery

Samuel A. Wells, Jr., M.D., Emory University, 1961.

DIVISION OF CARDIOTHORACIC SURGERY

Evarts A. Graham Professor of Surgery and Head of Division

James L. Cox, M.D., University of Tennessee, 1967.

John M. Shoenberg Professor of Cardiovascular Surgery

Nicholas T. Kouchoukos, M.D., Washington University, 1961.

Professors Emeriti

Thomas B. Ferguson, Sr., M.D., Duke University, 1947.

Charles L. Roper, M.D., University of Colorado, 1953.

Professors

John P. Boineau, M.D., Duke University, 1959.

Joel D. Cooper, M.D., Harvard College, 1964.

G. Alexander Patterson, M.D., Queen's University, Kingston, Ontario, 1974.

Thomas L. Spray, M.D., Duke University, 1973.

Associate Professors

T. Bruce Ferguson, Jr., M.D., Washington University, 1979.

Michael K. Pasque, M.D., University of Oklahoma, 1978.

Associate Professor (Clinical)

Martin Bergmann, M.D., Washington University, 1945.

Assistant Professors

Bill B. Daily, Jr., M.D., Ph.D., Washington University, 1985.

Carolyn M. Dresler, M.D., University of Colorado, 1980.

Charles B. Huddleston, M.D., Vanderbilt University, 1978.

Michael Rosenbloom, M.D., New York University, 1981.

R. Sudhir Sundaresan, M.D., University of Ottawa, 1983.

Thomas H. Wareing, M.D., University of Alabama, 1979.

Research Assistant Professors

Richard B. Schuessler, Ph.D., Clemson University, 1977.

Thoralf M. Sundt III, M.D., The Johns Hopkins University, 1984.

Instructor

Christina C. Pasque, M.D., University of California, Los Angeles, 1980.

DIVISION OF GENERAL SURGERY

Head of Division

Samuel A. Wells, Jr., M.D., Emory University, 1961.

Professor Emeritus

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, Chapel Hill, 1967; Ph.D., Duke University, 1980. (See Department of Molecular Microbiology.)

Thalachallour Mohanakumar, Ph.D., Duke University, 1974. (See Departments of Medicine and Pathology.)

William W. Monafo, Jr., M.D., Tufts University, 1957.

Jeffrey A. Norton, M.D., State University of New York, 1973.

Harry Edison Professor of Surgery

Gordon W. Philpott, M.D., Washington University, 1961.

David W. Scharp, M.D., Washington University, 1970.

Gregorio A. Sicard, M.D., University of Puerto Rico, 1972.

Steven M. Strasberg, M.D., University of Toronto, 1963.

Research Professors

Allan D. Callow, M.D., Harvard Medical School, 1942; Ph.D., Tufts University, 1952.

Una S. Ryan, Ph.D., Cambridge University, 1968. (See Department of Cell Biology and Physiology and Department of Medicine.)

Associate Professors

P. Robert C. Harvey, M.D., University of Toronto, 1981; Ph.D., University of Western Ontario, 1977.

Ira J. Kodner, M.D., Washington University, 1967.

Nathaniel J. Soper, M.D., University of Iowa, 1980.

Associate Professors Emeriti (Clinical)

Richard V. Bradley, M.D., Washington University, 1952.

Leo A. Sachar, M.D., Washington University, 1940.

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.

Richard G. Sisson, M.D., Yale University, 1946.

Assistant Professors

Brent T. Allen, M.D., Washington University, 1979.

Elisa H. Birnbaum, M.D., University of Illinois, 1985.

L. Michael Brunt, M.D., The Johns Hopkins University, 1980.

Gerard M. Doherty, Yale University, 1986.

James W. Fleshman, Jr., M.D., Washington University, 1980.

Todd K. Howard, M.D., University of Cincinnati, 1981.

William G. Kraybill, M.D., University of Cincinnati, 1969.

Jeffrey F. Moley, M.D., Columbia University, 1980.

Diane M. Radford, M.D., University of Glasgow, 1991.

Jeffrey M. Reilly, M.D., Dartmouth Univsity, 1985.

Brian G. Rubin, M.D., University of Vermont, 1984.

Kangla Tsung, Ph.D., State University of New York at Stony Brook, 1990.

Eric D. Whitman, M.D., Pennsylvania State University, 1985.

Research Assistant Professor Emeritus

Harry W. Margraf, Ph.D., Polytechnicum Milan, 1943; Sc.D., Washington University, 1971.

Research Assistant Professors

Judith M. Connett, Ph.D., Washington University, 1979.

Phillip Gambel, Ph.D., Pennsylvania State University, 1980.

Assistant Professors (Clinical)

Kenneth J. Arnold, M.D., Washington University, 1968.

Alvin Goldfarb, M.D., Washington University, 1943.

Jerome F. Levy, M.D., Washington University, 1958.

Stanley L. London, M.D., Washington University, 1949.

Jerry R. Meyers, M.D., Washington University, 1966.

Shale M. Rifkin, M.D., Washington University, 1948.

Andrew D. Spencer, M.D., Indiana University, 1954.

Research Instructor

Yael G. Alevy, Ph.D., Albert Einstein College of Medicine, 1975.

Instructors (Clinical)

Jerry L. Beguelin, M.D., Washington University, 1962.

Charles R. Berryman, M.D., University of South Alabama, 1978.

John B. Buettner, M.D., Washington University, 1967.

Steven W. Cooley, M.D., Louisiana State University, 1977.

Mitchell B. Cordover, M.D., University of Arizona, 1982.

Gary L. Gambill, M.D., University of Oregon, 1974.

Ronald J. Gaskin, M.D., Washington University, 1970.

Joseph H. Gatewood, M.D., The University of Chicago, 1970.

Jay W. Haines, M.D., Chicago Medical School, 1974.

Thomas C. Hill, M.D., Washington Universiy, 1972.

Elizabeth Hilliker, M.D., Washington University, 1970.

John D. Hirsch, M.D., Washington University, 1973.

Ronald Kinateder, M.D., University of Missouri, 1966.

Robert J. Kingsbury, M.D., University of Michigan, 1960.

David P. Krajcovic, M.D., Washington University, 1969.

G. Lynn Krause, Jr., M.D., University of Pennsylvania, 1954.

Eric H. Lindenblad, M.D., University of Missouri, 1981.

Alan M. Londe, M.D., Washington University, 1961.

Mark A. Ludwig, M.D., The University of Chicago, 1976.

Hubert S. Mickel, M.D., Harvard University, 1962.

Julian C. Mosley, Jr., M.D., Washington University, 1972.

George A. Oliver, M.D., Washington University, 1952.

Charles L. Parks, M.D., Washington University, 1969.

Jon Peterson, M.D., University of Southern California, 1978.

Frank O. Richards, M.D., Howard University, 1947.

Donald C. Sauer, M.D., Washington University, 1960.

Philip J. Schmitt, M.D., Washington University, 1979.

Marlys E. Schuh, M.D., Washington University, 1979.

David Siroospour, M.D., Shiraz University, Iran, 1967.

Calvin B. Terrell, M.D., Washington University, 1977.

Jeffrey E. Zuke, M.D., University of Missouri, 1979.

DIVISION OF HUMAN MOLECULAR GENETICS

Professor

Helen Donis-Keller, Ph.D., Harvard University, 1979.

Associate Professor

Paul J. Goodfellow, Ph.D., Queen's University, 1985.

Research Associate Professor

William G. Dilley, Ph.D., University of California, 1970.

DIVISION OF ORTHOPEDIC SURGERY

Fred C. Reynolds Professor and Head of Division

Paul R. Manske, M.D., Washington University, 1964. (See Irene Walter Johnson Institute of Rehabilitation.)

Professor Emeritus

Lee T. Ford, M.D., University of Tennessee, 1940.

Associate Professors

Keith H. Bridwell, M.D., Washington University, 1977.

Clayton R. Perry, M.D., St. Louis University, 1977.

Perry L. Schoenecker, M.D., University of Wisconsin, 1968.

William B. Strecker, M.D., St. Louis University, 1975.

Associate Professors Emeriti (Clinical)

Marshall B. Conrad, M.D., Washington University, 1945.

Harry C. Morgan, M.D., Harvard University, 1953.

Assistant Professor Emeritus

J. Otto Lottes, Ph.G., St. Louis College of Pharmacy, 1928; M.D., University of Louisville, 1937.

Assistant Professors

Jerome J. Gilden, M.D., Washington University, 1952.

Lawrence G. Lenke, M.D., Northwestern University, 1986.

Matthew Matava, M.D., University of Missouri, Kansas City, 1987.

Kurt D. Merkel, M.D., St. Louis University, 1980.

Gary A. Miller, M.D., Jefferson Medical College, 1977.

Donald L. Pruitt, M.D., New Jersey Medical School, 1983.

Robert A. Shively, M.D., University of Illinois, 1969.

Charles J. Sutherland, M.D., Yale University, 1971.

Research Assistant Professors

Kenton N. Fedde, Ph.D., The University of Chicago, 1983.

Basem Koudsi, M.D., Damascus Medical University, 1978.

Jueren Lou, M.D., Kiangi Medical College, Nanchang, China, 1983.

Assistant Professors (Clinical)

Jordon H. Ginsburg, M.D., University of Illinois, 1972.

Robert E. Kuhlman, M.D., Washington University, 1956.

Marvin R. Mishkin, M.D., University of Illinois, 1955.

Instructors

Donald O. Burst, M.D., St. Louis University, 1945.

Enes M. Kanlic, M.D., University of Sarajevo, 1971.

Richard L. Pearson, M.D., University of Illinois, Chicago, 1974.

Research Instructor

Donald E. Gayou, Ph.D., Iowa State University, 1979.

Instructors (Clinical)

Donald R. Bassman, M.D., Washington University, 1975.

Donald H. Brancato, M.D., Northwestern University, 1967.

William S. Costen, M.D., Washington University, 1954.

James P. Emanuel, M.D., Washington University, 1983.

Ronald C. Hertel, M.D., Washington University, 1956.

Barrett K. Holder, M.D., Washington University, 1969.

Robert S. Kramer, M.D., Washington University, 1983.

Robert C. Lander, M.D., University of Illinois, 1972.

W. Edward Lansche, M.D., Washington University, 1952.

Charles I. Mannis, M.D., University of Missouri, 1969.

Alan H. Morris, M.D., University of Illinois, 1963.

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

Jerome G. Piontek, M.D., St. Louis University, 1979.

Barry L. Samson, M.D., Washington University, 1974.

John J. Sheridan, M.D., Washington University, 1969. (Shriners Hospital for Crippled Children)

Keith R. Swanson, M.D., University of Texas, Galveston, 1971. (Shriners Hospital for Crippled Children)

Michael H. Winer, M.D., University of Illinois, 1968.

Assistants (Clinical)

John P. Arnot, M.D., Yale University, 1958.

Kyu Sop Cho, M.D., Yon-Sei University, 1954.

DIVISION OF PEDIATRIC SURGERY

Head of Division

Robert P. Foglia, M.D., Georgetown University, 1974.

Professor

Jessie L. Ternberg, Ph.D., University of Texas, 1950; M.D., Washington University, 1953; Sc.D. (hon.), Grinnell College, 1972. (See Department of Pediatrics.)

Associate Professor

Jacob C. Langer, M.D., University of Toronto, 1980.

Assistant Professors

Michael A. Skinner, M.D., Rush University, 1984.

Andrea L. Winthrop, M.D., Queen's University, 1981.

DIVISION OF PLASTIC AND RECONSTRUCTIVE SURGERY

Head of Division

Paul M. Weeks, M.D., University of North Carolina, 1958. (See Irene Walter Johnson Institute of Rehabilitation.)

Professor Emeritus

Minot P. Fryer, M.D., The Johns Hopkins University, 1940; D.S.C., Brown University, 1972.

Professors

Susan E. Mackinnon, M.D., Queen's University, Kingston, Ontario, 1975.

Jeffrey L. Marsh, M.D., The Johns Hopkins University, 1970. (See Department of Pediatrics.)

V. Leroy Young, M.D., University of Kentucky, 1970.

Associate Professors

Donald V. Huebener, D.D.S., Washington University, 1969; M.S., Case Western Reserve University, 1971.

Roger K. Khouri, M.D., American University of Beirut, 1981.

Assistant Professors

Mark E. Beehner, D.D.S., Loyola University, 1979; M.D., St. Louis University, 1990.

Christine A. Feely, Ph.D., Washington University, 1984.

Thomas J. Francel, M.D., University of Cincinnati, 1982.

Philip E. Higgs, M.D., University of Florida, 1974.

George J. Hruza, M.D., New York University, 1982. (See Department of Medicine.)

Timothy R. Jones, M.D., University of Oklahoma, 1983.

Bruce A. Kraemer, M.D., Washington University, 1979.

Michael W. Vannier, M.D., University of Kentucky,1979. (See Department of Radiology.)

Peter D. Witt, M.D., Case Western Reserve University, 1983.

Assistant Professors (Clinical)

Joseph W. Eades, M.D., Washington University, 1960.

Andrew K. Kim, D.M.D., Washington University, 1987.

Richard J. Nissen, D.D.S., University of Iowa, 1988.

Patricia A. Parsons, D.D.S., Washington University, 1957.

Homa Youn Sedighi, D.D.S., Washington University, 1987.

Instructors

Marlene B. Salas-Provance, Ph.D., University of Illinois, 1990.

Mary K. Seaton, B.S., University of Missouri, 1977.

Instructors (Clinical)

David A. Caplin, M.D., University of Cincinnati, 1975.

H. Groves Cooke, D.D.S., Washington University, 1971; M.S., George Washington University, 1975.

Thomas J. Veraldi, D.M.D., Washington University, 1979.

Bruce I. White, M.D., Washington University, 1964.

Robert A. Young, M.D., Ohio State University, 1978.

Research Associate Professor

Mary P. Watkins, M.S., Boston University, 1974.

Research Assistant Professor

Christine B. Novak, M.S., University of Toronto, 1992.

DIVISION OF UROLOGIC SURGERY

Head of Division

William J. Catalona, M.D., Yale University, 1968.

Professors

Ralph V. Clayman, M.D., University of California, San Diego, 1973. (See Department of 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 Professor

Gerald L. Andriole, Jr., M.D., Jefferson Medical College, 1978.

Research Associate Professor

Timothy L. Ratliff, Ph.D., University of Arkansas, 1977. (See Department of Pathology.)

Associate Emeritus Professor (Clinical)

M. Richard Carlin, M.D., Yale University, 1947.

Associate Professors (Clinical)

William T. Bowles, M.D., Stanford University, 1955.

Assistant Professors

Joseph W. Basler, M.D., University of Missouri, 1984.

Douglas E. Coplen, M.D., Indiana University, 1985.

M'Liss A. Hudson, M.D., University of Texas, 1982.

Carl G. Klutke, M.D., University of Michigan, 1983.

Elspeth M. McDougall, M.D., University of Calgary, 1979.

Assistant Emeritus Professor (Clinical)

Franz U. Steinberg, M.D., University of Berne, 1938. (See Department of Medicine.)

Assistant Professors (Clinical)

Lawrence M. Aronberg, M.D., Washington University, 1936.

James G. Bucy, M.D., Northwestern University, 1962.

Richard P. Parsons, M.D., Washington University, 1958.

Instructors

Arnold D. Bullock, M.D., The Johns Hopkins University, 1987.

John W. Colberg, M.D., Washington University, 1985.

Robert S. Figenshau, M.D., University of Minnesota, 1987.

David W. Keetch, M.D., University of Utah, 1987.

John F. McCarthy, M.D., Georgetown University, 1989.

Charles H. Nicolai, M.D., Washington University, 1946.

Research Instructors

Mark L. Day, Ph.D., Washington University, 1989.

Deborah Smith, Ph.D., Washington University, 1989.

Instructors (Clinical)

Saul Klein, M.D., Syracuse University, 1959.

Neal Neuman, M.D., St. Louis University, 1971.

Jeffrey A. Parres, M.D., University of Missouri, 1987.

Enrique P. Perinetti, M.D., National University of Cuyo, Argentina, 1968.

Courtney Shands III, M.D., Vanderbilt University, 1982.

Herbert Sunshine, M.D., Washington University, 1954.

Ralph J. Torrence, M.D., Georgetown University, 1980.

TEACHING AND RESEARCH DIVISIONS

DIVISION OF BIOSTATISTICS

The Division of Biostatistics is a medical school-wide facility that engages in teaching, research, and biostatistical consultation activities. An elementary course on biostatistics and epidemiology, Introduction to Biostatistics and Epidemiology, given to second-year medical students, affords a basis for understanding quantitative assessment in biology and medicine, and prepares the student for critical evaluation of reports in the medical literature. Interested students may pursue more intensive studies through electives offered by the Division. At the initiative of other departments, the Division also offers additional short courses in biostatistics. The Division participates actively in both pre- and postdoctoral training. In addition to the core research program of the Division, its research activities include collaborative projects with various departments of the School. Biostatistical consultation represents a major activity of the Division, providing expertise in both theoretical and applied areas.

First Year

Introduction to Biostatistics and Epidemiology

This introduction to the principles and methods of biostatistics emphasizes the concepts of statistical methodology and the appropriate design of clinical research projects as being essential to the proper application and interpretation of statistical methods and to a critical evaluation of the medical literature. Elementary statistical techniques illustrating the use of statistical principles in experimental and clinical research are discussed. Clinical summaries often precede the biostatistical lectures, highlighting the relevance of certain statistical principles. Small group discussions are also organized on prechosen topics to better prepare the students in evaluating published medical reports. *Drs. Schechtman and Spitznagel*

Electives

Biostatistics for Research Workers

This course is designed for those researchers who want to expand their knowledge of practical methods in statistics. It is oriented toward statistical and epidemiological concepts, applications, practical hints, and a hands-on approach to data, rather than theory or derivation of formulas. Heavy use is made of SAS/PC (a statistical analysis package for the PC computer, which is required for this course) for in-class examples and homework problems. The course begins with a basic overview of common statistical techniques, including: simpler, classical methods (e.g., t-test, chi-square, correlation); multivariate methods (regression, logistic models, ANOVA, survival analysis); and study design. These plus other selected topics (e.g., reliability, factor analysis, survey and sampling, research design) are then covered in greater detail in additional modules. Many faculty from different departments and backgrounds provide the instruction. *Dr. Province and Staff*

Genetic Epidemiology: A Research Elective

After being introduced to current approaches in Genetic Epidemiology, interested students are supervised on research projects dealing with methodological developments as well as analysis of real data. Topics to be covered include: resolution of cultural and biological inheritance, with emphasis on multivariate associations and temporal trends; detection of major gene effects, with emphasis on pleiotropy and genetic heterogeneity; and linkage analysis and gene mapping. Pre- and postdoctoral students in genetic epidemiology are required to take this course. *Dr. Rao and Staff*

Research

Research activities of the Division span a wide range of topics dealing with a number of disorders of considerable public health importance, providing research opportunities at both theoretical and applied levels. Several research projects involve close interaction and collaboration with a number of research groups at the Medical Center. The present core research program of the Division deals with genetic epidemiology, especially as it relates to cardiovascular disease. A number of theoretical and applied problems are addressed, including: nature-nurture resolution and identification of the genetic basis of risk factors such as lipids, lipoproteins, apolipoproteins, obesity, blood pressure, sex hormones, and glucose tolerance; exploration of temporal trends in the degree of genetic and environmental effects; and multivariate associations among multiple risk factors. Timely theoretical issues are also addressed, such as the sampling of families through patients, and statistical properties of methods of data analysis. Present collaborative research projects include: a coordinating center for a multisite NIA/NCNR cooperative study to reduce frailty and injuries in the elderly (FICSIT), a coordinating center for a multicenter family and genetic study of heart disease (FHS), a coordinating center for a multicenter study to assess the genetic basis of response to exercise training (HERITAGE), a coordinating center for a trial in ocular hypertensives (OHTS); studies in psychiatric epidemiology; studies of the epidemiology of falls, hip fracture, and osteoporosis; studies of Alzheimer's disease; a SCOR project involving several laboratory and clinical research protocols on ischemic heart disease; three epidemiological research projects developing methods for increasing public awareness and utilization of measures which are known to decrease the likelihood of developing heart disease, and for encouraging behaviors which will improve prognosis following a heart attack; and epidemiological genetics and family studies of mental disorders, including schizophrenia and alcoholism.

Biostatistical Consultation

The Division provides consultation in a wide range of areas including the statistical design of experiments and clinical trials, protocol development, data base management, analysis of data, and interpretation of results. Some of the areas of special strength and expertise include cardiovascular biostatistics, computing, and statistical packages. The Division is well equipped to provide assistance at the stage of preparing grant applications, including careful discussions of study design, sample size calculations, randomization schemes, computer resources, and data analysis.

Faculty

Professor and Director

Dabeeru C. Rao, Ph.D., Indian Statistical Institute, 1971. (See Departments of Psychiatry and Genetics.)

Professor Emeritus

Reimut Wette, D.Sc., University of Heidelberg, 1955.

Professors

J. Philip Miller, A.B., Washington University, 1965.

John P. Rice, Ph.D., Washington University, 1975. (See Department of Psychiatry.)

Stanley Sawyer, Ph.D., California Institute of Technology, 1964. (Also Faculty of Arts and Sciences)

Edward L. Spitznagel, Jr., Ph.D., The University of Chicago, 1965. (Also Faculty of Arts and Sciences)

Associate Professor

Kenneth B. Schechtman, Ph.D., Washington University, 1978. (See Department of Medicine.)

Assistant Professor Emeritus

Barbara B. Hixon, B.S., University of Illinois, 1941.

Assistant Professors

Mae Gordon, Ph.D., University of Wisconsin, 1978. (See Department of Ophthalmology and Visual Sciences.)

Zhaohai Li, Ph.D., Columbia University, 1989.

Curtis A. Parvin, Ph.D., University of Minnesota, 1980. (See Departments of Pathology and Medicine.)

Michael A. Province, Ph.D., Washington University, 1987.

George P. Vogler, Ph.D., University of Colorado, 1985.

Research Assistant Professors

Ingrid B. Borecki, Ph.D., University of Hawaii, 1981.

Laura E. Mitchell, Ph.D., Yale University, 1991.

Treva K. Rice, Ph.D., University of Colorado, 1987.

Research Instructors

Cynthia L. Arfken, Ph.D., Yale University, 1985.

Jane Rossiter Fornoff, D.Phil., Oxford University, 1993.

INSTITUTE FOR BIOMEDICAL COMPUTING

The Institute for Biomedical Computing is an interschool organization which spans computing research activities at both the School of Medicine and the School of Engineering and Applied Science that has been in existence since 1966. The Institute consists of research laboratory components which have close ties with several departments in the School of Engineering as well as with most departments in the School of Medicine. The Institute now includes the Biomedical Computer Laboratory (BCL), the Medical Informatics Group, the Center for Molecular Design, and the Center for Computational Biology.

The BCL emphasizes the development of computer hardware and software systems for use in the solution of research problems in biomedicine. Several systems have seen a progression from exploratory pilot studies, through major development projects, to public availability through commercial distribution. In general, BCL focuses on biomedical research applications which require solutions employing approaches to digital computing not available from commercial vendors or through other computing facilities at Washington University. Such applications often require the integration of 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 Medical Informatics Group has been formed to promote the application of information science to research and clinical activities; and to provide pre- and post-doctoral training spanning computer science and various disciplines of biomedicine. The Medical Informatics Group is closely linked with the Medical Informatics Division of the Department of Internal Medicine.

The Center for Molecular Design (CMD) provides a core facility with research in the development and application of theoretical chemistry and biophysics to problems at the molecular level. A long-term association among Institute components, Computer Science, and Pharmacology in the area of molecular recognition and drug design provides the base for industrial collaboration and strong interactions with other departments at Washington University.

The Center for Computational Biology focuses on databases of biological information and analysis of metabolic systems. The research involves algorithm development, database design, and database analysis with a particular emphasis on biochemical and neuromuscular structure and function. The center is also involved in technology development and informatics support for genome mapping and sequencing.

The overall purpose of the Institute for Biomedical Computing is to foster the development and application of advanced computing and engineering technologies to problems in biomedical science. In addition to its activities in collaborative research, the Institute serves as a focal point for interdisciplinary teaching and student research in areas not yet included in conventional curricula.

Research Opportunities

Research activities of the Institute for Biomedical Computing span a wide range from basic biological science and clinical research to topics in biomedical engineering, signal processing, computer architectures, and integrated circuit design. Many research projects of the Institute involve collaboration with researchers in the basic science and clinical departments of the School of Medicine, or in the Departments of Computer Science and Electrical Engineering of the School of Engineering and Applied Science. Additional collaborations take place through the interdepartmental program in Biomedical Engineering.

Current emphasis in the core research program of the Biomedical Computer Laboratory is on quantitative biomedical imaging, which includes: modeling of biological phenomena as image sources; transduction processes; instrumentation characteristics; data analysis strategies for extraction of information from images; algorithms for image reconstruction and analysis; development of a distributed facility for image presentation, analysis, and quantification; and high-performance computing using multiple-instruction stream multiple-data stream (MIMD) and single-instruction stream multiple-data stream (SIMD) parallel processors.

Major collaborative projects in BCL include research in: 1) the development of algorithms for positron-emission tomography systems; 2) the development of image-analysis methods for sequencing as well as physical and SSRP mapping of DNA; 3) the development of algorithms for computational light-microscopic optical sectioning and confocal fluorescent microscopy; 4) the application of advanced image analysis methods to electron-microscopic autoradiography; 5) the non-invasive delineation of pharmacology, blood flow, and metabolism in the brain; 6) the pathogenesis, treatment and sequelae of ischemic heart disease; 7) digital-communication networks; and 8) radiation-treatment planning. *Drs. Thomas and Rosenberger*

The Medical Informatics Group offers special opportunities to participate in and to develop new areas of interdisciplinary informatics research. Research areas of current interest include information retrieval, database theory, clinical decision-making, expert systems, and reasoning using temporal and spatial data. Application areas include infection control and quality assessment, and general internal medicine. *Drs. Frisse and Kahn*

Research opportunities in CMD center on algorithm development in molecular modeling, simulations and structure-based *de novo* drug design, data analysis and presentation of molecular comparisons, interpretation of NMR experimental data, three-dimensional quantitative structure-activity relationships, and predictions of protein tertiary structure. *Drs. Marshall, Beusen, Huston and Nikiforovich*

Research in the computational biology group focuses on databases of biological information, and analysis of metabolic systems. Research involves algorithm development, database design, and database analysis with a particular emphasis on biochemical and neuromuscular structure and function. The center is also involved in technology development and informatics support for genome mapping and sequencing. *Drs. States and Kazic*

Faculty

Associate Professor and Director of the Institute for Biomedical Computing, and Director of Biomedical Engineering

David J. States, M.D., Ph.D., Harvard University, 1983. (See Department of Genetics and Department of Biochemistry and Molecular Biophysics.) (Also School of Engineering and Applied Science)

Professor and Associate Director, and Director of BCL

Lewis J. Thomas, Jr., M.D., Washington University, 1975. (See Department of Anesthesiology and Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science)

Professor and Director of Center for Molecular Design

Garland R. Marshall, Ph.D., Rockefeller University, 1966. (See Department of Molecular Biology and Pharmacology.)

Associate Professor and Associate Director of BCL

Frederick U. Rosenberger, D.Sc., New York University 1969. (Also School of Engineering and Applied Science)

Assistant Professor and Director of the Medical Informatics Group

Michael G. Kahn, M.D., University of California, San Diego, 1979. (See Department of Medicine.)

Professor Emeritus

Harold W. Shipton, C.Eng., Shrewsbury Technical College, 1949. (Also School of Engineering and Applied Science)

Professors

R. Martin Arthur, Ph.D., University of Pennsylvania, 1968. (Also School of Engineering and Applied Science)

Jerome R. Cox, Jr., Sc.D., Massachusetts Institute of Technology, 1954. (See Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science)

Charles E. Molnar, Sc.D., Massachusetts Institute of Technology, 1966. (See Department of Cell Biology and Physiology.) (Also School of Engineering and Applied Science)

Seymour V. Pollack, M.S., Brooklyn Polytechnic Institute, 1960. (Also School of Engineering and Applied Science)

James A. Purdy, Ph.D., University of Texas, 1971. (See Radiation Physics.)

Donald L. Snyder, Ph.D., Massachusetts Institute of Technology, 1966. (Also School of Engineering and Applied Science)

Research Professor

Charles H. Anderson, Ph.D., Harvard University, 1962. (See Department of Anatomy and Neurobiology.)

Gregory V. Nikiforovich, Ph.D., Byelorussian University, 1972.

Associate Professors

G. James Blaine III, D.Sc., Washington University, 1974 (See Department of Radiology.) (Also School of Engineering and Applied Science)

Michael I. Miller, Ph.D., The Johns Hopkins University, 1983. (Also School of Engineering and Applied Science)

Mark E. Frisse, M.D., Washington University, 1978. (See Department of Medicine, and Library and Biomedical Communication Center.) (Also School of Engineering and Applied Science.)

Research Associate Professors

Jack R. Engsberg, Ph.D., University of Iowa, 1985. (See Department of Neurosurgery.)

Lyndon S. Hibbard, Ph.D., Michigan State University, 1977. (See Department of Neurology and Neurological Surgery.)

Assistant Professors

Denise D. Beusen, Ph.D., Washington University, 1985. (See Department of Molecular Biology and Pharmacology.)

Jose A. Concello, Ph.D., Dartmouth College, 1991.

James G. McNally, Ph.D., The University of Chicago, 1983. (See Department of Cell Biology and Physiology.) (Also Faculty of Arts and Sciences)

John M. Ollinger, D.Sc., Washington University, 1986.

Joseph M. Smith, M.D., Harvard Medical School, 1987. (See Department of Medicine.)

Research Assistant Professor

Shawn E. Huston, Ph.D., University of Texas, 1989.

Instructor

Toni M. Kazic, Ph.D., University of Pennsylvania, 1984.

Senior Research Associates

William M. Hart, Jr., M.D., Ph.D., University of Maryland, 1970. (See Department of Ophthalmology and Visual Sciences.)

James G. Miller, Ph.D., Washington University, 1969. (See Department of Medicine.) (Also Faculty of Arts and Sciences)

Research Associates

Pankaj Agarwal, Ph.D., New York University, 1993.

Kenneth W. Clark, M.S., St. Louis University, 1967.

Stanislov G. Galaktionov, Ph.D., Byelorussian University, 1964.

D'vorah Graeser, Ph.D., University of Michigan, 1993.

Gerald C. Johns, B.S., Washington University, 1966.

Guennadi P. Klimov, Ph.D., Moscow State University, 1970.

Jia Luo, Ph.D., Georgia Institute of Technology, 1987.

John W. Matthews, D.Sc., Washington University, 1980. (See Department of Radiology.)

Joanne Markham, M.S., Washington University, 1973.(See Department of Medicine.)

Toan B. Nguyen, Ph.D., Yale University, 1993.

Tudor I. Oprea, M.D., Ph.D., University of Medicine and Pharmacology Timisoara, 1992.

David G. Politte, M.S., Washington University, 1983.

Mark N. Smythe, Ph.D., Melbourne University, 1992.

Ilya Vakser, Ph.D., Moscow State University, 1989.

Research Assistants

H. Dieter Ambos, C.E.E., Washington University, 1973.(See Department of Medicine.)

David R. Maffitt, M.S., Washington University, 1989.

HEALTH KEY MEDICAL GROUP

Health Key Medical Group is a primary care group practice providing comprehensive health services to more than 70,000 people in the St. Louis area. Previously established in 1969 as The Medical Care Group of St. Louis, Health Key's relationship with the School of Medicine has been as a teaching and research unit serving within a medical school environment. Today, the group provides care in pediatrics, internal medicine, allergy, and obstetrics/gynecology in a separate facility on the campus of the School of Medicine, as well as in five other locations throughout the metropolitan area.

The practice is a site for optional programs for advanced residents in general internal medicine and general pediatrics. An elective is available for fourth-year medical students in Internal Medicine and Pediatrics. The Health Key Pediatric Division actively participates in the COPE program of the Department of Pediatrics.

Health Key also is a source of data for various clinical and health services research. The practice is staffed by physicians in private practice who are members of the faculty of the School of Medicine in the Departments of Internal Medicine, Pediatrics, and Obstetrics and Gynecology.

Staff

Susan R. Adams, M.D., University of Virginia, 1992. (See Department of Medicine.)

William Stuart Adams, M.D., University of Virginia, 1992. (See Department of Pediatrics.)

Patricia J. Amato, M.D., Medical College of Ohio, 1982. (See Department of Pediatrics.)

Scott J. Anderson, Ph.D., Duke University, 1981; M.D., 1982. (See Department of Medicine.)

John K. Appelbaum, M.D., Washington University, 1984. (See Department of Obstetrics and Gynecology.)

Bonnie J. Aust, M.D., University of Texas, 1979. (See Department of Pediatrics.)

Miriam J. Behar, M.D., The Johns Hopkins School of Medicine, 1981. (See Department of Pediatrics.)

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, Calicut, India, 1973. (See Department of Pediatrics.)

Tammy Chi, M.D., University of California, Los Angeles, 1990. (See Department of Pediatrics.)

Kathleen M. Cizek, M.D., The University of Chicago, 1990. (See Department of Medicine.)

Darryl S. Cohen, D.O., Texas College of Osteopathic Medicine, 1981. (See Department of Pediatrics.)

James M. Corry, M.D., Washington University, 1974. (See Department of Pediatrics.)

John C. Davis, M.D., University of Michigan, 1980. (See Department of Pediatrics.)

Nancy Z. Delaney, M.D., Brown University, 1980. (See Department of Medicine.)

Karen M. Diehl, P.N.P., Washington University, 1978.

Thomas D. Doerr, M.D., The University of Chicago, 1983. (See Department of Medicine.)

Irl J. Don, M.D., Washington University, 1972. (See Department of Medicine.)

Charles H. Dougherty, M.D., University of Rochester School of Medicine, 1973. (See Department of Pediatrics.)

Jay S. Epstein, M.D., Emory University, 1983. (See Department of Pediatrics.)

Renee D. Ewing, M.D., Southern Illinois University, 1984. (See Department of Obstetrics & Gynecology.)

Michael J. Fedak, M.D., University of Missouri, Columbia, 1982. (See Department of Medicine.)

Edward B. Fliesher, M.D., St. Louis University, 1978. (See Department of Pediatrics.)

John P. Galgani, Jr., M.D., St. Louis University, 1982. (See Department of Pediatrics.)

Sally S. Hader, C.N.M., St. Louis University, 1976.

David E. Hartenbach, M.D., University of Missouri, 1987. (See Department of Pediatrics.)

Steven D. Jacobson, M.D., Mayo Graduate School, 1988. (See Department of Medicine.)

William L. Johnson, M.D., University of Missouri, 1981. (See Department of Pediatrics.)

Angela M. Kennedy, P.N.P., University of California, 1987.

A. Donna King, L.C.S.W., B.C.D., Washington University, 1966.

John H. Kissel, M.D., Harvard University, 1971. (See Department of Medicine.)

Shirley M. Knight, M.D., Washington University, 1980. (See Department of Pediatrics.)

Katherine L. Komendowski, M.D., Uniformed Services of the Health Sciences, 1984. (See Department of Pediatrics.)

Richard L. Lazaroff, M.D., St. Louis University, 1978. (See Department of Pediatrics.)

Charline Ledgerwood, C.N.M., University of Illinois, 1977.

Margaret L. Lewis, P.N.P., Washington University, 1978.

Gerald M. Mahon, M.D., University of Texas, Dallas 1983. (See Department of Medicine.)

Jerald Maslanko, M.D., Emory University, 1975. (See Department of Medicine.)

Marjorie Maxwell, R.D., C.D.E., University of Missouri, 1971.

Katherine F. Phelps, P.N.P., Washington University, 1983.

Nancy Quigley, P.N.P., Washington University, 1970.

Catherine R. Remus, M.D., Rush Medical College, 1983. (See Department of Pediatrics.)

John H. Rice, M.D., University of Missouri, 1980. (See Department of Medicine.)

Carol A. Robinson, M.D., University of Missouri, 1985. (See Department of Pediatrics and Department of Medicine.)

Isabel L. Rosenbloom, M.D., University of Maryland, 1984. (See Department of Pediatrics.)

Caroline Rowlands, M.D., Washington University, 1991. (See Department of Pediatrics.)

Joseph Schachter, M.D., Indiana University, 1979. (See Department of Pediatrics.)

Paula C. Schlesinger, M.D., Yale University, 1982. (See Department of Pediatrics.)

Margaret A. Schmandt, M.D., St. Louis University, 1987. (See Department of Pediatrics.)

Lisa D. Schrock, M.D., University of Missouri, Columbia, 1990. (See Department of Pediatrics.)

Paul S. Simons, M.D., Washington University, 1967. (See Department of Pediatrics.)

Elizabeth A. Tracy, M.D., Medical College of Wisconsin, 1986. (See Department of Medicine.)

Stanley G. Vriezelaar, M.D., University of Iowa, 1981. (See Department of Medicine.)

Nancy J. Williams, M.D., University of Kansas, 1987. (See Department of Medicine.)

Patricia B. Wolff, M.D., University of Minnesota, 1972. (See Department of Pediatrics.)

GRADUATE PROGRAMS

DIVISION OF BIOLOGY AND BIOMEDICAL SCIENCES

The Division of Biology and Biomedical Sciences, organized in 1973, is a consortium of eight university departments which together provide interdisciplinary training for Ph.D. students. This unique organization was formed because of the realization that research and training in modern biology transcend the limits of departmental structure. The faculty consists of members of seven preclinical departments in the School of Medicine–Anatomy and Neurobiology, Biochemistry and Molecular Biophysics, Cell Biology and Physiology, Genetics, Molecular Microbiology, Pathology, and Molecular Biology and Pharmacology–and of the Department of Biology in the School of Arts and Sciences. More than 280 faculty are affiliated with one or more of 10 broad training programs: Developmental Biology; Evolutionary and Population Biology; Immunology; Molecular Biophysics; Molecular Cell Biology; Biochemistry; Molecular Genetics; Molecular Microbiology and Microbial Pathogenesis; Neurosciences; and Plant Biology. Faculty in these programs take responsibility for all Divisional activities, including recruiting, admissions, advising, research training, and in addition many Divisional courses and seminars are offered by the participating faculty.

Currently over 400 graduate students are enrolled in the Division, including 129 students pursuing both the Ph.D. and the M.D. through the Medical Scientist Training Program (see page 18). Requirements for the Ph.D. in each Divisional Program are highly flexible. They include a series of courses tailored to a student's background and interests, qualifying examinations usually taken during the second year, execution of laboratory research, and defense of a dissertation generated through original scientific investigation. Although students enter the Division through an affiliation with one of the 10 programs, it is possible for a student to transfer to another program as interests evolve. During the first year, advisers are appointed to assist students in selecting courses and seminars as well as to help them in choosing three laboratory rotations in which they will spend several months becoming acquainted with a particular area of scientific research. At the end of the first year, it is expected that each student will choose a research adviser, whereupon the student will be affiliated with one of the departments of the Division. Continued participation in both Divisional and departmental activities assures the versatility of interests developed during 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), 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 Graduate Studies Office, Washington University School of Medicine, 660 South Euclid Ave., Campus Box 8226, St. Louis, Missouri 63110-1093. Students who wish to pursue both the Ph.D. and M.D. degrees must apply to the Medical Scientist Training Program (see page 18).

Students admitted to the graduate programs are guaranteed full stipend and tuition support contingent upon satisfactory performance. The stipend for the 1994-95 academic year will be $14,000 annually. The tuition and health fee for a full-time student will be $18,714 per year. This provides coverage by the Medical Center Student Health Service. The Division provides support for its Ph.D. students from several sources, including federally funded training grants provided by the National Institutes of Health.

It is expected that each student in a Ph.D. training program will devote full time to that endeavor. The Division will not accept students for part-time study, nor will it enroll students interested in a Master's degree.

The following graduate courses are offered by the Division of Biology and Biomedical Sciences, and they are available both to Ph.D. and M.D. students who meet the prerequisites for the appropriate course. Those courses particularly relevant to a given department are cross-listed under the department in this Bulletin. Faculty members in charge of courses and their departmental affiliations are shown at the end of each course description.

Bio 501. Human Anatomy

Study of the human body primarily by dissection; extensive use of X-rays and CT scans. Emphasis on functional and clinical aspects of anatomy. Prerequisite, graduate or medical student status and permission of instructor. Credit 6 units. Same as Anthropology 501. *Conroy (Anatomy/Neurobiology), Phillips-Conroy, Cheverud*

Bio 5011. Ethics and Research Science

Exploration of ethical issues research scientists confront on a daily basis. Topics will include, but are not limited to: student-mentor relationships, allegations of fraud, collaborators rights and responsibilities, conflicts of interest and confidentiality, ethics and the genome initiative, oversight role of institutions. Case study and scenario presentations will

provide focus for discussions. Prerequisite, open to undergraduate, graduate, postdoctoral and medical students engaged in research. Six two-hour sessions. Credit 1 unit. *Donis-Keller (Surgery/Genetics/ Psychiatry)*

Bio 502. General Physiology

This course applies the fundamental physiological mechanisms of cell biology to the functions of the major organ systems of the body, namely, the cardiovascular, renal, respiratory, gastrointestinal, and endocrine systems. The course is intended primarily for first year medical students. The physiology and microscopic anatomy courses are closely coordinated within the same schedule. Prerequisite, Bio 5061 or the equivalent. Credit 6 units. *Wilkinson, Staff (Cell Biology/Physiology), Menton, Staff (Anatomy/ Neurobiology)*

Bio 5051. Foundations of Immunology

Designed for graduate students as an in-depth introduction to immunology. Topics: antibody structure and genetics, B cell recognition, T cell receptor, major histocompatibility complex, T cell recognition, regulation of the immune response, immune mediators, humoral and cellular efforts mechanisms. Discussion group will meet once a week on Thursday from 1:00-2:00 p.m. Prerequisite, Introductory Biochemistry and/or Genetics helpful. Permission of instructor. Credit 4 units. *Thomas (Pathology, Molecular Microbiology), Allen (Pathology)*

Bio 5061. Cell Biology

A course covering fundamental aspects of cell organization and physiology. The goal is to develop an understanding of cellular structure and fundamental cellular processes such as transport, secretion, motility, recognition, and cell/matrix interactions. Prerequisite, graduate standing in Arts and Sciences or in the Medical School. Credit 3 units. *Mecham (Cell Biology/Physiology)*

Bio 5062. Central Questions in Cell Biology

Fundamental and "cutting-edge" research in the following areas: cell-cell interactions, biogenesis of organelles, cytoskeleton, cell physiology, cell differentiation. For each section, introductory lectures and laboratory demonstrations are accompanied by discussions of experimental techniques and evaluations of the strategies employed in recent original papers. Prerequisites, 3 units in Biochemistry, Bio 5064, or permission of instructor. Two hours each week alternating between lectures and discussions. Credit 3 units. *Parkinson (Cell Biology/Physiology)*

Bio 5063. Molecular Cell Biology

This course is one of the three courses in the core curriculum for the graduate program in cell and molecular biology and biochemistry. As such, it provides a background of fundamental information on the molecular basis of cell strucutre and function. In addition, the course concentrates on the current status of research on these questions. Broad areas covered in this course include membranes, signal transduction, cell motility, cell-cell interactions, and extracellular matrix. The format includes both lectures and discussion sections. Original articles from the research literature will be discussed in detail in the sections. Several take-home exams will be given. Credit 3 units. *J. Cooper (Cell Biology/Physiology)*

Bio 5064. Introduction to Modern Techniques of Electron Microscopy

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 election microscope. Three hours of lecture/lab one day per week. Credit 3 units. *Heuser (Cell Biology/Physiology)*

Bio 507. Pharmacology

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular, neuropharmacology. Credit 4 units. Prerequisite, Bio 451, 502. Credit contingent upon completion of Bio 508 in Spring semester. *Covey (Pharmacology), Staff*

Bio 508. Pharmacology

Biological basis of drug action. The course is divided into three parts: general pharmacology, cardiovascular, neuropharmacology. Continuation of Bio 507. Credit 4 units. *Covey (Molecular Biology and Pharmacology), Staff*

Bio 512. Selected Topics in Developmental Biology

Course title for Spring 95: "Advanced Drosophila Developmental Genetics" faculty lectures and student presentations, supplemented by extensive readings from current literature. One or two 2-hour presentations per student. Prerequisite, permission of instructor. May not be offered every year. Credit 2 units. *Cheney (Genetics)*

Bio 5122. Cell-Matrix Interactions

Structure of extracellular matrix receptors and their ligands and cell adhesive receptors (integrins, cams, etc.). Specific examples from inflammation and immunology, cancer cell biology, development biology, and hemostasis. Prerequisite, Basic Biochemistry/Cell Biology. Credit 3 units. *Mecham, (Cell Biology/Physiology)*

Bio 5124. Cell Biology Journal Club

Discussion of key papers on all aspects of cell biology. Emphasis on recent papers that have addressed fundamental questions relevant to cell biology. Credit 1 unit contingent upon regular attendance and one presentation. *Parkinson (Cell Biology/Physiology)*

Bio 5125. Student-Run Cell Biology Journal Club

Participants (students) present summaries of current research published in various journals in the field of cell biology. A large component of this journal club includes coaching in oral presentation. Students receive one credit for regular participation and for making one presentation. Credit 1 unit. *Stahl (Cell Biology/Physiology)*

Bio 5126. Developmental Biology Journal Club

Participants (students, faculty and postdoctorates) present summaries of current research published in various journals in the field of developmental biology. Credit 1 unit, contingent on one presentation per semester. *Cheney (Genetics)*

Bio 5127. Pathobiology Journal Club

Participants (students, faculty and postdoctorates) present summaries of current research published in various journals in the general fields of cell and developmental biology. A large component of this journal club includes coaching in oral presentation. Students receive 1 credit for one presentation during the semester. *J. Baenziger (Pathology)*

Bio 5128. Extracellular Matrix and Cell Matrix Interactions Journal Club

This journal club covers a broad range of topics of current interest, including the fields of biochemistry, molecular biology, cell biology, and developmental biology. Speakers (graduate students, postdoctoral fellows and faculty) usually give a brief background to introduce the topic and then focus on one or two papers from the current literature. Students receive one credit for regular participation and for making one presentation. *Mecham (Cell Biology & Physiology/ Medicine)*

Bio 5132. Cell Motility and Cytoskeleton Journal Club

Weekly presentations of recent literature and research. Each participant will present once per semester. Opportunity for students to discuss the context, implications and future directions for research. Prerequisite, undergraduate course in cell biology. Credit 1 unit. *C. Cheney (Genetics), Staff (Cell Biology/Physiology, Biochemistry/Molecular Biophysics)*

Bio 5135. Molecular Basis of Disease

This course will consider the status of current research investigating the molecular basis of a number (8-12) of diseases related to the cytoskeleton. The format will be a seminar style, with students reading, presenting and discussing current research literature under the guidance of the faculty. The faculty will also help the student become familiar with resources for learning about the medical aspects of these diseases, to provide a context for understanding the research. Prerequisite, Bio 5063 or equivalent course in Cell Biology plus some background in Molecular Biology. Graduate status or permission of instructor. Credit 2 hours. *Cooper (Cell Biology and Physiology)*

Bio 5136. Topics in Herpes Virology and Neurovirology

Participants present summaries of current research published in various journals predominantly in the field of herpes virology but occasionally HIV. A large component of this journal club includes coaching in oral presentation. Prerequisite, graduate standing. Credit 1 unit contingent upon regular attendance and one presentation. *Leib (Ophthalmology Molecular Microbiology), Pepose (Ophthalmology/Pathology)*

Bio 5171. Medical Immunology

An introduction to basic concepts in immunology and immunopathology. Lectures focus on antigen-antibody interactions, immunoglobulin structure and genetics, cellular basis of the immune response and immune regulation, T cell effector mechanisms, inflammatory response, complement, positive and negative roles of hypersensitivity, and immune deficiency. Prerequisite, some background in biochemistry and genetics helpful. Offered during the first half of the second medical semester. Credit 2 or 3 units (3 if lab is taken). *Unanue, Schreiber (Pathology), Atkinson, Loh (Medicine, Molecular Microbiology)*

Bio 5191. Pathobiology of Human Disease States

Two or three human disease states will be discussed in detail. Topics will include background clinical and epidemiological information, followed by a detailed examination of the molecular and cellular events that underlie the disease state. Examples of pertinent topics might include malaria, cystic fibrosis, sickle cell anemia, diabetes, lupus, etc. Prerequisite, must be a Markey pathway student. Credit 2 units. *T. Ley (Genetics/Medicine)*

Bio 5221. Molecular Basis of Microbial Pathogenesis

Primarily for graduate and MSTP students, this seminar course involves discussion of current research of pathogenic microorganisms and their virulence determinants. Emphasis on new research strategies for examining the cellular and molecular basis of host-pathogen interactions. Prerequisite, advanced elective course "molecular microbiology and pathogenesis" or permission of instructor. One and one-half class hours a week. Credit 2 units. *D. Sibley (Molecular Microbiology)*

Bio 5225. Proteins Journal Club

A weekly journal club of recent literature and research in the fields of protein structure and function. Presentations are given by graduate students, postdoctoral fellows, and the faculty. Presentation of controversial topics and results are encouraged. Credit 1 unit contingent upon regular attendance and one presentation. Prerequisite, graduate standing. *L. Kurz (Biochemistry/Molecular Biophysics)*

Bio 5235. Human Genetics Journal Club

Participants present research reports from current literature in human genetics and related fields. One of the aims is to provide guidance in oral presentation. Credit 1 unit contingent upon regular attendance and one presentation. *Gerhard (Genetics/Psychiatry)*

Bio 5261. Molecular Mechanisms of Disease

Lectures and student presentations covering a wide range of topics on clinical immunology including inflammation, microbial immunity, immunodeficiencies, immunopharmacology, neuroimmunology, autoimmunity, and lymphoid malignancies. Prerequisite, Cell Biology or Foundation of Immunology. Credit 2 units. *Virgin (Pathology)*

Bio 5272. Advanced Topics in Molecular Immunology

This course uses a journal club format to discuss contemporary issues in the cell and molecular biology of the immune system. Discussions focus on the use of current approaches to analyze the cellular and molecular basis of immunity. Topics include mechanisms of antigenic specificity, diversity, cell communication, differentiation, activation, and effector activity. Prerequisite, Bio 5051 or permission of instructor. Credit 2 units. *Murphy (Pathology), Staff (Immunology)*

Bio 5288. Special Topics in Molecular Genetics

The course will cover one topic each semester and include subjects such as gene expression in mammalian species, genetic switches, and human genetics. Papers regarding the subject will be discussed in depth. Prerequisite: graduate level core courses for molecular genetics including nucleic acids (Bio 548) and Molecular Cell Biology (Bio 5063). 2 hours per week, 2 units credit. *Parker-Ponder (Biochemistry/Molecular Biophysics)*

Bio 5302. Molecular Basis of Systems Integration

The overall concept of this course is to provide a multi-tissue model for the regulation of a physiological function. The course will examine the regulation of blood pressure by considering the roles of the heart, the kidney, and the vasculature, in providing the driving force for blood movement, the control of the body's fluid balance, and the directionality of blood flow, respectively. These functions will be examined at the molecular level: ion channels, pumps, the mechanisms of contraction, and their regulation by second messengers will be considered. The course will be presented in two halves. The first will be in lecture format, 1 hour at a time, two hours per week, and will be followed by a mid-term exam. The second half of the course will consist of a two-hour seminar, one per week on special current topics. Each participant will present one paper within the series of seminars. Course offered in alternate years. *Morrison (Molecular Biology/Pharmacology)*

Bio 531. Advanced Biochemistry

Designed primarily for medical students; study of major control systems of metabolic processes. Begins with a treatment of protein structure and enzyme kinetics. Basic metabolic pathways are presented as a basis for the discussion of their regulation by hormone receptors and their signal transduction mechanisms, the role of kinases in metabolic regulation, lipoproteins and the regulation of lipid metabolism, control of cellular proliferation, oncongenes. Coordinated with other first semester medical school courses (Cell Biology and Molecular Genetics) to provide an integrated first semester curriculum in the basic sciences for medicine. Prerequisite, graduate standing in Medicine, or — permission of instructor in Arts and Sciences. Credit 3 units. *Silbert, Rose, Frieden, Pike, Frazier (Biochemistry/Molecular Biophysics), Schlesinger (Cell Biology/Physiology)*

Bio 5312. Macromolecular interactions

This course will cover equilibria, kinetics and mechanisms of macromolecular interactions from a quantitative perspective. Thermodynamics, multiple binding equilibria (binding polynomials), linkage phenomena, cooperativity, allostery, macromolecular assembly, analysis of binding isotherms, enzyme catalysis and mechanism, steady-state and pre-steady state kinetics, kinetic simulation and isotope effects. Prerequisite: Physical Chemistry, Biochemistry, Calculus, and Organic Chemistry. Two class hours per week, 3 units credit. *Lohman (Biochemistry/Molecular Biophysics)*

Bio 5315. Macromolecular Structure

A required course for the programs in Biochemistry and in Molecular Biophysics. This course introduces the student to protein and nucleic acid structure and structure determination, including X-ray crystallography, NMR, optical spectroscopies, and transport. Prerequisite, undergraduate course in Physical Chemistry. Credit 3 units. *Rose (Biochemistry/Molecular Biophysics)*

Bio 5323. Signal Transduction Journal Club
Journal club with both faculty and student presentations in area of signal transduction. Prerequisite, none. Credit 1 unit. *Frazier/Pike (Biochemistry/ Molecular Biophysics)*

Bio 5342. Macrophage Biology
This special topics course will examine aspects of cell and molecular biology of the macrophage: endocytosis, phagocytosis, adhesion, motility, signal transduction, antigen processing, lysosomes, intracellular parasitism. Prerequisite: Molecular Cell Biology (Bio 5063) or Foundations in Immunology (Bio 5051). Offered in alternate years. Two hours a week, 2 units credit. *Steinberg (Cell Biology/Physiology)*

Bio 5346. Physical DNA Mapping
Same as Computer Science 534

Bio 5352. Developmental Biology
Current literature and present information available on a variety of model systems being used to study developmental biology. Focus on molecular approaches, but based in classical concepts. Prerequisite, Molecular Cell Biology (5063) and Nucleic Acids. Credit 3 units. *McNally (Biology), Kirk, Miller, Duncan (Biology), Cheney (Genetics)*

Bio 5355. Statistical Thermodynamics of Macromolecular Interactions
Basic principles of statistical mechanics and thermodynamics. Detailed treatment of ligand binding and linkage properties of biological macromolecules. Prerequisite, undergraduate level Physical Chemistry. Credit 3 units. *E. Dicera, T. Lohman (Biochemistry/ Molecular Biophysics)*

Bio 536. Physical Chemistry of Macromolecules
Application of physical chemistry to proteins, nucleic acids, and other natural and synthetic polymers. Polymer chains statistics, thermodynamics and statistical mechanics of macromolecular solutions, conformational transitions and molecular interpretation of light scattering, viscosity, sedimentation, diffusion and circular dichroism experiments. Prerequisite, two semesters of Physical Chemistry or permisson of the instructor. Credit 3 units. Same as Chem 577, offered every other year. *Holtzer (Chemistry)*

Bio 5381. Mechanisms of Protein Targeting and Intercompartmental Transport
Recent advances regarding the molecular mechanisms responsible for targeting and intercompartmental transport to and between specific organelles, such as the endoplasmic reticulum, golgi apparatus, lysosomes, mitochondria, and nucleus. Particular emphasis on the development and use of cell-free systems that faithfully reconstitute key protein targeting and transport events. Material consists primarily of original research articles presented by students. Prerequisite, Molecular Biology (may not be taken concurrently.) Credit 1 unit. *Blumer, Stahl (Cell Biology/Physiology)*

Bio 5382. Membranes as Mediators
This course is an advanced analysis of current approaches to the study of membranes mediated processes including membrane structure (both lipid and protein components), the biosynthesis of membrane components, the structure and function of receptors, signal transduction elements such as G proteins, kinases and phosphatases, and the roles of protooncogenes in cellular signaling processes. Prerequisites, Bio 548, Bio 5063 and Bio 5083. Credit 3 units. *Frazier, Rotwein (Biochemistry/Molecular Biophysics)*

Bio 5391. Molecular Virology
General concepts of basic virology and the molecular mechanisms of viral replication; a review of the molecular biology of the major classes of viruses with an in-depth analysis of a prototype of each class. Emphasis on animal viruses, and medical virology, but plant and insect viruses also discussed. Prerequisite, Nucleic Acids. Credit 3 units. *Olivo (Medicine/Molecular Microbiology)*

Bio 5392. Molecular Microbiology and Pathogenesis
First half focuses on prokaryotic physiology and genetics, with special attention to recent discoveries in gene regulation and protein processing. Second half devoted to microorganisms that cause disease, with emphasis on the molecular interactions between pathogen and host. Prerequisite, first-semester core curriculum for programs in Cell and Molecular Biology. Credit 3 units. *Munson (Pediatrics), Russell (Molecular Microbiology)*

Bio 5393. Molecular Virology Journal Club
Journal club with a minimum of one student presentation with faculty critique. Credit 1 unit. *Majors (Biochemistry/Molecular Biophysics)*

Bio 5404. Molecular Neurobiology
The molecular biology and biochemistry of synaptic function, receptor recognition and regulation. Topics: the structure and function of neurotransmitter receptors, ion channels, and the mechanisms involved in the metabolism, storage and release of neurotransmitters. Examples chosen (from cholinergic, adrenergic, and peptidergic systems.) To illustrate applications of biochemistry and molecular biology for the analysis of these areas. Lectures, problem sets, reading and presentation of original articles. Three hours of lecture and one conference (1 1/2 hr) per week with occasional lab demonstra-

tions. Prerequisite, Basic Biological Chemistry. Minimum 10 students. Credit 4 units. *Neuroscience Staff (Anatomy/Neurobiology)*

Bio 5406. RNA Structure and Metabolism

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 Bio 548 can be used but not exclusively. Topics will change from year to year. One two-hour meeting per week. Credit 1 unit. *Kennell (Molecular Microbiology)*

Bio 5415. Mechanisms of Gene Regulation Journal Club

A weekly journal club emphasizing the mechanisms that control gene expression in prokaryotes and eukaryotes. Credit 1 unit, contingent on regular attendance, and one presentation per semester. *Pikaard, Landick (Biology)*

Bio 5416. Molecular Microbiology and Pathogenesis Journal Club

Presentations by students, postdoctoral fellows, and faculty on a broad range of topics of current interest, including the fields of molecular mechanisms of pathogenesis, biochemistry, molecular biology, cell biology, developmental biology, and immunology. Speakers usually give a brief background to introduce the topic and then focus on one or two papers from the current literature. Participants are expected to attend all the sessions. Credit requires attendance at all sessions and one or two presentations during year. Credit 1 unit. *Hultgren, (Molecular Microbiology)*

Bio 5417. Hematology/Oncology Journal Club

This journal club covers a broad range of topics of current interest, including the fields of biochemistry, molecular biology, cell biology, developmental biology and immunology. Speakers usually give a brief background to introduce the topic and then focus on one or two papers from the current literature. Presentations are given by graduate students, post-doctorate fellows and the faculty. Each attendee presents one or two times per year. Participants are expected to attend all the sessions. This journal club was founded in 1966. Credit 1 unit. *P. Majerus, S. Kornfeld (Medicine/Biochemistry/ Molecular Biophysics)*

Bio 5433. Molecular Biology of Ion Transport Proteins

Discussion of key papers characterizing several classes of ion transport protein, including pumps, antiport and cotansport proteins and ion channels. Prerequisite, Introductory Biology. Credit 2 units. Special topics course. *Gluck, Mercer (Cell Biology/ Physiology)*

Bio 5461. Molecular Recognition

The physical basis of molecular recognition as exemplified in ligand binding to macromolecules, protein folding, macromolecular assemblies, and other biological systems. Examined from several viewpoints, including quantum chemistry, molecular mechanics and conformational analysis [molecular dynamics, systematic search, and Monte Carlo]. Molecular modeling and computer graphics techniques will be demonstrated and applied to typical problems; success stories in computer-aided drug design and new developments in quantitative three-dimensional structure-activity relationships reviewed. Taught as seven two-day workshops, held on a consecutive Friday and Saturday once a month; each day includes three lectures and demonstration period with a computational laboratory. Each student expected to complete a project applying one computational method discussed. Offered in alternate years.

Prerequisite, Physical Chemistry, Basic Biological Chemistry. Minimum 5 students. Credit 3 units. *Marshall (Pharmacology), Ponder (Biochemistry/ Molecular Biophysics), Beusen (Institute for Biomedical Computing)*

Bio 548. Nucleic Acids and Protein Biosynthesis

Fundamental aspects of structure, biosynthesis, and function of nucleic acids and the biosynthesis of proteins. Emphasis on mechanisms involved in the biosynthetic processes and the regulation thereof. Prerequisites, Bio 337, 449, or equivalent or permission of instructor. Credit 3 units. *Johnston (Genetics)*

Bio 5491. Advanced Genetics

Fundamental aspects of organismal genetics with emphasis on experimental studies that have contributed to the molecular analysis of complex biological problems. Examples drawn from bacteria, yeast, nematodes, fruit flies and mammalian systems. Prerequisite, graduate standing or permission of instructor. Credit 3 units. *Schedl, Johnston, (Genetics), Staff*

Bio 550. Medical Genetics

Topics covered include population and quantitative genetics, clinical cytogenetics, biochemical genetics and metabolic defects. Lectures, clinics and small group discussions. Credit 2 units. Prerequisite, an introductory genetics course, and permission of the instructor. *Hansen (Genetics)*

Bio 5503. Molecular Pathobiology of Visual Disorders

The fundamental basis, diagnosis and management of diseases affecting the visual system, with emphasis on genetic and immunologic factors. Each topic addressed in two sessions; the first covers the fundamental etiology, the second is led by a clinician-scientist experienced in diagnosis and management of affected patients. Credit 3 units. *Petrash (Ophthalmology/Visual Sciences)*

Bio 5522. Memory

A seminar exploring experimental and theoretical approaches to understanding the biological basis of memory. Participants will read and discuss original literature with the goal of deciding what are (and are not) useful avenues into this poorly understood phenomenon. Not taught every year. Prerequisite, permission of instructor. 3 units. *Lichtman (Anatomy/Neurobiology)*

Bio 554. Neural Sciences

An integrated course dealing with structure, function and development of the nervous system. The course will be offered in the spring of the first year medical school calendar. Prerequisite, Bio 3411 or Bio 501 and Bio 5651 and approval of the instructor. Credit 5 units. *Van Essen, Lichtman, Thach (Anatomy/Neurobiology)*

Bio 5553. Developmental Neurobiology Journal Club

A weekly journal club to review important recent publications in developmental neurobiology. Emphasis on cellular and molecular mechanisms in development, in both vertebrate and invertebrate systems. Prerequisite, one year of graduate study in Division of Biology and Biomedical Sciences or equivalent. Credit 1 unit. *Taghert (Anatomy/Neurobiology)*

Bio 5562. Principles of Neural Development

An introduction to the development of the nervous system. Prerequisite, graduate status or permission of instructors. Credit 4 units. *Taghert, Sanes, Lichtman (Anatomy/Neurobiology)*

Bio 5571. Cellular Neurobiology

A survey of the basic principles of nerve structure and function, including quantitative analysis of voltage and chemically gated ion channels, synaptic transmission and sensory transduction. Lectures and conferences supplemented with reading of classic and contemporary papers. Prerequisite, matriculation in the Division of Biology & Biomedical Sciences or in the Medical School, advanced undergraduate standing, or permission of instructor. 4 hours a week, 4 units credit. *Lukasiewicz (Anatomy/Neurobiology, Ophthalmology)*

Bio 5581. Physiological Basis of Acoustic Communication

Lectures and seminars in hearing and acoustic signals of animals, from invertebrates to humans. Structural and functional adaptation for processing the signals for communication and echolocation are considered. Prerequisite, Bio 3411 or Bio 3421, or a course comparable to Physiological Psychology. One two-hour class a week. Offered in the fall semester of odd numbered years. Credit 2 units. *Suga (Biology)*

Bio 5590. Biomedical Research Ethics

Diiscussion class based on student presentation of research situations producing ethical conflicts. Prerequisites, none. Credit 1 unit. *Steinbach (Anatomy/Neurobiology)*

Bio 5601. Topics in Cognitive Neuroscience

How the brain organizes behavior, emphasizing higher functions such as perception, language and attention. Aim is a useful integration of information from neurobiological approaches (e.g., single unit recording, lesion-behavior experiments) and information-processing approaches (e.g., cognitive psychological models, connectionist models). Prerequisite, Psych 340 or 441. Credit 3 units. Same as Psychology 4411. *Petersen (Neurology)*

Bio 5651. Neural Systems

Introduction to the structure and function of the major systems within the central nervous system. Selected topics are chosen to provide an overview of the brain with emphasis on major general concepts. Laboratories and readings of the primary literature are an integral part of this course. Prerequisite, matriculation as a graduate or medical student, or advanced undergraduate standing with satisfactory performance in Bio 3411, Bio 3421, and permission of instructor. Three hours of lecture, 1 1/2 hours of discussion and 4 hours of laboratory a week. Credit 4 units. *Staff (Anatomy/Neurobiology)*

Bio 567. Advanced Tutorials in Neural Sciences

Directed readings and discussions for graduate students on selected topics in advanced neuroscience. Topics and specific instructors to be listed at registration. Each tutorial will last for 6 weeks. Two-class hours a week for 6 weeks for 1 credit. Credit 1-3 units, depending on how many sessions taken. Offered in both fall and spring semesters. Open to all students interested in the neurosciences program. Prerequisite: consent of instructor for non-neurosciences students. *J. Lichtman (Anatomy/Neurobiology), Staff (Neurosciences Program)*

Bio 568. Introduction to Principles of Neuropharmacology

Basic principles of pharmacodynamics, action of drugs affecting the autonomic nervous system, receptor binding, etc. Strongly recommended for all

first-year graduate students in the neurosciences program as part of the core curriculum. Permission of instructor required for non-neuroscience students. Eighteen hours of lecture and one lab, 2 units credit. The course will be offered from mid-November through mid-January. *Johnson (Molecular Biology and Pharmacology)*

Bio 572. Seminar in Plant Biology

Topic for discussion to be announced. Credit 2 units. *Staff (Biology)*

Bio 575. Advanced Studies in Plant Systematics

Seminars in specific topics with main emphasis in economic botany. Other topics include anatomy, chemotaxonomy, cytology, ecotaxonomy, embryology, nomenclature, palynology, phytogeography and bibliography. Prerequisite, Bio 308 or equivalent. One seminar alternate weeks. Credit 1 unit a semester. *Lewis (Biology)*

Bio 580. Seminar in Population Biology

Topic to be announced. Prerequisite, graduate standing or either Bio 301 or 302; and Bio 419. Credit variable, 2 or 3 units. *Staff (Biology)*

Bio 5821. Theoretical Population Genetics

A rigorous introduction to the theoretical basis of population genetics and evolutionary mechanisms. Quantitative genetics, population structure, and molecular evolution will be investigated first, followed by an examination of how selection, population structure and ecological factors interact in determining the evolutionary fate of a population. Will be taught every 4 years. Prerequisite: Bio 301, Math 118 and either 217 or 320. Credit 3 units. *Templeton (Biology)*

Bio 585. Seminar in Floristic Taxonomy

A survey of angiosperm families, their morphology, cytology, anatomy, palynology, chemistry, and evolution. Prerequisite, Bio 308 or equivalent. Credit 1 unit. *Richardson (Biology)*

Bio 590. Research.

Credit to be arranged. *Staff (Biology)*

Bio 5911. Seminar in Biology and Biomedical Sciences

These summaries cover the recent literature in various areas not included in other courses, or in more depth than other courses. Credit to be arranged. *Staff*

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

PROGRAM IN BIOLOGICAL AND BIOMEDICAL ENGINEERING

Biological engineering is a multidisciplinary science drawing on expertise in computing, electronics, materials, mechanics and other fields of engineering to bear on problems of biological and medical importance. The quantitative approaches of engineering and the applied sciences are increasingly needed in the biological sciences. Biological and biomedical engineers are playing critical roles in renovating our nation's health care system and improving the environment by developing new tools and strategies to make the delivery of health care both better and more cost effective and to optimize the interactions between human activities and our biological environment. Analytical approaches and quantitative methodology are essential to understand the complex systems encountered in medicine and biology. Ecosystems and the human body are intricate and well engineered systems; their maintenance and repair present many engineering challenges.

Biological engineering has been a focus of activity for over 25 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 several novel imaging technologies for biology and medicine; positron emission tomography (PET); confocal optical microscopy and advanced ultrasound, and extensions to magnetic resonance and X-ray tomography. The University has played a leading role in applying high speed communications systems to transmit medical information and link physicians at remote sites. Washington University is recognized worldwide for its work in mapping and sequencing the human genome and for mapping of the human brain. These activities have occurred in the absence of a formal program in biological engineering. To facilitate research activities in medical applications of engineering, to enhance collaborations between the medical and engineering schools, and to make these activities available as an educational opportunity, Washington University is now creating a formal degree granting program in biological engineering.

Biological engineering is an extremely diverse field encompassing the activities of faculty at Washington University in departments ranging from physics to cardiology, as well as all of the engineering departments. Recognizing the strength and diversity of existing programs, biological engineering is organized as an interdepartmental program drawing faculty from several departments in the School of Engineering and Applied Science, College of Arts and Sciences, the School of Medicine, and the Institute for Biomedical Computing. Organizing biological engineering as an interdepartmental

program allows the program to enlist diverse faculty regardless of primary departmental or school affiliations. One of the characteristics of Washington University as a school is support for such collaborative efforts. For example, all graduate students in the biological sciences are admitted and pursue their degrees through the Division of Biology and Biomedical Sciences. Within this division, degree granting programs in areas such as molecular biophysics or cell biology are taught and administered by faculty whose primary appointments may be in several different departments. At the School of Engineering and Applied Sciences, interdepartmental programs have been organized in materials science and environmental engineering.

Modern biological engineering is emerging as a new discipline grounded in the tremendous advances that have been made in biology, genetics, and medicine over the past three decades. The biotechnology revolution has created a host of powerful new tools with applications ranging from forensics and the neurosciences to agriculture. Biological engineering brings quantitative analysis and rational design approaches to these new technologies so that they can be reliably used and extended.

The goals of the biological engineering program at Washington University are to continue the University's innovative and nationally recognized research programs and to train a new generation of leaders able to integrate quantitative tools in the biological and medical sciences in unique and novel ways. This is being achieved by merging faculty resources from the engineering and medical schools and by initiating new efforts in genome analysis, medical informatics, and computational neurosciences.

The degree programs in biological and biomedical engineering are administered through the School of Engineering and Applied Science. For full program descriptions, see the School of Engineering Graduate Catalog.

Biomedical Engineering course offerings:

BMed 502. Mathematical Methods in Biophysics
BMed 547. Biological Mass and Momentum Transfer
BMed 559. Introductory Biomechanics
BMed 560. Biomechanics
BMed 576. Sensory Communications
BMed 582. Biophysical Measurement
BMed 583. Models of Sensory Communication
BMed 585. Ion Selective Channels in Cell Membranes
BMed 600. Research for Doctoral Dissertation
BMed 651. Science of Synthetic and Biological Polymers
BMed 660. Biomedical Applications of Small Digital Computers
BMed 693. Special Topics in Biomedical Engineering

For additional related courses, see Biomedical Computer Laboratory in this Bulletin and the Bulletin of the School of Engineering and Applied Science.

FACULTY

Professor Emeritus
Harold W. Shipton

Professors

Joseph J. H. Ackerman
Gary K. Ackers
R. Martin Arthur
Harold Brandon
Harold Burton
James M. Cheverud
Douglas F. Covey
Jerome R. Cox, Jr.
Helen Donis-Keller
Eliot L. Elson
Carl Frieden
Will Gillett
George W. Gokel
Richard W. Gross
Stephen M. Highstein
Kenneth L. Jerina
John L. Kardos
Jeffery Lichtman
Garland R. Marshall
James G. Miller
Michael I. Miller
Charles E. Molnar
William F. Pickard
Seymour V. Pollack
James A. Purdy
Marcus E. Raichle
D. C. Rao
Nathan V. Ravi
John P. Rice
George D. Rose
Stanley Sawyer
Jacob Schaefer
David Schlessinger
Donald L. Snyder
Robert E. Sparks
Edward W. Spitznagel
Nobuo Suga
Salvatore P. Sutera
Alan R. Templeton
Michel M. Ter-Pogossian
W. Thomas Thach

Curt Theis
Lewis J. Thomas, Jr.
David C. Van Essen
Michael W. Vannier
Robert H. Waterston
George I. Zahalak

Research Professors

Charles H. Anderson
Norbert S. Mason
Gregory V. Nikiforovich

Associate Professor Emeritus

William F. Holmes

Associate Professors

G. James Blaine III
Stuart B. Boxerman
Ron K. Cytron
Mark E. Frisse
Thomas R. Miller
Stanley Misler
Frederick U. Rosenberger
David J. States
John-Steven Taylor
Samuel A. Wickline
Robert S. Woodward

Research Associate Professors

Jack R. Engberg
Lyndon S. Hibbard

Assistant Professors

James K. Bashkin
David P. Cistola
Enrico Di Cera
Julius M. Guccione
Michael G. Kahn
Sandor J. Kovacs
Piu-yan Kwok
James G. McNally
John M. Ollinger
Jay W. Ponder
W. David Richard
Joseph M. Smith

Research Assistant Professors

Shawn E. Huston
Richard K. Wilson

Instructor

Mark E. Haacke
Toni M. Kazic

HEALTH ADMINISTRATION PROGRAM

The Philosophy

The faculty of the Health Administration Program of Washington University believes that administrative personnel in health organizations require not only a solid foundation in management but also an understanding of those aspects of finance, regulation, and planning unique to the health care field. Additionally, since its inception in 1946, the program has acted on the premise that health administration students would benefit from exposure to the environment in which they will ultimately be involved. To this end the program has maintained an organizational structure consisting of a core faculty located within the School of Medicine, augmented by faculty from other schools and departments within the University, as well as affiliated institutions and agencies. This multidisciplinary approach enables the student to acquire not only specific management skills but an understanding of the many complexities unique to the 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 joint M.H.A.-J.D. degree between the Health Administration Program and the school of Law, a joint M.H.A.-M.B.A. degree between the Health Administration and the graduate School of Business Administration, and a joint M.H.A.-M.I.M. degree between the Health Administration Program and the School of Technology and Information Management. Two new joint degrees are offered between the Health Administration Program and the George Warren Brown School of Social Work (M.H.A.-M.S.W.) and with the School of Arts and Sciences in Human Resource Management (M.H.A.-M.A.) through University College.

The sequence of study requires two years, each consisting of a fall and spring semester. Upon completion of the four semesters, or a total of 60 units, the student will receive a master of health administration (M.H.A.) degree conferred by Washington University. The statute of limitations is five years from the date of matriculation to complete all requirements for the M.H.A. degree. Contingent upon graduation the student has the option of pursuing a 12-month postgraduate administrative fellowship. A certificate will be awarded by Washington University School of Medicine and the affiliated fellowship organization upon completion of the fellowship.

Administrative Fellowship

The 12-month optional postgraduate administrative fellowship will be served in a hospital, health agency, or health organization which has been recommended and approved by the full-time faculty. This option is available only to those persons who have the M.H.A. degree conferred upon them by Washington University. The purpose of the fellowship is to provide the graduate with an opportunity to observe and practice those concepts and principles learned during the didactic on-campus exposure. The administrative fellowship is strongly recommended, as this postgraduate clinical exposure is deemed necessary for adequate professional career preparation. The fellowship is completed under the direction of a well-qualified and experienced health care administrator who is given an annual adjunct faculty appointment at Washington University School of Medicine.

The full-time faculty maintains close liaison with the administrative fellow and the preceptor. An educational plan which outlines the fellow's resident's activities for the coming year must be filed by the preceptor. The preceptor also sends two evaluation reports to the Director of HAP and shares the responsibility for recommending awarding of the certificate by Washington University School of Medicine and the fellowship site organization.

Within available resources an on-campus faculty member visits the site to meet with the preceptor and resident. HAP also sponsors an annual preceptors conference at Washington University. Interaction of these site and campus visits enables joint review of the resident's progress, as well as evaluation and refinement of the administrative fellowship experience.

Admission Requirements

Washington University's Health Administration Program is committed to nondiscriminatory practices in selection of applicants regarding race, sex, age, religion, or national origin. The faculty and staff are affirmatively committed to recruiting, enrolling, and educating students from minority groups who have the potential for graduate study.

A minimum of a bachelor's degree from an accredited university or college acceptable to Washington University School of Medicine is required, as is completion of the Graduate Record Examination (Aptitude Test) or the Graduate Management Aptitude Test. No specific undergraduate major field of study is required for admission into the program; however, introductory courses in

accounting, economics, statistics (or their equivalents), and mathematics through college algebra are very strongly recommended.

Tuition per semester	$8,250
Books and supplies (per semester)	550
Application fee (nonrefundable)	30

"B" Electives Health Administration

During the 1990s, the American Healthcare System is undergoing dynamic change as never seen before in the 20th Century. This change is a social mandate from the American people demanding the direct involvement of the Federal government in designing, organizing and financing the delivery of patient care.

The goal of this six-week elective is to expose the senior medical student to the history of healthcare organization in the U.S. with focus on the evolving National Healthcare System under President Clinton's administration. It will also explore the impact of new National Health Policy upon medical practice, medical education and medical research.

The elective will be conducted by senior faculty using a seminar approach drawing upon a background textbook, monographs, timely topical articles and current research publications to focus the weekly discussions.

The medical student will also have the opportunity to participate in Health Administration Program classes in economics, finance, human resource management, health law, management information systems and case studies. This will be arranged according to individual interest and schedules.

Faculty

Professor and Director

James O. Hepner, Ph.D., University of Iowa, 1964.

Associate Professor and Deputy Director

Stuart B. Boxerman, D.Sc., Washington University, 1970.

Associate Professor and Associate Director/Research

Robert S. Woodward, Ph.D., Washington University, 1972.

Associate Professors (Adjunct)

Ted Bowen, M.H.A., Washington University, 1951.

James D. Harvey, M.H.A., Washington University, 1952.

David H. Hitt, M.H.A., University of Minnesota, 1952.

Wayne M. Lerner, D.P.H., University of Michigan, 1988.

Assistant Professor

Ronald E. Gribbins, Ph.D., University of Wisconsin, 1975.

Assistant Professors (Adjunct)

Frank S. Groner, LL.D., East Texas Baptist College, 1946.

Boone Powell, Sr., LL.D., Baylor University, 1958.

Mary R. Rocklage, M.H.A., St. Louis University, 1963.

Instructor

Linda B. Cottler, Ph.D., Washington University, 1987.

Instructors (Adjunct)

Richard M. Abell, M.H.A., Washington University, 1972.

Lee A. Bernstein, M.H.A., Washington University, 1980.

Edgar V. Borgenhammar, Ph.D., University of California, Berkeley, 1972.

Frederick L. Brown, M.H.A., George Washington University, 1966.

L. Gerald Bryant, M.H.A., Washington University, 1968.

Keith W. Curtis, Ph.D., University of Oklahoma, 1973.

Jeptha W. Dalston, Ph.D., University of Oklahoma, 1970.

Stephen Dorn, M.H.A., St. Louis University, 1958.

John T. Farrell, M.H.A., St. Louis University, 1973.

Max D. Francis, M.H.A., Washington University, 1966.

Phillip H. Goodwin, M.H.A., Washington University, 1968.

Dennis A. Hall, M.H.A., Washington University, 1973.

M. James Henderson, M.H.A., Washington University, 1975.

Robert A. Hille, M.A., Baylor University, 1969.

Charlotte Lehmann, M.H.A., Washington University, 1979.

Sherman P. McCoy, M.P.A., Cornell University, 1971.

Michael T. McGovern, M.H.A., Ohio State University, 1982.

John P. McGuire, M.H.A., Washington University, 1985.

Garry A. Maness, M.H.A., Memphis State University, 1977.

Larry L. Mathis, M.H.A., Washington University, 1972.

Joseph J. Neidenbach, M.H.A., Washington University, 1974.

Glenn E. Potter, M.H.A., Washington University, 1972.

Boone Powell, Jr., M.A., University of California, 1960.

Joseph H. Powell, M.H.A., University of Minnesota, 1955.

E. Wynn Presson, M.H.A., Washington University, 1965.

Stephen C. Reynolds, M.H.A., Washington University, 1972.

Mark A. Wallace, M.H.A., Washington University, 1978.

Dan S. Wilford, M.H.A., Washington University, 1966.

Lecturers

Walter F. Ballinger, M.D., University of Pennsylvania, 1948.

Marlowe W. Erickson, Ph.D., University of Michigan, 1964.

Sandra S. Grant, M.A., Webster University, 1983.

Dennis L. Lambert, Ph.D., Washington University, 1994.

David H. LeMoine, M.A., University of Illinois, 1968.

Merlin E. Lickhalter, B.A., Massachusetts Institute of Technology, 1957.

Miles W. Meyer, Ph.D., Washington University, 1984.

J. Stuart Showalter, J.D., Washington University, 1971.

Peg Tichacek, M.B.A., Washington University, 1987.

Stuart D. Yoak, Ph.D., Washington University, 1985.

Lecturers (Adjunct)

Warren R. Betts, M.H.A., Virginia Commonwealth University, 1959.

David S. Ramsey, M.H.S.A., University of Michigan, 1962.

Donald B. Wagner, M.H.A., Baylor University, 1960.

HEALTH CARE SERVICES PROGRAM

The Health Care Services Program at Washington University responds to the growing need for multidisciplinary professionals with expertise in the planning, implementation, and evaluation of health service programs. Sponsored jointly by Washington University's School of Medicine, Department of Psychology, and University College, this 30-unit graduate degree program draws on the broad expertise of University faculty and research personnel. The curriculum examines organizational influences important to the development of innovative programs for individuals and families, stressing health education and the application of current research findings.

Admission to the Health Care Services program is open on a selective basis to qualified applicants with a baccalaureate degree in a science or health-related field from an accredited institution. Applicants should have completed training in one of the several professions involved in the 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, etc.).

Faculty

Director, Health Care Services Program

Debra L. Haire-Joshu, Ph.D., R.N., Research Assistant Professor in Medicine, Center for Health Behavior Research

Associate Director, Health Care Services Program

Cheryl A. Houston, M.S., R.D., Research Instructor in Medicine, Center for Health Behavior Research

Professor of Psychology

Director, Center for Health Behavior Research

Edwin B. Fisher, Jr., Ph.D.

Associate Professors

Wendy Auslander, Ph.D., LCSW, George Warren Brown School of Social Work

Kenneth B. Schechtman, Ph.D., Biostatistics

Neil H. White, M.D., St. Louis Children's Hospital

Research Assistant Professor

Cynthia L. Arfken, Ph.D., Center for Health Behavior Research and Division of Biostatistics

Reserach Instructors

Jeffrey Gavard, Ph.D., Center for Health Behavior Research

Carol Stubblefield, M.S.N., Center for Health Behavior Research and Jewish Hospital College of Nursing and Allied Health

Linda K. Sussman, Ph.D., Center for Health Behavior Research and Research Associate Department of Anthropology

Program Instructors

Joan Heins, M.A., R.D., C.D.E., Center for Health Behavior Research

Jan Munro, M.Ed., Center for Health Behavior Research

Adjunct Instructors

Carol Dyer, M.A., Psychology

Donna Jeffe, Ph.D., Center for Health Behavior Research

Donald Richert, Ph.D., R.Ph., Vice President of Student Affairs, St. Louis College of Pharmacy

Ex Officio

Julio V. Santiago, M.D., Professor of Pediatrics

PROGRAM IN OCCUPATIONAL THERAPY

The Program in Occupational Therapy prepares individuals to practice, do research and teach in the field of occupational therapy, an applied social and biological science. Occupational therapy benefits persons of all ages whose ability to engage in life tasks is impaired by physical or mental disease, injury, birth defect or aging. Through a variety of intervention strategies, occupational therapy professionals help people develop skills and adapt to disabilities so that their lives become more productive and meaningful. Occupational therapists help individuals develop, regain or retain the skills they need to learn, play, earn a living and tend to their personal needs. A critical shortage of talented individuals exists in this rewarding, well-paid field.

Master of Science in Occupational Therapy Degree Program

The Professional Master of Science degree program prepares individuals to practice as professional occupational therapists and provides them with additional knowledge and skills needed to evaluate practice, engage in educational activities, and plan and execute specialty programs. Applicants must hold a bachelor's degree or be an approved participant in a Three-Two program, and have completed prerequisites from an accredited college or university.

Each candidate for a Master's degree must complete the professional curriculum, which consists of 80 hours of coursework and is usually accomplished in five semesters of academic study (two academic years and the intervening summer). The student must complete an assistantship and a master's project during the five semester program. Six months of supervised clinical internship is required following course work.

Tuition (graduate), per semester	$8,400
Fee, Clinical Internship	1,950

Post Professional Master of Science Degree Graduate Program

Advanced studies leading to a Master of Science degree are offered to practicing health professionals. The multidisciplinary faculty of the Program in Occupational Therapy mentors students as they learn specialized clinical skills and participate in ongoing clinical research in one of the three tracks: occupational health, geriatric rehabilitation, and pediatrics. The Occupational Health Track focuses on the relationship between the workplace and worker's health. The Geriatric Rehabiitation Track focuses on the development and evaluation of rehabilitation and health promotion programs for older adults and their caregivers. The Pediatric Track focuses on infant development with emphasis on neonatal assessment and/or intervention.

The program requires completion of 36 semester credits including a thesis. A part time evening format allows health practitioners to work and pursue graduate education simultaneously. The program can be completed in two and one half years. All graduate work, including the thesis, must be completed within five years.

For further information, contact the Program in Occupational Therapy, Campus Box 8066, 4567 Scott Avenue, St. Louis, Missouri 63110.
Phone: (314) 362-6911, TDD: (314) 362-5911,
FAX: (314) 362-0182

Faculty

Elias Michael Director and Assistant Professor

M. Carolyn Baum, Ph.D., Washington University, 1993; M.A., Webster College, 1979.

Associate Director of Professional Programs and Instructor

Catherine Rose, M.A., Washington University, 1992.

Associate Director of Community Services and Instructor

Kathleen Kniepmann, M.P.H., Ed.M., Harvard University, 1981.

Coordinator of Graduate Program and Instructor

Peggy Strecker Neufeld, M.A., OTR/C, New York University, 1976.

Coordinator of Fieldwork Education and Instructor

Karen Parker Davis, M.A., OTR/C, Webster University, 1983.

Coordinator of Admissions and Communications and Instructor

Claudia Hilton, M.B.A., University of Evansville, 1986.

Community Education Coordinator and Instructor

Monica Perlmutter, M.A., Washington University, 1989.

Professors

Susan E. Mackinnon, M.D., Queen's University, Kingston, Ontario, 1975.

John Gail Neely, M.D., University of Oklahoma, 1965.

Associate Professor

C. Robert Almli, Ph.D., Michigan State University, 1970.

Associate Research Professor

Mary P. Watkins, M.S., P.T., Boston University, 1974.

Assistant Professors

Judy Bachelder, Ph.D., University of Kansas, Lawrence, 1987.

Janet Duchek, Ph.D., University of South Carolina, 1982.

Dorothy F. Edwards, Ph.D., Washington University, 1980.

Christine A. Feely, Ph.D., Washington University, 1984.

Philip E. Higgs, M.D., University of Florida, Gainesville, 1974.

Luci Kohn, Ph.D., University of Wisconsin, Madison, 1989.

Jay F. Piccirillo, M.D., University of Vermont, 1985.

Marc H. Schieber, M.D., Ph.D., Washington University, 1982.

Adjunct Assistant Professors

Mary Evert, M.B.A., National University, San Diego, 1979.

Leonard Matheson, Ph.D., University of Southern California, 1979.

Assistant Research Professor

Christine B. Novak, M.S., P.T., University of Toronto, 1992.

Instructors

Diane Barnes, B.S., University of Illinois, Champaign, 1982.

Karen F. Barney, M.S., University of Wisconsin, 1982.

Christine Berg, M.S., Boston University, 1979.

Mary Bettlach, M.P.H., OTR/C, St. Louis University, 1992.

Ronald E. Gribbins, Ph.D., University of Wisconsin, Madison, 1975.

Linda Hunt, M.S., Washington University, 1991.

Alison Laver, Dip, COT, dorset House, Oxford, England, 1986.

Patricia La Vesser, M.A., Webster University, 1987.

Mary K. Seaton, B.S., University of Missouri, 1977.

Susan Stark, M.S.O.T., Washington University, 1989.

Lecturers

Ibrahim Abusharbain, B.S., Southern Illinois University, 1989.

Harriet A. Backhaus, M.A., Webster University, 1992.

Theresa Braford, B.S., Washington University, 1978.

Nancy Mohr, M.S.O.T., Washington University, 1989.

Pia Nystrom, Ph.D., Washington University, 1992.

Susan Rhomberg, M.A., Washington University, 1991.

Annette Schmitz, O.T., University of Missouri, 1989.

PROGRAM IN PHYSICAL THERAPY

The Program in Physical Therapy at the School of Medicine offers an intensive two and one-half year curriculum which leads to the degree of Master of Science in Physical Therapy. Applicants for admission must have completed: 1) a baccalaureate degree at an accredited college or university and 2) prerequisite courses in English, psychology, biology, mathematics, physics, chemistry and social sciences.

The study of human movement — both normal and abnormal — forms the core of the curriculum. Competence in clinical practice results from integrating information learned from courses in basic science, clinical science, and from applying this information to actual practice. Students develop the ability to assess, remedy, and prevent movement disorders for a wide variety of patient care problems. The goals of the curriculum are to prepare individuals for the profession of physical therapy who (1) have attained the competencies of an entry-level, science based, general practitioner, (2) are prepared to accept their professional responsibilities, and (3) are committed to a lifelong career.

The Program seeks to prepare students for both the current and future practice of physical therapy. The faculty actively participates in clinical practice, research and curriculum development to enhance and influence the direction of the profession. Students are provided with an environment in which both clinical and academic faculty assist them to achieve their highest personal and professional potential.

Tuition per semester $8,500

Further information may be secured by direct correspondence with the Program in Physical Therapy, Campus Box 8502, 660 South Euclid Avenue, St. Louis, Missouri 63110.

Faculty

Assistant Professor and Director

Susan S. Deusinger, Ph.D., Washington University, 1987.

Associate Professor Emeritus

Beatrice F. Schulz, M.A., Washington University, 1955.

Assistant Professor Emeritus

Lorraine F. Lake, Ph.D., Washington University, 1962.

Associate Professor

Shirley A. Sahrmann, Ph.D., Washington University, 1973. (See Departments of Neurology and Neurological Surgery and Cell Biology and Physiology.)

Visiting Associate Professor

Eugene Michels, M.A., University of Pennsylvania, 1967.

Assistant Professors

Marybeth Brown, Ph.D., University of Southern California, 1984.

Robert H. Deusinger, Ph.D., The University of Iowa, 1981.

Robert J. Hickok, M.H.A., Washington University, 1971. (See Administration and Health Administration Program.)

Scott D. Minor, Ph.D., University of Iowa, 1987.

Michael Mueller, Ph.D., Washington University, 1992.

David R. Sinacore, Ph.D., University of West Virginia, 1991.

Adjunct Assistant Professor

Anthony Delitto, Ph.D., Washington University, 1990.

Instructors

Gail W. Baudendistel, M.S., St. Louis University, 1977.

Cheryl Caldwell, M.H.S./P.T., Washington University, 1989.

Ruth Clark, Ph.D., St. Louis University, 1988.

Suzanne M. Cornbleet, M.A., Washington University, 1987.

Jay Diamond, M.H.S./P.T., Washington University, 1989.

Kathleen Dixon, M.Ed., Johns Hopkins University, 1969.

Patricia Kohne, M.H.S./P.T., Washington University, 1992.

Mary Kate McDonnell, M.H.S./P.T., Washington University, 1985.

Barbara J. Norton, M.H.S./P.T., Washington University, 1984.

Marc H. Schieber, M.D., Ph.D., Washington University, 1982.

Jennifer S. Stith, M.S., University of Southern California, 1978.

Janet A. Tenhula, M.H.S./P.T., O.C.S., Washington University, 1986.

Linda Van Dillen, M.H.S./ P.T., Washington University, 1985.

Tamara Versluis, M.H.S./P.T., Washington University, 1993.

Nancy B. Woolsey, M.S., Washington University, 1979.

Lecturers

Dana Altermatt, B.S., University of Missouri, 1988.

Ethel Frese, M.H.S./P.T., Washington University, 1985.

Richard C. Lehman, M.D., University of Miami, 1980.

Kathleen McDonald, B.A., University of Pennsylvania, 1986.

Sue Million, B.S., Washington University, 1982.

Susan Strecker, B.S., University of Kansas, 1980.

Instructors (Clinical)

Barbara Alexander
Steve Allen
Cindy Alvino
Linda Anderson
Dan Arnold
Linda Autz
David Auvinen
Karen Bachman
Pat Barbier
Lisa Barker
Barbara Barnett
Noemi Barroga
Sarah Baumgartner
Dana Beggs
Marlys Bennett
Carla Bennett
Renee Bennett
Kathy Bitzer
Susan Barr Black
Jocelyn Blaskey
Jeanne Boardman
Philip Boeckmann
Karen Boudouris
Denise Brasseaux
Kathy Braun
Beth Brill
Sylvia Brothers
Laura Brown
Sue Burton
Pam Bustanante
Marlene Cailteux
Susan Cannon
Christine Canupp
Margaret Carr
Barbara W. Carroll
Terri Casey
Steve Cassabaum
Paulette Cebulski
Diana Chartrau
Mike Cibulka
Michael Clark
Sherry Clark
Betsy Cook
Susan Crabtree
Sue Crawford
Kim Crosley
Arlene Crouther
Chris Haag Deans
Steven Dickoff-Hoffman
Bobbie Dimond
Jeff Dobbins
Karen Donahue
John Dooley
Chris Easley
Beverly Edge
Marilyn Engmann
Teresa Erickson
Rachel Evans
Bruce Evers
Kathy Kilkenny-Febos
Jayne Fleck-Pool
Jean Fleming
Janet Foy
Nancy Frasch
Annette Gallagher
Kathy Garrity
Trena Glenn
Beth Goettman-Miller
Prem Gogia
Ira Gorman
Marlene Gravat
Jennie Gregory
Dina Griffith
Claire Grueter
Willie Gutierrez
Linda Haar
Judy Hackmann
Iola Haddock
Theresa Hall
Cheryl Halverson
Jim Hambrick
Donabelle Hansen
Diane Harvey
Cheri Hayes
Carina Heesterman
Peggy Heisel
Mindy Hensley
Carol Jean Hood
Deborah Hubbard
Rick Huelsing
Kathy Huxhold
Joe Jacobson
Ann Jampel
Mary Pat Jobes
Dana Johnson
Elaine Jones
Janice Jones
Vicki Kannmacher
Sandra Karcher
Annette Keipp
Dan Kelley
Kimberly Kerbel
Ginge Kettenbach
Pam Knickerbocker
Keith Kocher
Kelly Koga
Nancy Krick
Joy Krull
John LaRocco
Stacy LaRock
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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, 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).

Faculty

Professor and Director

Lee N. Robins, (University Professor of Social Science and Professor of Social Science in Psychiatry)

Professors

Theodore J. Cicero (Neuropharmacology)

C. Robert Cloninger (Psychiatry)

Dabeeru C. Rao (Biostatistics)

Theodore Reich (Psychiatry)

John P. Rice (Mathematics in Psychiatry and Biostatistics)

Edward L. Spitznagel, Jr. (Biostatistics)

J. Philip Miller (Biostatistics)

Associate Professors

Linda B. Cottler (Epidemiology in Psychiatry)

Andrew C. Heath (Psychology in Psychiatry)

Collins E. Lewis (Psychiatry)

Elizabeth M. Smith (Social Work in Psychiatry)

Arlene Stiffman (Social Work)

Assistant Professors

Wilson Compton III (Psychiatry)

Carol S. North (Psychiatry)

George P. Vogler (Biostatistics)

Research Assistant Professors

Kathleen K. Bucholz (Epidemiology in Psychiatry)

Mae Gordon (Ophthalmology and Visual Sciences)

Rosalind J. Neuman (Mathematics in Psychiatry)

Gwendolyn G. Reich (Anthropology in Psychiatry)

Research Instructor

Rumi K. Price (Epidemiology in Psychiatry)

Instructor (Adjunct)

Deborah Smith (Epidemiology in Psychiatry)

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Davenport, IA
B.S., University of Iowa, '83
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Joslin, Gregory
Jamaica Plain, MA
B.S., University of Massachusetts, Boston, '87
Obstetrics - Gynecology
Barnes Hospital
St. Louis, MO

Lee, Katherine Ann
Skaneateles, NY
B.A., Carleton College, '86
Transitional
CMHS/St. Joseph Mercy
Ann Arbor, MI
Ophthalmology
University of Michigan
Ann Arbor, MI

Mariencheck, Maria Chiara Filiaggi
Glen Ellyn, IL
A.B., Washington University, '87
Internal Medicine - Preliminary
Duke University
Durham, NC

Myers-Powell, Brenda A.
Ft. Washington, MD
B.S., The Johns Hopkins University, '87
Transitional
St. John's Mercy
St. Louis, MO
Ophthalmology
University of Texas
Houston, TX

Niederman, Thomas N. J.
Los Angeles, CA
B.S., University of California, Los Angeles, '87
Internal Medicine
Brigham & Women's Hospital
Boston, MA

Rudnick, David Alan
Champaign, IL
B.S., University of Illinois, '87
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Schlaggar, Bradley Lorin
Wilmette, IL
Sc.B., Brown University, '86
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

VanDeerlin, Vivianna M. D.
Chicago, IL
B.S., M.S., The University of Chicago, '86
Pathology
Hospital of University of Pennsylvania
Philadelphia, PA

Wilson, Thomas Edward
Madison, WI
B.S., University of Wisconsin, Madison, '87
Lab Medicine
Barnes Hospital
St. Louis, MO

Doctor of Medicine and Master of Arts Degrees

Cox, Stephanie
College Corner, OH
B.A., Northwestern University, '89
Obstetrics - Gynecology
McGaw Medical Ctr. - Northwestern
Chicago, IL

Fox, Lee Andrew
Manhasset Hills, NY
B.S., Duke University, '89
Transitional
St. Vincent's Hospital
New York, NY
Radiology-DX
Brigham & Women's Hospital
Boston, MA

Franano, Frank Nicholas
Ottawa, KS
B.S., University of Kansas, '89
Radiology-DX
Johns Hopkins Hospital
Baltimore, MD

Guillerman, Robert Paul
Waverly, KY
B.A., Transylvania University, '89
Radiology-DX
Barnes Hospital
St. Louis, MO

Jensen, John Newcomb
St. Louis, MO
B.A., University of Iowa, '88
Surgery - Preliminary
Barnes Hospital
St. Louis, MO

Mutone, Martina Francesca
Pittsburgh, PA
B.S., Notre Dame University, '88
Obstetrics - Gynecology
Loyola University
Chicago, IL

Neil, John Ellis
Hays, KS
B.A., University of Kansas, '89
Radiology-DX
Barnes Hospital
St. Louis, MO

Sun, Paul Chaoyuan
Van Nuys, CA
B.S., Dartmouth College, '89
Surgery - Preliminary
Barnes Hospital
St. Louis, MO
Otolaryngology
Washington University
St. Louis, MO

Doctor of Medicine Degrees

Ahluwalia, Arlina
Oak Brook, IL
B.S., Washington University, '90
Internal Medicine
University of Colorado
Denver, CO

Akins, Victoria Fite
Vero Beach, FL
B.A., Wake Forest University, '80; Ph.D., University of Tennessee, Memphis, '89
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Allman, Kimberly Carson
Chagrin Falls, OH
B.A., Miami University, Oxford Campus, '90
Pediatrics
Stanford University Hospital
Stanford, CA

Aminian, Afshin
Northbrook, IL
B.S., Northwestern University, '90
Orthopedic Surgery
McGaw Medical Ctr. - Northwestern
Chicago, IL

Austin, J. Christopher
Hinsdale, IL
B.A., Northwestern University, '90
Urology
University of Iowa Hospital & Clinics
Iowa City, IA

Avva, Ramesh
Dayton, OH
B.A., Northwestern University, '90
Radiology-DX
University of Arkansas
Little Rock, AR

Belle, Beverly Ann Vanessa[2]
Brooklyn, NY
B.A., Barnard College, '85;
M.S., Columbia University, '87
Obstetrics - Gynecology
Harlem Hospital Center
New York, NY

Bernardo, Bernadette D.
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B.S., Georgetown University, '90
Obstetrics - Gynecology
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Bloomfeld, Richard Seth
Spring Valley, NY
B.S., Duke University, '88;
M.S., Northwestern University, '90
Internal Medicine
Duke University
Durham, NC

Bodenheimer, Marc Alan
Knoxville, TN
B.S., University of Tennessee, Knoxville, '88;
M.S., University of North Carolina, Raleigh, '89
Transitional
University of Tennessee
Chattanooga, TN
Ophthalmology
University of Tennessee
Chattanooga, TN

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Pediatrics
University of Cincinnati Hospital
Cincinnati, OH

Boustany, Marc Kamel
Chesterfield, MO
B.S., University of Pennsylvania, '90
General Surgery
SUNY Health Science
Syracuse, NY

Bradley, Catherine Sands
Minneapolis, MN
B.A., The University of Chicago, '90
Obstetrics - Gynecology
Hospital of University of Pennsylvania
Philadelphia, PA

Bruns, Luke Andrew
Gifford, IL
B.S., Indiana University at Bloomington, '90
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Burke, Robert Eugene
Springfield, IL
B.A., Washington University, '90
Internal Medicine
Dwight D. Eisenhower Medical Center
Fort Gordon, GA

Carico, John Bennett
Thomasville, GA
B.S., Vanderbilt University, '90
Radiology-DX
Barnes Hospital
St. Louis, MO

Carmichael, Stanley Thomas
Westlake Village, CA
B.S., University of California, Los Angeles, '86
Ph.D., Washington University, '93;
Medicine - Preliminary
Barnes Hospital
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Neurology
Washington University
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Cassidy, Brian Hanley
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B.A., Emory University, '90
Pediatrics
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Jackson, MS
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General Surgery
Walter Reed Army Medical Center
Washington, DC

Chan, Joseph
Oak Brook, IL
B.S., Washington University, '90
Transitional
Baylor College of Medicine
Houston, TX
Radiology-DX
Baylor College of Medicine
Houston, TX

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Jamestown, ND
B.A., Carleton College, '90
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Medicine - Preliminary
St. Mary's Hospital
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Radiation - Oncology
University of California - Irvine
Irvine, CA

Devine, Thomas Darren
Chesterton, IN
B.S., The Johns Hopkins University, '90
Internal Medicine
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Chicago, IL

Dodge, Stephen Michael
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B.S., Pepperdine University, '90
General Surgery
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St. Louis, MO

Farwell, Donald Gregory
Republic, MO
B.A., Drury College, '90
Otolaryngology
University of Washington
Seattle, WA

Friesen, Darrin Scott
Newton, KS
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Psychiatry
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Garstang, Susan Veronica
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Internal Medicine - Preliminary
Jewish Hospital
St. Louis, MO
Physical Medicine & Rehabilitation
Baylor College of Medicine
Houston, TX

Gill, Arvin Singh
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B.S., University of Illinois, '90
Internal Medicine
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Ann Arbor, MI

Girotto, John Alan
Cedar Rapids, IA
B.A., Washington University, '90
Plastic Surgery
Johns Hopkins Hospital
Baltimore, MD

Groesch, Scott David
Springfield, IL
B.S., University of Illinois, '90
Internal Medicine
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Guinn, Brett Joseph
Yorktown, IN
B.A., De Pauw University, '90
General Surgery
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Hakakha, Benjamin Asher
Calabasas, CA
B.S., University of California, Los Angeles, '90
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B.S., Purdue University,'79; Ph.D., '84
Internal Medicine
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McGaw Medical Center - Northwestern
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Wood River, IL
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Internal Medicine
Barnes Hospital
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Surgery - Preliminary
University of Hawaii
Honolulu, HI

Ho, Paul
Lincoln, NE
B.S., Washington University, '90
Radiology - DX
University of Wisconsin Hospital
Madison, WI

Hoffman, Jacqueline
St. Louis, MO
B.S., University of California, Davis, '73; Ph.D., Harvard University, '79;
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Holt, Danica Carmel
Santa Maria, CA
B.A., University of California, San Diego, '90
Radiology - DX
University of New Mexico
Albuquerque, NM

Hsu, Te-Chung
Kelso, WA
B.A., University of California, Berkeley, '90
Radiology - DX
Indiana University
Indianapolis, IN

Hunt, Nicholas Cuyler
St. Louis, MO
B.A., Hampshire College, '90
Internal Medicine
University of Washington
Seattle, WA

Ingels, Marianne
Norman, OK
B.A., Yale University, '89
ER Medicine
University of Cincinnati
Cincinnati, OH

Jong, Peter Chun-Ming
Downey, CA
B.A., University of California, Berkeley, '90
Internal Medicine - Preliminary
UCLA - San Fernando Valley
Sepulveda, CA
Anesthesiology
University of California - Irvine
Irvine, CA

Keiser, Paul Bernhard
Vienna, VA
B.S., George Washington University, '90
Internal Medicine
Georgetown University
Washington, DC

Kenyherz, Gregory Edward
Pittsburgh, PA
B.A., Duke University, '90
Orthopedic Surgery
University of New Mexico
Albuquerque, NM

Kill, Mathias John
Chicago, IL
B.S., Northwestern University, '90
General Surgery
University of Texas - Southwestern
Dallas, TX

Kiser, Julie Diane[3]
Washington, DC
B.S., Stanford University, '84
Family Practice
Community Hospital of Sonoma
Sonoma, CA

Klein, Molly Elizabeth
Madison Lake, MN
B.A., Case Western Reserve University, '90
Obstetrics - Gynecology
Barnes Hospital
St. Louis, MO

Kodner, Charles Matthew
St. Louis, MO
B.A., Harvard University, '89
Family Practice
St. John's Mercy
St. Louis, MO

Kokoska, Evan Raymond
Terre Haute, IN
B.S., Rose-Hulman Institute of Technology, '89
General Surgery
St. Louis University
St. Louis, MO

Kong, Li Kuo
Murphy, NC
B.A., The Johns Hopkins University, '90
Internal Medicine
Duke University
Durham, NC

Kotton, Darrell
Beachwood, OH
B.A., University of Pennsylvania, '89
Internal Medicine - Preliminary
Hospital of University of Pennsylvania
Philadelphia, PA

Krause, Gregory E.
Miami, FL
B.S., University of Pennsylvania, '88

Krug, Lee Michael
Creve Coeur, MO
B.S., Emory University, '90
Internal Medicine
Johns Hopkins Hospital
Baltimore, MD

Kuru, Tunay
Karsiyaka, Turkey
B.S., Massachusetts Institute of Technology, '90
Internal Medicine
Barnes Hospital
St. Louis, MO

Lee, Ray J.
Oak Ridge, TN
B.A., Washington University, '90
Internal Medicine
University of Texas - Southwestern
Dallas, TX

Lenze, Eric Juckeland
Indianapolis, IN
B.A., Washington University, '90
Psychiatry
Barnes Hospital
St. Louis, MO

Levy, Armond
Emmaus, PA
B.S., Washington University, '86
Surgery - Preliminary
Rhode Island Hospital
Providence, RI
Neurosurgery
Rhode Island Hospital
Providence, RI

Lu, Linda
Elmhurst, IL
B.S., University of Illinois, '90
Internal Medicine
University of Michigan
Ann Arbor, MI

McBurney, Leanne Marie
Mandeville, LA
B.S., Louisiana State University,
Baton Rouge, '90
Psychiatry
UCLA Neuropsych. Inst.
Los Angeles, CA

Makkar, Haramandeep Singh
Hoffman Estates, IL
B.S., University of Illinois, '90
Transitional
The University of Chicago -
PRG B/Weiss
Chicago, IL
Psychiatry
Johns Hopkins Hospital
Baltimore, MD

Marceny, Joseph Heinrick
Englewood, CO
B.A., University of Colorado, '89
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Mariencheck, Jr., William I.
Memphis, TN
B.S., St. Louis University, '89
Internal Medicine - Preliminary
Duke University
Durham, NC

Miller, Craig
Hillsborough, CA
B.S. '85; M.S., '88; Ph.D., University
of California, Davis, '90;
Internal Medicine - Preliminary
Kaiser Permanente
Santa Clara, CA

Miller, David Michael
Farmington Hills, MI
B.S., University of Michigan,
Ann Arbor, '88
Otolaryngology
University of Pennsylvania
Philadelphia, PA

Miller, Elizabeth Anne
Kirkwood, MO
B.A., Smith College, '90
Urology
University of Washington
Seattle, WA

Mutch, Matthew Gardner
Sioux Falls, SD
B.A., St. Olaf College, '90
Surgery - Preliminary
Barnes Hospital
St. Louis, MO

Norrbom, Corina Jo
Eland, WI
B.S., Marquette University, '90
Family Practice
Duluth Grad. Med. Ed.
Duluth, MN

Okada, Carol Reiko
Keenesburg, CO
B.A., Colorado College, '90
Pediatrics
University of Colorado
Denver, CO

Paterson, Jennifer Lynn
Milan, OH
B.A., University of Michigan, '90
Family Practice
Duluth Grad. Med. Ed.
Duluth, MN

Pavlopoulos, Tricia V.
Creve Coeur, MO
B.S., Stanford University, '89
Internal Medicine
Barnes Hospital
St. Louis, MO

Philpott, Timothy Charles
St. Louis, MO
B.A., Carleton College, '87
Obstetrics - Gynecology
Barnes Hospital
St. Louis, MO

Pinter, Scott Merrill
Kewanee, IL
B.S., University of Notre Dame, '90
Transitional
CMHS/St. Joseph Mercy
Ann Arbor, MI
Ophthalmology
University of Michigan
Ann Arbor, MI

Pitt, Alan
Fresno, CA
B.A.,Carleton College, '86;
Ph.D., Washington University, '91
Internal Medicine - Preliminary
CMHS/St. Joseph Mercy
Ann Arbor, MI

Poole, Amy Marie
Chicago, IL
B.A., Northwestern University, '90
Pediatrics
St. Louis Children's Hospital
St. Louis, MO

Raney, Michael Joe
Harrison, AR
B.S., Georgetown University, '90
Transitional
St. John's Mercy
St. Louis, MO
Radiology - DX
Methodist Hospital
Memphis, TN

Reichner, Daniel Richard
Pittsburgh, PA
B.S., Auburn University, '85
General Surgery
Kern Medical Center
Bakersfield, CA

Sadeghi, Mehryar
Tehran, Iran
B.S., University of Toronto, '89
Transitional
Presbyterian Medical Center
Philadelphia, PA

Schielke, Lorenz
Longmeadow, MA
B.S., University of Massachusetts,
Amherst, '89
Internal Medicine - Preliminary
Baystate Medical Center
Springfield, MA
Radiology - DX
Baystate Medical Center
Springfield, MA

Seiner, Stephen Jay
Troy, MI
B.S., University of Michigan, '90
Psychiatry
McLean Hospital
Belmont, MA

Shah, Ankit Arvind
Glen Ellyn, IL
B.A., The University of Chicago, '90
Internal Medicine
McGaw Medical Center -
Northwestern
Chicago, IL

Shah, Arjav Jayendra
Richmond, VA
B.A., University of Virginia, '89
Surgery - Preliminary
University of Texas - Galveston
Galveston, TX

Sjak-Shie, Nelida
Lelydorp, Surinam
B.S., University of Florida, '87;
Ph.D., '90
Internal Medicine
University of Florida - Shands Hospital
Gainesville, FL

Smith, Christopher Edward
Bedford, MA
B.S., Yale University, '90
Surgery - Preliminary
Barnes Hospital
St. Louis, MO

Smith-Kim, Karen Michelle[4]
Chattanooga, TN
B.A., University of Tennessee, Chattanooga, '89

Southwick, Robert David
Naperville, IL
B.A., Augustana College, '90
Obstetrics - Gynecology
Medical College of Wisconsin
Madison, WI

Steiner, Mark Allen
New Orleans, LA
B.A., University of Virginia, '90
Internal Medicine
Barnes Hospital
St. Louis, MO

Vest-Mason, Mary Lynn
Godfrey, IL
B.S., University of Illinois, '90
Internal Medicine - Preliminary
Jewish Hospital
St. Louis, MO
Radiation - Oncology
Barnes Hospital
St. Louis, MO

Waggoner, Brian Scott
Nashville, TN
B.A., St. Louis University, '90
Internal Medicine
Vanderbilt University
Memphis, TN

Waldman, Michael David
Omaha, NE
B.A., University of Pennsylvania, '90
Internal Medicine
The University of Chicago
Chicago, IL

Wei, Steven Yin
Rockville, MD
B.A., University of Michigan, '90
Orthopedic Surgery
Hospital of University of Pennsylvania
Philadelphia, PA

Whellan, David Joshua
Davenport, IA
B.S., University of Pennsylvania, '89
Internal Medicine
Hospital of University of Pennsylvania
Philadelphia, PA

Wiseman, Alex Clark
Spokane, WA
B.A., Washington University, '90
Internal Medicine
University of California - San Francisco
San Francisco, CA

Wissink, Stephen Craig
Middleton, WI
B.A., Augustana College, '90
Internal Medicine
Lackland Air Force Base
San Antonio, TX

Yoon, Myeong Sook
Riverside, MO
B.S., University of Missouri, Kansas City, '90
Radiology - DX
Barnes Hospital
St. Louis, MO

1 Degree conferred on December 21, 1993
2 Degree conferred on August 13, 1993
3 Degree conferred on June 18, 1993
4 Degree conferred on December 31, 1993

Medical Scientist Training Program (M.D. and Ph.D. Degrees)

Ninth-Year Trainees

Zempel, John Martin
Elkhorn, WI
B.S., University of Wisconsin, '85

Eighth-Year Trainees

Glaser, Paul Edward
Euclid, OH
B.S., M.S., The University of Chicago, '86

Goodkin, Howard Parker
Sierra Madre, CA
B.S.E., University of Pennsylvania, '85

Kolodney, Michael Spencer
Fair Lawn, NJ
S.B., Massachusetts Institute of Technology, '86

Matheny, Cali Christine
Portales, NM
B.S., Eastern New Mexico University, '86

Strauss, Brian Louis
Millville, NJ
B.S., Massachusetts Institute of Technology, '86

Young, Robert Lindsay
San Jose, CA
B.S., A.B., Stanford University, '86

Seventh-Year Trainees

Chiara, David Carl
Redding, CA
B.S., University of California, Davis, '84

Godambe, Sandip Ashok
Lisle, IL
B.A., Washington University, '87

Heusel, Jonathan William
Lincoln, NE
B.S., University of Nebraska, '87

Ho, Chris Meichung Wang
West Lafayette, IN
B.S., Purdue University, '87

Hsu, Benjamin Li-ping
Gaithersburg, MD
B.A., Harvard College, '86

Hug, Christopher
Cincinnati, OH
B.S., B.A., University of Cincinnati, '87

Jay, Patrick Yin Kan
San Jose, CA
B.S., Stanford University, '87

Leonis, Michael Anthony
Las Vegas, NV
B.A., Washington University, '87

Novack, Deborah Jean Veis
Skokie, IL
B.A., Princeton University, '87

Porter, Brenda Elaine
St. Louis, MO
B.S., Washington University, '87

Rudnick, Caroline Marie
Mt. Clemens, MI
B.S., Duke University, '87

Silbert, Seth Cheng
Clayton, MO
B.S., Harvard University, '86

Tarle, Ivan
Novi Sad, Yugoslavia
B.S., California Institute of Technology, '87

Velleca, Mark Albert
New Haven, CT
B.S., Yale University, '85

Sixth-Year Trainees

Aiken, Kimberly Dawn
Burlington, WI
B.S., University of Wisconsin, '87

Beck, Anita Elizabeth
Troy, OH
B.S., Massachusetts Institute of Technology, '88

DuBois, Brian W.
San Diego, CA
B.A., University of California, San Diego, '88

Glickman, Jonathan
Scarsdale, NY
B.S., Yale University, '87

Johnson, Donald Russell
Columbus, OH
B.A., Ohio State University, '87

Lee, Stephen Luming
Westerville, OH
B.A., Washington University, '88

Roberts, Charles Mortimer
Madison, WI
B.S., University of Wisconsin, '88

Sachais, Bruce S.
Florham Park, NJ
B.A., Lehigh University, '88

Solaro, Christopher Ross
Mariemont, OH
B.S., Northwestern University, '88

Striker, Robert Todd
Cincinnati, OH
B.S., Purdue University, '88

Tykodi, Scott Simon
South Dartmouth, MA
B.A., Northwestern University, '88

Warshawsky, Ilka Ruth
West Bloomfield, MI
B.A., Brandeis University, '88

Fifth-Year Trainees

Alvarez, John David
Mechanicsburg, PA
B.S., Pennsylvania State University, '89

Bullock, Eric Daniel
Ankeny, IA
B.S., University of Iowa, '89

Chu, Gerald Chen
Oswego, NY
B.A., Cornell University, '89

Colman, Howard
Irvin, CA
Sc.B., Brown University, '89

Colvin, Jennifer Susan
Towson, MD
A.B., Harvard University, '87

Dighe, Anand Shrikant
Bethesda, MD
B.S., Massachusetts Institute of Technology, '89

Gallagher, Martin
Palos Park, IL
B.S., University of Notre Dame, '89

Greenlund, Andrew Christopher
Nevada, MO
B.S., Southern Methodist University, '89

Greenlund, Laura Schwarze
Rochester, MN
B.S., Univeristy of Wisconsin, '89

Hermiston, Michelle E.
Durant, IA
B.S., University of Iowa, '88

Hodsdon, Michael Edwin
Bloomington, IN
B.S., Indiana University, '89

Kotzbauer, Paul Thomas
Cincinnati, OH
B.S., Northwestern University, '89

McCoy, Roderick Lawrence
Santa Monica, CA
B.S., Stanford University, '89

Mathews, Gregory Christopher
Berkeley Heights, NJ
B.S., Georgetown University, '89

Moscoso, Lisa Mae
Medford, WI
B.S., University of Wisconsin, '89

Norris, Andrew William
Olathe, KS
B.S., Massachusetts Institute of Technology, '89

Rogers-Rovira, Howard Wooding
Newbury, MA
B.S., Harvard University, '89

Wu, Justina Eng Hui
Westminster, CA
B.S., University of California, Irvine, '89

York, Sally Jane
Hopewell, NJ
B.S., University of Iowa, '86

Fourth-Year Trainees

Ardelt, Agnieszka Anna
West Lafayette, IN
B.S., Purdue University, '89

Bhatnagar, Rajiv Sahai
Burlingame, CA
B.S., A.B., University of California, Berkeley, '89

Bry, Lynn Virginia
Hilton Head Island, SC
B.A., Cornell University, '90

Chan, Iris Tanchi
Jamaica, NY
Sc.B., Brown University, '90

Cheng, Judy Mary
Hoffman Estates, IL
B.S., University of Michigan, '89

Culican, Susan Margaret
Frederick, MD
B.A., Washington University, '90

Darrow, Bruce Jonathan
White Plains, NY
B.S., Yale University, '90

Fogg, George Chee-Chiu
Littleton, CO
A.B., Cornell University, '90

Gubitose-Klug, Rose
Euclid, OH
B.S., Washington University, '90

Hsieh, Chyi-Song
Carbondale, IL
B.S., M.S., University of Chicago, '90

Hug, Bruce Allen
Tinley Park, IL
B.S., University of Illinois '88

McCarter, James Philip
Northfield, IL
A.B., Princeton University, '89

Martin, Tod Andrew
Carbondale, IL
B.A., Vanderbilt University, '90

Nichol, Peter Frosio
Madison, WI
B.S., Macalester College, '89

Pinckard, James Keith
Tucson, AZ
B.S., University of Arizona, '90

Schreiber, Matthew A.
Cleveland Heights, OH
B.S., Case Western Reserve, '88

Seydel, Karl Boynton
Redwood City, CA
B.S., M.S., Stanford University, '89

Wolf, Matthew Joseph
Dunwoody, GA
B.A., Washington University, '90

Ying, Howard Shann-Cherng
Tampa, FL
B.S., The Johns Hopkins University, '89

Third-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 Lyune
Tuskegee, AL
B.S., University of North Carolina, Chapel Hill, '91

Second-Year Trainees

Buckman, ShaAvhree
Camp Springs, MD
A.B., Washington University, '92

Easton, Rachel
Springfield, MA
B.A., Washington and Lee University, '92

Frohnert, Paul
Frankfurt, A.M. Germany
B.S., Macalester College, '92

Garabedian, Emily
New York, NY
B.S., University of Michigan, '92

Grossman, William
Glencoe, MN
B.A., University of St. Thomas, '92

Guler, Mehmet
Ankara, Turkey
B.S., University of Illinois, '92

Ho, Albert
Boston, MA
B.S., California Institute of Technology, '92

Jacobson, Nils
Ann Arbor, MI
B.A., University of California, Berkeley, '92

Kundra, Robin
Atlanta, GA
B.S., University of Georgia, '92

Minning, Dena
Melbourne, FL
B.S., University of Florida, '92

Randolph, David
Gainesville, FL
B.S., University of Colorado, '90

Saulino, Evan
Marshfield, WI
B.A.,, University of California, San Diego, '92

Smith, Arnold
Rochester, MN
B.S., Mississippi State University, '92

Soto, Gabriel
Boston, MA
B.A., Wesleyan University, '92

Trask, Timothy
Philadelphia, PA
B.A., University of Pennsylvania, '91

VanBlerkom, Suzanne
Amherst, MA
B.A., University of Colorado, Boulder, '92

Verbsky, James
Madison, WI
B.S., University of Wisconsin, Madison, '92

Yu, Benjamin Diung-Yuen
Orinda, CA
B.S., University of North Carolina, Chapel Hill, '91

First-Year Trainees

Barrera, Pamela
Alice, TX
B.A., Rice University, '93

Brown, Amy
Coon Rapids, MN
B.S., University of Wisconsin, Madison, '93

Chuang, Hubert
Louisville, KY
B.S., Yale University, '92

Clements, Mark
East Chicago, IN
B.S., Butler University, '93

Fisher, Daniel
Burlingame, CA
B.S., University of Washington, '91

Gym, Aimee
Corvallis, OR
B.S., Stanford University, '93

Hill, Matthew
Urbana, IL
A.B., Washington University, '93

Nguyen, Quyen
Manoi, Vietnam
B.S., University of Southern California, '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

M.A. and M.D. Degrees Trainees

Baghadady, Rose
Weston, MA
B.A., Wellesley College, '90

Cabanellas, Jennine
San Juan, Puerto Rico
B.S., University of Michigan, Ann Arbor, '90

Kim, Mike Chunguck
Los Angeles, CA
B.A., University of California, Berkeley, '90

Liang, Griffith
Arlington Heights, IL
B.A., Northwestern University, '91

Miller, David Michael
Farmington Hills, MI
B.S., University of Michigan, Ann Arbor, '88

Park, John Yong
Levittown, NY
B.S., University of Pennsylvania, '90

Patel, Vikas V.
St. Louis, MO
B.S., University of Illinois, '91

Silbert, Jonathan Edmund
St. Louis, MO
B.A., University of California, Berkeley, '89

Sun, John Chaopin
Van Nuys, CA
B.S., Dartmouth College, '90

Tantuwaya, Vrijesh
St. Louis, MO
B.A., Northwestern University, '90

West, Robert Burnard
LaJolla, CA
B.S., Brown University, '90

Howard Hughes Medical Institute Research Scholars Program Trainees

Daly, Thomas Matthew
Doylestown, OH
B.A., Case Western Reserve University, '90

Korenblat, Kevin M.
St. Louis, MO
B.A., Cornell University, '91

Ohl, Michael
Eau Claire, WI
B.S., University of Wisconsin, Eau Claire, '90

Four Schools Program Trainees

Dudek, Steven Michael
Joliet, IL
B.A., The Johns Hopkins University, '90

Horwitz, Phillip Andrew
Englewood, CA
B.S., Colorado College, '89

M.D. Degree Trainees

Third-Year Class

Ahuja, Ajay
Indianapolis, IN
B.S., Duke University, '91

Alvey, Justin Charles
Salt Lake City, UT
B.S., University of Utah, '91

Amin, Avinash
Creve Coeur, MO
B.A., Washington University, '91

Ball, Douglas James
Salt Lake City, UT
B.S., University of Utah, '89

Bauer, Gregory
North Canton, OH
B.A., Washington University, '91

Bautista, Jocelyn
Long Grove, IL
B.S., University of Illinois, '91

Belz, Mark
Pittsburgh, PA
B.S., University of Pittsburgh, '91

Blam, Michael
Port Washington, NY
B.S., SUNY at Binghamton, '91

Board, Mary Ruth
Carpentersville, IL
B.A., Miami University, '91

Brown, David J.
Anaheim, CA
B.A., Claremont McKenna College, '91

Buckner, Alyson
Knoxville, TN
B.S., University of Tennessee, Knoxville, '91

Burrows, Stephen Leon
Stillwater, OK
B.S., Oklahoma State University, '91

Caccamo, David J.
Kansas City, MO
B.A., Washington University, '91

Couchman, Jeffrey
Springfield, VA
B.S., University of Michigan, '90

Day, Caroline
Littleton, CO
B.S., University of Colorado, '90

Delcruznewlan, Francisco
Peoria, IL
B.S., University of Illinois, '91

Dickson, Jamesina
St. Louis, MO
B.A., Washington University, '91

Ellman, Carol
Wilmette, IL
B.S., University of Illinois, '91

Erlanger, Lisa
Madison, WI
B.S., University of Wisconsin, Madison, '90

Faulkner, Dina
Peoria, IL
B.S., University of Illinois, '91

Feiz, Vahid
Ames, Iowa
B.S., M.S., Iowa State University, '91

Foltz, Gregory Dean
Rochester, IL
B.A., Washington University, '90

Gehlbach, Brian
Lincoln, IL
B.S., University of Illinois, '91

Hadsall, Jeffrey
Anaheim, CA
B.A., California State University, Fullerton, '91

Hampton, Jr., James
Glenwood, IL
B.A., The University of Chicago, '91

Hawk, Bobbie Joy
Richardson, TX
B.A., University of Kansas, '91

Hirsch, Kenneth
Bethesda, MD
B.A., Wesleyan University, '91

Ho, Alice
Columbia, MD
B.A., The Johns Hopkins University, '91

Horiuchi, Todd
Hilo, HI
B.A., Washington University, '91

Huebner, David M.
Omaha, NE
B.S., University of Nebraska, Lincoln, '91

Hunstad, David
Red Wing, MN
B.A., Carleton College, '91

Jackson, Lance
Kerrville, TX
B.S., Massachusetts Institute of Technology, '90

Jakoby IV, Michael George
Manito, IL
B.S., Bradley University, '90

Janzow, Matthew
Cape Girardeau, MO
B.S., Southeast Missouri State University, '91

Jarvis, Howard
St. Louis, MO
B.S., Graceland College, '91

Johnson, Krista Marie
Peoria, IL
B.S., University of Illinois, '91

Kang, Yoon
Macungie, PA
B.S., University of Pennsylvania, '91

Kaskowitz, Lawrence
St. Louis, MO
B.A., Washington University, '86

Kirchmann, Eric
Omaha, NE
B.A., Knox College, '91

Kirkpatrick, Kraig
Lee's Summit, MO
B.S., Graceland College, '91

Kissela, Brett
Fond du Lac, WI
B.S., Marquette University, '91

Koler, Mark
Parma, OH
B.S., University of Dayton, '91

Korenblat, Kevin M.
St. Louis, MO
B.A., Cornell University, '91

Kraujalis, Michael J.
Carmel, IN
B.A., Northwestern University, '91

Kraus, Carl N.
St. Louis, MO
B.A., Washington University, '91

Krumholtz, Jason
Muttontown, NY
B.S., University of Michigan, '91

Kutka, Lori Jean
Topeka, KS
B.A., Washington University, '90

Lattibourdere, Rennae
Miramar, FL
B.S., University of Miami, '91

Lawner, Brian
East Brunswick, NJ
B.A., Duke University, '91

Lee, Scott
Flossmoor, IL
B.A., Harvard University, '90

Lee, Wai
Kuala Lumpur, Malasia
B.S., University of Oregon, '90;
M.S., '91

Lehman, John
Belleville, IL
B.A., Washington University, '91

Liu, Kenneth
Arlington Heights, IL
B.S., University of Illinois, '89

Lyons, William
Oceanside, CA
B.S., University of California, Santa Barbara, '80;
M.S., University of California, San Diego, '91

McCulley, Timothy
Dallas, TX
B.A., Pitzer College, '91

MacDonald, Nancy E.
Lynn, MA
B.A., College of the Holy Cross, '90

McKinley, Derrick
Boston, MA
B.S., Carnegie-Mellon University, '84
M.B.A., Xavier University, '91

Malempati, Suman
Pikeville, KY
B.A., Duke University, '90

Mickevicius, Richard
Wind Lake, WI
B.S., Marquette University, '91

Miller, David H.
Houston, TX
B.A., Washington University, '91

Miller, David P.
Rockford, IL
B.S., University of Illinois, '91

Muller, Nancy
St. Louis, MO
B.S., St. Louis University, '89

Naylor, Michael
Pascoag, RI
B.S., Providence College, '91

Nguyen, Jamie
Santa Ana, CA
B.S., University of California, Irvine, '91

Oliak, David
Racine, WI
B.S., Northwestern University, '91

Palmer, Christopher
Fort Wayne, IN
B.S., Purdue University, '91

Parker, Ian Chase
Brooklyn, NY
B.S., Cornell University, '87

Perez, Nona
Bethesda, MD
B.S., Georgetown University, '91

Pogue, Douglas
South Euclid, OH
B.A., Miami University, '90

Porter, Brent
Topeka, KS
B.A., University of Kansas, '91

Primack, Jonathan, D.
Commack, NY
B.A., Washington University, '91

Raissi, Abdolreza
Edina, MN
B.A., Northwestern University, '90

Rastorfer, Suzanne
Gladstone, MO
B.A., University of Kansas, '91

Reynolds, John
Nashville, TN
B.E., Vanderbilt University, '91

Reznik, Scott
Oklahoma City, OK
B.A., Duke University, '91

Richardson, David
Fountain Valley,CA
B.A., Brigham Young University, '91

Robey, Thomas
Wauwatosa, WI
B.S., Duke University, '91

Rogakos, John
Centerville, OH
B.S., University of Dayton, '90

Roy, Soham
Lincoln, NE
B.A., Stanford University, '91

Ruff, Joel
Cincinnati, OH
B.S., University of Cincinnati, '90

Salaris, Sheryln
West Lafayette, IN
B.S., Purdue University, '91

Schein, Joel
Sunnyvale, CA
B.A., University of California, San Diego, '91

Schendel, Timothy
Elk Grove, CA
B.A., California State University, Sacramento, '91

Schmidt, Kari Ann
Cedarburg, WI
B.S., Northeast Missouri State University, '91

Schulte, Douglas
West Des Moines, IA
B.S., University of Iowa, '91

Sirinek, Matthew
Gladstone, MO
B.A., University of Michigan, '91

Smith, Andrew
Wilmington, DE
B.A., University of Virginia, '91

St. Peter, Steven
Wichita, KS
B.A., University of Kansas, '89

Stacy, Gregory S.
Hillsborough, CA
B.A., University of California, Berkeley, '91

Starr, Ann
Plattsburgh, NY
B.S., Tulane University, '91

Strawhecker, Kristen
New Rochelle, NY
B.A., Washington University, '91

Terry, Martha Sue
Columbia, MO
B.A., Williams College, '89

Thornton, John D.
La Mesa, CA
B.A., Williams College, '91

Trump, Nichol Marie
St. Louis Park, MN
B.A., Washington University, '91

Walter II, James Cleo
Tulsa, OK
B.S., Stanford University, '91

Wang, Po
Lenexa, KS
B.A., Washington University, '89

Wasserstrom, Scott Paul
Chicago, IL
B.S., University of Illinois, '90

Wu, Debbie
Douglasville, GA
B.A., Washington University, '91

Young, Natawadee
Kaduna, Nigeria
B.A., Illinois Wesleyan University, '91

Zimmerman, Patrick
Salt Lake City, UT
B.A., University of Utah, '91

Zogakis, Theresa
Satellite Beach, FL
B.S., University of Florida, '91

Second-Year Class

Anderson, Eric, Edward
Lowell, IN
B.A., Wabash College, '92

Aronovitz, Joseph, Arthur
Broomall, PA
B.A., Cornell University, '81; Ph.D., Harvard University, '86

Arvin, Kara, Lynn
Loogootee, IN
B.S., University of Evansville, '88

Bane, Robert, Arlo
Leroy, IL
B.S., University of Illinois, '92

Barker, Thomas, Edward
Kendallville, IN
B.A., Stanford University, '90

Bateman, Timothy, Robert
Oroville, CA
B.S., Washington University, '92

Baxter, Jeffrey, D.
Cleveland Hts, OH
B.A., University of Rochester, '91

Beahm, Pamela Hopkins
Boxford, MA
B.A., Cornell University, '90

Beall, Abby, Elizabeth
Indianapolis, IN
B.A., Case Western Reserve University, '92

Bhayani, Sam, Bipin
Bourbonnais, IL
B.A., Cornell University, '92

Bhusri, Priya
Holmdel, NJ
B.S., Stanford University, '91

Blum, Andrea, Lynn
Cincinnati, OH
B.A., Washington University, '92

Boyer, Suzanne, Audrey
Cincinnati, OH
B.S., Case Western Reserve University, '92

Brischetto, Brenda, Joy
San Antonio, TX
B.A., Washington University, '91

Burgin, Heather, Joy
Salem, OR
B.S., Oregon State University, '92

Capstack, Timothy, M.
Mahwah, NJ
B.A., Rutgers University, '92

Carmichael, Craig, Wayne
Pekin, IL
B.S., University of Illinois, '92

Chau, Yuen
Sandy, UT
B.A., Princeton University, '92

Chen, Christopher, Jean
Rockville, MD
B.S., The Johns Hopkins University, '92

Choi, Paul, Daniel
Morton Grove, IL
B.S., Stanford University, '92

Clements, Lori, Diane
Edwardsville, IL
B.S., Southern Illinois University, '92

Cohan, Susan Forman
Highland Park, IL
B.S., University of Illinois, '92

Cooper, Joshua, Morrey
St Louis, MO
B.A., Harvard University, '92

Cordes, Barry, G.
St Louis, MO
B.S., University of Missouri, '92

Cranmer, Hilarie, Hartel
Boston, MA
B.E., Hofstra University, '89; M.S., University of Minnesota, '92

Dagnew, Elias
Dallas, TX
B.S., Dallas Baptist University, '92

Dahl, Karen, Marie
Dunwoody, GA
B.S., Georgia Institute of Technology '92

De Laney, Jennifer, Ann
Indianapolis, IN
B.A., Georgetown University, '92

Eaton, Adam, Christopher
St Charles, MO
B.S., University of Illinois, '92

Ehsani, Hamid
Nairobi, Kenya
B.S., Stanford University, '91

Ellis, Byron, Keith
Tuskegee, AL
B.S., University of Alabama, Birmingham, '92

Englander, Stacey, Ellen
Narberth, PA
B.A., University of Pennsylvania, '92

Ewbank, Penelope, Ann
Franklin Grove, IL
B.S., Olivet Nazarene College, '92

Fink, Andrew, James
Tampa, FL
B.A., University of Dallas, '92

Fonseca, Rosalia, Chipelo
Naugatuck, CT
B.S., Yale University, '92

Forage, James, Steven
Tucson, AZ
B.A., B.S., University of Arizona, '92

Frei, Pamela, Ann, W.
Milton, OH
B.S., University of Dayton, '92

Gartner, Elaina, Marie
Pleasant Ridge, MI
B.A., Washington University, '92

Ghaem Maghami, Elham
Indian Head Pk, IL
B.S., The University of Chicago, '92

Gilbert, Scott, Jeffrey
Falmouth, ME
B.A., University of Pennsylvania, '91

Goergen, Corrie, Ann
Batavia, NY
B.S., SUNY, Albany '92

Goldberg, Kimberly, Anne
Highland Park, IL
B.S., University of Illinois, '92

Handler, Richard J.
Neshanic Station, NJ
B.A., SUNY at Binghampton, '91

Harvey, Heather, Dianne
Bloomington, IN
B.A., Miami University, '92

Haussler, Tanya, Susan
Tucson, AZ
B.A., University of California, Santa Cruz, '91

Hayne, Thomas, Wesley
Orlando, FL
B.S., University of Central Florida, '84; M.S., University of Miami, '92

Hodges, Harlan Dru
U City, MO
B.S., Morehouse College, '92

Hsu, Raymond, M.
Gaithersburg, MD
B.S., University of Maryland, College Park, '92

Huang, James, Ting-Chih
Louisville, KY
B.S., Washington University, '91

Huff, Carla, Michelle
Indianapolis, IN
B.S., Duke University, '91

Hung, Irene, Hwang
Prairie Village, KS
B.A., University of California, Berkeley, '92

Jerng, Diane, Yaping
Montville, NJ
B.A., University of Pennsylvania, '92

Karsan, Damla
Gulsum, Norway
B.A., Rice University, '92

Kim, Matthew, Ian
Manchester, CT
B.A., Yale University, '90

Kindsvater, Steven, Michael
Dodge City, KS
B.S., US Air Force Academy, '92

Klepps, Steven, Jay
Great Falls, MT
B.A., Carroll College, '92

Kraft, Judith, Ellen
Gaithersburg, MD
B.A., Cornell University, '92

La Starza, Mark
New Smyrna Bch, FL
B.S., University of Florida, '86

Liang, Jeff, E.
Morton Grove, IL
B.A., Northwestern University, '91

Ligibel, Jennifer, Ann
Toledo, OH
B.S., Duke University, '92

Lim, John Taek
E. Liverpool, OH
B.S., Stanford University, '90

Linder, John Jason
Columbia, MO
B.S., University of Missouri, '91

Lindes, Deborah Suzanne
Palo Alto, CA
B.S., Stanford University, '91

Lohrbach, Brian Lee
Appleton, WI
B.S., University of Wisconsin, '92

Loren, David Ethan
New Rochelle, NY
B.A., Washington University, '91

Lozeron, Michele Marie
Ballwin, MO
B.S., University of Wisconsin, '92

Lu, James
Addison, IL
B.S., University of Chicago, '92

Mahr, Michael Anton
Centralia, IL
B.S., University of Illinois, '92

Makram, Maurice Nabil
Parkesburg, PA
B.S., Brown University, '91

Malempati, Suman
Pikeville, KY
B.A., Duke University, '90

Maranzano, Elizabeth A.
Madison, NJ
B.A., Wellesley College, '92

Melford, Ryland
Cincinnati, OH
B.S., Michigan State University, '91

Meng, Sherry Fanlu
Hacienda Hts, CA
B.A., University of California, Berkeley, '90

Miller, Julie Ann
Houston, TX
B.A., University of Texas '92

Minutello, Robert Mark
Brooklyn, NY
B.S., Brown University, '91

Montani, David M.
St Louis, MO
B.A., Harvard University, '91

Neidhart, Linda Renee
Chanhassen, MN
B.A., Carleton College, '85;
M.A., Boston University, '87;
M.S., Northwestern University, '91;

Olsen, Neil Marvin
Corvallis, OR
B.S., Washington State University, '91

Pass, Randall Steven
St Louis, MO
B.S., Yale University, '90

Payne, Jennifer Lanier
Beckley, WV
B.S., Davidson College, '90

Ricca, Christoper E.
Glen Ellyn, IL
B.S., University of Illinois, '92

Ruecker, Karen E.
Manchester, MO
B.A., Rice University, '92

Sagel, Scott David
Creve Coeur, MO
B.A., University of Michigan, '92

Salzhauer, Michael A.
Orangeburg, NY
B.A., Brooklyn College - CUNY, '93

Schiel, Kimberly Ann
Chicago, IL
B.S., Washington University, '92

Serlin, David Michael
Ferndale, MI
B.A., Washington University, '92

Shah, Amit Gunvant
Matteson, IL
B.S., University of Illinois, '92

Shah, Monika Kanu
Arlington Hgts, IL
B.S., University of Illinois, '92

Shannon, Scott Edwin
Wheaton, IL
B.A., Wheaton College, '91

Shiue, Katherine M.
Henderson, NV
B.S., Washington University, '92

Shry, Eric Allen
Russellville, AR,
B.A., Washington University, '92

Skeete, Dionne Allison
Miami, FL
B.S., University of Miami, '92

Sou, Jenny
Marion, IN
B.S., Purdue University, '92

Stevens, Eric Christopher
Sacramento, CA
B.S., University of California, Davis, '92

Stocklin, Catherine Jane
Austin, TX
B.S., University of Texas, '90

Sturtevant, Heidi A.
Aurora, CO
B.A., University of Denver, '92

Thekdi, Apurva Arvind
Sylvania, OH
B.A., Northwestern University, '92

Tong, Eugene
Spring, TX
B.A., Rice University, '92

Tsou, Christine Chaming
Alhambra, CA
B.A., University of California, Berkeley, '92

Ung, Feodor
Flushing, NY
B.A., Harvard University, '92

Wakoff, Alison Rachel
Wilton, CT
B.A., Harvard University, '92

Wang, Wen-Hung
Plano, TX
B.A., Washington University, '92

Weigle, Kathleen Anne
Cherry Hill, NJ
B.A., Dartmouth College, '92

Willeumier, Nicole Denise
Bloomfield, MI
B.S., University of Michigan, '92

Yang, Robert K.
Potomac, MD
B.S., Washington University, '92

Young, Terence Shawn
Brooklyn, NY
B.S., Morehouse College, '92

Zoberi, Imran
Vermillion, SD
B.S., University of South Dakota, '92

First-Year Class

Agarwala, Amit Omprakash
Baltimore, MD
B.S., The Johns Hopkins University, '93

Allen, Thomas John
Lexington, MA
B.A., College of the Holy Cross, '86

Anderson, Kirsten Lynn
Brentwood, MO
B.S., Princeton University, '92

Angstreich, Greg Richard
Syosset, NY
B.A., Washington University, '93

Appel, Noah Bennett
Houston, TX
B.A., Washington University, '93

Aulivola, Bernadette
Holtsville, NY
B.S., SUNY at Stony Brook, 93

Baglan, Julie Ann
St. Louis, MO
B.S., Brown University, '93

Baglan, Kathy Lynn
St. Louis, MO
B.A., Washington University, '93

Bane, Amy, Elizabeth
Edwardsville, IL
B.S., University of Illinois, '93

Barnes, Alison Madearie
Memphis, TN
B.S., Spelman College, '93

Barrera, Pamela
Houston, TX
B.A., William Marsh Rice University, '93

Blam, Oren Gil
Pt. Washington, NY
B.A., SUNY at Binghamton, '93

Brechtdoscher, Aimee Radhia
Venice, CA
B.A., University of California, San Diego, 93

Brown, Amy Margaret
Sauk City, WI
B.S., University of Wisconsin, Madison, '93

Brown, Kathryn Corinne
Orange, TX
B.A., The Johns Hopkins University, '93

Bruckel, Matthew Martin
Auburn, AL
B.S., Auburn University, '93

Brunschwig, Ari Scott
Denver, CO
B.S., Stanford University, '92

Carns, Jason
Scottsdale, AZ
B.S., University of Pennsylvania, '92

Chen, Belinda
Lake Hiawatha, NJ
B.S., Washington University, '92

Chuang, Hubert Hsing
Cambridge, MA
B.S., Yale University, '92

Chung, Ben
Berkeley, CA
B.A., University of California, Berkeley, '93

Clements, Mark Allen
Plymouth, IN
B.S., Butler University, '93

Cohran, Valeria Cornell
Senatobia, MS
B.S., Tougaloo College, '93

Cousins, Marleen Annette
Columbus, OH
B.S., Ohio State University, '93

DeLamielleure, Jennifer Lynn
Ann Arbor, MI
B.S., Indiana University, Bloomington, '93

Desch, Karl Coe
St. Charles, IL
B.S., Indiana University, Bloomington, '92

Dolan, Dan Hennessy
Columbia, MO
B.S., University of Missouri, Columbia, '92

Dudek, Scott Matthew
Channahon, IL
B.A., Washington University, '92

Evans, Jason Lynn
Norman, OK
B.S., Oklahoma University, '93

Ferrone, Cristina Rosa
Scarsdale, NY
B.S., University of Pennsylvania, '93

Fisher, Daniel Arthur
Seattle, WA
B.S., University of Washington, '91

Frank, Rachel Anne
East Lansing, MI
B.A., University of Michigan, Ann Arbor, '92

Fuchs, Julie Robin
Stanford, CA
B.S., Stanford University, '93

Gallahue, Fiona
Arlington, VA
B.A., Washington University, '92

Gold, Jennifer Sue
St. Louis, MO
B.S., Cornell University, '91

Gorman, Gregory Harron
Washington, DC
B.A., Georgetown University, '93

Gupta, Vivek Kumar
University City, MO
B.A., Washington University, '93

Gym, Aimee Sue
Stanford, CA
B.S., Stanford University, '93

Halpin, Valerie Jo
Olympia, WA
B.S., University of Washington, '93

Hanson, Travis Wade
Houston, TX
B.A., William Marsh Rice University, '93

Harper, Adrienne Kathryn
Pensacola, FL
B.S., University of West Florida, '91

Harper, Kimberly Louise
Alamo, CA
B.S., Stanford University, '92

Hendin, Lori Beth
Pasadena, CA
B.A., Wesleyan University, '92

Hill, Matthew Walter
St. Louis, MO
B.A., Washington University, '93

Igwebuike, Ada Rita
Kent, OH
B.S., Kent State University, '93

Johnson, Devin Brooke
Salt Lake City, UT
B.S., University of Utah, '93

Johnson, Lloyd
Hanover, NH
B.A., Dartmouth College, '93

Jones, Michele Lili
Ann Arbor, MI
B.S., University of Michigan, Ann Arbor, '93

Kapur, Vineet
Gilbert, AZ
B.S., Arizona State University, '93

Kleindorfer, Dawn
Bloomington, IN
B.S., Indiana University at Bloomington, '92

Kogelman, Laura
New Haven, CT
B.S., Yale University, '93

Kuchnir, Louis Daniel
Arlington, MA
B.S., Massachusetts Institute of Technology, '87

Kumar, Dana Ann
Champaign, IL
B.S., University of Illinois, '93

Kwon, Brian
St. Louis, MO
B.A., Washington University, '93

Lamberti, Paul Matthew
Urbana, IL
B.S., University of Illinois, '93

Lawrence, Steven
Clayton, IN
B.S., Rose-Hulman Institute of Technology, '92

Le, Francoise G.
Germantown, MD
B.S., University of Maryland, College Park, '92

Leacock, Natasha
Urbana, IL
B.S., University of Illinois, '93

Lee, Charles K.
St. Louis, MO
B.A., Washington University, '93

Lotsoff, David S.
Arlington Heights, IL
B.S., University of Illinois, '93

McGregor, David
Leawood, KS
B.A., Washington University, '93

Mahoney, Robert John
St. Louis, MO
B.A., Princeton University, '93

Manheimer, Karen
New York, NY
B.S., Princeton University, '89

Martin, Tracie Ann
Ames, IA
B.S., Iowa State University, '93

Meltzer, Sharon
Englewood, CO
B.A., Duke University, '92

Menteer, Jon-David
Colleyville, TX
B.A., University of California, Berkeley, '90

Merrick, John
Half Moon Bay, CA
B.A., Miami University, '92

Monrad, Seetha Ursala
Urbana, IL
B.S., University of Illinois, '93

Mooney, Kathleen
Brockton, MA
B.S., University of Notre Dame, '92

Neidhart, David
Chesterfield, MO
B.A., Carleton College, '84

Nemeth, Blaise Alexander
Boulder, CO
B.A., University of Colorado, Boulder, '93

Nguyen, Quyen To
Los Angeles, CA
B.S., University of Southern California, '93

Oh, Charles
Ormond Beach, FL
B.S., University of Miami, '92

Oldham, Lisa Marie
Chicago, IL
B.A., Stanford University, '91

Omurtag, Meral
St. Louis, MO
B.S., Washington University, '93

Ou, Henry
Ithaca, NY
B.A., Cornell University, '93

Overdeck, Daniel L.
Evanston, IL
B.A., Northwestern University, '93

Paulos, Mark
Coraopolis, PA
B.A., Brown University, '93

Perron, Gregory
Glendale, AZ
B.A., University of Virginia, '93

Peterson, Daniel
Greenwood, NE
B.S., University of Nebraska at Lincoln, '93

Piltch, Rebecca
St. Louis, MO
B.S., University of Michigan, '92

Poulin, Eric
Tulsa, OK
B.S., Oral Roberts University, '93

Preddie, Dean
Berrien Springs, MI
B.S., Andrews University, '93

Puchalski, Robert
Ithaca, NY
B.A., Cornell University, '93

Putcha, Girish
London, France
B.A., William Marsh Rice University, '91

Rao, Rekha C.
Menlo Park, CA
B.S., Stanford University, '92

Reed, Nevada Waugh
Athens, GA
B.S., University of Georgia, '93

Robb, Bruce William
Clayton, MO
B.A., Washington University, '93

Saifee, Owais
St. Louis, MO
B.A., Northwestern University, '93

Sams, James
Arlington, VA
B.A., Duke University, '89

Sater, Nicola
St. Louis, MO
B.S., University of California, Berkeley, '83

Schwartz, Daniel
Boston, MA
B.S., Massachusetts Institute of Technology, '93

Sheinker, Claire Diane
Omaha, NE
B.S., Creighton University, '93

Sheppard, Shandra Annette
Lakewood, CO
B.S., University of Denver, '93

Sheu, Susan Shuyan
San Marino, CA
B.S., California Institute of Technology, '93

Shiels, Aaron
Champaign, IL
B.S., University of Illinois, '93

Simpson, Joseph
Creve Coeur, MO
B.A., Harvard University, '92

Slishman, Samuel
Pawlina, NY
B.A., Wesleyan University, '93

Socolow, Joshua
Atlanta, GA
B.S., Yale University, '93

Sommers, Thomas
St. Louis, MO
B.S., William Marsh Rice University, '93

Song, Steve
Emeryville, CA
B.A., University of California, Berkeley, '93

Stambuk, Mikula
Washington, DC
B.S., University of California, Berkeley, '92

Stevens, Susan
Glen Ellyn, IL
B.S., University of Illinois, '93

Stoffel, John T.
Stanford, CA
B.H., Stanford University, '93

Stone, Laura
Baltimore, MD
B.A., Yale University, '92

Strauss, Gordon Jay
Dania, FL
B.S., University of Florida, '92

Thomure, Jennifer
Bloomington, IN
B.A., Cornell University, '93

Tun, Sovanrith
Silver Spring, MD
B.S., The Johns Hopkins University, '93

Vaishampayan, Anjala R.
Providence, RI
B.S., Brown University, '93

Vedder, Charles Todd
Atlanta, GA
B.A., Emory University, '93

Wang, Lawrence Likai
Cambridge, MA
B.S., Harvard University, '93

Weed, Amy
Durham, NC
B.S., Duke University, '93

Wetmore, Jennifer
New Haven, CT
B.A., Yale University, '93

Whiteside, Karen
Chesterfield, MO
B.A., Washington University, '93

Williams, Jeffrey
Durham, NC
B.A., Duke University, '92

Willmore, Theodore M.
Houston, TX
B.H., University of Texas, Austin, '93

Wiltrout, Lisa Marie
Silver Spring, MD
B.A., Wellesley College, '92

Yang, Howard Chaochong
Cockeysville, MD
B.S., Washington University, '93

Yang, Susan Helen
Palo Alto, CA
B.S., Stanford University, '92

Yu, Janet Li
St. Louis, MO
B.S., Washington University, '93

Yung, David Tsuntat
New York, NY
B.A., Columbia University, '93

Zarrin, Amy Rebecca
Ithaca, NY
B.S., Cornell University, '93

Zerega, Michael James
Bloomington, IN
B.S., Indiana University at Bloomington, '93

SUMMARY OF STUDENTS IN THE SCHOOL OF MEDICINE: 1993-94

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Master of Science in Occupational Therapy Degree

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Second Year	37
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Total	***1099***

STAFF INDEX

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.

Professors Emeriti of Preventive Medicine and Public Health

C. Howe Eller, M.D., University of Colorado, 1930 (Public Health); Ph.D., Johns Hopkins University, 1934.

Robert E. Shank, M.D., Washington University, 1939. (See Department of Medicine.)

Danforth Professor of Preventive Medicine and Public Health

M. Kenton King, M.D., Vanderbilt University, 1951. (See Department of Medicine.)

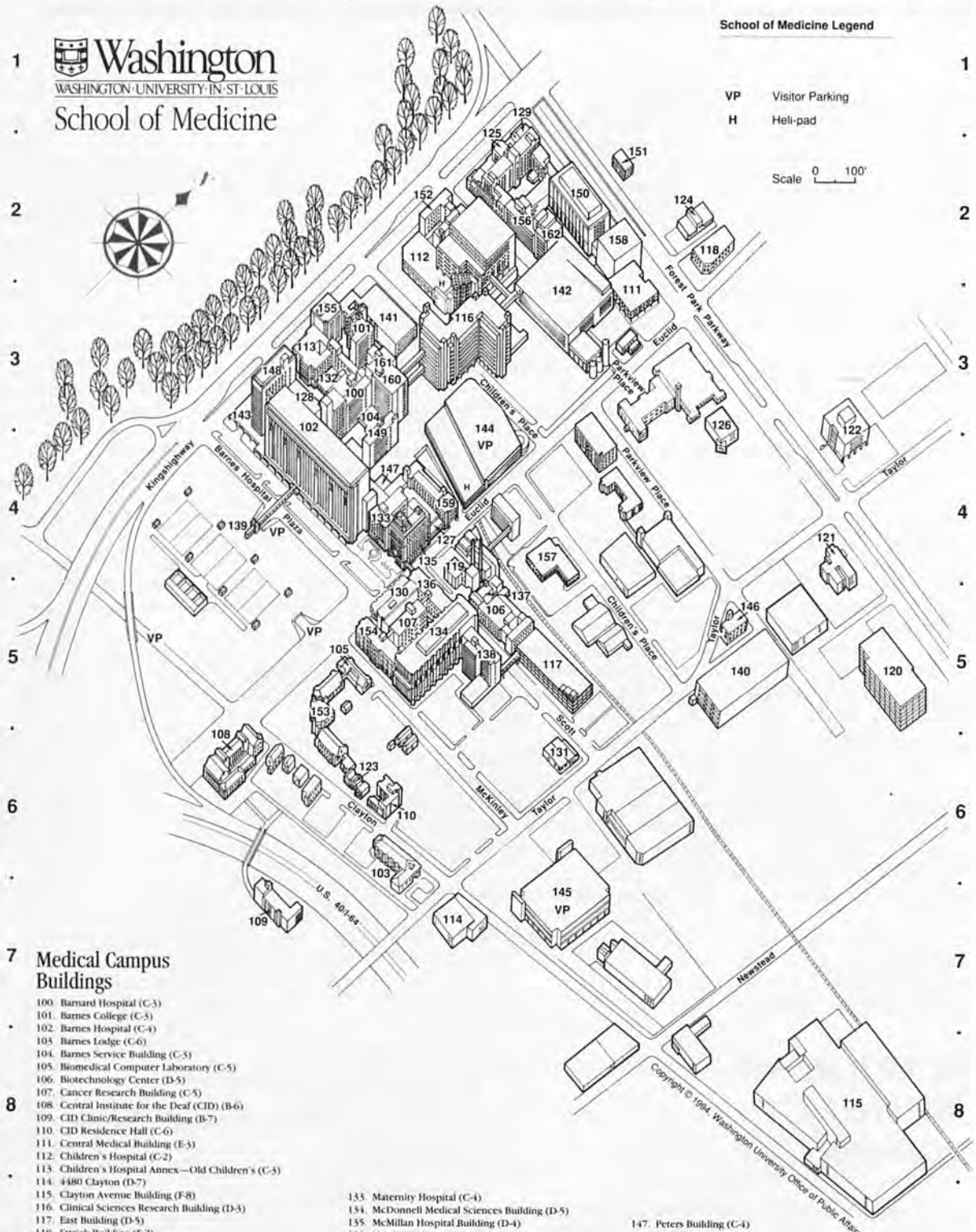
INDEX

SCHOOLS OF WASHINGTON UNIVERSITY

All schools are located at One Brookings Drive, St. Louis, Missouri 63130, except Medicine (660 South Euclid Avenue, 63110). A University-sponsored shuttle bus travels between the Hilltop Campus and the Medical Center every 20 minutes.

College of Arts and Sciences
Graduate School of Arts and Sciences
School of Engineering and Applied Sciences
School of Technology and Information Management
School of Architecture
John M. Olin School of Business
School of Fine Arts
George Warren Brown School of Social Work
School of Law
School of Medicine
University College

The information that appears in this Bulletin was compiled in the spring of 1994. It is current as of April 1, 1994.



Medical Campus Buildings

100. Barnard Hospital (C-3)
101. Barnes College (C-3)
102. Barnes Hospital (C-4)
103. Barnes Lodge (C-6)
104. Barnes Service Building (C-3)
105. Biomedical Computer Laboratory (C-5)
106. Biotechnology Center (D-5)
107. Cancer Research Building (C-5)
108. Central Institute for the Deaf (CID) (B-6)
109. CID Clinic/Research Building (B-7)
110. CID Residence Hall (C-6)
111. Central Medical Building (E-3)
112. Children's Hospital (C-2)
113. Children's Hospital Annex—Old Children's (C-3)
114. 4480 Clayton (D-7)
115. Clayton Avenue Building (F-8)
116. Clinical Sciences Research Building (D-3)
117. East Building (D-5)
118. Ettrick Building (E-2)
119. Euclid Power Plant (D-4)
120. 4444 Forest Park (G-5)
121. 4488 Forest Park (F-4)
122. 4511 Forest Park Medical Building (F-3)
123. Health Administration (C-6)
124. Internal Medicine Business Office (E-2)
125. Jewish Hospital (D-2)
126. Jewish Hospital Daycare (F-3)
127. Irene Walter Johnson Institute of Rehabilitation (D-4)
128. Rand Johnson Building (C-3)
129. Kingshighway Building (D-1)
130. Library and Biomedical Communications Center (C-5)
131. Library Annex (D-6)
132. Mallinckrodt Institute of Radiology (C-3)
133. Maternity Hospital (C-4)
134. McDonnell Medical Sciences Building (D-5)
135. McMillan Hospital Building (D-4)
136. North Building (D-5)
137. Occupational Therapy Program (D-5)
138. Spencer T. Olin Residence Hall (D-5)
139. Parking Facility, Barnes Plaza (B-4)
140. Parking Facility, Barnes (Taylor Avenue) (F-5)
141. Parking Facility, Children's Hospital (C-3)
142. Parking Facility, Jewish Hospital (D-3)
143. Parking Facility, Queeny Tower (B-5)
144. Parking Facility, School of Medicine (Euclid and Children's Place) (D-3)
145. Parking Facility, School of Medicine (Taylor and Clayton) (D-7)
146. Parkview Building (F-5)
147. Peters Building (C-4)
148. Queeny Tower (C-3)
149. Renard Hospital (C-4)
150. Shoenberg Pavilion (E-2)
151. Shoenberg Research Building (E-2)
152. Shoenberg School of Nursing (D-2)
153. Shriners Building (C-5)
154. South Building (C-5)
155. Spoehrer Children's Hospital Tower (C-3)
156. Steinberg Building (D-2)
157. Storz Building (D-4)
158. Waldheim Ambulatory Care Facility (E-2)
159. West Building (D-4)
160. Wohl Clinic (C-3)
161. Wohl Hospital Building (C-3)
162. Yalem Research Building (D-2)

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